# APPLICATION FOR CERTIFICATION

FOR THE

# LOS ESTEROS CRITICAL ENERGY FACILITY

## SAN JOSE, CALIFORNIA

## VOLUME II: APPENDICES

Submitted to:

**California Energy Commission**
Sacramento, California

Submitted by:

**Los Esteros Critical Energy Facility, LLC**

San Jose, California

**December 2003**

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# *Los Esteros Critical Energy Facility*

# *Appendix 1-A*
# *Legal Description of Project Parcel*

***December 2003***

OCTOBER 16, 2003
JOB NO. 210043-10
LEGAL. 28

EXHIBIT A
TO
TEMPORARY CONSTRUCTION EASEMENT AGREEMENT

LEGAL DESCRIPTION
LANDS OF LOS ESTEROS CRITICAL ENERGY FACILITY (LECEF)

ALL THAT REAL PROPERTY SITUATE IN THE COUNTY OF SANTA CLARA, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

ALL THAT CERTAIN 12.943 ACRE PARCEL OF LAND SHOWN AND SO DESIGNATED AS "UNOCCUPIED LANDS OF LECEF" ON THAT CERTAIN RECORD OF SURVEY FILED FOR RECORD IN THE OFFICE OF THE COUNTY RECORDER OF SANTA CLARA COUNTY IN BOOK 760 OF MAPS AT PAGE 50, TOGETHER WITH A PORTION OF THAT 20.830 ACRE PARCEL OF LAND SHOWN AND SO DESIGNATED AS "LOS ESTEROS CRITICAL ENERGY FACILITY (LECEF)" ON SAID RECORD OF SURVEY (760 M 50), ALL OF WHICH IS DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWESTERN CORNER OF SAID 12.943 ACRE LECEF PARCEL; THENCE, FROM SAID POINT OF BEGINNING, NORTHERLY ALONG THE WESTERN LINE THEREOF AND ALONG THE WESTERN LINE OF SAID 20.830 ACRE LECEF PARCEL NORTH 14°30'59" WEST 1443.99 FEET; THENCE, LEAVING SAID WESTERN LINE NORTH 75°29'01" EAST 1020.52 FEET TO A POINT ON THE EASTERN LINE OF SAID 20.830 ACRE LECEF PARCEL; THENCE, SOUTHERLY ALONG SAID EASTERN LINE AND ALONG THE EASTERN LINE OF SAID 12.943 ACRE LECEF PARCEL SOUTH 14°31'34" EAST 1433.32 FEET TO A POINT WHICH BEARS NORTH 74°53'04" EAST FROM THE HEREINABOVE DESCRIBED POINT OF BEGINNING; THENCE, SOUTH 74°53'04" WEST 1020.67 FEET TO THE POINT OF BEGINNING AND CONTAINING 33.709 ACRES OF LAND, MORE OR LESS.

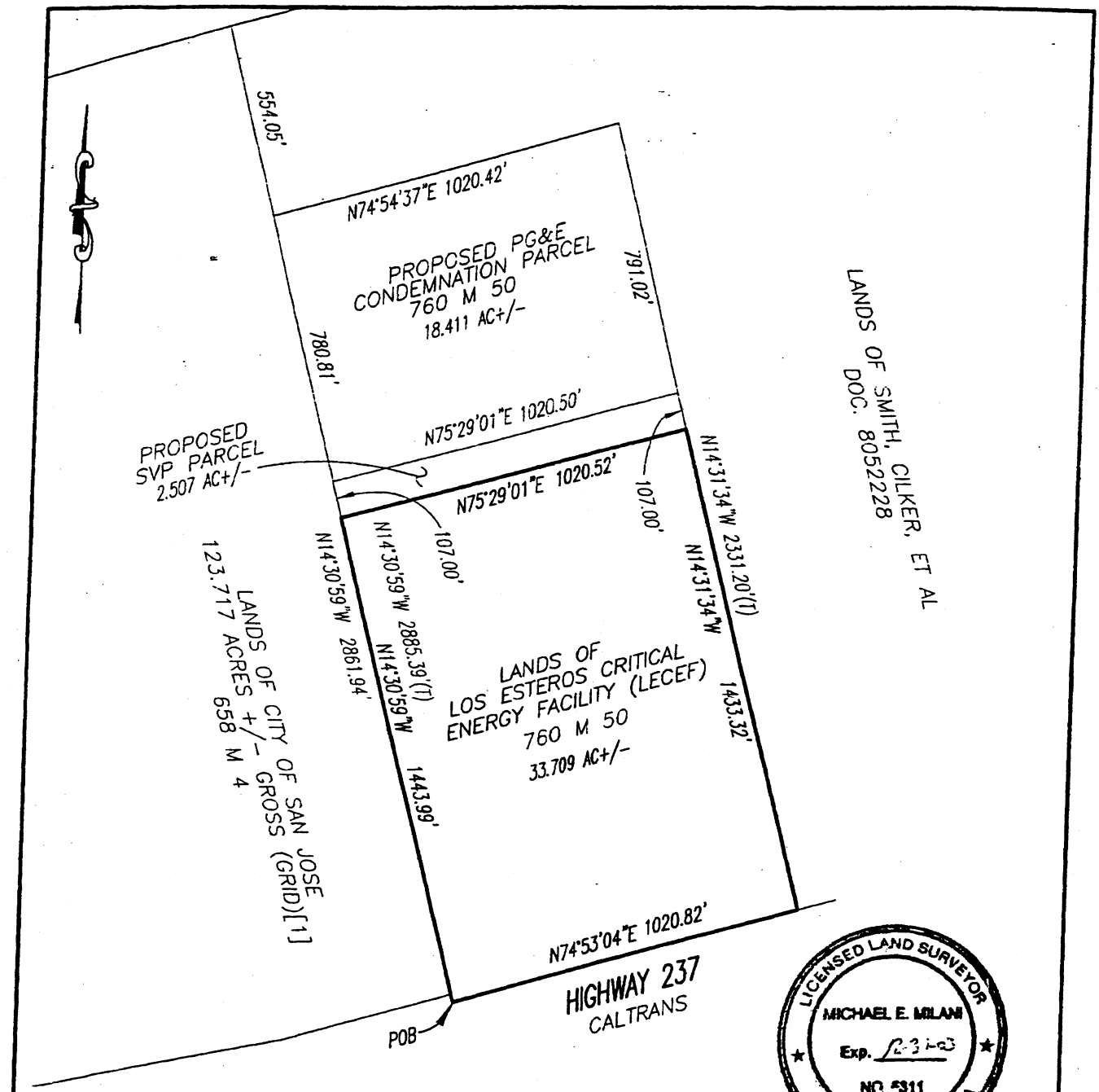
THE DISTANCES GIVEN IN THIS DESCRIPTION ARE GROUND DISTANCES; TO CONVERT TO GRID DISTANCES MULTIPLY DISTANCES GIVEN BY 0.999945623.

ALL AS SHOWN ON EXHIBIT "A" ATTACHED HERETO AND MADE APART HERE OF.

END OF DESCRIPTION

LICENSED LAND SURVEYOR
MICHAEL E. MILANI
Exp. 12-31-03
NO. 5311
STATE OF CALIFORNIA

FOR MILANI & ASSOCIATES
MICHAEL E. MILANI
L.S. 5311
EXPIRES: 12/31/03




LICENSED LAND SURVEYOR
MICHAEL E. MILANI
Exp. 12-31-03
NO. 5311
STATE OF CALIFORNIA

# LOS ESTEROS CRITICAL ENERGY FACILITY (LECEF)

## PORTION OF LECEF PARCEL PER 760 M 50

## SANTA CLARA COUNTY – CALIFORNIA


& Associates
MILANI

Planners – Engineers – Surveyors
4071 Port Chicago Hwy., Suite 100
Concord CA 94520-1122
Phone: (925) 674-9082
Fax: (925) 674-9279


FOR MILANI & ASSOCIATES
MICHAEL E. MILANI
LS 5311, EXP. 12/31/03

OCTOBER 16, 2003

SCALE: 1"=400'

SHEET 1 OF 1 SHEET

10043-10\LGL16 (FOR LEGAL.28)

OFFICE OF COUNTY ASSESSOR — SANTA CLARA COUNTY, CALIFORNIA

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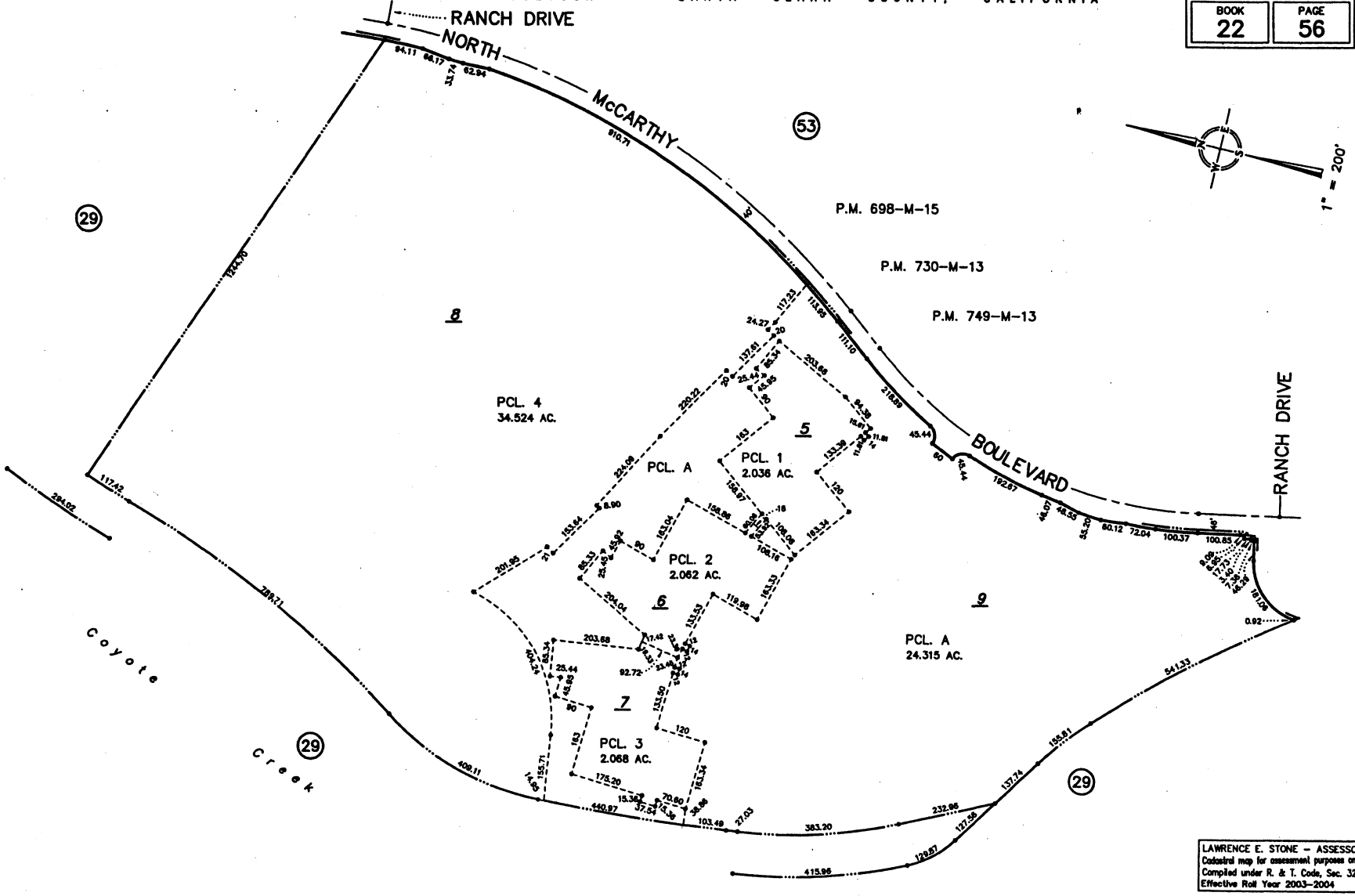


LAWRENCE E. STONE – ASSESSOR
Cadastral map for assessment purposes only.
Compiled under R. & T. Code, Sec. 327.
Effective Roll Year 2003-2004

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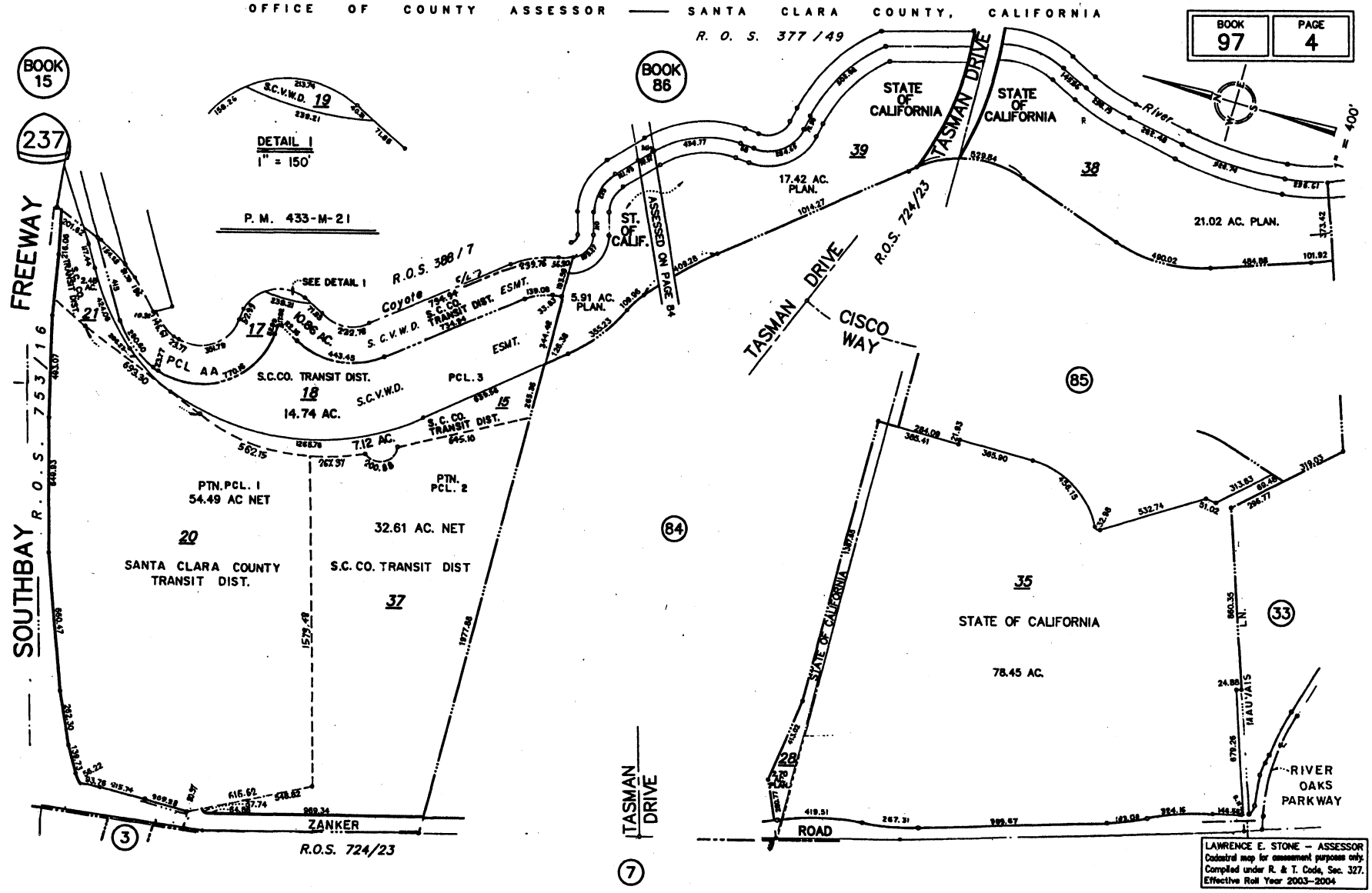

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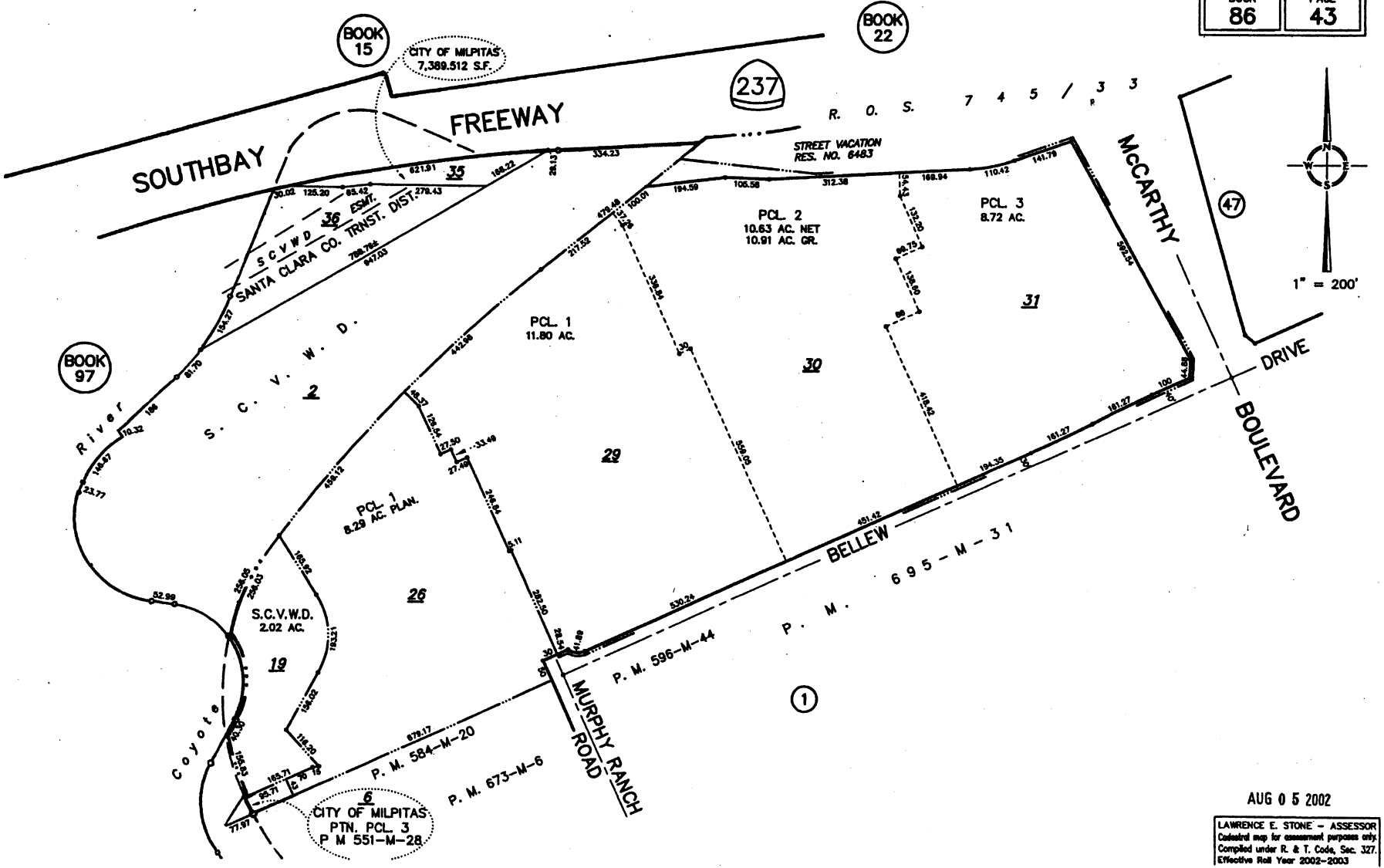


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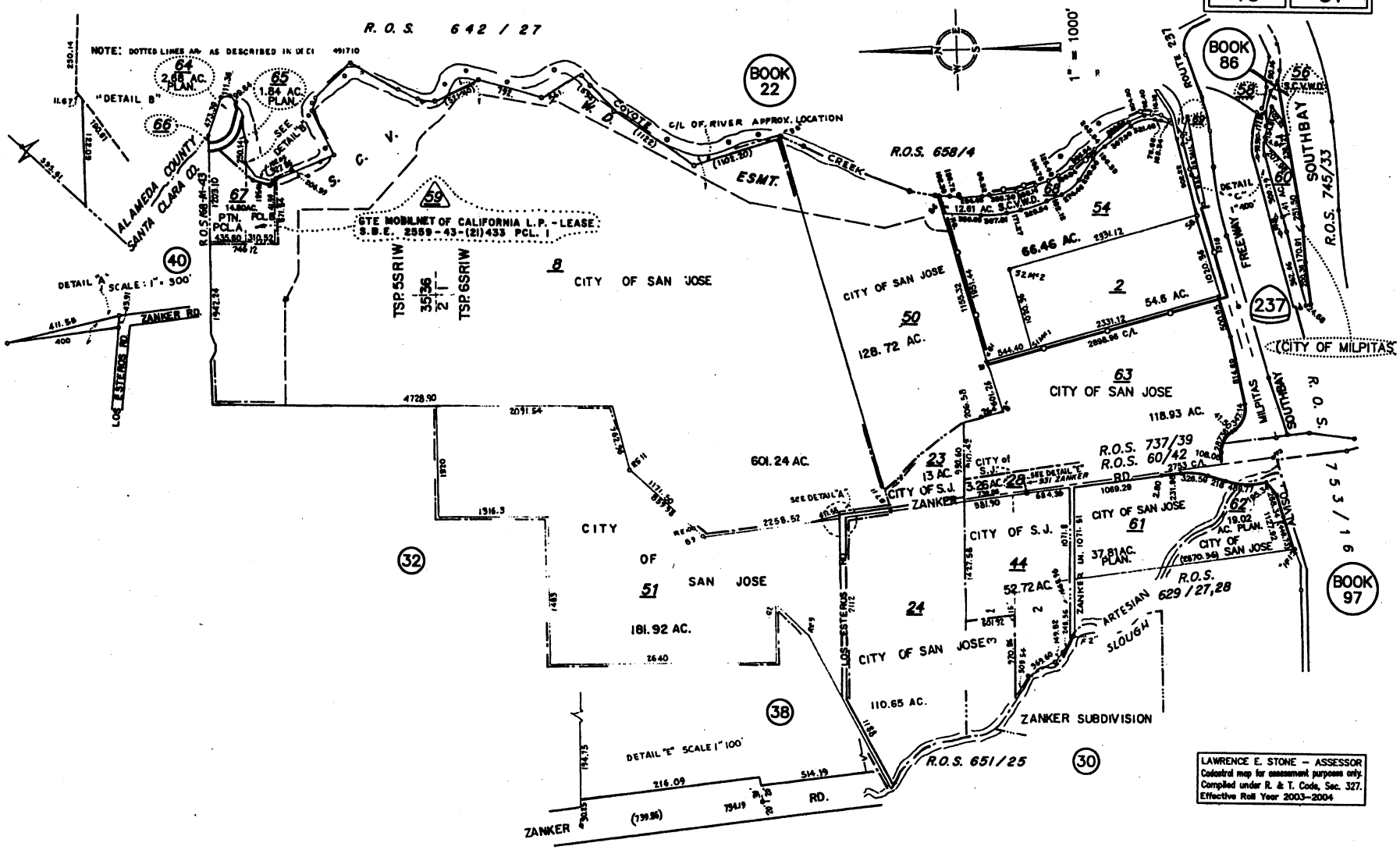


LAWRENCE E. STONE — ASSESSOR
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Effective Roll Year 2003-2004

# *Los Esteros Critical Energy Facility*

## *Appendix 1-B*
## *Owners Adjacent to the Site and Linear Corridors*

***December 2003***

015 31 002
NORTH SAN JOSE ENERGY CENTER
1515 ALVISO-MILPITAS
ALVISO CA 95002

015 31 054
ELIZABETH C SMITH
1631 WILLOW ST #225
SAN JOSE CA 95125

015 31 056
SANTA CLARA VALLEY WATER DIST
5750 ALMADEN EXPRESSWAY
SAN JOSE CA 95118

015 31 058
MCCARTHY RANCH
367 CYPRESS DR
MILPITAS CA 95035

015 31 060
CITY OF MILPITAS
455 E CALAVERAS BLVD
MILPITAS CA 95035

015 31 063
CITY OF SAN JOSE
FIRST & MISSION ST
SAN JOSE CA 95110

015 31 068
SANTA CLARA VALLEY WATER DIST
5750 ALMADEN EXPRESSWAY
SAN JOSE CA 95118

015 31 069
SANTA CLARA VALLEY WATER DIST
5750 ALMADEN EXPRESSWAY
SAN JOSE CA 95118

022 56 009
FIRST SECURITY BANK
370 ELLIS ST
MOUNTAIN VIEW CA 94043

086 43 002
SANTA CLARA VALLEY WATER DIST
5750 ALMADEN EXPRESSWAY
SAN JOSE CA 95118

086 43 029
ABN AMRO LEASING INC
160 RIO ROBLES #D
SAN JOSE CA 95134

086 43 030
TENCOR CORP KLA
160 RIO ROBLES #D
SAN JOSE CA 95134

086 43 035
CITY OF MILPITAS
455 E CALAVERAS BLVD
MILPITAS CA 95035

086 43 036
SANTA CLARA COUNTY TRANSIT DIS
3331 N FIRST ST
SAN JOSE CA 95134

097 04 017
SANTA CLARA COUNTY TRANSIT DIS
3331 N FIRST ST
SAN JOSE CA 95134

097 04 018
SANTA CLARA COUNTY TRANSIT DIS
3331 N FIRST ST
SAN JOSE CA 95134

097 04 020
SANTA CLARA COUNTY TRANSIT DIS
3331 N FIRST ST
SAN JOSE CA 95134

097 04 021
SANTA CLARA COUNTY TRANSIT DIS
3331 N FIRST ST
SAN JOSE CA 95134

TETRA TECH FW, INC.
3947 LENNANE DRIVE, STE 200
SACRAMENTO, CA 95834
ATTN: DOUG DAVY

# *Los Esteros Critical Energy Facility*

## *Appendix 1-C*
## *Persons Who Prepared the AFC*

***December 2003***

# APPENDIX 1C
# LIST OF CONTRIBUTORS

| Affiliation | Name | Responsibility |
|---|---|---|
| Calpine Corporation | Rick Tetzloff, P.E. | Project Manager |
| | Geoffrey Baxter, P.E. | Project Engineer |
| | Bob McCaffrey | General Manager, South Bay Projects |
| | Dana Petrin | Compliance Manager, South Bay Projects |
| | Charles Hoock | Operations Manager, South Bay Projects |
| | Mark Breen | Plant Engineer, South Bay Projects |
| | Dan Sampson | Water Specialist |
| | Alan Roth | Transmission Engineering |
| | Ali Amirali | Transmission Engineering |
| Ellison, Schneider & Harris | Gregg Wheatland | Legal Counsel |
| | Jeff Harris | Legal Counsel |
| De Young Environmental Consulting | Steve De Young | Environmental Permitting Manager |
| Tetra Tech FW, Inc. | Douglas M. Davy, Ph.D. | Project Manager |
| | Tim Presley | Noise |
| | Suzanne Burnell | Water Resources |
| | Monica Caravati | Public Health |
| | Jenna Farrell | Cultural Resources |
| | Eric Htain | Biological Resources |
| | Amanda Johnson | Soils and Agriculture |
| | Tamer Kirac | Socioeconomics |
| | Matt Kozleski | CAD, GIS |
| | Brent Moore | Land Use |
| | David Perry | Visual Resources |
| | Aileen Giovanello | Traffic and Transportation |
| | Leo Sicuranza | Alternatives |
| | Thomas Stewart, Ph.D. | Paleontology, Geological Resources |
| | Connie Stark | Document Production, Technical Editing |
| | Douglas Urry | Hazardous Materials Handling, Waste Management |
| Sierra Research | Nancy Matthews | Air modeling |
| | Gary Rubenstein | Air Quality |
| 3DScape | Timothy Zack | Visual simulation |
| Hessler Associates | Elden Ray, INCE | Noise modeling |

| | |
|---|---|
| CH2M Hill | Some of the information in this AFC is based on material developed by CH2M Hill for the 2000 AFC for Phase 1 of the LECEF. The conclusions and recommendations in this AFC, however, are those of Calpine Corporation, Tetra Tech FW, Sierra Research, and their subconsultants. |

# *Los Esteros Critical Energy Facility*

# *Appendix 5-A*
# *Alternative Interconnection System Impact/Facilities Study*

***December 2003***

# APPENDIX 5-A

PLEASE NOTE:

Appendix 5-A is not available electronically and on our website because of “sensitive technical information.”

Please contact the Energy Commission's Project Manager Robert Worl for a printed version.

Bob Aldrich
Webmaster
California Energy Commission

# *Los Esteros Critical Energy Facility*

# *Appendix 5-B*
# *EMF and Power Line Concepts*

***December 2003***

## EMF CHARACTERISTICS

The power system frequency in the United States is 60 cycles per second or 60 hertz (Hz). At 60 Hz the electromagnetic field is calculated as two separate fields: an electric field and a magnetic field. These fields are a naturally occurring phenomenon associated with electricity. The electric and magnetic fields have the same frequency as the electricity that creates them. Thus, the fields that are the subject of this report are 60 Hz fields. Electric field concepts are presented below, followed by a discussion of magnetic fields.

### Electric Fields

The quantity of electricity is defined in terms of electric charge. "Electric charge, like mass, length, and time, is accepted as a fundamentally assumed concept, required by the existence of forces measurable experimentally: other definitions of electromagnetic quantities are developed on the bases of these four concepts."[1]

The potential energy stored in an electric charge is measured in volts. Voltage on a wire is often described as analogous to water pressure in a pipe.

An electric field exists wherever there is an electric charge. The electric field is an invisible force that exists in space between positive and negative electric charges. An electric field has a direction associated with it, from positive charge to negative charge. It is measured in units of kilovolts per meter (kV/m). An electric field is present wherever there is electrical energy, including home wiring, appliances, and power lines. Electric fields have the following characteristics:

1. The strength of the electric field is proportional to the voltage of the electric system causing it. Thus, a high-voltage power line would have a higher electric field than low-voltage house wiring.

2. The strength of the electric field decreases as the distance from the source increases. Thus, moving farther from a power line will reduce the field.

3. An electric field is stopped by ground and can be shielded by enclosing it within a grounded metallic object. Trees, bushes, houses, etc., will also significantly attenuate electric fields.

4. Two electric fields may tend to add together or cancel each other depending upon whether they are in the same or opposite directions.

5. Electric fields will induce a charge on ungrounded metallic objects within the field. Thus, electric utilities take precautions to ground fences and metal buildings that are very close to transmission lines.

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[1] IEEE Standard Dictionary of Electrical and Electronics Terms

6. People are able to detect the presence of some electric fields by sensation of small body hairs. This detection depends upon the strength of the field and the sensitivity of the person.

**Magnetic Fields**

A magnetic field is produced whenever electric current flows. Current is the movement of electric charges and is measured in amperes (also called amps). The magnetic field is an invisible force that exists in space around the current source. The unit used to measure magnetic field is milliGauss (mG).

The characteristics of magnetic fields are listed below. In many ways, magnetic fields differ from electric fields described above.

1. The strength of a magnetic field is proportional to current. The relevance of this will be discussed in more detail in the section on power lines.

2. The strength of a magnetic field decreases as the distance from the source increases. Thus, moving farther from a power line will reduce the magnetic field, similar to the electric field.

3. A magnetic field is not stopped by ground and is not significantly attenuated by buildings, trees, etc. It is attenuated only if the current source is enclosed by a magnetic material.

4. Two magnetic fields may tend to add together or cancel each other depending upon whether they are in the same or opposite direction.

5. A magnetic field will induce current in a conducting metallic loop. This is a concern to electric utilities where pipelines or railroads are close to and parallel to power lines. Precautions are taken to prevent the induced currents from causing interference to the corrosion protection system on pipelines or to communication systems on railroads.

6. People are not able to sense the presence of a magnetic field.

A magnetic field will be found near household appliances and home wiring, as well as power lines.

To review the terminology, voltage is a measure of the potential energy of the electrical charge, analogous to the potential energy of water pressure inside a pipe. An electric field is associated with voltage. Current is the movement of electrical charge in a wire, analogous to the flow of water in a pipe. A lamp plugged into the household wall outlet will have voltage to the switch, but current will flow only when the switch is turned on. A magnetic field is associated with current.

## Measurement and Calculation of EMF

The measurement of the strength of electric and magnetic fields is made with readily available meters. A different meter is needed to measure each. The Institute of Electrical and Electronic Engineers (IEEE) develops and publishes guidelines and standards for instrumentation and measurement procedures. Near power lines, the standards state that the fields are to be measured at 1 meter (3.28 feet) above ground. The field strengths given in this report are calculated at 1 meter above ground.

The electric and magnetic fields associated with a power line have a special orientation with regard to the power line. The electric field (near the power line) at 1 meter above ground is essentially vertical along the route of the power line. Magnetic fields, on the other hand, may have vertical and horizontal components. It is important, especially when making measurements, that orientation of the field be taken into consideration.

In this report, calculation of magnetic field strengths refers to the maximum field rather than a horizontal or vertical component.

# POWER TRANSMISSION CONCEPTS

## Power Line Voltages and Currents

The electric and magnetic fields are calculated for typical transmission line configurations. Transmission lines are almost always three-phase (three conductors servicing a particular load or customer). For the calculations in this report we have assumed the three phases to be balanced in voltage and current.

Electric utilities operate power lines at nearly constant voltage; normal operation is typically within 5 percent of the nominal voltage. Similarly, the voltage maintained within a house is nearly constant at 120 volts. The current over a power line, however, will vary considerably as power requirements change. This same situation occurs within a house. The electrical outlets in the home will all supply power at nearly 120 volts, but if no appliance is turned on, then no current flows. However, as refrigerators, lamps, and various appliances are turned on, more and more current flows to provide power. Thus, the current varies considerably depending upon the amount of power being used.

The electric field, which is proportional to voltage, will be nearly constant under a transmission line since the line is held at nearly constant voltage. On the other hand, the magnetic field, which is proportional to current, will vary greatly during the day as the power requirements on the transmission line vary. In discussing the magnetic field near a transmission line it is, therefore, important to distinguish the current that was used to determine the magnetic field level. In this report, discussion of magnetic fields will include reference to the associated current level.

# *Los Esteros Critical Energy Facility*

## *Appendix 7-A*
## *Water Resources Will-Serve Letter*

***December 2003***

Attn. - DANA P.

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

**CITY OF SAN JOSE, CALIFORNIA**
**ENVIRONMENTAL SERVICES DEPARTMENT**
Watershed Protection Division
4245 Zanker Road • San Jose, California 95134
Telephone: (408) 945-3000 • Fax: (408) 934-0476

December 10, 2003

Mr. Dana Petrin
Compliance Manager
Los Esteros Critical Energy Facility
3800 Cisco Way
San Jose, CA 95132

Subject: Ability to Serve Recycled Water for Los Esteros Critical Energy Facility (LECEF) - Phase II

Dear Mr. Petrin:

We have received your letter to Saroj Dhillon dated November 25, 2003 advising us of a projected increase in recycled water usage at the Los Esteros Critical Energy Facility located at 1515 Alviso-Milpitas Road. According to your estimates, in 2006 the facility will have a peak use of 2,297,461 gallons per day (gpd) and an average use of 1,357,251 gpd.

This letter confirms the ability of the San Jose/Santa Clara Water Pollution Control Plant as the entity responsible for operation of South Bay Water Recycling to serve your facility with that quantity of recycled water at a minimum pressure of 40 psi as measured upstream of your 18-inch service meter located on Zanker Road.

Please note that if you plan to modify or expand your distribution facilities we recommend that you provide the City of San Jose Environmental Services, South Bay Water Recycling with plans and specifications at least three months in advance of construction in order to ensure that the California Department of Health Services is able to review and approve the modified system before the work is scheduled to begin. Should you have any questions, please contact Saroj Dhillon at (408) 945-5189.

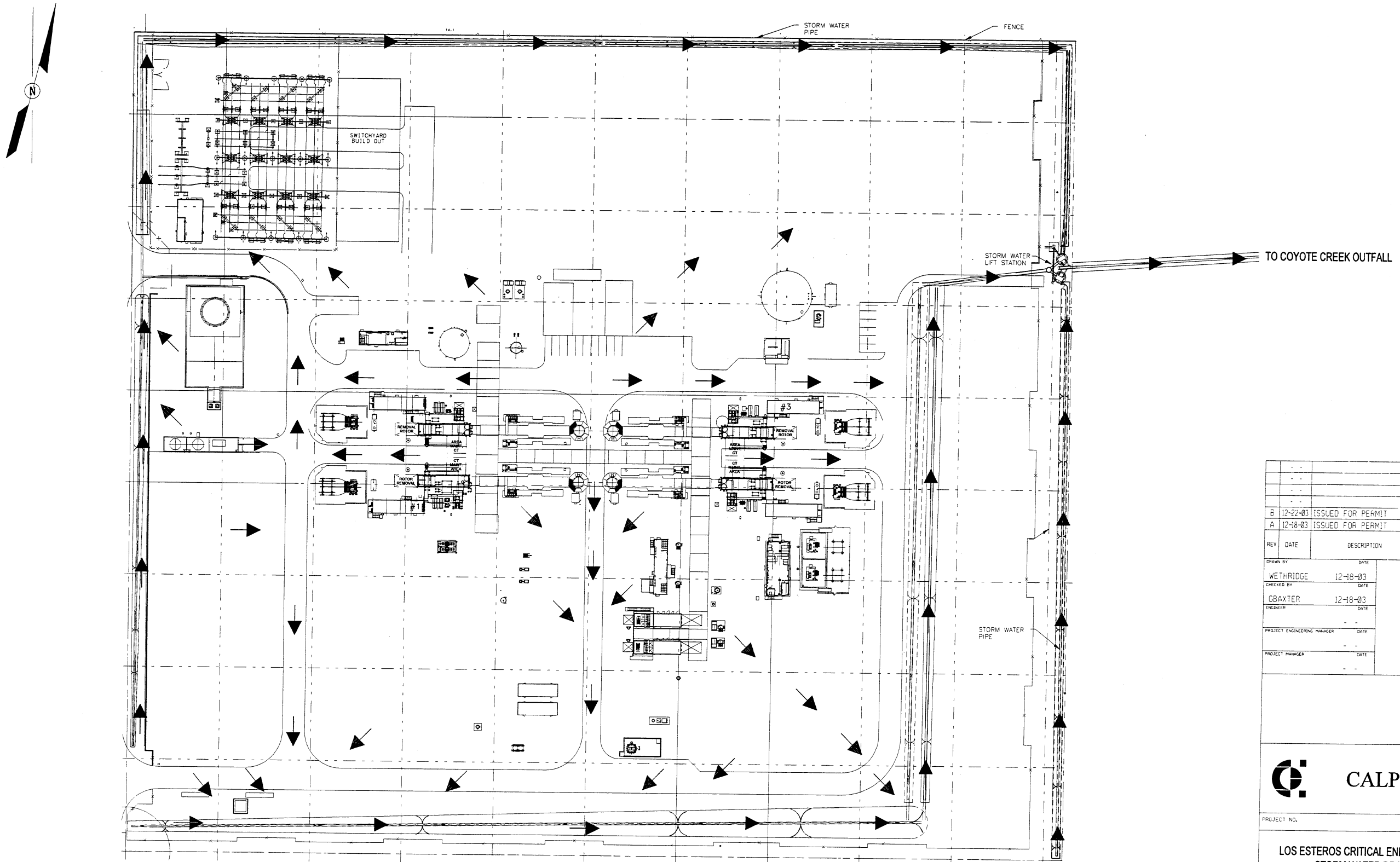
Sincerely,

Randolph A. Shipes
Deputy Director
Environnemental Services Department
Watershed Protection

# *Los Esteros Critical Energy Facility*

# *Appendix 7-B*
# *Storm Water Drainage Diagram – LECEF*
# *Phase 1*

***December 2003***

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| A | 12-18-03 | ISSUED FOR PERMIT | WE | GB | GB | | |

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PROJECT ENGINEERING MANAGER DATE - -
PROJECT MANAGER DATE - -

CALPINE

PROJECT NO.

LOS ESTEROS CRITICAL ENERGY FACILITY
STORM WATER DRAINAGE
EXIST SIMPLE CYCLE (PHASE 1)

SCALE

DWG. NO. LECEF1-G-1005

REVISION B

BASE 2D GRADING_SIMCYCLE.DGN

24x36

# *Los Esteros Critical Energy Facility*

# *Appendix 7-C*
# *Storm Water Runoff Analysis – LECEF*
# *Phase 2*

***December 2003***

## LOS ESTEROS CRITICAL ENERGY FACILITY
## STORM WATER CALCULATIONS

The following section describes the evaluation methodology used to determine the impact of the Phase 2 combined cycle expansion of the LECEF on the existing storm water system. The evaluation determined that the storm water run off for Phase 2 is less than the current Phase 1 configuration and therefore the existing storm facilities and permits are adequate. Since Phase 2 will be constructed within the original Phase 1 project the analysis was done to evaluate the impact of covering some existing open area with equipment foundations. .

The additional equipment installed, as part of Phase 2, will be located in areas currently surfaced with a uniformly graded crushed rock over a compacted earth surface. It is estimated that the runoff coefficient "C" for this surface is 0.65. The Phase 2 installation requires certain portions of this gravel area to be surfaced with concrete for the construction of various foundations. The areas that will be surfaced with concrete will fall into two categories. One category will allow storm runoff to sheet flow to the adjacent grade. These areas will have a conservative estimated runoff coefficient after construction of 1.0. The other category will not allow storm water to sheet flow to the adjacent grade. This is because these areas of Phase 2 will be contained. The contained areas include the cooling tower basin and the transformer containments. Rain that falls within these areas will be used in the cooling tower process or will be drained as process water, and therefore the runoff coefficient for these areas will be 0.0.

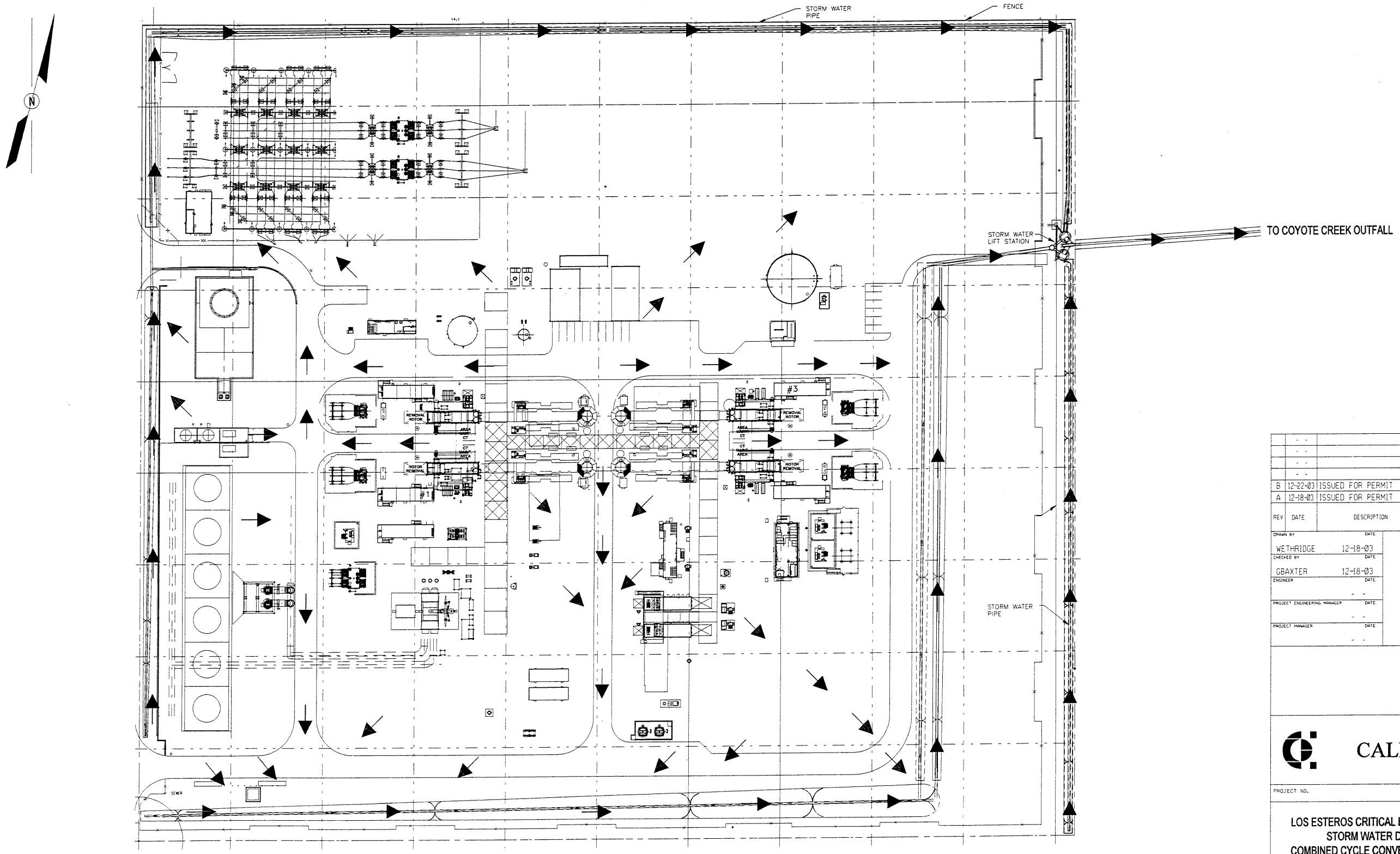
The total area of gravel surface that will be converted to a concrete surface in the Phase 2 construction is approximately 31,900 sf. Of this total area, approximately 12,010 sf will allow storm water to sheet flow from site, and 19,890 sf will not allow storm runoff.

The runoff before Phase 2 is estimated by the equation Q=CIA, where "C" is the runoff coefficient, "I" is the rainfall intensity, and "A" is the area. The storm runoff before Phase 2 is estimated as (0.65)(I)(A) = (0.65)(I)(31,900) = 20,735(I). The runoff after Phase 2 is estimated as (0.0)(I)(19,890) + (1.0)(I)(12,010) = 12,010(I). Therefore, the estimated runoff for Phase 2 is less than that for same area for Phase 1 . Furthermore the existing storm facilities are adequate for the storm water runoff after completion of the Phase 2 construction.

# *Los Esteros Critical Energy Facility*

# *Appendix 7-D*
# *Storm Water Drainage Diagram – LECEF*
# *Phase 2*

***December 2003***

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| A | 12-18-03 | ISSUED FOR PERMIT | WE | GB | GB | | |

| | |
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| CHECKED BY: GBAXTER | DATE: 12-18-03 |
| ENGINEER | DATE: - - |
| PROJECT ENGINEERING MANAGER | DATE: - - |
| PROJECT MANAGER | DATE: - - |

CALPINE

PROJECT NO.

LOS ESTEROS CRITICAL ENERGY FACILITY
STORM WATER DRAINAGE
COMBINED CYCLE CONVERSION (PHASE 2)

SCALE

DWG. NO. LECEF2-G-1005

REVISION B

BASE 2D GRADING.DGN

24x36

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-A1*
# *Emissions and Operating Parameters for the Simple-Cycle Facility*

***December 2003***

**Table 8.1-A1-1**
**Emissions and Operating Parameters for Simple Cycle Combustion Turbines**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| | 29 deg no chilling | 59 deg chilling | 95 deg no chilling | 95 deg chilling |
| Ambient Temp, F | 29 | 59 | 95 | 95 |
| GT Load, % | 100 | 100 | 100 | 100 |
| GT heat input, MMBtu/hr (HHV) | 472.6 | 460.8 | 371.8 | 460.4 |
| Stack flow, lb/hr | 1,095,774 | 1,044,286 | 890,313 | 1,045,426 |
| Stack flow, dscfm | 222,366 | 210,403 | 179,182 | 210,092 |
| Stack flow, acfm | 601,312 | 595,065 | 515,446 | 596,553 |
| Stack temp, F | 805 | 849 | 868 | 849 |
| Stack exhaust, vol % | | | | |
| O2 (dry) | 14.65 | 14.46 | 14.80 | 14.45 |
| CO2 (dry) | 3.59 | 3.70 | 3.51 | 3.70 |
| H2O | 10.07 | 11.03 | 11.26 | 11.38 |
| Emissions | | | | |
| NOx, ppmvd @ 15% O2 | 5.00 | 5.00 | 5.00 | 5.00 |
| NOx, lb/hr | 8.55 | 8.34 | 6.72 | 8.33 |
| NOx, lb/MMBtu | 0.0181 | 0.0181 | 0.0181 | 0.0181 |
| SO2, ppmvd @ 15% O2 | 0.18 | 0.18 | 0.18 | 0.18 |
| SO2, lb/hr | 0.44 | 0.42 | 0.34 | 0.42 |
| SO2, lb/MMBtu | 0.0009 | 0.0009 | 0.0009 | 0.0009 |
| CO, ppmvd @ 15% O2 | 4.00 | 4.00 | 4.00 | 4.00 |
| CO, lb/hr | 4.17 | 4.07 | 3.28 | 4.06 |
| CO, lb/MMBtu | 0.0088 | 0.0088 | 0.0088 | 0.0088 |
| VOC, ppmvd @ 15% O2 | 2.00 | 2.00 | 2.00 | 2.00 |
| VOC, lb/hr | 1.19 | 1.16 | 0.94 | 1.16 |
| VOC, lb/MMBtu | 0.0025 | 0.0025 | 0.0025 | 0.0025 |
| PM10, lb/hr | 3.0 | 3.0 | 3.0 | 3.0 |
| PM10, lb/MMBtu | 0.0063 | 0.0065 | 0.0081 | 0.0065 |
| PM10, gr/dscf | 0.00157 | 0.00166 | 0.00195 | 0.00167 |
| NH3, ppmvd@15% O2 | 10.0 | 10.0 | 10.0 | 10.0 |
| NH3, lb/hr | 6.33 | 6.17 | 4.98 | 6.16 |

**Table 8.1-A1-2**
**Calculation of Cooling Tower Emissions**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| Cooling Tower Design Parameters | |
|---|---|
| Water Flow Rate, 10E6 lbm/hr | 7.07 |
| Water Flow Rate, gal/min | 14,150.0 |
| Drift Rate, % | 0.0005 |
| Drift, lbm water/hr | 35.36 |
| PM10 Emissions based on TDS Level | |
| TDS level, ppm | 10,000 |
| PM10, lb/hr | 0.35 |
| PM10, tpy | 1.55 |

**Table 8.1-A1-3**
**Fire Pump Engine Emissions**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| | |
|---|---|
| Mfr | John Deere |
| Model | JDFP-06WR |
| Output (Bhp) | 290 |
| Fuel cons, gal/hr | 13.5 |
| Fuel cons, MMBtu/hr | 1.890 |

| | | NOx | SO2 (1) | CO | POC | PM10 |
|---|---|---|---|---|---|---|
| Emissions | | | | | | |
| | g/bhp-hr | 6.7 | 0.14 | 0.25 | 0.060 | 0.070 |
| | lb/hr (3) | 3.21 | 0.07 | 0.12 | 0.03 | 0.034 |
| | tpy (4) | 0.214 | 0.004 | 0.008 | 0.002 | 0.002 |

| | | |
|---|---|---|
| Exhaust temp | 856 | deg F |
| | 730.78 | deg K |
| Stack diam. | 5 | in |
| | 0.127 | m |
| Exh flow | 1,506 | cfm |
| | 0.71 | m3/s |
| Exh velocity | 56.11 | m/s |

Notes:
1. Calculated from fuel consumption rate and fuel sulfur content of 0.05% by weight.
2. Emissions data from manufacturer's performance data.
3. Operation limited to 45 minutes out of any hour.
4. Based on 100 hours per year of operation.

**Table 8.1-A1-4**
**Detailed Calculations for Maximum Hourly, Daily and Annual Criteria Pollutant Emissions**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| | Base Load | | | Startup | | NOx | | | SO2 | CO | | | POC | | PM10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | max. hour | hrs/day | hrs/yr | hrs/day | hrs/yr | Maximum lb/hr | Ann. Avg. lb/hr | Startup lb/hr | lb/hr | Maximum lb/hr | Ann. Avg. lb/hr | Startup lb/hr | Maximum lb/hr | Startup lb/hr | lb/hr |
| Each CTG | 1 | 22 | 8510 | 2 | 250 | 8.55 | 4.28 | 40.0 | 0.44 | 4.17 | 4.17 | 4.17 | 1.19 | 1.19 | 3.0 |

| | NOx | | | SO2 | | | CO | | | POC | | | PM10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max lb/hr | Max lb/day | Total tpy | Max lb/hr | Max lb/day | Total tpy | Max lb/hr | Max lb/day | Total tpy | Max lb/hr | Max lb/day | Total tpy | Max lb/hr | Max lb/day | Total tpy |
| CTG 1 | 40.0 | 205.2 | 18.73 | 0.44 | 10.6 | 1.93 | 4.17 | 99.8 | 18.3 | 1.2 | 28.3 | 5.2 | 3.0 | 72.0 | 13.1 |
| CTG 2 | 40.0 | 205.2 | 18.73 | 0.44 | 10.6 | 1.93 | 4.17 | 99.8 | 18.3 | 1.2 | 28.3 | 5.2 | 3.0 | 72.0 | 13.1 |
| CTG 3 | 40.0 | 205.2 | 18.73 | 0.44 | 10.6 | 1.93 | 4.17 | 99.8 | 18.3 | 1.2 | 28.3 | 5.2 | 3.0 | 72.0 | 13.1 |
| CTG 4 | 40.0 | 205.2 | 18.73 | 0.44 | 10.6 | 1.93 | 4.17 | 99.8 | 18.3 | 1.2 | 28.3 | 5.2 | 3.0 | 72.0 | 13.1 |
| Total, 4 CTGs | 160 | 821 | 74.9 | 1.76 | 42.2 | 7.7 | 17 | 399 | 72.9 | 4.8 | 113 | 20.8 | 12 | 288 | 52.6 |
| Permit Limit | | 821 | 74.9 | | 32.0 | 5.8 | | 399 | 72.9 | | 113 | 20.8 | | 240 | 43.8 |
| One-Cell Cooling Tower | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.4 | 8.5 | 1.5 |
| Fire Pump Engine | 3.2 | 3.2 | 0.2 | 0.1 | 0.1 | 3.4E-03 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 1.4E-03 | 0.0 | 0.0 | 1.7E-03 |
| Facility Total | 163.2 | 824.0 | 75.1 | 1.8 | 42.3 | 7.7 | 16.8 | 399.3 | 72.9 | 4.8 | 113.0 | 20.8 | 12.4 | 296.5 | 54.1 |
| Total, Permitted Units | 163.2 | 824.0 | 75.1 | 1.8 | 42.3 | 7.7 | 16.8 | 399.3 | 72.9 | 4.8 | 113.0 | 20.8 | 12.0 | 288.0 | 52.6 |
| | | | | | | | | | | | | | | | |
| Permit Limit | | | 75.4 | | | | | | | | | 21 | | | 44.1 |
| Net Increase | | | -0.3 | | 10.2 | 1.9 | | | | | | | | 48 | 8.76 |

**Table 8.1A1-5**
**Calculation of Noncriteria Pollutant Emissions from Gas Turbines**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| Compound | Emission Factor, lb/MMscf (2) | Maximum Hourly Emissions, lb/hr Each turbine (3) | Total, four turbines | Total Annual Emissions, 4 turbines lb/yr | tpy |
|---|---|---|---|---|---|
| Ammonia | (5) | 6.33 | 25.32 | 221,803.2 | 110.9 |
| Propylene | 7.71E-01 | 0.35 | 1.42 | 12,395.8 | 6.2 |
| Hazardous Air Pollutants | | | | | |
| Acetaldehyde | 4.08E-02 | 0.02 | 0.07 | 656.0 | 0.33 |
| Acrolein | 3.69E-03 | 0.00 | 0.01 | 59.3 | 0.03 |
| Benzene | 3.33E-03 | 0.00 | 0.01 | 53.5 | 0.03 |
| 1,3-Butadiene | 4.39E-04 | 2.01E-04 | 8.057E-04 | 7.1 | 3.5E-03 |
| Ethylbenzene | 3.26E-02 | 0.01 | 0.06 | 524.1 | 0.26 |
| Formaldehyde | 3.67E-01 | 0.17 | 0.67 | 5,900.5 | 2.95 |
| Hexane | 2.59E-01 | 0.12 | 0.48 | 4,164.1 | 2.08 |
| Naphthalene | 1.66E-03 | 7.62E-04 | 3.047E-03 | 26.7 | 1.33E-02 |
| PAHs (listed individually below) | 1.79E-04 | 8.21E-05 | 3.285E-04 | 2.9 | 1.44E-03 |
| Anthracene | | | | | |
| Benzo(a)anthracene | | | | | |
| Benzo(a)pyrene | | | | | |
| Benzo(b)fluoranthrene | | | | | |
| Benzo(k)fluoranthrene | | | | | |
| Chrysene | | | | | |
| Dibenz(a,h)anthracene | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | |
| Propylene oxide | 2.69E-02 | 0.01 | 0.05 | 432.5 | 0.22 |
| Toluene | 1.33E-01 | 0.06 | 0.24 | 2,138.3 | 1.07 |
| Xylene | 6.53E-02 | 0.03 | 0.12 | 1,049.9 | 0.52 |
| Total HAPs | | | 1.71 | 15,014.8 | 7.51 |

Notes:

(1) All factors except PAHs, hexane and propylene from AP-42, Table 3.4-1. Acrolein, benzene and formaldehyde reflect oxidation catalyst. Individual PAHs, hexane and propylene are CATEF mean results as AP-42 does not include factors for these compounds

(2) Based on maximum permitted hourly turbine fuel use of 472.6 MMBtu/hr and fuel HHV of 1030 Btu/scf. 0.46 MMscf/hr

(3) Based on maximum permitted annual fuel use of 16,560,000MMBtu/yr and fuel HHV of 1030 Btu/scf. 16,078 MMscf/yr

(4) Based on 10 ppm ammonia slip from SCR system.

**Table 8.1A1-6**
**Calculation of Noncriteria Pollutant Emissions from Cooling Tower (1)**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| Constituent | Concentration in Cooling Tower Return Water | Emissions, lb/hr | Emissions, lb/day | Emissions, ton/yr | BAAQMD TAC Trigger Level, lb/yr |
|---|---|---|---|---|---|
| Ammonia (2) | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.93E+04 |
| Cadmium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.60E-02 |
| Chromium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Copper | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.63E+02 |
| Lead | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.90E+01 |
| Mercury | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.79E+01 |
| Nickel | 19 ppb | 6.72E-07 | 1.61E-05 | 5.89E-03 | 7.30E-01 |
| Silver | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Zinc | 460 ppb | 1.63E-05 | 3.90E-04 | 1.42E-01 | 6.76E+03 |

Notes:
(1) Emissions calculated from maximum drift rate of 35.36 lb/hr
(2) Ammonia is not a TAC.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-B1*
# *Modeling Analysis for the Simple-Cycle Facility*

***December 2003***

**FIGURE 8.1-B1-1**

**Building Layout for GEP Analysis: Phase 1 Relicensing**

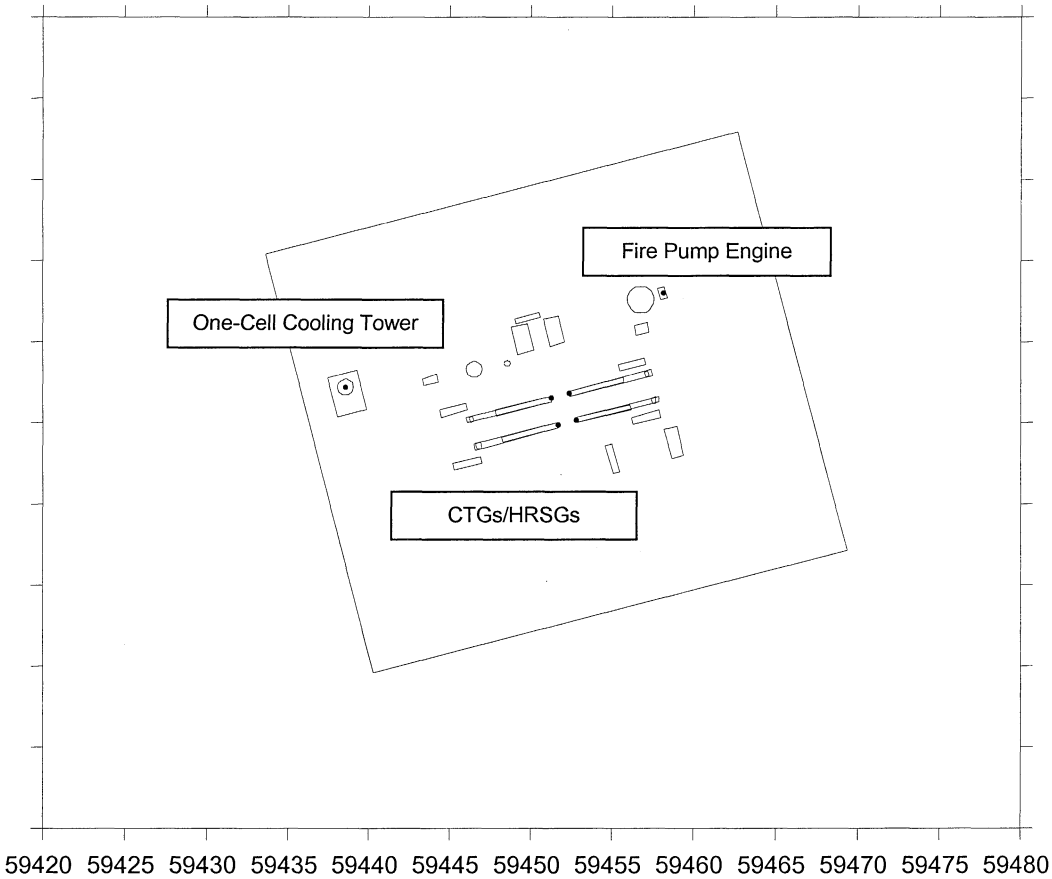


**Figure 8.1-B1-2**
Receptor Grids for the Simple Cycle Facility

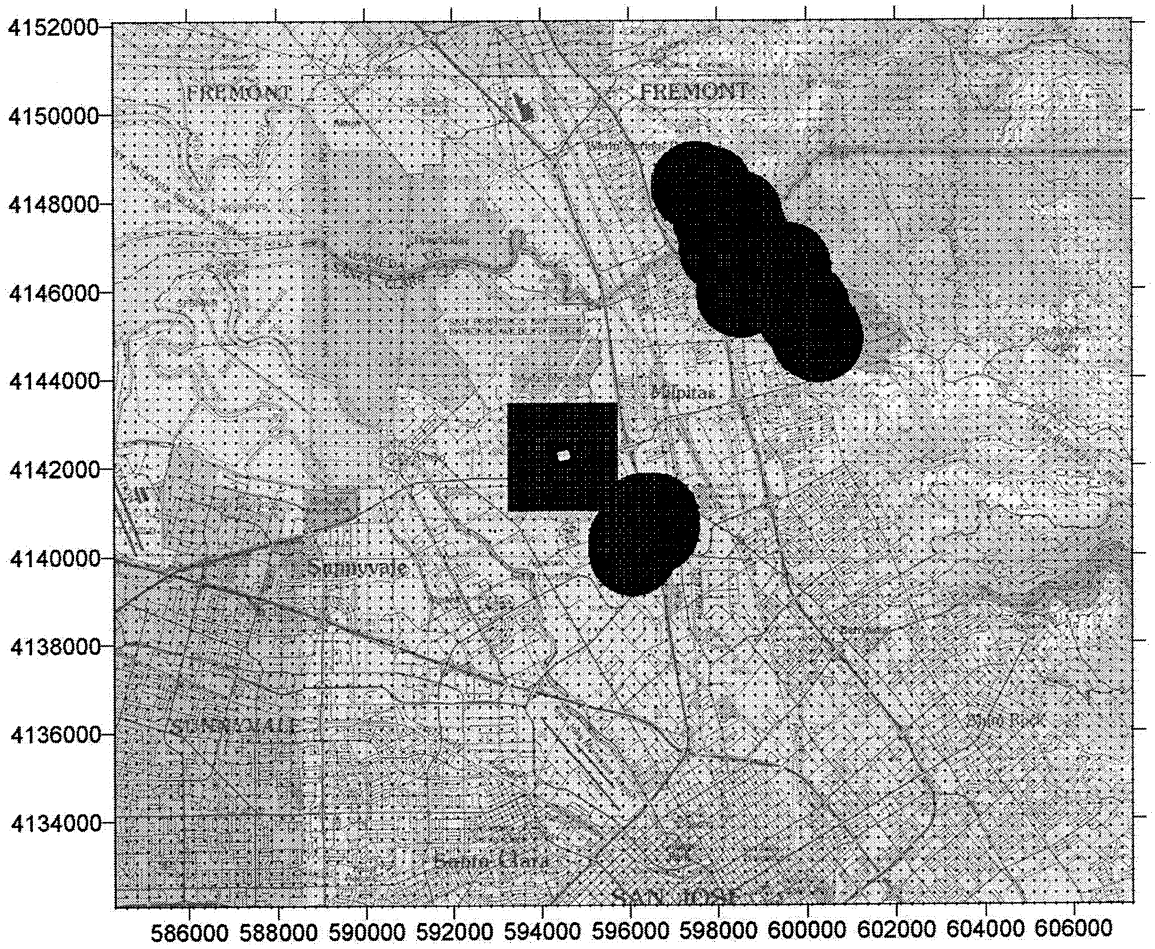


**TABLE 8.1-B1-1**
Building Dimensions Used in the Modeling Analysis

| Feature | Height (feet) | Length (feet) | Width (feet) | Diameter (feet) |
|---|---|---|---|---|
| HRSG Units | | | | |
| HRSG casings | 59' | 118' | 15' | - |
| To platform | 65' | | | - |
| To top of highest drums | 71' | | | - |
| To top of top works support steel | 80.5' | | | - |
| To top of highest relief valves and vent silencers | 88' | | | - |
| HRSG stacks | 90' | - | - | 11'-4.5" |
| Combustion Turbine Generators | | | | |
| Combustion turbines & generators (base unit) | 16' | 57' | 14' | - |
| Inlet air filters (located above CT) | 35' (above grade) | 34' | 34' | - |
| Aux Cooling Tower (1 cell) | | 54'4" | 61'4" | 32' (fan) |
| To top of deck | 42' | | | |
| To top of fan shrouds (cones) | 56' | | | |
| Tanks | | | | |
| Service/Firewater Tank | 32' | | | 55' |
| Demineralized Water Storage Tank | 32' | | | 32' |
| Potable Storage Tank | 30' | | | 12' |
| Admin Building | 13' | 60' | 30' | |
| Control Building | 13' | 57' | 32' | - |
| Bathroom/Shower Building | 13' | 52' | 12' | |
| Misc. PDCs | 13' | Varies | Varies | |

**Table 8.1-B1-2**
**Emissions and Stack Parameters for Screening Modeling**
**Los Esteros Critical Energy Facility: Phase I Relicensing**

| Case | Ambient Temp | Ambient Temp (deg K) | Stack Diam (m) | Stack Height (m) | Exhaust Temp (deg K) | Exhaust Velocity (m/s) |
|---|---|---|---|---|---|---|
| 1 | 29 | 271.33 | 3.467 | 27.432 | 702.444 | 30.059 |
| 2 | 59 | 288.00 | 3.467 | 27.432 | 726.889 | 29.746 |
| 3 | 95 | 308.00 | 3.467 | 27.432 | 737.444 | 25.766 |
| 4 | 95 | 308.00 | 3.467 | 27.432 | 726.889 | 29.821 |

Note: Parameters are for each turbine.

**Table 8.1-B1-3**
**Results of the CTG Screening Analysis**
**Los Esteros Critical Energy Facility: Phase I Relicensing**

| Case | Max. Impact, ug/m3 per 4.0 g/s | | | | |
|---|---|---|---|---|---|
| | 1-hr | 3-hr | 8-hr | 24-hr | annual |
| | 1996 Met Data | | | | |
| 1 | 12.3939 | 9.348 | 4.242 | 1.592 | 0.114 |
| 2 | 12.3651 | 9.319 | 4.229 | 1.587 | 0.113 |
| 3 | 12.7955 | 9.616 | 4.367 | 1.640 | 0.118 |
| 4 | 12.3590 | 9.313 | 4.226 | 1.586 | 0.113 |
| | 1997 Met Data | | | | |
| 1 | 12.3994 | 12.090 | 4.534 | 1.777 | 0.103 |
| 2 | 12.3712 | 12.043 | 4.516 | 1.772 | 0.102 |
| 3 | 12.8018 | 12.399 | 4.650 | 1.831 | 0.107 |
| 4 | 12.3651 | 12.034 | 4.513 | 1.771 | 0.102 |
| | 1998 Met Data | | | | |
| 1 | 12.4048 | 9.131 | 5.003 | 2.012 | 0.110 |
| 2 | 12.3771 | 9.101 | 4.983 | 2.005 | 0.109 |
| 3 | 12.8079 | 9.547 | 5.337 | 2.119 | 0.113 |
| 4 | 12.3710 | 9.095 | 4.980 | 2.004 | 0.109 |
| | 1999 Met Data | | | | |
| 1 | 12.4042 | 12.014 | 4.867 | 1.569 | 0.115 |
| 2 | 12.3764 | 11.973 | 4.855 | 1.564 | 0.114 |
| 3 | 12.8072 | 12.412 | 4.986 | 1.615 | 0.119 |
| 4 | 12.3703 | 11.967 | 4.852 | 1.563 | 0.114 |
| | 2000 Met Data | | | | |
| 1 | 12.4060 | 10.806 | 5.491 | 1.841 | 0.123 |
| 2 | 12.3784 | 10.786 | 5.480 | 1.837 | 0.123 |
| 3 | 12.8093 | 11.100 | 5.865 | 1.955 | 0.129 |
| 4 | 12.3723 | 10.780 | 5.477 | 1.836 | 0.123 |

| Emission Rates for Screening Modeling (lb/hr) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Turbine | NOx | | SO2 | | | | CO | | PM10 | |
| Case | 1-hr | annual avg | 1-hr | 3-hr | 24-hr | annual avg | 1-hr | 8-hr | 24-hr | annual avg |
| 1 | 8.55 | 4.28 | 0.44 | 0.44 | 0.44 | 0.44 | 4.17 | 4.17 | 3.00 | 3.00 |
| 2 | 8.34 | 4.28 | 0.42 | 0.42 | 0.42 | 0.44 | 4.07 | 4.08 | 3.00 | 3.00 |
| 3 | 6.72 | 4.28 | 0.34 | 0.34 | 0.34 | 0.44 | 3.28 | 3.39 | 3.00 | 3.00 |
| 4 | 8.33 | 4.28 | 0.42 | 0.42 | 0.42 | 0.44 | 4.06 | 4.07 | 3.00 | 3.00 |

| Turbine Emission Rates for Screening Modeling (g/s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Turbine | NOx | | SO2 | | | | CO | | PM10 | |
| Case | 1-hr | annual avg | 1-hr | 3-hr | 24-hr | annual avg | 1-hr | 8-hr | 24-hr | annual avg |
| 1 | 1.077 | 0.539 | 0.055 | 0.055 | 0.055 | 0.055 | 0.525 | 0.525 | 0.378 | 0.378 |
| 2 | 1.051 | 0.539 | 0.053 | 0.053 | 0.053 | 0.055 | 0.513 | 0.514 | 0.378 | 0.378 |
| 3 | 0.847 | 0.539 | 0.043 | 0.043 | 0.043 | 0.055 | 0.413 | 0.427 | 0.378 | 0.378 |
| 4 | 1.050 | 0.539 | 0.053 | 0.053 | 0.053 | 0.055 | 0.512 | 0.513 | 0.378 | 0.378 |

| Turbine | Load/ | Modeled Impacts, ug/m3, by Pollutant and Averaging Period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient | NOx | | SO2 | | | | CO | | PM10 | |
| Case | Temp | 1-hr | Annual | 1-hr | 3-hr | 24-hr | Annual | 1-hr | 8-hr | 24-hr | Annual |
| 1 | 29 deg no chilling | **13.365** | 0.066 | **0.0068** | **0.670** | **0.112** | 0.0068 | **0.065** | **2.88** | 0.76 | 0.047 |
| 2 | 59 deg w/chilling | 13.008 | 0.066 | 0.0065 | 0.637 | 0.106 | 0.0068 | 0.063 | 2.82 | 0.76 | 0.046 |
| 3 | 95 deg no chilling | 10.846 | **0.069** | 0.0055 | 0.532 | 0.091 | **0.0071** | 0.053 | 2.51 | **0.80** | **0.049** |
| 4 | 95 deg w/chilling | 12.986 | 0.066 | 0.0065 | 0.637 | 0.106 | 0.0068 | 0.063 | 2.81 | 0.76 | 0.046 |

**Table 8.1B1-4**
**Emission Rates and Stack Parameters for Refined Modeling**
**Los Esteros Critical Energy Facility: Phase I Relicensing**

| | Stack Diam, m | Stack Height, m | Exh Temp, Deg K | Exhaust Flow, m3/s | Exhaust Velocity, m/s | Emission Rate, g/s | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | NOx | SO2 | CO | PM10 |
| Averaging Period: 1 hour | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 702.44 | 283.79 | 30.059 | 1.077 | 5.544E-02 | 0.525 | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | 0.405 | 8.458E-03 | 1.510E-02 | n/a |
| Averaging Period: 3 hours | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 702.44 | 283.79 | 30.059 | n/a | 5.544E-02 | n/a | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | 2.819E-03 | n/a | n/a |
| Averaging Period: 8 hours | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 702.44 | 283.79 | 30.059 | n/a | n/a | 0.525 | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | n/a | 1.888E-03 | n/a |
| Averaging Period: 24 hours, SO2 | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 702.44 | 283.79 | 30.059 | n/a | 5.544E-02 | n/a | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | 3.524E-04 | n/a | n/a |
| Averaging Period: 24 hours, PM10 | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 737.44 | 243.26 | 25.766 | n/a | n/a | n/a | 0.378 |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | n/a | n/a | 1.762E-04 |
| Cooling Tower (one cell) | 9.754 | 17.069 | 294.11 | 454.44 | 6.082 | n/a | n/a | n/a | 4.455E-02 |
| Averaging Period: Annual | | | | | | | | | |
| Each CTG | 3.467 | 27.432 | 737.44 | 243.26 | 25.766 | 0.539 | 5.544E-02 | n/a | 0.378 |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | 6.161E-03 | 1.287E-04 | n/a | 6.437E-05 |
| Cooling Tower (one cell) | 9.754 | 17.069 | 294.11 | 454.44 | 6.082 | n/a | n/a | n/a | 4.455E-02 |

**Table 8.1-B1-5**
**Analysis of Impacts due to Fumigation**
**Los Esteros Critical Energy Facility: Phase I Relicensing**

**CTG Emission Rates, g/s**

| | NOx | CO | PM10 | SO2 |
|---|---|---|---|---|
| Case 1 | 1.077 | 0.525 | 0.378 | 0.055 |
| Case 2 | 1.051 | 0.513 | 0.378 | 0.053 |
| Case 3 | 0.847 | 0.413 | 0.378 | 0.043 |
| Case 4 | 1.05 | 0.512 | 0.378 | 0.053 |
| Startup | 5.0400 | 5.1660 | - | - |

**Inversion Breakup Modeling Results from SCREEN3**

| | Unit Impacts, ug/m3 per g/s | Maximum One-Hour Avg Impacts, ug/m3 | | | | Distance to Maximum |
|---|---|---|---|---|---|---|
| | | NOx | CO | PM10 | SO2 | |
| Case 1 | 1.0000 | 1.0770 | 0.5250 | 0.3780 | 0.0550 | 18967 |
| Case 2 | 0.9911 | 1.0416 | 0.5084 | 0.3746 | 0.0525 | 19097 |
| Case 3 | 1.0880 | 0.9215 | 0.4493 | 0.4113 | 0.0468 | 17835 |
| Case 4 | 0.9893 | 1.0388 | 0.5065 | 0.3740 | 0.0524 | 19122 |
| Startup | 1.3360 | 6.7334 | 6.9018 | - | - | 15340 |

**Flat Terrain Modeling Results from SCREEN3**

| | Unit Impacts, ug/m3 per g/s | Maximum One-Hour Avg Impacts, ug/m3 | | | | Distance to Maximum |
|---|---|---|---|---|---|---|
| | | NOx | CO | PM10 | SO2 | |
| Case 1 | 0.7168 | 0.7720 | 0.3763 | 0.2710 | 0.0394 | 1190 |
| Case 2 | 0.7080 | 0.7441 | 0.3632 | 0.2676 | 0.0375 | 1194 |
| Case 3 | 0.8013 | 0.6787 | 0.3309 | 0.3029 | 0.0345 | 1150 |
| Case 4 | 0.7063 | 0.7416 | 0.3616 | 0.2670 | 0.0374 | 1195 |
| Startup | 1.0150 | 5.1156 | 5.2435 | - | - | 1072 |

**Adjust unit impacts for longer averaging periods to account for one-hour duration of**

| | 1-hr unit | 3-hr unit | 8-hr unit | 24-hr unit |
|---|---|---|---|---|
| Case 1 | 1.0000 | 0.9056 | 0.7522 | 0.7286 |
| Case 2 | 0.9911 | 0.8967 | 0.7434 | 0.7198 |
| Case 3 | 1.0880 | 0.9924 | 0.8371 | 0.8132 |
| Case 4 | 0.9893 | 0.8950 | 0.7417 | 0.7181 |
| Startup | 1.3360 | 1.2290 | 1.0551 | 1.0284 |

**Calculation of Fumigation Impacts for Four Units**

| Case/Avg Period | NOx | CO | PM10 | SO2 |
|---|---|---|---|---|
| One-Hour | | | | |
| Case 1 | 4.3080 | 2.1000 | - | 0.2200 |
| Case 2 | 4.1666 | 2.0337 | - | 0.2101 |
| Case 3 | 3.6861 | 1.7974 | - | 0.1871 |
| Case 4 | 4.1551 | 2.0261 | - | 0.2097 |
| Startup | 26.9338 | 27.6071 | - | - |
| 3 Hours | | | | |
| Case 1 | - | - | - | 0.1793 |
| Case 2 | - | - | - | 0.1891 |
| Case 3 | - | - | - | 0.1684 |
| Case 4 | - | - | - | 0.1888 |
| Startup | - | - | - | - |
| 8 Hours | | | | |
| Case 1 | - | 1.1057 | - | - |
| Case 2 | - | 1.0678 | - | - |
| Case 3 | - | 0.9681 | - | - |
| Case 4 | - | 1.0633 | - | - |
| Startup | - | 15.2622 | - | - |
| 24 Hours | | | | |
| Case 1 | - | - | 0.4407 | 0.0641 |
| Case 2 | - | - | 0.4353 | 0.0610 |
| Case 3 | - | - | 0.4919 | 0.0560 |
| Case 4 | - | - | 0.4343 | 0.0609 |
| Startup | - | - | - | - |

## NOTES TO TABLE 8.1-B1-5

## FUMIGATION IMPACTS ANALYSIS FOR THE SIMPLE CYCLE FACILITY

### *Inversion Breakup Fumigation*

Inversion breakup fumigation is generally a short-term phenomenon and was evaluated here as persisting for up to one hour. SCREEN3 was used to model one-hour unit impacts from the turbines/HRSGs and the auxiliary boiler under 2.5 m/s winds and F stability (for fumigation impacts) and under all meteorological conditions (shown in the table as "Inversion Breakup Modeling Results from SCREEN3").

For longer-term averaging periods, impacts were calculated using the highest modeled impact from SCREEN3 for the corresponding averaging period. A sample calculation for 24-hour average $PM_{10}$ for Case 3 is as follows:

- For a single turbine, Case 3, 1-hour average unit impact = 1.088 ug/m3 per g/s
- For a single turbine, Case 3, max. 1-hour average unit impact from SCREEN3 = 0.8013 ug/m3 per g/s
- For a single turbine, 24-hour unit impact is calculated as 1 hours of inversion breakup fumigation plus 23 hours of operation under typical conditions (from SCREEN3): [(1 * 1.088 ug/m3 per g/s) + (23 * 0.8013 ug/m3 per g/s)] ÷ 24 hrs * 0.4 [persistence factor for converting 1-hour average screening impact into 24-hour average concentration] = 0.3253 ug/$m^3$ per g/s
- For four turbines with an emission rate of 0.378 g/s, the total 24-hour average $PM_{10}$ impact under inversion breakup fumigation conditions is: 0.3253 ug/$m^3$ per g/s * 0.378 g/s per turbine * 4 turbines = 0.4919 ug/$m^3$

**Table 8.1B1-6**
**Emission Rates and Stack Parameters for Modeling of NO2 Impacts During Star**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| | Stack Diam, m | Stack Height, m | Exh Temp, Deg K | Exhaust Flow, m3/s | Exhaust Velocity, m/s | NOx Emission Rate, g/s |
|---|---|---|---|---|---|---|
| Averaging Period: One hour | | | | | | |
| Turbine 1 | 3.47 | 27.43 | 671.9 | 192.6 | 20.40 | 5.040 |
| Turbine 2 | 3.47 | 27.43 | 671.9 | 192.6 | 20.40 | 5.040 |
| Turbine 3 | 3.47 | 27.43 | 671.9 | 192.6 | 20.40 | 5.040 |
| Turbine 4 | 3.47 | 27.43 | 671.9 | 192.6 | 20.40 | 5.040 |

**Table 8.1B1-7**
**Comparison of Monitored Ozone Levels at San Jose Stations**
**Los Esteros Critical Energy Facility: Phase 1 Relicensing**

| | Monitoring Station | |
|---|---|---|
| **1996** | **Piedmont** | **4th Street** |
| **# valid hours** | 8729 | 8343 |
| **Avg. Concentration (ppm)** | 0.019 | 0.015 |
| **Max. Concentration (ppm)** | 0.18 | 0.11 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 5707 | 2145 |
| **1997** | **Piedmont** | **4th Street** |
| **# valid hours** | 7997 | 8330 |
| **Avg. Concentration (ppm)** | 0.017 | 0.016 |
| **Max. Concentration (ppm)** | 0.095 | 0.094 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 3626 | 3450 |
| **1998** | **Piedmont** | **4th Street** |
| **# valid hours** | 5819 | 8173 |
| **Avg. Concentration (ppm)** | 0.021 | 0.018 |
| **Max. Concentration (ppm)** | 0.129 | 0.147 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 2853 | 2605 |

## 1996 WIND FREQUENCY DISTRIBUTION: ANNUAL

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 17. | 135. | 130. | 86. | 53. | 31. | 16. | 6. | 6. | 1. | 2. | 483. |
| NNE | 17. | 79. | 54. | 19. | 10. | 7. | 8. | 4. | 1. | 2. | 1. | 202. |
| NE | 21. | 74. | 12. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 111. |
| ENE | 26. | 90. | 5. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 122. |
| E | 24. | 102. | 7. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 134. |
| ESE | 44. | 176. | 25. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 248. |
| SE | 81. | 381. | 216. | 86. | 63. | 40. | 28. | 13. | 6. | 2. | 0. | 916. |
| SSE | 94. | 386. | 290. | 177. | 126. | 96. | 41. | 11. | 2. | 4. | 0. | 1227. |
| S | 61. | 182. | 46. | 45. | 36. | 27. | 18. | 7. | 1. | 0. | 0. | 423. |
| SSW | 43. | 78. | 12. | 17. | 4. | 2. | 6. | 1. | 0. | 0. | 0. | 163. |
| SW | 55. | 91. | 14. | 12. | 8. | 3. | 0. | 0. | 0. | 0. | 0. | 183. |
| WSW | 38. | 65. | 19. | 9. | 7. | 2. | 0. | 0. | 0. | 0. | 0. | 140. |
| W | 24. | 115. | 62. | 42. | 19. | 11. | 4. | 4. | 0. | 0. | 0. | 281. |
| WNW | 27. | 168. | 202. | 195. | 155. | 135. | 53. | 18. | 7. | 5. | 0. | 965. |
| NW | 23. | 205. | 420. | 354. | 346. | 363. | 153. | 64. | 18. | 1. | 0. | 1947. |
| NNW | 21. | 192. | 267. | 185. | 168. | 179. | 135. | 72. | 20. | 0. | 0. | 1239. |
| TOTAL | 616. | 2519. | 1781. | 1235. | 996. | 896. | 462. | 200. | 61. | 15. | 3. | |

## 1996 WIND FREQUENCY DISTRIBUTION: FIRST QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 9. | 39. | 28. | 21. | 11. | 8. | 4. | 0. | 0. | 0. | 0. | 120. |
| NNE | 5. | 17. | 14. | 4. | 4. | 3. | 1. | 1. | 0. | 0. | 0. | 49. |
| NE | 5. | 18. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 26. |
| ENE | 6. | 22. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| E | 3. | 32. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 38. |
| ESE | 4. | 65. | 9. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 79. |
| SE | 12. | 113. | 79. | 28. | 25. | 16. | 6. | 0. | 2. | 0. | 0. | 281. |
| SSE | 19. | 150. | 99. | 77. | 52. | 39. | 16. | 5. | 1. | 0. | 0. | 458. |
| S | 15. | 75. | 14. | 18. | 11. | 10. | 7. | 3. | 0. | 0. | 0. | 153. |
| SSW | 18. | 31. | 7. | 11. | 1. | 2. | 5. | 0. | 0. | 0. | 0. | 75. |
| SW | 12. | 33. | 5. | 9. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 64. |
| WSW | 9. | 23. | 4. | 3. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 43. |
| W | 4. | 35. | 17. | 9. | 9. | 5. | 1. | 0. | 0. | 0. | 0. | 80. |
| WNW | 6. | 37. | 60. | 43. | 17. | 17. | 7. | 4. | 2. | 2. | 0. | 195. |
| NW | 4. | 35. | 54. | 71. | 42. | 29. | 16. | 15. | 7. | 0. | 0. | 273. |
| NNW | 8. | 47. | 41. | 39. | 32. | 42. | 10. | 1. | 0. | 0. | 0. | 220. |
| TOTAL | 139. | 772. | 438. | 335. | 213. | 171. | 73. | 29. | 12. | 2. | 0. | |

## 1996 WIND FREQUENCY DISTRIBUTION: SECOND QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 2. | 33. | 34. | 38. | 22. | 15. | 7. | 3. | 2. | 0. | 0. | 156. |
| NNE | 1. | 21. | 28. | 14. | 4. | 3. | 3. | 2. | 1. | 0. | 0. | 77. |
| NE | 1. | 22. | 7. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 31. |
| ENE | 5. | 29. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 36. |
| E | 4. | 23. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 27. |
| ESE | 9. | 27. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 39. |
| SE | 15. | 65. | 28. | 2. | 3. | 2. | 1. | 1. | 0. | 0. | 0. | 117. |
| SSE | 22. | 61. | 63. | 41. | 26. | 20. | 5. | 1. | 0. | 0. | 0. | 239. |
| S | 14. | 38. | 12. | 16. | 13. | 9. | 9. | 2. | 0. | 0. | 0. | 113. |
| SSW | 5. | 18. | 2. | 4. | 3. | 0. | 1. | 1. | 0. | 0. | 0. | 34. |
| SW | 18. | 19. | 5. | 1. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 47. |
| WSW | 7. | 17. | 8. | 4. | 3. | 2. | 0. | 0. | 0. | 0. | 0. | 41. |
| W | 4. | 23. | 17. | 21. | 6. | 6. | 3. | 1. | 0. | 0. | 0. | 81. |
| WNW | 6. | 25. | 26. | 34. | 28. | 29. | 12. | 5. | 0. | 0. | 0. | 165. |
| NW | 7. | 33. | 64. | 92. | 115. | 114. | 66. | 36. | 8. | 0. | 0. | 535. |
| NNW | 3. | 34. | 83. | 58. | 60. | 73. | 83. | 43. | 9. | 0. | 0. | 446. |
| TOTAL | 123. | 488. | 380. | 328. | 286. | 274. | 190. | 95. | 20. | 0. | 0. | |

## 1996 WIND FREQUENCY DISTRIBUTION: THIRD QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 4. | 31. | 44. | 18. | 11. | 2. | 1. | 1. | 0. | 0. | 0. | 112. |
| NNE | 5. | 28. | 6. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 39. |
| NE | 11. | 23. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| ENE | 11. | 26. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 37. |
| E | 10. | 14. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| ESE | 10. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| SE | 22. | 43. | 22. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 91. |
| SSE | 16. | 56. | 52. | 16. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 140. |
| S | 11. | 24. | 6. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 45. |
| SSW | 9. | 8. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 18. |
| SW | 13. | 18. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 32. |
| WSW | 9. | 11. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 22. |
| W | 12. | 27. | 14. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 57. |
| WNW | 7. | 65. | 61. | 65. | 77. | 62. | 10. | 2. | 0. | 0. | 0. | 349. |
| NW | 6. | 88. | 235. | 127. | 129. | 181. | 53. | 8. | 0. | 0. | 0. | 827. |
| NNW | 5. | 72. | 95. | 47. | 36. | 35. | 31. | 24. | 9. | 0. | 0. | 354. |
| TOTAL | 161. | 549. | 541. | 283. | 255. | 280. | 95. | 35. | 9. | 0. | 0. | |

## 1996 WIND FREQUENCY DISTRIBUTION: FOURTH QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 2. | 32. | 24. | 9. | 9. | 6. | 4. | 2. | 4. | 1. | 2. | 95. |
| NNE | 6. | 13. | 6. | 1. | 2. | 1. | 4. | 1. | 0. | 2. | 1. | 37. |
| NE | 4. | 11. | 1. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 19. |
| ENE | 4. | 13. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 19. |
| E | 7. | 33. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 44. |
| ESE | 21. | 69. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 105. |
| SE | 32. | 160. | 87. | 52. | 35. | 22. | 21. | 12. | 4. | 2. | 0. | 427. |
| SSE | 37. | 119. | 76. | 43. | 48. | 37. | 20. | 5. | 1. | 4. | 0. | 390. |
| S | 21. | 45. | 14. | 8. | 11. | 8. | 2. | 2. | 1. | 0. | 0. | 112. |
| SSW | 11. | 21. | 2. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 36. |
| SW | 12. | 21. | 3. | 2. | 0. | 2. | 0. | 0. | 0. | 0. | 0. | 40. |
| WSW | 13. | 14. | 5. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 34. |
| W | 4. | 30. | 14. | 9. | 3. | 0. | 0. | 3. | 0. | 0. | 0. | 63. |
| WNW | 8. | 41. | 55. | 53. | 33. | 27. | 24. | 7. | 5. | 3. | 0. | 256. |
| NW | 6. | 49. | 67. | 64. | 60. | 39. | 18. | 5. | 3. | 1. | 0. | 312. |
| NNW | 5. | 39. | 48. | 41. | 40. | 29. | 11. | 4. | 2. | 0. | 0. | 219. |
| TOTAL | 193. | 710. | 422. | 289. | 242. | 171. | 104. | 41. | 20. | 13. | 3. | |

## 1997 WIND FREQUENCY DISTRIBUTION: ANNUAL

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 20. | 114. | 161. | 115. | 38. | 16. | 23. | 23. | 6. | 1. | 8. | 525. |
| NNE | 27. | 84. | 59. | 6. | 4. | 7. | 8. | 2. | 4. | 1. | 2. | 204. |
| NE | 34. | 87. | 9. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 132. |
| ENE | 45. | 86. | 3. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 136. |
| E | 36. | 102. | 7. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 147. |
| ESE | 55. | 228. | 43. | 8. | 2. | 0. | 2. | 0. | 0. | 0. | 0. | 338. |
| SE | 63. | 456. | 149. | 84. | 65. | 30. | 11. | 3. | 2. | 1. | 0. | 864. |
| SSE | 62. | 321. | 179. | 88. | 64. | 26. | 11. | 9. | 0. | 2. | 1. | 763. |
| S | 45. | 159. | 22. | 22. | 15. | 2. | 2. | 4. | 3. | 0. | 1. | 275. |
| SSW | 44. | 96. | 14. | 5. | 1. | 1. | 0. | 3. | 0. | 0. | 0. | 164. |
| SW | 28. | 88. | 18. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 137. |
| WSW | 25. | 94. | 36. | 6. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 163. |
| W | 27. | 130. | 79. | 44. | 27. | 8. | 4. | 0. | 0. | 1. | 1. | 321. |
| WNW | 17. | 125. | 240. | 231. | 278. | 180. | 65. | 28. | 23. | 19. | 12. | 1218. |
| NW | 23. | 208. | 362. | 343. | 314. | 366. | 240. | 125. | 24. | 3. | 1. | 2009. |
| NNW | 58. | 178. | 287. | 280. | 192. | 157. | 117. | 66. | 17. | 7. | 5. | 1364. |
| TOTAL | 609. | 2556. | 1668. | 1237. | 1005. | 794. | 483. | 263. | 79. | 35. | 31. | |

## 1997 WIND FREQUENCY DISTRIBUTION: FIRST QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 1. | 26. | 24. | 13. | 4. | 3. | 10. | 10. | 1. | 0. | 0. | 92. |
| NNE | 2. | 18. | 7. | 2. | 3. | 2. | 7. | 0. | 2. | 1. | 2. | 46. |
| NE | 7. | 25. | 6. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 40. |
| ENE | 6. | 27. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| E | 11. | 24. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 38. |
| ESE | 10. | 76. | 14. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 101. |
| SE | 17. | 135. | 52. | 29. | 18. | 10. | 3. | 1. | 0. | 1. | 0. | 266. |
| SSE | 20. | 110. | 44. | 22. | 18. | 12. | 4. | 9. | 0. | 2. | 1. | 242. |
| S | 12. | 54. | 3. | 4. | 2. | 0. | 1. | 3. | 3. | 0. | 1. | 83. |
| SSW | 16. | 30. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 51. |
| SW | 2. | 33. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 37. |
| WSW | 7. | 32. | 16. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 57. |
| W | 6. | 48. | 25. | 15. | 8. | 4. | 0. | 0. | 0. | 0. | 0. | 106. |
| WNW | 4. | 39. | 77. | 81. | 76. | 49. | 20. | 15. | 9. | 4. | 7. | 381. |
| NW | 4. | 49. | 78. | 65. | 69. | 62. | 30. | 1. | 0. | 0. | 0. | 358. |
| NNW | 3. | 41. | 46. | 56. | 37. | 30. | 12. | 2. | 0. | 0. | 0. | 227. |
| TOTAL | 128. | 767. | 402. | 293. | 236. | 172. | 87. | 41. | 15. | 8. | 11. | |

## 1997 WIND FREQUENCY DISTRIBUTION: SECOND QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 4. | 27. | 52. | 47. | 8. | 5. | 4. | 5. | 1. | 0. | 8. | 161. |
| NNE | 4. | 21. | 30. | 0. | 0. | 1. | 1. | 2. | 0. | 0. | 0. | 59. |
| NE | 7. | 24. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 32. |
| ENE | 12. | 19. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 31. |
| E | 8. | 21. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 29. |
| ESE | 13. | 32. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 46. |
| SE | 13. | 62. | 16. | 6. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 97. |
| SSE | 8. | 47. | 37. | 16. | 12. | 6. | 5. | 0. | 0. | 0. | 0. | 131. |
| S | 6. | 27. | 2. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 38. |
| SSW | 5. | 20. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| SW | 5. | 12. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 22. |
| WSW | 5. | 12. | 4. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 23. |
| W | 3. | 17. | 12. | 18. | 8. | 2. | 3. | 0. | 0. | 1. | 1. | 65. |
| WNW | 2. | 10. | 54. | 51. | 73. | 58. | 21. | 11. | 11. | 8. | 4. | 303. |
| NW | 7. | 42. | 86. | 101. | 107. | 126. | 96. | 86. | 19. | 1. | 0. | 671. |
| NNW | 3. | 33. | 95. | 100. | 66. | 59. | 44. | 32. | 10. | 5. | 4. | 451. |
| TOTAL | 105. | 426. | 395. | 343. | 275. | 257. | 174. | 136. | 41. | 15. | 17. | |

## WIND FREQUENCY DISTRIBUTION: THIRD QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 5. | 34. | 66. | 42. | 7. | 2. | 0. | 0. | 0. | 0. | 0. | 156. |
| NNE | 4. | 32. | 19. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 59. |
| NE | 8. | 16. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| ENE | 7. | 19. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 27. |
| E | 8. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 23. |
| ESE | 13. | 23. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 37. |
| SE | 12. | 48. | 14. | 2. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 77. |
| SSE | 14. | 49. | 39. | 16. | 14. | 0. | 0. | 0. | 0. | 0. | 0. | 132. |
| S | 3. | 24. | 5. | 6. | 9. | 1. | 1. | 1. | 0. | 0. | 0. | 50. |
| SSW | 11. | 17. | 2. | 4. | 1. | 1. | 0. | 3. | 0. | 0. | 0. | 39. |
| SW | 8. | 18. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 28. |
| WSW | 6. | 21. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| W | 8. | 33. | 19. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 62. |
| WNW | 4. | 35. | 51. | 43. | 65. | 51. | 10. | 0. | 0. | 0. | 0. | 259. |
| NW | 11. | 67. | 122. | 118. | 90. | 147. | 103. | 33. | 3. | 2. | 1. | 697. |
| NNW | 49. | 59. | 104. | 94. | 58. | 53. | 56. | 30. | 4. | 0. | 0. | 507. |
| TOTAL | 171. | 510. | 449. | 331. | 244. | 256. | 170. | 67. | 7. | 2. | 1. | |

## 1997 WIND FREQUENCY DISTRIBUTION: FOURTH QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 10. | 27. | 19. | 13. | 19. | 6. | 9. | 8. | 4. | 1. | 0. | 116. |
| NNE | 17. | 13. | 3. | 0. | 1. | 4. | 0. | 0. | 2. | 0. | 0. | 40. |
| NE | 12. | 22. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| ENE | 20. | 21. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 43. |
| E | 9. | 42. | 5. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 57. |
| ESE | 19. | 97. | 27. | 7. | 2. | 0. | 2. | 0. | 0. | 0. | 0. | 154. |
| SE | 21. | 211. | 67. | 47. | 47. | 19. | 8. | 2. | 2. | 0. | 0. | 424. |
| SSE | 20. | 115. | 59. | 34. | 20. | 8. | 2. | 0. | 0. | 0. | 0. | 258. |
| S | 24. | 54. | 12. | 10. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 104. |
| SSW | 12. | 29. | 7. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 49. |
| SW | 13. | 25. | 9. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 50. |
| WSW | 7. | 29. | 13. | 2. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 53. |
| W | 10. | 32. | 23. | 9. | 11. | 2. | 1. | 0. | 0. | 0. | 0. | 88. |
| WNW | 7. | 41. | 58. | 56. | 64. | 22. | 14. | 2. | 3. | 7. | 1. | 275. |
| NW | 1. | 50. | 76. | 59. | 48. | 31. | 11. | 5. | 2. | 0. | 0. | 283. |
| NNW | 3. | 45. | 42. | 30. | 31. | 15. | 5. | 2. | 3. | 2. | 1. | 179. |
| TOTAL | 205. | 853. | 422. | 270. | 250. | 109. | 52. | 19. | 16. | 10. | 2. | |

## 1998 WIND FREQUENCY DISTRIBUTION: ANNUAL

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 26. | 125. | 107. | 54. | 24. | 4. | 11. | 0. | 0. | 0. | 0. | 351. |
| NNE | 18. | 73. | 34. | 2. | 1. | 0. | 0. | 2. | 0. | 0. | 0. | 130. |
| NE | 20. | 64. | 8. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 92. |
| ENE | 31. | 86. | 8. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 127. |
| E | 21. | 119. | 9. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 152. |
| ESE | 66. | 193. | 73. | 18. | 6. | 2. | 0. | 0. | 0. | 0. | 0. | 358. |
| SE | 49. | 448. | 328. | 180. | 94. | 63. | 42. | 31. | 26. | 11. | 9. | 1281. |
| SSE | 60. | 356. | 224. | 126. | 80. | 42. | 17. | 8. | 7. | 0. | 0. | 920. |
| S | 50. | 122. | 62. | 36. | 22. | 13. | 12. | 12. | 4. | 1. | 1. | 335. |
| SSW | 38. | 94. | 26. | 14. | 9. | 3. | 0. | 0. | 0. | 0. | 0. | 184. |
| SW | 34. | 106. | 35. | 11. | 7. | 4. | 0. | 0. | 0. | 0. | 0. | 197. |
| WSW | 20. | 101. | 56. | 28. | 16. | 1. | 2. | 0. | 0. | 0. | 0. | 224. |
| W | 23. | 130. | 138. | 98. | 75. | 42. | 8. | 4. | 1. | 0. | 2. | 521. |
| WNW | 19. | 182. | 277. | 286. | 250. | 155. | 51. | 13. | 6. | 5. | 3. | 1247. |
| NW | 16. | 206. | 424. | 315. | 310. | 305. | 146. | 27. | 1. | 0. | 0. | 1750. |
| NNW | 15. | 170. | 260. | 164. | 100. | 110. | 60. | 11. | 0. | 1. | 0. | 891. |
| TOTAL | 506. | 2575. | 2069. | 1337. | 994. | 744. | 349. | 108. | 45. | 18. | 15. | |

## 1998 WIND FREQUENCY DISTRIBUTION: FIRST QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 5. | 27. | 21. | 5. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 61. |
| NNE | 5. | 20. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| NE | 2. | 15. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 20. |
| ENE | 6. | 20. | 5. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 32. |
| E | 4. | 36. | 4. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 46. |
| ESE | 26. | 73. | 47. | 12. | 4. | 1. | 0. | 0. | 0. | 0. | 0. | 163. |
| SE | 11. | 134. | 182. | 116. | 71. | 46. | 32. | 23. | 25. | 11. | 9. | 660. |
| SSE | 10. | 93. | 73. | 47. | 35. | 17. | 6. | 4. | 5. | 0. | 0. | 290. |
| S | 11. | 34. | 19. | 15. | 8. | 3. | 3. | 5. | 1. | 0. | 0. | 99. |
| SSW | 8. | 29. | 11. | 4. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 56. |
| SW | 9. | 19. | 5. | 4. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 41. |
| WSW | 2. | 13. | 12. | 8. | 6. | 1. | 2. | 0. | 0. | 0. | 0. | 44. |
| W | 3. | 24. | 21. | 18. | 21. | 16. | 3. | 4. | 0. | 0. | 1. | 111. |
| WNW | 4. | 34. | 51. | 42. | 38. | 33. | 7. | 6. | 3. | 1. | 0. | 219. |
| NW | 5. | 35. | 48. | 37. | 29. | 20. | 8. | 1. | 1. | 0. | 0. | 184. |
| NNW | 5. | 29. | 34. | 21. | 6. | 6. | 2. | 0. | 0. | 1. | 0. | 104. |
| TOTAL | 116. | 635. | 541. | 332. | 227. | 145. | 63. | 43. | 35. | 13. | 10. | |

## 1998 WIND FREQUENCY DISTRIBUTION: SECOND QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 3. | 20. | 28. | 15. | 6. | 0. | 0. | 0. | 0. | 0. | 0. | 72. |
| NNE | 0. | 16. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 31. |
| NE | 2. | 13. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 17. |
| ENE | 5. | 14. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 21. |
| E | 3. | 18. | 3. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| ESE | 10. | 27. | 12. | 5. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 57. |
| SE | 9. | 97. | 71. | 41. | 14. | 5. | 0. | 0. | 0. | 0. | 0. | 237. |
| SSE | 7. | 73. | 40. | 40. | 23. | 14. | 6. | 2. | 0. | 0. | 0. | 205. |
| S | 6. | 28. | 17. | 15. | 14. | 9. | 7. | 7. | 0. | 0. | 0. | 103. |
| SSW | 6. | 19. | 5. | 8. | 6. | 2. | 0. | 0. | 0. | 0. | 0. | 46. |
| SW | 1. | 35. | 14. | 3. | 4. | 2. | 0. | 0. | 0. | 0. | 0. | 59. |
| WSW | 4. | 36. | 29. | 17. | 7. | 0. | 0. | 0. | 0. | 0. | 0. | 93. |
| W | 3. | 23. | 42. | 54. | 38. | 21. | 5. | 0. | 1. | 0. | 1. | 188. |
| WNW | 1. | 28. | 54. | 68. | 58. | 52. | 27. | 5. | 2. | 2. | 3. | 300. |
| NW | 3. | 33. | 76. | 92. | 81. | 110. | 78. | 18. | 0. | 0. | 0. | 491. |
| NNW | 1. | 31. | 61. | 52. | 33. | 36. | 24. | 1. | 0. | 0. | 0. | 239. |
| TOTAL | 64. | 511. | 471. | 411. | 286. | 252. | 147. | 33. | 3. | 2. | 4. | |

## 1998 WIND FREQUENCY DISTRIBUTION: THIRD QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 7. | 33. | 40. | 22. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 106. |
| NNE | 10. | 23. | 11. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 44. |
| NE | 7. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 22. |
| ENE | 11. | 24. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 36. |
| E | 5. | 20. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 25. |
| ESE | 9. | 11. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 22. |
| SE | 9. | 31. | 15. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 57. |
| SSE | 13. | 47. | 48. | 14. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 125. |
| S | 13. | 13. | 12. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 41. |
| SSW | 7. | 20. | 7. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 34. |
| SW | 13. | 23. | 8. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 45. |
| WSW | 9. | 25. | 9. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 46. |
| W | 9. | 40. | 38. | 13. | 10. | 4. | 0. | 0. | 0. | 0. | 0. | 114. |
| WNW | 6. | 68. | 92. | 101. | 106. | 48. | 0. | 0. | 0. | 0. | 0. | 421. |
| NW | 2. | 89. | 190. | 128. | 129. | 142. | 44. | 4. | 0. | 0. | 0. | 728. |
| NNW | 5. | 64. | 97. | 58. | 39. | 46. | 25. | 8. | 0. | 0. | 0. | 342. |
| TOTAL | 135. | 546. | 569. | 344. | 293. | 240. | 69. | 12. | 0. | 0. | 0. | |

## 1998 WIND FREQUENCY DISTRIBUTION: FOURTH QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 11. | 45. | 18. | 12. | 11. | 4. | 11. | 0. | 0. | 0. | 0. | 112. |
| NNE | 3. | 14. | 3. | 2. | 1. | 0. | 0. | 2. | 0. | 0. | 0. | 25. |
| NE | 9. | 21. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 33. |
| ENE | 9. | 28. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 38. |
| E | 9. | 45. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 56. |
| ESE | 21. | 82. | 12. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 116. |
| SE | 20. | 186. | 60. | 21. | 9. | 12. | 10. | 8. | 1. | 0. | 0. | 327. |
| SSE | 30. | 143. | 63. | 25. | 19. | 11. | 5. | 2. | 2. | 0. | 0. | 300. |
| S | 20. | 47. | 14. | 3. | 0. | 1. | 2. | 0. | 3. | 1. | 1. | 92. |
| SSW | 17. | 26. | 3. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 48. |
| SW | 11. | 29. | 8. | 3. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 52. |
| WSW | 5. | 27. | 6. | 2. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 41. |
| W | 8. | 43. | 37. | 13. | 6. | 1. | 0. | 0. | 0. | 0. | 0. | 108. |
| WNW | 8. | 52. | 80. | 75. | 48. | 22. | 17. | 2. | 1. | 2. | 0. | 307. |
| NW | 6. | 49. | 110. | 58. | 71. | 33. | 16. | 4. | 0. | 0. | 0. | 347. |
| NNW | 4. | 46. | 68. | 33. | 22. | 22. | 9. | 2. | 0. | 0. | 0. | 206. |
| TOTAL | 191. | 883. | 488. | 250. | 188. | 107. | 70. | 20. | 7. | 3. | 1. | |

## 1999 WIND FREQUENCY DISTRIBUTION: ANNUAL

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 22. | 133. | 164. | 89. | 49. | 15. | 12. | 6. | 1. | 0. | 0. | 491. |
| NNE | 35. | 99. | 68. | 17. | 2. | 5. | 12. | 3. | 1. | 0. | 0. | 242. |
| NE | 15. | 83. | 8. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 108. |
| ENE | 27. | 88. | 12. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 127. |
| E | 36. | 112. | 10. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 158. |
| ESE | 56. | 197. | 48. | 3. | 2. | 0. | 1. | 0. | 0. | 0. | 0. | 307. |
| SE | 72. | 434. | 186. | 77. | 45. | 22. | 14. | 3. | 3. | 0. | 0. | 856. |
| SSE | 91. | 380. | 180. | 101. | 98. | 27. | 14. | 6. | 0. | 1. | 0. | 898. |
| S | 75. | 154. | 43. | 21. | 24. | 9. | 7. | 1. | 0. | 1. | 0. | 335. |
| SSW | 42. | 91. | 17. | 10. | 10. | 6. | 2. | 0. | 1. | 0. | 0. | 179. |
| SW | 35. | 109. | 32. | 6. | 7. | 2. | 1. | 0. | 0. | 0. | 0. | 192. |
| WSW | 38. | 100. | 35. | 13. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 191. |
| W | 23. | 123. | 99. | 54. | 39. | 28. | 10. | 1. | 0. | 0. | 0. | 377. |
| WNW | 27. | 161. | 290. | 239. | 229. | 116. | 45. | 33. | 20. | 4. | 8. | 1172. |
| NW | 25. | 198. | 387. | 388. | 314. | 348. | 194. | 63. | 17. | 3. | 1. | 1938. |
| NNW | 17. | 178. | 301. | 211. | 154. | 167. | 112. | 37. | 8. | 1. | 3. | 1189. |
| TOTAL | 636. | 2640. | 1880. | 1231. | 978. | 745. | 424. | 153. | 51. | 10. | 12. | |

## 1999 WIND FREQUENCY DISTRIBUTION: FIRST QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| SECTOR | WIND SPEED (M/S) 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 7. | 26. | 22. | 12. | 10. | 0. | 1. | 1. | 0. | 0. | 0. | 79. |
| NNE | 4. | 21. | 6. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 32. |
| NE | 2. | 17. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 19. |
| ENE | 5. | 19. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 28. |
| E | 6. | 26. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| ESE | 19. | 64. | 25. | 2. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 112. |
| SE | 13. | 159. | 74. | 53. | 34. | 19. | 8. | 1. | 0. | 0. | 0. | 361. |
| SSE | 19. | 127. | 57. | 50. | 68. | 15. | 8. | 3. | 0. | 1. | 0. | 348. |
| S | 20. | 59. | 17. | 9. | 12. | 6. | 5. | 1. | 0. | 1. | 0. | 130. |
| SSW | 12. | 30. | 7. | 4. | 4. | 5. | 2. | 0. | 1. | 0. | 0. | 65. |
| SW | 7. | 33. | 15. | 2. | 2. | 2. | 0. | 0. | 0. | 0. | 0. | 61. |
| WSW | 7. | 24. | 9. | 4. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 45. |
| W | 4. | 38. | 21. | 9. | 8. | 4. | 2. | 1. | 0. | 0. | 0. | 87. |
| WNW | 5. | 24. | 54. | 56. | 51. | 24. | 14. | 12. | 7. | 1. | 0. | 248. |
| NW | 4. | 34. | 63. | 76. | 49. | 50. | 24. | 8. | 2. | 1. | 0. | 311. |
| NNW | 5. | 41. | 65. | 43. | 27. | 11. | 6. | 1. | 0. | 0. | 0. | 199. |
| TOTAL | 139. | 742. | 442. | 321. | 267. | 136. | 71. | 28. | 10. | 4. | 0. | |

## 1999 WIND FREQUENCY DISTRIBUTION: SECOND QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 2. | 28. | 72. | 45. | 29. | 11. | 7. | 1. | 1. | 0. | 0. | 196. |
| NNE | 19. | 28. | 27. | 13. | 0. | 2. | 4. | 0. | 1. | 0. | 0. | 94. |
| NE | 3. | 22. | 3. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| ENE | 1. | 25. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 27. |
| E | 3. | 21. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 27. |
| ESE | 2. | 19. | 4. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 26. |
| SE | 2. | 45. | 27. | 5. | 2. | 2. | 4. | 0. | 0. | 0. | 0. | 87. |
| SSE | 3. | 72. | 55. | 24. | 20. | 4. | 3. | 0. | 0. | 0. | 0. | 181. |
| S | 3. | 31. | 10. | 2. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 50. |
| SSW | 2. | 18. | 4. | 3. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 29. |
| SW | 2. | 16. | 10. | 2. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 34. |
| WSW | 2. | 16. | 9. | 6. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| W | 2. | 20. | 18. | 31. | 26. | 24. | 8. | 0. | 0. | 0. | 0. | 129. |
| WNW | 2. | 26. | 32. | 42. | 53. | 37. | 21. | 19. | 12. | 3. | 8. | 255. |
| NW | 0. | 30. | 71. | 89. | 83. | 128. | 90. | 40. | 15. | 2. | 1. | 549. |
| NNW | 3. | 29. | 93. | 72. | 64. | 84. | 57. | 22. | 7. | 1. | 3. | 435. |
| TOTAL | 51. | 446. | 439. | 336. | 289. | 293. | 194. | 82. | 36. | 6. | 12. | |

## 1999 WIND FREQUENCY DISTRIBUTION: THIRD QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 6. | 52. | 59. | 29. | 7. | 2. | 0. | 0. | 0. | 0. | 0. | 155. |
| NNE | 8. | 27. | 27. | 2. | 0. | 0. | 5. | 1. | 0. | 0. | 0. | 70. |
| NE | 6. | 24. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 33. |
| ENE | 14. | 25. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 44. |
| E | 11. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 26. |
| ESE | 11. | 19. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| SE | 18. | 29. | 29. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 77. |
| SSE | 15. | 43. | 28. | 6. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 93. |
| S | 18. | 19. | 7. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 44. |
| SSW | 11. | 16. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 28. |
| SW | 7. | 20. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 29. |
| WSW | 15. | 24. | 6. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 47. |
| W | 6. | 30. | 24. | 6. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 67. |
| WNW | 7. | 39. | 80. | 61. | 70. | 34. | 5. | 1. | 1. | 0. | 0. | 298. |
| NW | 8. | 68. | 156. | 151. | 133. | 150. | 72. | 13. | 0. | 0. | 0. | 751. |
| NNW | 5. | 52. | 112. | 78. | 53. | 64. | 44. | 7. | 1. | 0. | 0. | 416. |
| TOTAL | 166. | 502. | 539. | 336. | 265. | 250. | 126. | 22. | 2. | 0. | 0. | |

## 1999 WIND FREQUENCY DISTRIBUTION: FOURTH QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 7. | 27. | 11. | 3. | 3. | 2. | 4. | 4. | 0. | 0. | 0. | 61. |
| NNE | 4. | 23. | 8. | 1. | 2. | 3. | 3. | 2. | 0. | 0. | 0. | 46. |
| NE | 4. | 20. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 26. |
| ENE | 7. | 19. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 28. |
| E | 16. | 50. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 70. |
| ESE | 24. | 95. | 19. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 139. |
| SE | 39. | 201. | 56. | 18. | 9. | 1. | 2. | 2. | 3. | 0. | 0. | 331. |
| SSE | 54. | 138. | 40. | 21. | 9. | 8. | 3. | 3. | 0. | 0. | 0. | 276. |
| S | 34. | 45. | 9. | 10. | 8. | 3. | 2. | 0. | 0. | 0. | 0. | 111. |
| SSW | 17. | 27. | 5. | 3. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 57. |
| SW | 19. | 40. | 5. | 2. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 68. |
| WSW | 14. | 36. | 11. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 64. |
| W | 11. | 35. | 36. | 8. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 94. |
| WNW | 13. | 72. | 124. | 80. | 55. | 21. | 5. | 1. | 0. | 0. | 0. | 371. |
| NW | 13. | 66. | 97. | 72. | 49. | 20. | 8. | 2. | 0. | 0. | 0. | 327. |
| NNW | 4. | 56. | 31. | 18. | 10. | 8. | 5. | 7. | 0. | 0. | 0. | 139. |
| TOTAL | 280. | 950. | 460. | 238. | 157. | 66. | 33. | 21. | 3. | 0. | 0. | |

## 2000 WIND FREQUENCY DISTRIBUTION: ANNUAL

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 12. | 159. | 158. | 82. | 40. | 15. | 15. | 5. | 2. | 2. | 1. | 491. |
| NNE | 22. | 119. | 81. | 18. | 8. | 7. | 14. | 3. | 2. | 1. | 1. | 276. |
| NE | 19. | 88. | 8. | 2. | 0. | 2. | 0. | 0. | 0. | 0. | 0. | 119. |
| ENE | 37. | 85. | 7. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 129. |
| E | 40. | 117. | 10. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 167. |
| ESE | 51. | 221. | 38. | 8. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 321. |
| SE | 67. | 446. | 180. | 85. | 62. | 24. | 16. | 11. | 3. | 2. | 1. | 897. |
| SSE | 76. | 383. | 213. | 127. | 78. | 45. | 18. | 8. | 4. | 0. | 0. | 952. |
| S | 58. | 160. | 40. | 34. | 25. | 25. | 12. | 9. | 3. | 0. | 0. | 366. |
| SSW | 57. | 99. | 19. | 14. | 7. | 4. | 3. | 2. | 1. | 0. | 1. | 207. |
| SW | 44. | 79. | 16. | 7. | 1. | 5. | 0. | 0. | 0. | 0. | 0. | 152. |
| WSW | 31. | 105. | 34. | 11. | 9. | 6. | 3. | 0. | 0. | 0. | 0. | 199. |
| W | 29. | 112. | 113. | 60. | 18. | 8. | 0. | 1. | 2. | 0. | 0. | 343. |
| WNW | 21. | 157. | 227. | 223. | 160. | 115. | 38. | 16. | 9. | 1. | 2. | 969. |
| NW | 21. | 181. | 436. | 370. | 342. | 331. | 167. | 49. | 8. | 1. | 0. | 1906. |
| NNW | 23. | 212. | 306. | 208. | 170. | 198. | 123. | 38. | 11. | 1. | 0. | 1290. |
| TOTAL | 608. | 2723. | 1886. | 1249. | 921. | 787. | 409. | 142. | 45. | 8. | 6. | |

## 2000 WIND FREQUENCY DISTRIBUTION: FIRST QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 2. | 31. | 28. | 11. | 9. | 1. | 7. | 3. | 1. | 0. | 0. | 93. |
| NNE | 6. | 22. | 8. | 3. | 1. | 2. | 6. | 0. | 1. | 1. | 0. | 50. |
| NE | 2. | 24. | 1. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 29. |
| ENE | 12. | 34. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 48. |
| E | 12. | 35. | 4. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 51. |
| ESE | 9. | 67. | 14. | 4. | 1. | 2. | 0. | 0. | 0. | 0. | 0. | 97. |
| SE | 17. | 102. | 82. | 57. | 49. | 19. | 12. | 10. | 2. | 2. | 1. | 353. |
| SSE | 21. | 123. | 71. | 71. | 49. | 33. | 11. | 4. | 2. | 0. | 0. | 385. |
| S | 13. | 50. | 14. | 16. | 9. | 10. | 3. | 4. | 2. | 0. | 0. | 121. |
| SSW | 17. | 29. | 7. | 3. | 1. | 2. | 1. | 1. | 1. | 0. | 1. | 63. |
| SW | 10. | 26. | 5. | 5. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 47. |
| WSW | 7. | 29. | 10. | 10. | 5. | 5. | 3. | 0. | 0. | 0. | 0. | 69. |
| W | 9. | 32. | 26. | 17. | 6. | 2. | 0. | 1. | 2. | 0. | 0. | 95. |
| WNW | 6. | 38. | 39. | 49. | 32. | 31. | 11. | 2. | 4. | 0. | 0. | 212. |
| NW | 5. | 32. | 72. | 61. | 58. | 22. | 15. | 7. | 1. | 1. | 0. | 274. |
| NNW | 4. | 50. | 43. | 33. | 29. | 27. | 6. | 5. | 0. | 0. | 0. | 197. |
| TOTAL | 152. | 724. | 426. | 341. | 249. | 158. | 75. | 37. | 16. | 4. | 2. | |

## 2000 WIND FREQUENCY DISTRIBUTION: SECOND QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 1. | 36. | 47. | 31. | 12. | 6. | 3. | 0. | 0. | 0. | 0. | 136. |
| NNE | 4. | 15. | 25. | 5. | 1. | 1. | 2. | 0. | 0. | 0. | 0. | 53. |
| NE | 3. | 24. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 30. |
| ENE | 8. | 14. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 24. |
| E | 6. | 17. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 26. |
| ESE | 12. | 21. | 11. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 47. |
| SE | 9. | 51. | 26. | 9. | 4. | 3. | 3. | 1. | 1. | 0. | 0. | 107. |
| SSE | 8. | 52. | 49. | 25. | 12. | 5. | 2. | 4. | 2. | 0. | 0. | 159. |
| S | 5. | 34. | 7. | 9. | 7. | 3. | 3. | 0. | 0. | 0. | 0. | 68. |
| SSW | 5. | 19. | 7. | 10. | 2. | 2. | 1. | 0. | 0. | 0. | 0. | 46. |
| SW | 3. | 14. | 2. | 2. | 1. | 3. | 0. | 0. | 0. | 0. | 0. | 25. |
| WSW | 3. | 21. | 9. | 1. | 1. | 1. | 0. | 0. | 0. | 0. | 0. | 36. |
| W | 6. | 18. | 31. | 17. | 7. | 5. | 0. | 0. | 0. | 0. | 0. | 84. |
| WNW | 1. | 28. | 58. | 60. | 73. | 60. | 25. | 11. | 5. | 1. | 2. | 324. |
| NW | 0. | 40. | 112. | 102. | 98. | 122. | 102. | 28. | 7. | 0. | 0. | 611. |
| NNW | 3. | 47. | 89. | 54. | 53. | 71. | 61. | 23. | 7. | 0. | 0. | 408. |
| TOTAL | 77. | 451. | 481. | 328. | 271. | 282. | 202. | 67. | 22. | 1. | 2. | |

## 2000 WIND FREQUENCY DISTRIBUTION: THIRD QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 5. | 53. | 56. | 28. | 7. | 2. | 0. | 0. | 0. | 0. | 0. | 151. |
| NNE | 7. | 49. | 38. | 5. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 99. |
| NE | 6. | 26. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 35. |
| ENE | 9. | 12. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 21. |
| E | 11. | 19. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 31. |
| ESE | 10. | 30. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 41. |
| SE | 10. | 68. | 11. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 90. |
| SSE | 19. | 54. | 39. | 10. | 2. | 2. | 3. | 0. | 0. | 0. | 0. | 129. |
| S | 20. | 18. | 7. | 9. | 5. | 9. | 3. | 4. | 1. | 0. | 0. | 76. |
| SSW | 10. | 17. | 3. | 1. | 3. | 0. | 0. | 1. | 0. | 0. | 0. | 35. |
| SW | 15. | 12. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 28. |
| WSW | 13. | 17. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 31. |
| W | 5. | 19. | 21. | 14. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 59. |
| WNW | 7. | 36. | 50. | 48. | 29. | 14. | 0. | 0. | 0. | 0. | 0. | 184. |
| NW | 5. | 58. | 151. | 141. | 142. | 163. | 47. | 12. | 0. | 0. | 0. | 719. |
| NNW | 4. | 65. | 125. | 84. | 62. | 80. | 49. | 8. | 2. | 0. | 0. | 479. |
| TOTAL | 156. | 553. | 508. | 341. | 250. | 270. | 102. | 25. | 3. | 0. | 0. | |

## 2000 WIND FREQUENCY DISTRIBUTION: FOURTH QUARTER

### WIND SPEED AT 10 M HEIGHT (M/S)

| | WIND SPEED (M/S) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SECTOR | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10+ | TOTAL |
| N | 4. | 39. | 27. | 12. | 12. | 6. | 5. | 2. | 1. | 2. | 1. | 111. |
| NNE | 5. | 33. | 10. | 5. | 6. | 4. | 6. | 3. | 1. | 0. | 1. | 74. |
| NE | 8. | 14. | 1. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 25. |
| ENE | 8. | 25. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 36. |
| E | 11. | 46. | 2. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 59. |
| ESE | 20. | 103. | 12. | 1. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 136. |
| SE | 31. | 225. | 61. | 18. | 9. | 2. | 1. | 0. | 0. | 0. | 0. | 347. |
| SSE | 28. | 154. | 54. | 21. | 15. | 5. | 2. | 0. | 0. | 0. | 0. | 279. |
| S | 20. | 58. | 12. | 0. | 4. | 3. | 3. | 1. | 0. | 0. | 0. | 101. |
| SSW | 25. | 34. | 2. | 0. | 1. | 0. | 1. | 0. | 0. | 0. | 0. | 63. |
| SW | 16. | 27. | 8. | 0. | 0. | 1. | 0. | 0. | 0. | 0. | 0. | 52. |
| WSW | 8. | 38. | 14. | 0. | 3. | 0. | 0. | 0. | 0. | 0. | 0. | 63. |
| W | 9. | 43. | 35. | 12. | 5. | 1. | 0. | 0. | 0. | 0. | 0. | 105. |
| WNW | 7. | 55. | 80. | 66. | 26. | 10. | 2. | 3. | 0. | 0. | 0. | 249. |
| NW | 11. | 51. | 101. | 66. | 44. | 24. | 3. | 2. | 0. | 0. | 0. | 302. |
| NNW | 12. | 50. | 49. | 37. | 26. | 20. | 7. | 2. | 2. | 1. | 0. | 206. |
| TOTAL | 223. | 995. | 471. | 239. | 151. | 77. | 30. | 13. | 4. | 3. | 2. | |

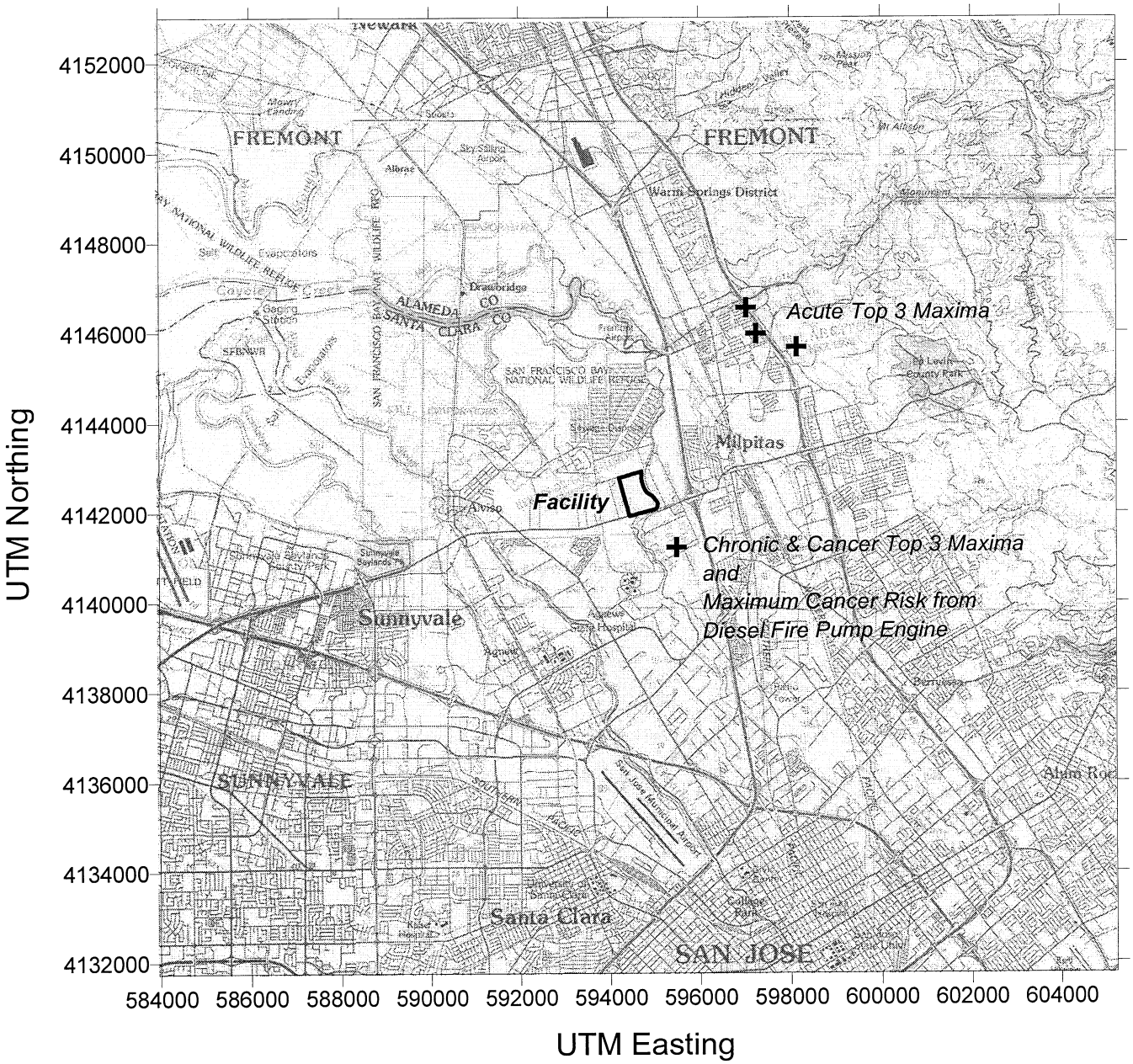
# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-C1*
# *Screening Health Risk Assessment for the Simple-Cycle Facility*

***December 2003***

**FIGURE 8.1-C1-1**

**Locations of Maximum Acute, Chronic and Cancer Risks From the Simple Cycle Facility**



**Screening Health Risk Assessment**
**Los Esteros Critical Energy Facility**

**Acute Inhalation Hazard Index**

| Pollutant Name | Max. Modeled 1-hr Conc, ug/m3 | Acute REL, ug/m3 (1) | Toxicological Endpoints | Acute Inhalation Hazard Index |
|---|---|---|---|---|
| Acrolein | 2.67E-03 | 1.90E-01 | Eye irritation | 1.41E-02 |
| Ammonia | 9.91E+00 | 3.20E+03 | Eye and respiratory irritation | 3.10E-03 |
| Benzene | 2.41E-03 | 1.30E+03 | Reproductive/ Developmental | 1.85E-06 |
| Formaldehyde | 2.66E-01 | 9.40E+01 | Eye irritation | 2.83E-03 |
| Propylene oxide | 1.95E-02 | 3.10E+03 | Eye and respiratory irritation | 6.28E-06 |
| Toluene | 9.63E-02 | 3.70E+04 | CNS (mild); Eye and respiratory irritation | 2.60E-06 |
| Xylenes | 4.73E-02 | 2.20E+04 | Eye and respiratory irritation | 2.15E-06 |
| **Total Acute Hazard Index** | | | | **0.020** |

**Screening Health Risk Assessment**
**Los Esteros Critical Energy Facility**

**Chronic Inhalation Hazard Index**

| Pollutant Name | Max. Modeled Annual Avg Conc, ug/m3 | Chronic REL, ug/m3 (1) | Toxicological Endpoints | Chronic Inhalation Hazard Index |
|---|---|---|---|---|
| Ammonia | 9.53E-02 | 2.00E+02 | Respiratory irritation | 4.77E-04 |
| Acetaldehyde | 2.84E-04 | 9.00E+00 | Respiratory system | 3.16E-05 |
| Acrolein | 2.57E-05 | 2.00E-02 | Respiratory system; eyes | 1.28E-03 |
| Benzene | 2.32E-05 | 6.00E+01 | Hematopoietic system; development; nervous system | 3.86E-07 |
| Ethylbenzene | 2.27E-04 | 2.00E+03 | Development; alimentary system (liver); kidney; endocrine system | 1.13E-07 |
| Formaldehyde | 2.56E-03 | 3.00E+00 | Respiratory system; eyes | 8.52E-04 |
| Hexane | 1.80E-03 | 7.00E+03 | Nervous system | 2.58E-07 |
| Naphthalene | 1.16E-05 | 9.00E+00 | Respiratory system | 1.28E-06 |
| Propylene | 5.37E-03 | 3.00E+03 | Respiratory system | 1.79E-06 |
| Propylene oxide | 1.87E-04 | 3.00E+01 | Respiratory system | 6.24E-06 |
| Toluene | 9.26E-04 | 3.00E+02 | Nervous system; respiratory system; development | 3.09E-06 |
| Xylene | 4.55E-04 | 7.00E+02 | Nervous system; respiratory system | 6.49E-07 |
| Total | | | | 2.66E-03 |

Notes:
(1) Resp: respiratory; CV/BL: cardiovascular/blood; CNS: central nervous system; Repro: reproductive system; Kidn: renal system; GI/LV: gastrointestinal/liver; Immun: immunological system

**Summary of HRA Modeling Results**
**Los Esteros Critical Energy Facility**

**Individual Cancer Risk**

| | Air | Soil | Skin | Garden | Mmilk | Other |
|---|---|---|---|---|---|---|
| Gas Turbines | 1.83E-08 | 3.33E-10 | 2.11E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **TOTAL RISK** | **0.02** | **in one million** | | | | |

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# ACUTE INHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros CEF

Jun. 28, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: ONEHR.M96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| ACROLEIN | 2.671E-03 |
| AMMONIA | 9.908E+00 |
| BENZENE | 2.410E-03 |
| FORMALDEHYDE | 2.660E-01 |
| PROPYLENE OXIDE | 1.947E-02 |
| TOLUENE | 9.627E-02 |
| XYLENES | 4.726E-02 |

ACUTE INHALATION HAZARD INDEX

| Pollutant | Resp | CV/BL | CNS | Eye | Repro | Kidn | GI/LV | Immun |
|---|---|---|---|---|---|---|---|---|
| ACROLEIN | 0.0141 | -- | -- | 0.0141 | -- | -- | -- | -- |
| AMMONIA | 0.0031 | -- | -- | 0.0031 | -- | -- | -- | -- |
| BENZENE | -- | <.0001 | -- | -- | <.0001 | -- | -- | <.0001 |
| FORMALDEHYDE | 0.0028 | -- | -- | 0.0028 | -- | -- | -- | 0.0028 |
| PROPYLENE OXIDE | <.0001 | -- | -- | <.0001 | <.0001 | -- | -- | -- |
| TOLUENE | <.0001 | -- | <.0001 | <.0001 | <.0001 | -- | -- | -- |
| XYLENES | <.0001 | -- | -- | <.0001 | -- | -- | -- | -- |
| Total Acute | 0.0200 | <.0001 | <.0001 | 0.0200 | <.0001 | -- | -- | 0.0028 |

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# CHRONIC INHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros CEF

Jun. 28, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 3.056E-06 |
| ACETALDEHYDE | 2.841E-04 |
| ACROLEIN | 2.569E-05 |
| AMMONIA | 9.530E-02 |
| BENZENE | 2.318E-05 |
| ETHYL BENZENE | 2.270E-04 |
| FORMALDEHYDE | 2.555E-03 |
| N-HEXANE | 1.803E-03 |
| NAPHTHALENE | 1.202E-03 |
| PAH:BENZ(A)ANTHRACENE | 1.573E-07 |
| PAH:BENZO(A)PYRENE | 9.677E-08 |
| PAH:BENZO(B)FLUORANTHENE | 7.867E-08 |
| PAH:BENZO(K)FLUORANTHENE | 7.658E-08 |
| PAH:CHRYSENE | 1.764E-07 |
| PAH:DIBENZ(A,H)ANTHRACENE | 1.636E-07 |
| PAH:INDENO(1,2,3-C,D)PYRENE | 1.636E-07 |
| PROPYLENE (PROPENE) | 5.368E-03 |
| PROPYLENE OXIDE | 1.873E-04 |
| TOLUENE | 9.260E-04 |
| XYLENES | 4.546E-04 |

CHRONIC INHALATION HAZARD INDEX

| Pollutant | Resp | CV/BL | CNS | Skin | Repro | Kidn | GI/LV | Immun |
|---|---|---|---|---|---|---|---|---|
| ACETALDEHYDE | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| ACROLEIN | 0.0013 | -- | -- | 0.0013 | -- | -- | -- | -- |
| AMMONIA | 0.0005 | -- | -- | -- | -- | -- | -- | -- |
| BENZENE | -- | <.0001 | <.0001 | -- | <.0001 | -- | -- | -- |
| ETHYL BENZENE | -- | -- | -- | -- | <.0001 | <.0001 | <.0001 | -- |
| FORMALDEHYDE | 0.0009 | -- | -- | 0.0009 | -- | -- | -- | -- |
| N-HEXANE | -- | -- | <.0001 | -- | -- | -- | -- | -- |
| NAPHTHALENE | 0.0001 | -- | -- | -- | -- | -- | -- | -- |
| PROPYLENE (PROP | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| PROPYLENE OXIDE | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| TOLUENE | <.0001 | -- | <.0001 | -- | <.0001 | -- | -- | -- |
| XYLENES | <.0001 | -- | <.0001 | -- | -- | -- | -- | -- |
| Total Chronic | 0.0028 | <.0001 | <.0001 | 0.0021 | <.0001 | <.0001 | <.0001 | -- |

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros CEF

Jun. 28, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 3.056E-06 |
| ACETALDEHYDE | 2.841E-04 |
| ACROLEIN | 2.569E-05 |
| AMMONIA | 9.530E-02 |
| BENZENE | 2.318E-05 |
| ETHYL BENZENE | 2.270E-04 |
| FORMALDEHYDE | 2.555E-03 |
| N-HEXANE | 1.803E-03 |
| NAPHTHALENE | 1.202E-03 |
| PAH:BENZ(A)ANTHRACENE | 1.573E-07 |
| PAH:BENZO(A)PYRENE | 9.677E-08 |
| PAH:BENZO(B)FLUORANTHENE | 7.867E-08 |
| PAH:BENZO(K)FLUORANTHENE | 7.658E-08 |
| PAH:CHRYSENE | 1.764E-07 |
| PAH:DIBENZ(A,H)ANTHRACENE | 1.636E-07 |
| PAH:INDENO(1,2,3-C,D)PYRENE | 1.636E-07 |
| PROPYLENE (PROPENE) | 5.368E-03 |
| PROPYLENE OXIDE | 1.873E-04 |
| TOLUENE | 9.260E-04 |
| XYLENES | 4.546E-04 |

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

---

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

CHRONIC NONINHALATION EXPOSURE

| Pollutant | Avg. Dose (mg/kg-d) | REL (mg/kg-d) | Avg Dose/REL |
|---|---|---|---|
| 1,3-BUTADIENE | --- | --- | --- |
| ACETALDEHYDE | --- | --- | --- |
| ACROLEIN | --- | --- | --- |
| AMMONIA | --- | --- | --- |
| BENZENE | --- | --- | --- |
| ETHYL BENZENE | --- | --- | --- |
| FORMALDEHYDE | --- | --- | --- |
| N-HEXANE | --- | --- | --- |
| NAPHTHALENE | 5.14E-07 | --- | --- |
| PAH:BENZ(A)ANTHRACENE | 3.53E-11 | --- | --- |
| PAH:BENZO(A)PYRENE | 2.17E-11 | --- | --- |
| PAH:BENZO(B)FLUORANTHENE | 1.77E-11 | --- | --- |
| PAH:BENZO(K)FLUORANTHENE | 1.72E-11 | --- | --- |
| PAH:CHRYSENE | 3.96E-11 | --- | --- |
| PAH:DIBENZ(A,H)ANTHRACEN | 3.67E-11 | --- | --- |
| PAH:INDENO(1,2,3-C,D)PYR | 3.67E-11 | --- | --- |
| PROPYLENE (PROPENE) | --- | --- | --- |
| PROPYLENE OXIDE | --- | --- | --- |
| TOLUENE | --- | --- | --- |
| XYLENES | --- | --- | --- |

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# INDIVIDUAL CANCER RISK REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros CEF

Jun. 28, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 3.056E-06 |
| ACETALDEHYDE | 2.841E-04 |
| ACROLEIN | 2.569E-05 |
| AMMONIA | 9.530E-02 |
| BENZENE | 2.318E-05 |
| ETHYL BENZENE | 2.270E-04 |
| FORMALDEHYDE | 2.555E-03 |
| N-HEXANE | 1.803E-03 |
| NAPHTHALENE | 9.260E-06 |
| PAH:BENZ(A)ANTHRACENE | 1.573E-07 |
| PAH:BENZO(A)PYRENE | 9.677E-08 |
| PAH:BENZO(B)FLUORANTHENE | 7.867E-08 |
| PAH:BENZO(K)FLUORANTHENE | 7.658E-08 |
| PAH:CHRYSENE | 1.764E-07 |
| PAH:DIBENZ(A,H)ANTHRACENE | 1.636E-07 |
| PAH:INDENO(1,2,3-C,D)PYRENE | 1.636E-07 |
| PROPYLENE (PROPENE) | 5.368E-03 |
| PROPYLENE OXIDE | 1.873E-04 |
| TOLUENE | 9.260E-04 |
| XYLENES | 4.546E-04 |

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

---

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

| Pollutant | Air | Soil | Skin | Garden | MMilk | Other |
|---|---|---|---|---|---|---|
| 1,3-BUTADIENE | 3.27E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ACETALDEHYDE | 4.82E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BENZENE | 4.23E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FORMALDEHYDE | 9.64E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZ(A)ANTH | 1.09E-11 | 1.67E-11 | 1.06E-11 | 0.00E+00 | 4.29E-11 | 0.00E+00 |
| PAH:BENZO(A)PYR | 6.69E-11 | 1.03E-10 | 6.54E-11 | 0.00E+00 | 2.64E-10 | 0.00E+00 |
| PAH:BENZO(B)FLU | 5.44E-12 | 8.37E-12 | 5.32E-12 | 0.00E+00 | 2.14E-11 | 0.00E+00 |
| PAH:BENZO(K)FLU | 5.29E-12 | 8.15E-12 | 5.17E-12 | 0.00E+00 | 2.09E-11 | 0.00E+00 |
| PAH:CHRYSENE | 1.22E-12 | 1.88E-12 | 1.19E-12 | 0.00E+00 | 4.81E-12 | 0.00E+00 |
| PAH:DIBENZ(A,H) | 1.23E-10 | 5.95E-11 | 3.78E-11 | 0.00E+00 | 1.52E-10 | 0.00E+00 |
| PAH:INDENO(1,2, | 1.13E-11 | 1.74E-11 | 1.11E-11 | 0.00E+00 | 4.46E-11 | 0.00E+00 |
| PROPYLENE OXIDE | 4.36E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Route Total | 1.15E-08 | 2.15E-10 | 1.37E-10 | 0.00E+00 | 5.51E-10 | 0.00E+00 |

TOTAL RISK: 1.24E-08

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

| Pollutant | Air | Soil | Skin | Garden | MMilk | Other |
|---|---|---|---|---|---|---|
| 1,3-BUTADIENE | 5.20E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ACETALDEHYDE | 7.67E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BENZENE | 6.72E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FORMALDEHYDE | 1.53E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZ(A)ANTH | 1.73E-11 | 2.59E-11 | 1.65E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZO(A)PYR | 1.06E-10 | 1.59E-10 | 1.01E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZO(B)FLU | 8.65E-12 | 1.30E-11 | 8.23E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZO(K)FLU | 8.42E-12 | 1.26E-11 | 8.01E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:CHRYSENE | 1.94E-12 | 2.91E-12 | 1.84E-12 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:DIBENZ(A,H) | 1.96E-10 | 9.21E-11 | 5.85E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:INDENO(1,2, | 1.80E-11 | 2.69E-11 | 1.71E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PROPYLENE OXIDE | 6.93E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Route Total | 1.83E-08 | 3.33E-10 | 2.11E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

TOTAL RISK: 1.89E-08

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-D1*
# *Construction Emissions and Impact Analysis for the Simple-Cycle Facility*

***December 2003***

## APPENDIX 8.1-D1

## CONSTRUCTION EMISSIONS AND IMPACT ANALYSIS FOR THE SIMPLE CYCLE FACILITY

No construction impacts as the facility has already been constructed.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-E1*
# *Evaluation of Best Available Control Technology for the Simple-Cycle Facility*

***December 2003***

# APPENDIX 8.1-E1

# EVALUATION OF BEST AVAILABLE CONTROL TECHNOLOGY FOR THE SIMPLE CYCLE FACILITY

See Section 8.1.6.1.3

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-F1*
# *Protocol for a Cumulative Impacts Analysis for the Simple-Cycle Facility*

***December 2003***

## APPENDIX 8.1-F1

## PROTOCOL FOR A CUMULATIVE IMPACTS ANALYSIS FOR THE SIMPLE CYCLE FACILITY

Potential cumulative air quality impacts that might be expected to occur resulting from the continued operation of Los Esteros Critical Energy Facility as a simple-cycle facility and other reasonably foreseeable projects are both regional and localized in nature. These cumulative impacts will be evaluated as follows.

Cumulative impacts from LECEF could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted $PM_{10}$. To ensure that other projects that might have significant cumulative impacts in conjunction with LECEF are identified, a search area with a radius of 6 km will be used for the cumulative impacts analysis.

Within this search area, three categories of projects with combustion sources will be used as criteria for identification:

- Projects that are existing and have been in operation since at least 2002.
- Projects for which air pollution permits to construct have been issued and that began operation after 2002.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

Projects that are existing and have been in operation since at least 2002 are already reflected in the ambient air quality data that has been used to represent background concentrations; consequently, no further analysis of the emissions from this category of facilities will be performed. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational by 2002 will be identified through a request of permit records from the Bay Area AQMD. The search has been requested to be performed at two levels. Projects that had a permit to construct issued after January 1, 2000, will be included in the cumulative air quality impacts analysis. The January 1, 2000 date was selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the 2002 ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 10 pounds per day will be assumed to be *de minimis*, and will not be included in the dispersion modeling analysis.

A list of projects within the area for which air pollution permits to construct have not yet been issued, but that are reasonably foreseeable, has also been requested from the BAAQMD staff.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-A2*
# *Emissions and Operating Parameters for the Phase 2 Combined-Cycle Facility*

***December 2003***

**Table 8.1-A2-1**
**Emissions and Operating Parameters for CTGs/HRSGs**
**Los Esteros Critical Energy Facility: Phase 2**

| | No Duct Firing | | | With Duct Firing | | |
|---|---|---|---|---|---|---|
| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 |
| | 29 deg no chilling | 61 deg chilling | 81 deg chilling | 29 deg no chilling | 61 deg chilling | 81 deg chilling |
| Ambient Temp, F | 29 | 61 | 81 | 29 | 61 | 81 |
| GT Load, % | 100 | 100 | 100 | 100 | 100 | 100 |
| GT heat input, MMBtu/hr (HHV) | 500.0 | 471.2 | 471.9 | 500.0 | 471.2 | 471.9 |
| DB heat input, MMBtu/hr (HHV) | 0.0 | 0.0 | 0.0 | 139.0 | 135.0 | 139.0 |
| Total heat input, MMBtu/hr (HHV | 500.0 | 471.2 | 471.9 | 639.0 | 606.2 | 610.9 |
| Stack flow, lb/hr | 1,174,574 | 1,090,181 | 1,072,806 | 1,180,605 | 1,096,057 | 1,078,864 |
| Stack flow, dscfm | 238,868 | 220,667 | 217,168 | 236,649 | 218,505 | 214,945 |
| Stack flow, acfm | 339,532 | 313,021 | 309,794 | 336,827 | 312,517 | 308,977 |
| Stack temp, F | 207 | 201 | 205 | 196 | 194 | 197 |
| Stack exhaust, vol % | | | | | | |
| O2 (dry) | 14.75 | 14.62 | 14.51 | 1.95 | 12.73 | 12.53 |
| CO2 (dry) | 3.55 | 3.62 | 3.68 | 4.56 | 4.69 | 4.81 |
| H2O | 9.76 | 10.39 | 10.35 | 11.37 | 12.06 | 12.11 |
| Emissions | | | | | | |
| NOx, ppmvd @ 15% O2 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| NOx, lb/hr | 4.53 | 4.27 | 4.27 | 5.78 | 5.49 | 5.53 |
| NOx, lb/MMBtu | 0.0091 | 0.0091 | 0.0090 | 0.0090 | 0.0091 | 0.0091 |
| SO2, ppmvd @ 15% O2 | 0.182 | 0.182 | 0.182 | 0.182 | 0.182 | 0.182 |
| SO2, lb/hr | 0.46 | 0.43 | 0.43 | 0.59 | 0.56 | 0.56 |
| SO2, lb/MMBtu | 0.00092 | 0.00092 | 0.00092 | 0.00092 | 0.00092 | 0.00092 |
| CO, ppmvd @ 15% O2 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| CO, lb/hr | 4.41 | 4.16 | 4.16 | 5.63 | 5.35 | 5.39 |
| CO, lb/MMBtu | 0.0088 | 0.0088 | 0.0088 | 0.0088 | 0.0088 | 0.0088 |
| VOC, ppmvd @ 15% O2 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| VOC, lb/hr | 1.26 | 1.19 | 1.19 | 1.61 | 1.53 | 1.54 |
| VOC, lb/MMBtu | 0.0025 | 0.0025 | 0.0025 | 0.0025 | 0.0025 | 0.0025 |
| PM10, lb/hr | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PM10, lb/MMBtu | 0.0060 | 0.0064 | 0.0064 | 0.0047 | 0.0049 | 0.0049 |
| PM10, gr/dscf | 0.00147 | 0.00159 | 0.00161 | 0.00148 | 0.00160 | 0.00163 |
| NH3, ppmvd@15% O2 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| NH3, lb/hr | 6.70 | 6.32 | 6.33 | 8.56 | 8.13 | 8.00 |

**Table 8.1-A2-2**
**Calculation of Cooling Tower Emissions**
**Los Esteros Critical Energy Facility: Phase 2**

| One-Cell Cooling Tower Design Parameters | |
|---|---|
| Water Flow Rate, 10E6 lbm/hr | 7.07 |
| Water Flow Rate, gal/min | 14,150.0 |
| Drift Rate, % | 0.0005 |
| Drift, lbm water/hr | 35.36 |
| PM10 Emissions based on TDS Level | |
| TDS level, ppm | 10000 |
| PM10, lb/hr | 0.35 |
| PM10, tpy | 1.55 |

| New 6-Cell Cooling Tower Design Parameters | |
|---|---|
| Water Flow Rate, 10E6 lbm/hr | 36.49 |
| Water Flow Rate, gal/min | 73,000.0 |
| Drift Rate, % | 0.0005 |
| Drift, lbm water/hr | 182.43 |
| PM10 Emissions based on TDS Level | |
| TDS level, ppm | 10000 |
| PM10, lb/hr | 1.82 |
| PM10, tpy | 7.99 |

**Table 8.1-A2-3**
**Calculation of Annual Fuel Use**
**Los Esteros Critical Energy Facility: Phase 2**

| | Operating Hours | | | Max Hourly Fuel |
|---|---|---|---|---|
| | max. hour | hrs/day | hrs/yr | Use, MMBtu |
| Turbine 1, no DB | 0 | 0 | 7510 | 500 |
| Turbine 2, no DB | 0 | 0 | 7510 | 500 |
| Turbine 3, no DB | 0 | 0 | 7510 | 500 |
| Turbine 4, no DB | 0 | 0 | 7510 | 500 |
| Turbine 1, w/ DB | 1 | 24 | 1250 | 639 |
| Turbine 2, w/ DB | 1 | 24 | 1250 | 639 |
| Turbine 3, w/ DB | 1 | 24 | 1250 | 639 |
| Turbine 4, w/ DB | 1 | 24 | 1250 | 639 |

| | Fuel Use | | |
|---|---|---|---|
| | MMBtu/hr | MMBtu/day | MMBtu/yr |
| Turbine 1, no DB | n/a | 0.0 | 3,755,000 |
| Turbine 2, no DB | n/a | 0.0 | 3,755,000 |
| Turbine 3, no DB | n/a | 0.0 | 3,755,000 |
| Turbine 4, no DB | n/a | 0.0 | 3,755,000 |
| Turbine 1, w/ DB | 639.0 | 15,336.0 | 798,750 |
| Turbine 2, w/ DB | 639.0 | 15,336.0 | 798,750 |
| Turbine 3, w/ DB | 639.0 | 15,336.0 | 798,750 |
| Turbine 4, w/ DB | 639.0 | 15,336.0 | 798,750 |
| Total | **2,556.0** | **61,344.0** | **18,215,000** |

**Table 8.1-A2-4**
**Fire Pump Engine Emissions**
**Los Esteros Critical Energy Facility: Phase 2**

| | |
|---|---|
| Mfr | John Deere |
| Model | JDFP-06WR |
| Output (Bhp) | 290 |
| Fuel cons, gal/hr | 13.5 |
| Fuel cons, MMBtu/hr | 1.890 |

| | | NOx | SO2 (1) | CO | POC | PM10 |
|---|---|---|---|---|---|---|
| Emissions | | | | | | |
| | g/bhp-hr | 6.7 | 0.14 | 0.25 | 0.060 | 0.070 |
| | lb/hr (3) | 3.21 | 0.07 | 0.12 | 0.03 | 0.034 |
| | tpy (4) | 0.214 | 0.004 | 0.008 | 0.002 | 0.002 |

| | | |
|---|---|---|
| Exhaust temp | 856 | deg F |
| | 730.78 | deg K |
| Stack diam. | 5 | in |
| | 0.127 | m |
| Exh flow | 1,506 | cfm |
| | 0.71 | m3/s |
| Exh velocity | 56.11 | m/s |

Notes:
1. Calculated from fuel consumption rate and fuel sulfur content of 0.05% by weight.
2. Emissions data from manufacturer's performance data.
3. Operation limited to 45 minutes out of any hour.
4. Based on 100 hours per year of operation.

**Table 8.1-A2-5**
**Detailed Calculations for Maximum Hourly, Daily and Annual Criteria Pollutant Emissions**
**Los Esteros Critical Energy Facility: Phase 2**

| | | | | |
|---|---|---|---|---|
| Duct Firing: | 20 | hrs/day | 1250 | hrs/yr |
| Startups: | 4 | hrs/day | 250 | hrs/yr |
| Total Hours (incl start/shut): | 24 | hrs/day | 8760 | hrs/yr |

| | Operating Hours | | | | | NOx | | | SO2 | CO | | POC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base Load | | Startup | | Maximum | Annual | Startup | | Maximum | Startup | Maximum | Startup | PM10 |
| | max. hour | hrs/day | hrs/yr | hrs/day | hrs/yr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr |
| CTG/HRSG 1, no DB | 0 | 0 | 7260 | 4 | 250 | 4.53 | 4.53 | 40 | 0.46 | 4.41 | 41 | 1.26 | 12 | 3.0 |
| CTG/HRSG 2, no DB | 0 | 0 | 7260 | 4 | 250 | 4.53 | 4.53 | 40 | 0.46 | 4.41 | 41 | 1.26 | 12 | 3.0 |
| CTG/HRSG 3, no DB | 0 | 0 | 7260 | 4 | 250 | 4.53 | 4.53 | 40 | 0.46 | 4.41 | 41 | 1.26 | 12 | 3.0 |
| CTG/HRSG 4, no DB | 0 | 0 | 7260 | 4 | 250 | 4.53 | 4.53 | 40 | 0.46 | 4.41 | 41 | 1.26 | 12 | 3.0 |
| CTG/HRSG 1, w/ DB | 1 | 20 | 1250 | 0 | 0 | 5.78 | 5.78 | n/a | 0.59 | 5.63 | n/a | 1.61 | n/a | 3.0 |
| CTG/HRSG 2, w/ DB | 1 | 20 | 1250 | 0 | 0 | 5.78 | 5.78 | n/a | 0.59 | 5.63 | n/a | 1.61 | n/a | 3.0 |
| CTG/HRSG 3, w/ DB | 1 | 20 | 1250 | 0 | 0 | 5.78 | 5.78 | n/a | 0.59 | 5.63 | n/a | 1.61 | n/a | 3.0 |
| CTG/HRSG 4, w/ DB | 1 | 20 | 1250 | 0 | 0 | 5.78 | 5.78 | n/a | 0.59 | 5.63 | n/a | 1.61 | n/a | 3.0 |

| | NOx | | | SO2 | | | CO | | | POC | | | PM10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max | Max | Total | Max | Max | Total | Max | Max | Total | Max | Max | Total | Max | Max | Total |
| | lb/hr | lb/day | tpy | lb/hr | lb/day | tpy | lb/hr | lb/day | tpy | lb/hr | lb/day | tpy | lb/hr | lb/day | tpy |
| CTG/HRSG 1 | 40.0 | 275.6 | 25.1 | 0.59 | 14.2 | 2.10 | 41.00 | 276.6 | 24.65 | 12.00 | 80.2 | 7.08 | 3.0 | 72.0 | 13.14 |
| CTG/HRSG 2 | 40.0 | 275.6 | 25.1 | 0.59 | 14.2 | 2.10 | 41.00 | 276.6 | 24.65 | 12.00 | 80.2 | 7.08 | 3.0 | 72.0 | 13.14 |
| CTG/HRSG 3 | 40.0 | 275.6 | 25.1 | 0.59 | 14.2 | 2.10 | 41.00 | 276.6 | 24.65 | 12.00 | 80.2 | 7.08 | 3.0 | 72.0 | 13.14 |
| CTG/HRSG 4 | 40.0 | 275.6 | 25.1 | 0.59 | 14.2 | 2.10 | 41.00 | 276.6 | 24.65 | 12.00 | 80.2 | 7.08 | 3.0 | 72.0 | 13.14 |
| One-Cell Cooling Tower | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.4 | 8.5 | 1.5 |
| Six-Cell Cooling Tower | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.8 | 43.8 | 8.0 |
| Fire Pump Engine | 3.2 | 3.2 | 0.2 | 0.1 | 0.1 | 3.4E-03 | 0.1 | 0.1 | 6.0E-03 | 0.0 | 0.0 | 1.4E-03 | 0.0 | 0.0 | 1.7E-03 |
| Facility Total | 163.2 | 1105.6 | 99.2 | 2.4 | 56.7 | 8.4 | 164.1 | 1106.5 | 98.6 | 48.0 | 320.8 | 28.3 | 14.2 | 340.3 | 62.1 |
| Total, Permitted Units | 163.2 | 1105.6 | 99.2 | 2.4 | 56.7 | 8.4 | 164.1 | 1106.5 | 98.6 | 48.0 | 320.8 | 28.3 | 13.9 | 331.8 | 60.6 |
| Total, CTGs/HRSGs | 160.0 | 1102.4 | 99.0 | 2.4 | 56.6 | 8.4 | 164.0 | 1106.4 | 98.6 | 48.0 | 320.8 | 28.3 | 12.0 | 288.0 | 52.6 |
| Current Permit Limit | n/a | 821 | 74.9 | 1.32 | 32 | 5.8 | n/a | 399 | 72.9 | n/a | 113 | 20.8 | 10 | 240 | 43.8 |
| Increase, Turbines | | 281.4 | 24.1 | | 24.6 | 2.6 | | 707.4 | 25.7 | | 207.8 | 7.5 | | 48.0 | 8.8 |
| Offsets Provided | | | 75.4 | | | | | | | | | 21 | | | |
| Add'l Offsets Required | | | 23.80 | | | | | | | | | 7.3 | | | |

**Table 8.1-A2-6**
**Calculation of Noncriteria Pollutant Emissions from Combustion Turbines and Duct Burners**
**Los Esteros Critical Energy Facility: Phase 2**

| Compound | Emission Factor, lb/MMscf (2) | Maximum Hourly Emissions, lb/hr Each CTG/HRSG (3) | Total, four units | Total Annual Emissions, 4 units lb/yr | tpy |
|---|---|---|---|---|---|
| Ammonia | (5) | 8.56 | 34.24 | 236,028.0 | 118.0 |
| Propylene | 7.71E-01 | 0.48 | 1.91 | 13,634.7 | 6.8 |
| Hazardous Air Pollutants | | | | | |
| Acetaldehyde | 4.08E-02 | 0.03 | 0.10 | 721.5 | 0.36 |
| Acrolein | 3.69E-03 | 0.00 | 0.01 | 65.3 | 0.03 |
| Benzene | 3.33E-03 | 0.00 | 0.01 | 58.9 | 0.03 |
| 1,3-Butadiene | 4.39E-04 | 2.72E-04 | 1.089E-03 | 7.8 | 3.9E-03 |
| Ethylbenzene | 3.26E-02 | 0.02 | 0.08 | 576.5 | 0.29 |
| Formaldehyde | 3.67E-01 | 0.23 | 0.91 | 6,490.2 | 3.25 |
| Hexane | 2.59E-01 | 0.16 | 0.64 | 4,580.3 | 2.29 |
| Naphthalene | 1.66E-03 | 1.03E-03 | 4.119E-03 | 29.4 | 1.47E-02 |
| PAHs (listed individually below) | 1.79E-04 | 1.11E-04 | 4.442E-04 | 3.2 | 1.58E-03 |
| Anthracene | | | | | |
| Benzo(a)anthracene | | | | | |
| Benzo(a)pyrene | | | | | |
| Benzo(b)fluoranthrene | | | | | |
| Benzo(k)fluoranthrene | | | | | |
| Chrysene | | | | | |
| Dibenz(a,h)anthracene | | | | | |
| Indeno(1,2,3-cd)pyrene | | | | | |
| Propylene oxide | 2.69E-02 | 0.02 | 0.07 | 475.7 | 0.24 |
| Toluene | 1.33E-01 | 0.08 | 0.33 | 2,352.0 | 1.18 |
| Xylene | 6.53E-02 | 0.04 | 0.16 | 1,154.8 | 0.58 |
| Total HAPs | | | 2.32 | 16,515.5 | 8.26 |

Notes:

(1) All factors except PAHs, hexane and propylene from AP-42, Table 3.4-1. Acrolein, benzene and formaldehyde reflect oxidation catalyst. Individual PAHs, hexane and propylene are CATEF mean results as AP-42 does not include factors for these compounds.

(2) Based on maximum hourly CTG/HRSG fuel use of 639 MMBtu/hr and fuel HHV of 1030 Btu/scf. 0.62 MMscf/hr

(3) Based on annual fuel use of 4,553,250 MMBtu/yr per unit and fuel HHV of 1030 Btu/scf. 17,684 MMscf/yr

(4) Based on 10 ppm ammonia slip from SCR system.

**Table 8.1-A2-7**
**Calculation of Noncriteria Pollutant Emissions from Cooling Towers**
**Los Esteros Critical Energy Facility**

One-Cell Cooling Tower (1)

| Constituent | Concentration in Cooling Tower Return Water | Emissions, lb/hr | Emissions, lb/day | Emissions, ton/yr | BAAQMD TAC Trigger Level, lb/yr |
|---|---|---|---|---|---|
| Ammonia (2) | 120 ppb | 4.24E-06 | 1.02E-04 | 3.72E-02 | 1.93E+04 |
| Cadmium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.60E-02 |
| Chromium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Copper | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.63E+02 |
| Lead | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.90E+01 |
| Mercury | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.79E+01 |
| Nickel | 19 ppb | 6.72E-07 | 1.61E-05 | 5.89E-03 | 7.30E-01 |
| Silver | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Zinc | 460 ppb | 1.63E-05 | 3.90E-04 | 1.42E-01 | 6.76E+03 |

Six-Cell Cooling Tower (3)

| Constituent | Concentration in Cooling Tower Return Water | Emissions, lb/hr | Emissions, lb/day | Emissions, ton/yr | BAAQMD TAC Trigger Level, lb/yr |
|---|---|---|---|---|---|
| Ammonia (2) | 120 ppb | 2.19E-05 | 5.25E-04 | 1.92E-01 | 1.93E+04 |
| Cadmium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.60E-02 |
| Chromium | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Copper | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.63E+02 |
| Lead | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.90E+01 |
| Mercury | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.79E+01 |
| Nickel | 19 ppb | 3.47E-06 | 8.32E-05 | 3.04E-02 | 7.30E-01 |
| Silver | 0 ppb | 0.00E+00 | 0.00E+00 | 0.00E+00 | n/a |
| Zinc | 460 ppb | 8.39E-05 | 2.01E-03 | 7.35E-01 | 6.76E+03 |

Notes:
(1) Emissions calculated from maximum drift rate of 39.98 lb/hr
(2) Ammonia is not a TAC.
(3) Emissions calculated from maximum drift rate of 182.43 lb/hr

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-B2*
# *Modeling Analysis for the Phase 2 Combined-Cycle Facility*

***December 2003***

**FIGURE 8.1-B2-1**

**Building Layout for GEP Analysis: Phase 2 Combined Cycle Conversion**

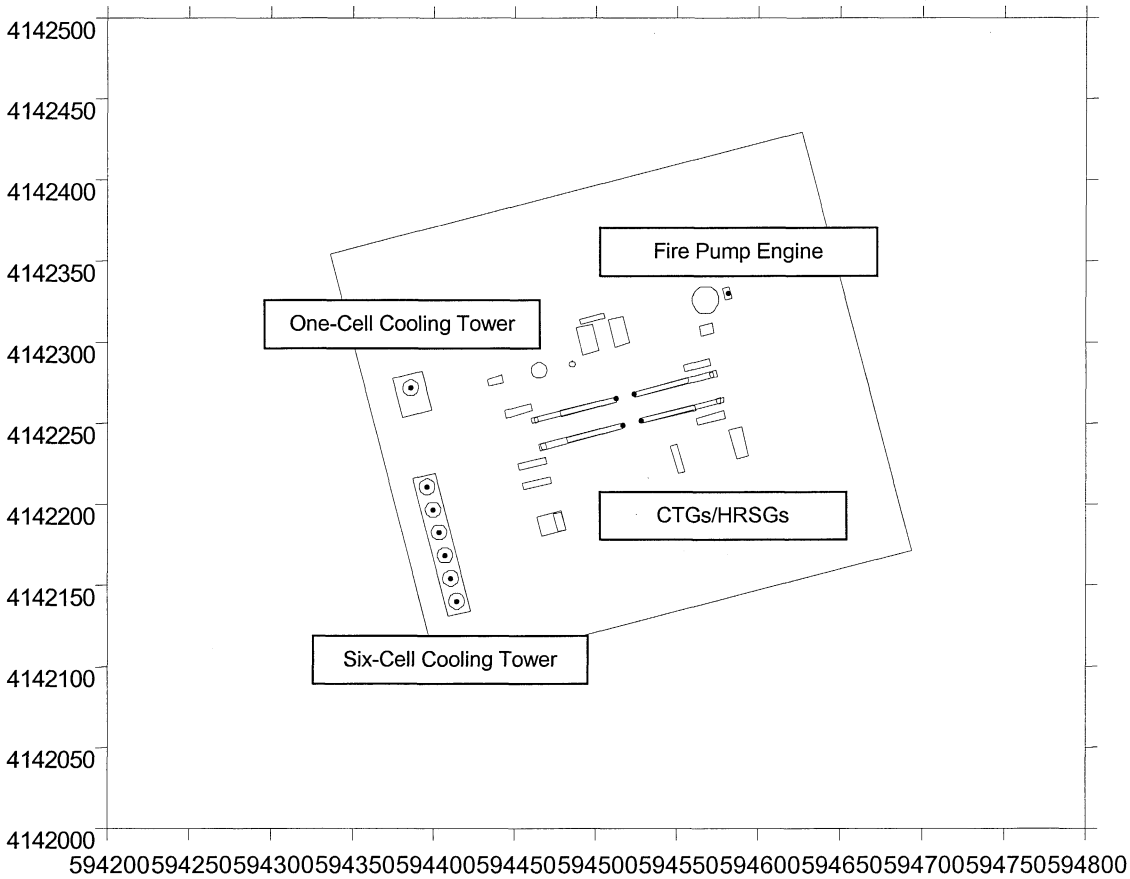


**Figure 8.1-B2-2**
Receptor Grids for the Combined Cycle Facility

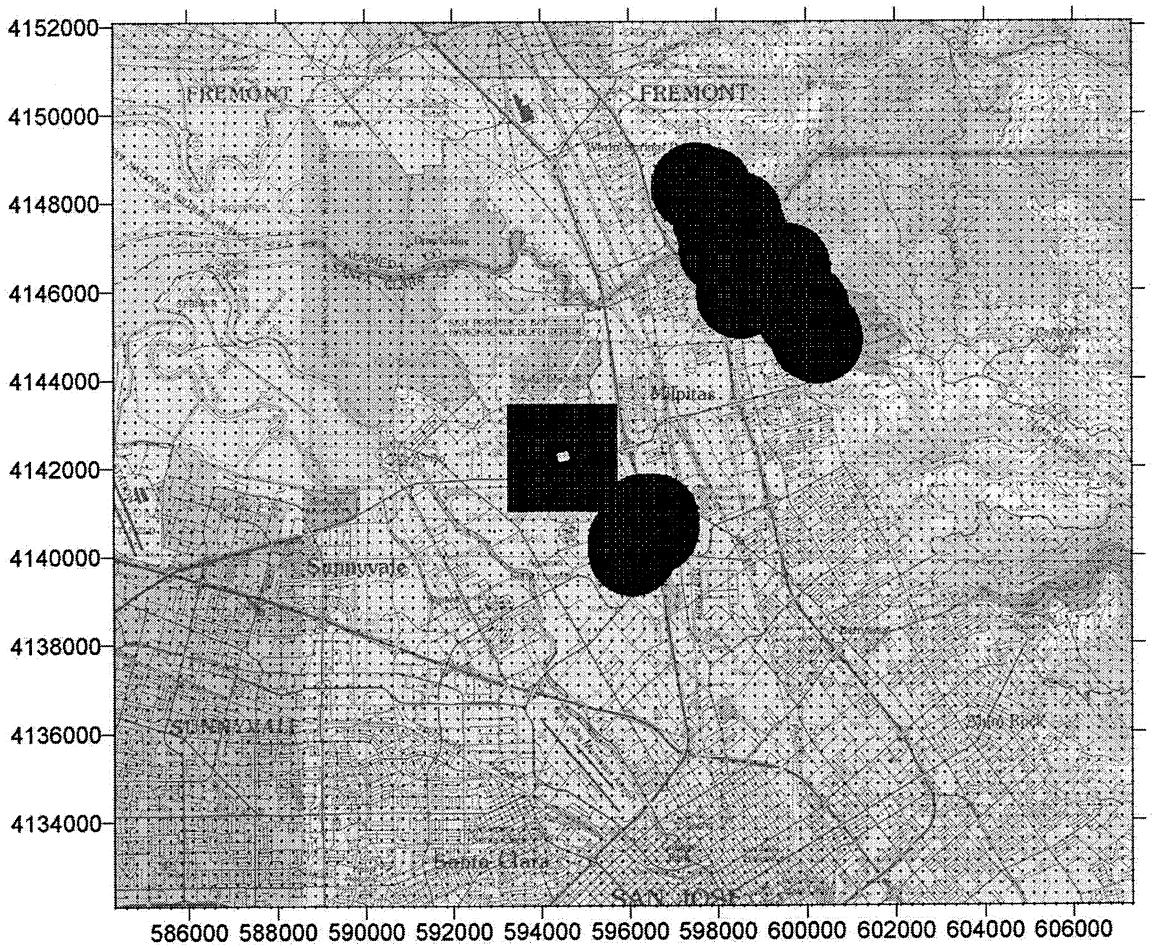


**Figure 8.1-B2-3**
24-Hour Average $PM_{10}$ Impacts for the Combined Cycle Facility (in $\mu g/m^3$)

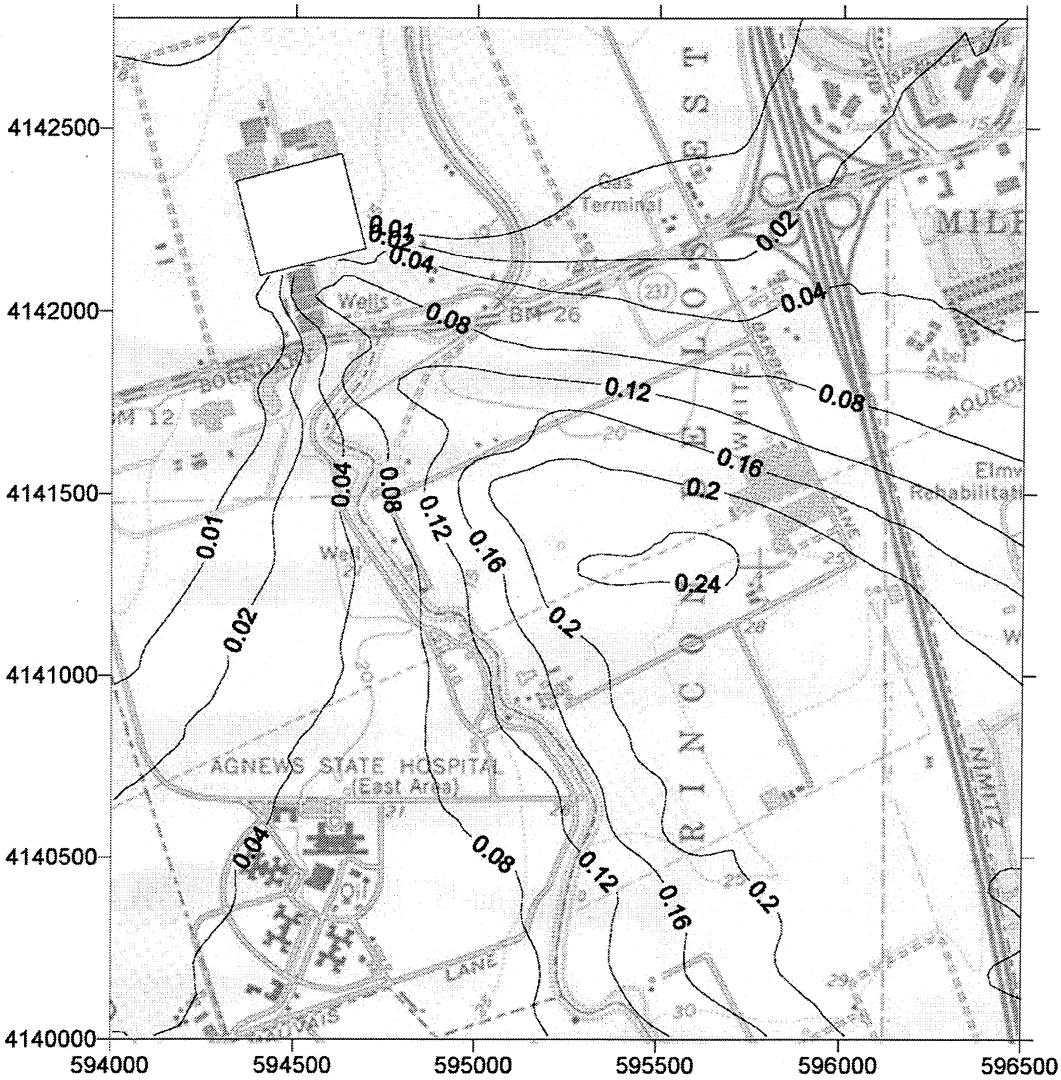


**Figure 8.1-B2-4**
Annual Average $PM_{10}$ Impacts for the Combined Cycle Facility (in $\mu g/m^3$)

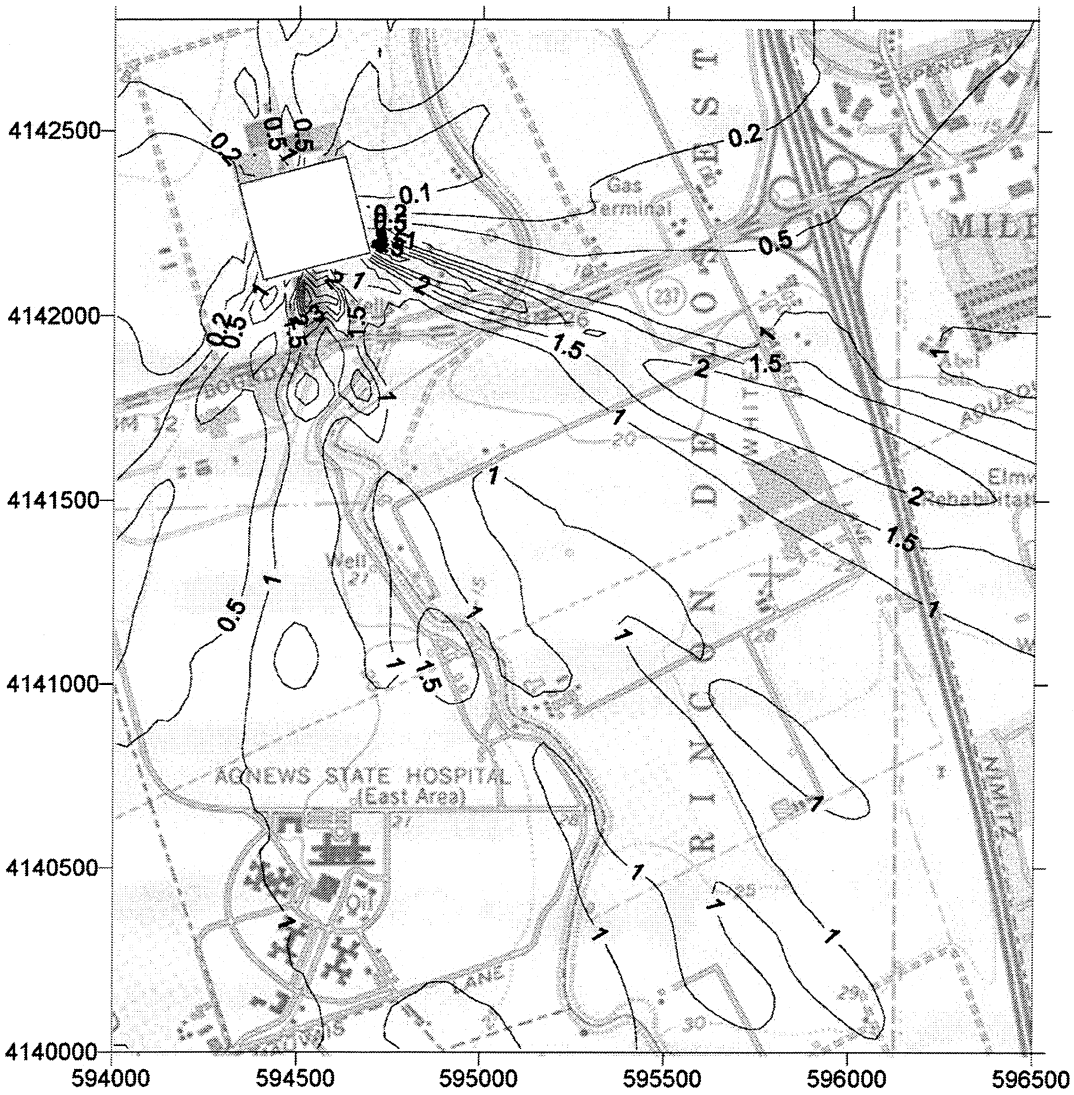


**TABLE 8.1-B2-1**
Building Dimensions Used in the Modeling Analysis

| Feature | Height (feet) | Length (feet) | Width (feet) | Diameter (feet) |
|---|---|---|---|---|
| HRSG Units | | | | |
| HRSG casings | 59' | 118' | 15' | - |
| To platform | 65' | | | - |
| To top of highest drums | 71' | | | - |
| To top of top works support steel | 80.5' | | | - |
| To top of highest relief valves and vent silencers | 88' | | | - |
| HRSG stacks | 90' | - | - | 11'-4.5" |
| Combustion Turbine Generators | | | | |
| Combustion turbines & generators (base unit) | 16' | 57' | 14' | - |
| Inlet air filters (located above CT) | 35' (above grade) | 34' | 34' | - |
| Steam Turbine Generator | | | | |
| Top of STG Enclosure | 55' (above grade) | | | - |
| STG pedestal | 36' | 75' | 25' | - |
| Pipe Rack | | | | |
| Bottom | 20 | | | - |
| Top | 48' | | | - |
| STG Cooling Tower (6 cells) | | 289' | 49' | 32' (fan) |
| To top of deck | 45' | | | |
| To top of fan shrouds (cones) | 58' | | | |
| Aux Cooling Tower (1 cell) | | 54'4" | 61'4" | 32' (fan) |
| To top of deck | 42' | | | |
| To top of fan shrouds (cones) | 56' | | | |
| Tanks | | | | |
| Service/Firewater Tank | 32' | | | 55' |
| Demineralized Water Storage Tank | 32' | | | 32' |
| Potable Storage Tank | 30' | | | 12' |
| Admin Building | 13' | 60' | 30' | |
| Control Building | 13' | 57' | 32' | - |
| Bathroom/Shower Building | 13' | 52' | 12' | |
| Misc. PDCs | 13' | Varies | Varies | |

**Table 8.1-B2-2**
**Emissions and Stack Parameters for Screening Modeling**
**Los Esteros Critical Energy Facility: Phase 2**

| Case | Ambient Temp | Ambient Temp (deg K) | Stack Diam (m) | Stack Height (m) | Exhaust Temp (deg K) | Exhaust Velocity (m/s) |
|---|---|---|---|---|---|---|
| 1 | 29 | 271.33 | 3.467 | 27.432 | 370.222 | 16.973 |
| 2 | 61 | 289.11 | 3.467 | 27.432 | 366.889 | 15.647 |
| 3 | 81 | 300.22 | 3.467 | 27.432 | 369.111 | 15.486 |
| 4 | 29 | 271.33 | 3.467 | 27.432 | 364.111 | 16.838 |
| 5 | 61 | 289.11 | 3.467 | 27.432 | 363.000 | 15.622 |
| 6 | 81 | 300.22 | 3.467 | 27.432 | 364.667 | 15.445 |

Note: Parameters are for each unit.

**Table 8.1-B2-3**
**Results of the CTG/HRSG Screening Analysis**
**Los Esteros Critical Energy Facility: Phase 2**

| Case | Max. Impact, ug/m3 per 4.0 g/s | | | | |
|---|---|---|---|---|---|
| | 1-hr | 3-hr | 8-hr | 24-hr | annual |
| | 1996 Met Data | | | | |
| 1 | 38.336 | 29.639 | 17.907 | 6.009 | 0.340 |
| 2 | 46.502 | 37.765 | 23.843 | 8.045 | 0.399 |
| 3 | 46.864 | 38.176 | 24.168 | 8.159 | 0.393 |
| 4 | 40.555 | 31.713 | 19.355 | 6.502 | 0.371 |
| 5 | 47.662 | 38.892 | 24.663 | 8.328 | 0.423 |
| 6 | 48.230 | 39.511 | 25.146 | 8.496 | 0.420 |
| | 1997 Met Data | | | | |
| 1 | 44.108 | 37.360 | 29.157 | 10.239 | 0.369 |
| 2 | 51.952 | 43.474 | 34.704 | 12.502 | 0.427 |
| 3 | 52.324 | 43.770 | 34.977 | 12.631 | 0.423 |
| 4 | 46.197 | 39.000 | 30.611 | 10.795 | 0.401 |
| 5 | 53.003 | 44.433 | 35.443 | 12.806 | 0.447 |
| 6 | 53.565 | 44.980 | 35.850 | 12.994 | 0.445 |
| | 1998 Met Data | | | | |
| 1 | 45.227 | 29.151 | 16.349 | 5.483 | 0.306 |
| 2 | 49.653 | 32.130 | 19.227 | 7.233 | 0.355 |
| 3 | 49.903 | 32.257 | 19.373 | 7.396 | 0.349 |
| 4 | 46.332 | 29.973 | 17.088 | 5.738 | 0.333 |
| 5 | 50.161 | 32.546 | 19.629 | 7.604 | 0.377 |
| 6 | 50.508 | 32.746 | 19.850 | 7.846 | 0.374 |
| | 1999 Met Data | | | | |
| 1 | 41.576 | 28.656 | 18.303 | 8.469 | 0.335 |
| 2 | 45.845 | 36.714 | 20.997 | 9.920 | 0.391 |
| 3 | 46.021 | 37.080 | 21.109 | 9.984 | 0.386 |
| 4 | 42.790 | 30.798 | 19.057 | 8.865 | 0.366 |
| 5 | 46.438 | 37.900 | 21.386 | 10.129 | 0.411 |
| 6 | 46.718 | 38.479 | 21.567 | 10.231 | 0.409 |
| | 2000 Met Data | | | | |
| 1 | 36.658 | 17.695 | 8.165 | 2.862 | 0.331 |
| 2 | 44.407 | 22.871 | 10.326 | 4.136 | 0.385 |
| 3 | 44.736 | 23.126 | 10.494 | 4.214 | 0.380 |
| 4 | 38.792 | 19.025 | 8.233 | 3.170 | 0.360 |
| 5 | 45.531 | 23.600 | 10.765 | 4.327 | 0.404 |
| 6 | 46.058 | 23.990 | 11.020 | 4.443 | 0.402 |

**Table 8.1-B2-3**
**Results of the CTG/HRSG Screening Analysis**
**Los Esteros Critical Energy Facility: Phase 2**

| Emission Rates for Screening Modeling (lb/hr) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NOx | | SO2 | | | | CO | | PM10 | |
| Case | 1-hr | annual avg | 1-hr | 3-hr | 24-hr | annual avg | 1-hr | 8-hr | 24-hr | annual avg |
| 1 | 4.53 | 5.72 | 0.46 | 0.46 | 0.46 | 0.48 | 4.41 | 4.41 | 3.00 | 3.00 |
| 2 | 4.27 | 5.72 | 0.43 | 0.433 | 0.433 | 0.48 | 4.16 | 4.16 | 3.00 | 3.00 |
| 3 | 4.27 | 5.72 | 0.434 | 0.434 | 0.434 | 0.48 | 4.16 | 4.16 | 3.00 | 3.00 |
| 4 | 5.78 | 5.72 | 0.59 | 0.59 | 0.59 | 0.48 | 5.63 | 5.63 | 3.00 | 3.00 |
| 5 | 5.49 | 5.72 | 0.56 | 0.56 | 0.56 | 0.48 | 5.35 | 5.35 | 3.00 | 3.00 |
| 6 | 5.53 | 5.72 | 0.56 | 0.56 | 0.56 | 0.48 | 5.39 | 5.39 | 3.00 | 3.00 |

| Turbine Emission Rates for Screening Modeling (g/s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Turbine | NOx | | SO2 | | | | CO | | PM10 | |
| Case | 1-hr | annual avg | 1-hr | 3-hr | 24-hr | annual avg | 1-hr | 8-hr | 24-hr | annual avg |
| 1 | 0.571 | 0.721 | 0.058 | 0.058 | 0.058 | 0.060 | 0.556 | 0.556 | 0.378 | 0.378 |
| 2 | 0.538 | 0.721 | 0.055 | 0.055 | 0.055 | 0.060 | 0.524 | 0.524 | 0.378 | 0.378 |
| 3 | 0.538 | 0.721 | 0.055 | 0.055 | 0.055 | 0.060 | 0.524 | 0.524 | 0.378 | 0.378 |
| 4 | 0.728 | 0.721 | 0.074 | 0.074 | 0.074 | 0.060 | 0.709 | 0.709 | 0.378 | 0.378 |
| 5 | 0.692 | 0.721 | 0.071 | 0.071 | 0.071 | 0.060 | 0.674 | 0.674 | 0.378 | 0.378 |
| 6 | 0.697 | 0.721 | 0.071 | 0.071 | 0.071 | 0.060 | 0.679 | 0.679 | 0.378 | 0.378 |

| | Load/ | Modeled Impacts, ug/m3, by Pollutant and Averaging Period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient | NOx | | SO2 | | | | CO | | PM10 | |
| Case | Temp | 1-hr | Annual | 1-hr | 3-hr | 24-hr | Annual | 1-hr | 8-hr | 24-hr | Annual |
| 1 | 29 deg no DF | 25.81 | 0.266 | 2.621 | 2.165 | 0.593 | 0.0223 | 25.13 | 16.20 | 3.87 | 0.140 |
| 2 | 61 deg no DF | 27.95 | 0.308 | 2.834 | 2.372 | 0.682 | 0.0258 | 27.23 | 18.19 | 4.73 | 0.161 |
| 3 | 81 deg no DF | 28.15 | 0.305 | 2.861 | 2.394 | 0.691 | 0.0255 | 27.43 | 18.33 | 4.77 | 0.160 |
| 4 | 29 deg w/ DF | 33.74 | 0.289 | 3.444 | 2.899 | 0.803 | 0.0242 | 32.87 | 21.71 | 4.08 | 0.151 |
| 5 | 61 deg w/ DF | 36.66 | **0.322** | 3.740 | 3.135 | 0.904 | **0.0269** | 35.73 | 23.89 | 4.84 | **0.169** |
| 6 | 81 deg w/ DF | **37.32** | 0.321 | **3.780** | **3.174** | **0.917** | 0.0268 | **36.38** | **24.35** | **4.91** | 0.168 |

**Table 8.1-B2-4**
**Emission Rates and Stack Parameters for Refined Modeling**
**Los Esteros Critical Energy Facility Phase 2**

| | Stack Diam, m | Stack Height, m | Exh Temp, Deg K | Exhaust Flow, m3/s | Exhaust Velocity, m/s | Emission Rate, g/s | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | NOx | SO2 | CO | PM10 |
| Averaging Period: 1 hour | | | | | | | | | |
| Each CTG/HRSG | 3.467 | 27.432 | 364.67 | 145.82 | 15.445 | 0.697 | 7.056E-02 | 0.679 | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | 0.405 | 8.458E-03 | 1.510E-02 | n/a |
| Averaging Period: 3 hours | | | | | | | | | |
| Each CTG/HRSG | 3.467 | 27.432 | 364.67 | 145.82 | 15.445 | n/a | 7.056E-02 | n/a | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | 2.819E-03 | n/a | n/a |
| Averaging Period: 8 hours | | | | | | | | | |
| Each CTG/HRSG | 3.467 | 27.432 | 364.67 | 145.82 | 15.445 | n/a | n/a | 0.679 | n/a |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | n/a | 1.888E-03 | n/a |
| Averaging Period: 24 hours | | | | | | | | | |
| Each CTG/HRSG | 3.467 | 27.432 | 364.67 | 145.82 | 15.445 | n/a | 7.434E-02 | n/a | 3.780E-01 |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | n/a | 3.524E-04 | n/a | 1.762E-04 |
| Chiller (one cell) | 9.754 | 17.069 | 294.11 | 454.438 | 6.082 | n/a | n/a | n/a | 4.455E-02 |
| Cooling Tower (each cell) | 9.754 | 17.678 | 301.46 | 600.317 | 8.035 | n/a | n/a | n/a | 3.831E-02 |
| Averaging Period: Annual | | | | | | | | | |
| Each CTG/HRSG | 3.467 | 27.432 | 363.00 | 147.49 | 15.622 | 7.134E-01 | 6.030E-02 | n/a | 3.780E-01 |
| Fire Pump Engine | 0.127 | 3.048 | 730.78 | 0.711 | 56.108 | 6.161E-03 | 1.287E-04 | n/a | 6.437E-05 |
| Chiller (one cell) | 9.754 | 17.069 | 294.11 | 454.438 | 6.082 | n/a | n/a | n/a | 4.455E-02 |
| Cooling Tower (each cell) | 9.754 | 17.678 | 301.46 | 600.317 | 8.035 | n/a | n/a | n/a | 3.831E-02 |

**Table 8.1-B2-5**
**Analysis of Impacts due to Fumigation**
**Los Esteros Critical Energy Facility: Phase 2**

**CTG Emission Rates, g/s**

| | NOx | CO | PM10 | SO2 |
|---|---|---|---|---|
| Case 1 | 0.571 | 0.556 | 0.378 | 0.058 |
| Case 2 | 0.538 | 0.524 | 0.378 | 0.055 |
| Case 3 | 0.538 | 0.524 | 0.378 | 0.055 |
| Case 4 | 0.728 | 0.709 | 0.378 | 0.074 |
| Case 5 | 0.692 | 0.674 | 0.378 | 0.071 |
| Case 6 | 0.697 | 0.679 | 0.378 | 0.071 |
| Startup | 5.0400 | 5.1660 | - | - |

**Inversion Breakup Modeling Results from SCREEN3**

| | Unit Impacts, ug/m3 per g/s | Maximum One-Hour Avg Impacts, ug/m3 | | | | Distance to Maximum (m) |
|---|---|---|---|---|---|---|
| | | NOx | CO | PM10 | SO2 | |
| Case 1 | 3.063 | 1.7490 | 1.7030 | 1.1578 | 0.1777 | 8339 |
| Case 2 | 3.315 | 1.7835 | 1.7371 | 1.2531 | 0.1823 | 7870 |
| Case 3 | 3.285 | 1.7673 | 1.7213 | 1.2417 | 0.1807 | 7922 |
| Case 4 | 3.221 | 2.3449 | 2.2837 | 1.2175 | 0.2384 | 8038 |
| Case 5 | 3.417 | 2.3646 | 2.3031 | 1.2916 | 0.2426 | 7696 |
| Case 6 | 3.399 | 2.3691 | 2.3079 | 1.2848 | 0.2413 | 7725 |
| Startup | 3.417 | 17.2217 | 17.6522 | - | - | 7696 |

**Flat Terrain Modeling Results from SCREEN3**

| | Unit Impacts, ug/m3 per g/s | Maximum One-Hour Avg Impacts, ug/m3 | | | | Distance to Maximum (m) |
|---|---|---|---|---|---|---|
| | | NOx | CO | PM10 | SO2 | |
| Case 1 | 2.167 | 1.2374 | 1.2049 | 0.8191 | 0.1257 | 945 |
| Case 2 | 2.334 | 1.2557 | 1.2230 | 0.8823 | 0.1284 | 1042 |
| Case 3 | 2.306 | 1.2406 | 1.2083 | 0.8717 | 0.1268 | 1046 |
| Case 4 | 2.23 | 1.6234 | 1.5811 | 0.8429 | 0.1650 | 1100 |
| Case 5 | 2.434 | 1.6843 | 1.6405 | 0.9201 | 0.1728 | 1028 |
| Case 6 | 2.417 | 1.6846 | 1.6411 | 0.9136 | 0.1716 | 1030 |
| Startup | 2.434 | 12.2674 | 12.5740 | - | - | 1028 |

**Adjust unit impacts for longer averaging periods to account for one-hour duration of fumigation**

| | 1-hr unit | 3-hr unit | 8-hr unit | 24-hr unit |
|---|---|---|---|---|
| Case 1 | 3.0630 | 2.7643 | 2.2790 | 2.2043 |
| Case 2 | 3.3150 | 2.9880 | 2.4566 | 2.3749 |
| Case 3 | 3.2850 | 2.9587 | 2.4284 | 2.3468 |
| Case 4 | 3.2210 | 2.8907 | 2.3539 | 2.2713 |
| Case 5 | 3.4170 | 3.0893 | 2.5569 | 2.4750 |
| Case 6 | 3.3990 | 3.0717 | 2.5398 | 2.4579 |
| Startup | 3.4170 | 3.0893 | 2.5569 | 2.4750 |

**Calculation of Fumigation Impacts for Four Units**

| Case/Avg Period | NOx | CO | PM10 | SO2 |
|---|---|---|---|---|
| One-Hour | | | | |
| Case 1 | 6.9959 | 6.8121 | - | 0.7106 |
| Case 2 | 7.1339 | 6.9482 | - | 0.7293 |
| Case 3 | 7.0693 | 6.8854 | - | 0.7227 |
| Case 4 | 9.3796 | 9.1348 | - | 0.9534 |
| Case 5 | 9.4583 | 9.2122 | - | 0.9704 |
| Case 6 | 9.4764 | 9.2317 | - | 0.9653 |
| Startup | 68.8867 | 70.6089 | - | - |
| 3 Hours | | | | |
| Case 1 | - | - | - | 0.5772 |
| Case 2 | - | - | - | 0.6564 |
| Case 3 | - | - | - | 0.6504 |
| Case 4 | - | - | - | 0.8581 |
| Case 5 | - | - | - | 0.8734 |
| Case 6 | - | - | - | 0.8688 |
| Startup | - | - | - | - |
| 8 Hours | | | | |
| Case 1 | - | 3.5479 | - | - |
| Case 2 | - | 3.6044 | - | - |
| Case 3 | - | 3.5629 | - | - |
| Case 4 | - | 4.6729 | - | - |
| Case 5 | - | 4.8253 | - | - |
| Case 6 | - | 4.8286 | - | - |
| Startup | - | 36.9847 | - | - |
| 24 Hours | | | | |
| Case 1 | - | - | 1.3332 | 0.2046 |
| Case 2 | - | - | 1.4363 | 0.2090 |
| Case 3 | - | - | 1.4193 | 0.2065 |
| Case 4 | - | - | 1.3737 | 0.2689 |
| Case 5 | - | - | 1.4969 | 0.2812 |
| Case 6 | - | - | 1.4865 | 0.2792 |
| Startup | - | - | - | - |

## NOTES TO TABLE 8.1-B2-5

## FUMIGATION IMPACTS ANALYSIS FOR THE PHASE 2 COMBINED CYCLE FACILITY

### *Inversion Breakup Fumigation*

Inversion breakup fumigation is generally a short-term phenomenon and was evaluated here as persisting for up to one hour. SCREEN3 was used to model one-hour unit impacts from the turbines/HRSGs and the auxiliary boiler under 2.5 m/s winds and F stability (for fumigation impacts) and under all meteorological conditions (shown in the table as "Inversion Breakup Modeling Results from SCREEN3").

For longer-term averaging periods, impacts were calculated using the highest modeled impact from SCREEN3 for the corresponding averaging period. A sample calculation for 24-hour average $PM_{10}$ for Case 5 is as follows:

- For a single turbine, Case 5, 1-hour average unit impact = 3.417 ug/m3 per g/s
- For a single turbine, Case 5, max. 1-hour average unit impact from SCREEN3 = 2.434 ug/m3 per g/s
- For a single turbine, 24-hour unit impact is calculated as 1 hours of inversion breakup fumigation plus 23 hours of operation under typical conditions (from SCREEN3): [(1 * 3.417 ug/m3 per g/s) + (23 * 2.434 ug/m3 per g/s)] ÷ 24 hrs * 0.4 [persistence factor for converting 1-hour average screening impact into 24-hour average concentration] = 0.990 ug/$m^3$ per g/s
- For four turbines with an emission rate of 0.378 g/s, the total 24-hour average $PM_{10}$ impact under inversion breakup fumigation conditions is: 0.990 ug/$m^3$ per g/s * 0.378 g/s per turbine * 4 turbines = 1.4969 ug/$m^3$

**Table 8.1-B2-6**
**Emission Rates and Stack Parameters for Modeling of Impacts During Startup**
**Los Esteros Critical Energy Facility: Phase 2**

| | Stack Diam, m | Stack Height, m | Exh Temp, Deg K | Exhaust Flow, m3/s | Exhaust Velocity, m/s | NOx Emission Rate, g/s | CO Emission Rate, g/s |
|---|---|---|---|---|---|---|---|
| Averaging Period: One hour | | | | | | | |
| Turbine 1 | 3.47 | 27.43 | 363.0 | 147.5 | 15.62 | 5.040 | 5.166 |
| Turbine 2 | 3.47 | 27.43 | 363.0 | 147.5 | 15.62 | 5.040 | 5.166 |
| Turbine 3 | 3.47 | 27.43 | 363.0 | 147.5 | 15.62 | 5.040 | 5.166 |
| Turbine 4 | 3.47 | 27.43 | 363.0 | 147.5 | 15.62 | 5.040 | 5.166 |

**Table 8.1B2-7**
**Comparison of Monitored Ozone Levels at San Jose Stations**
**Los Esteros Critical Energy Facility: Phase 2**

| | Monitoring Station | |
|---|---|---|
| **1996** | **Piedmont** | **4th Street** |
| **# valid hours** | 8729 | 8343 |
| **Avg. Concentration (ppm)** | 0.019 | 0.015 |
| **Max. Concentration (ppm)** | 0.18 | 0.11 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 5707 | 2145 |
| **1997** | **Piedmont** | **4th Street** |
| **# valid hours** | 7997 | 8330 |
| **Avg. Concentration (ppm)** | 0.017 | 0.016 |
| **Max. Concentration (ppm)** | 0.095 | 0.094 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 3626 | 3450 |
| **1998** | **Piedmont** | **4th Street** |
| **# valid hours** | 5819 | 8173 |
| **Avg. Concentration (ppm)** | 0.021 | 0.018 |
| **Max. Concentration (ppm)** | 0.129 | 0.147 |
| **# hours O3 Concentration is higher than the other station (must have valid concentration at both stations)** | 2853 | 2605 |

**Table 8.1-B2-8**
**Gas Turbine Commissioning Profile**
**Los Esteros Critical Energy Facility: Phase 2**

| Operating Mode | Hours of Operation(1) | Fuel Use MMBtu/hr (2) (HHV) | Emission Factors (lbs/MMBtu) NOx(3) | CO(4) | VOC(5) | PM10(6) | SOx(7) | Hourly Emissions (lbs/hr) NOx | CO | VOC | PM10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Turbine 1 - FSNL | 4 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 2 - FSNL | 4 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 3 - FSNL | 4 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 4 - FSNL | 4 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 1 - Min. Load, no SCR or ox cat | 20 | 100.0 | 0.153 | 0.150 | 0.020 | n/a | 0.00092 | 15.29 | 14.99 | 2.02 | 3.0 |
| Turbine 2 - Min. Load, no SCR or ox cat | 20 | 100.0 | 0.153 | 0.150 | 0.020 | n/a | 0.00092 | 15.29 | 14.99 | 2.02 | 3.0 |
| Turbine 3 - Min. Load, no SCR or ox cat | 20 | 100.0 | 0.153 | 0.150 | 0.020 | n/a | 0.00092 | 15.29 | 14.99 | 2.02 | 3.0 |
| Turbine 4 - Min. Load, no SCR or ox cat | 20 | 100.0 | 0.153 | 0.150 | 0.020 | n/a | 0.00092 | 15.29 | 14.99 | 2.02 | 3.0 |
| Turbine 1 - FSNL (if necessary) | 24 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 2 - FSNL (if necessary) | 24 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 3 - FSNL (if necessary) | 24 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 4 - FSNL (if necessary) | 24 | 100.0 | 0.364 | 0.265 | 0.076 | n/a | 0.00092 | 36.40 | 26.46 | 7.56 | 3.0 |
| Turbine 1 - Multiple Load - Full SCR/ox cat | 48 | 500.0 | 0.059 | 0.009 | 0.003 | n/a | 0.00092 | 29.58 | 4.41 | 1.26 | 3.0 |
| Turbine 2 - Multiple Load - Full SCR/ox cat | 48 | 500.0 | 0.059 | 0.009 | 0.003 | n/a | 0.00092 | 29.58 | 4.41 | 1.26 | 3.0 |
| Turbine 3 - Multiple Load - Full SCR/ox cat | 48 | 500.0 | 0.059 | 0.009 | 0.003 | n/a | 0.00092 | 29.58 | 4.41 | 1.26 | 3.0 |
| Turbine 4 - Multiple Load - Full SCR/ox cat | 48 | 500.0 | 0.059 | 0.009 | 0.003 | n/a | 0.00092 | 29.58 | 4.41 | 1.26 | 3.0 |
| Total | 384 | | | | | | | | | | |

Notes:
(1) Hours of Operation - based on information supplied by MID for the MEGS project.
(2) Fuel Use
- No Load test: Based on 20% of maximum heat input rating.
- Minimum Load test: Based on 20% of maximum heat input rating.
- Multiple Load test: Based on 100% of maximum heat input rating.
(3) NOx Emission Factors
- No Load test: Based on 100 ppm @ 15% O2.
- Minimum Load test: Based on maximum uncontrolled emission rate of 42 ppm @ 15% O2.
- Multiple Load Full SCR/ox cat test: Based on NOx emission levels at the midway point between 30 ppm and 2.5 ppm @ 15% O2.
(4) CO Emission Factors
- No Load test: Based on maximum uncontrolled emission rate of 30 times controlled level, or 120 ppm @ 15% O2.
- Minimum Load test: Based on maximum uncontrolled emission rate of 17 times controlled level, or 68 ppm @ 15% O2.
- Multiple Load Full SCR/ox cat test: Based on unit meeting the project design level of 4 ppm @ 15% O2 with oxidation catalyst installed and operating.
(5) VOC Emission Factors
- No Load test: Based on maximum uncontrolled emission rate of 30 times controlled level, or 60 ppm @ 15% O2.
- Minimum Load test: Based on maximum uncontrolled emission rate of 8 times controlled level, or 16 ppm @ 15% O2.
- Multiple Load Full SCR/ox cat test: Based on unit meeting the project design level of 2 ppm @ 15% O2 with oxidation catalyst installed and operating.
(6) PM10 Emission Factors
- For all tests, based on project design PM10 level of 3.0 lbs/hr.
(7) SOx Emission Factors
- For all tests, based on annual average natural gas sulfur content of 0.33 gr/100 scf.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-C2*
# *Screening Health Risk Assessment for the Phase 2 Combined-Cycle Facility*

***December 2003***

**Figure 8.1-C2-1**

**Locations of Maximum Acute, Chronic and Cancer Risks From the Phase 2 Combined Cycle Facility**

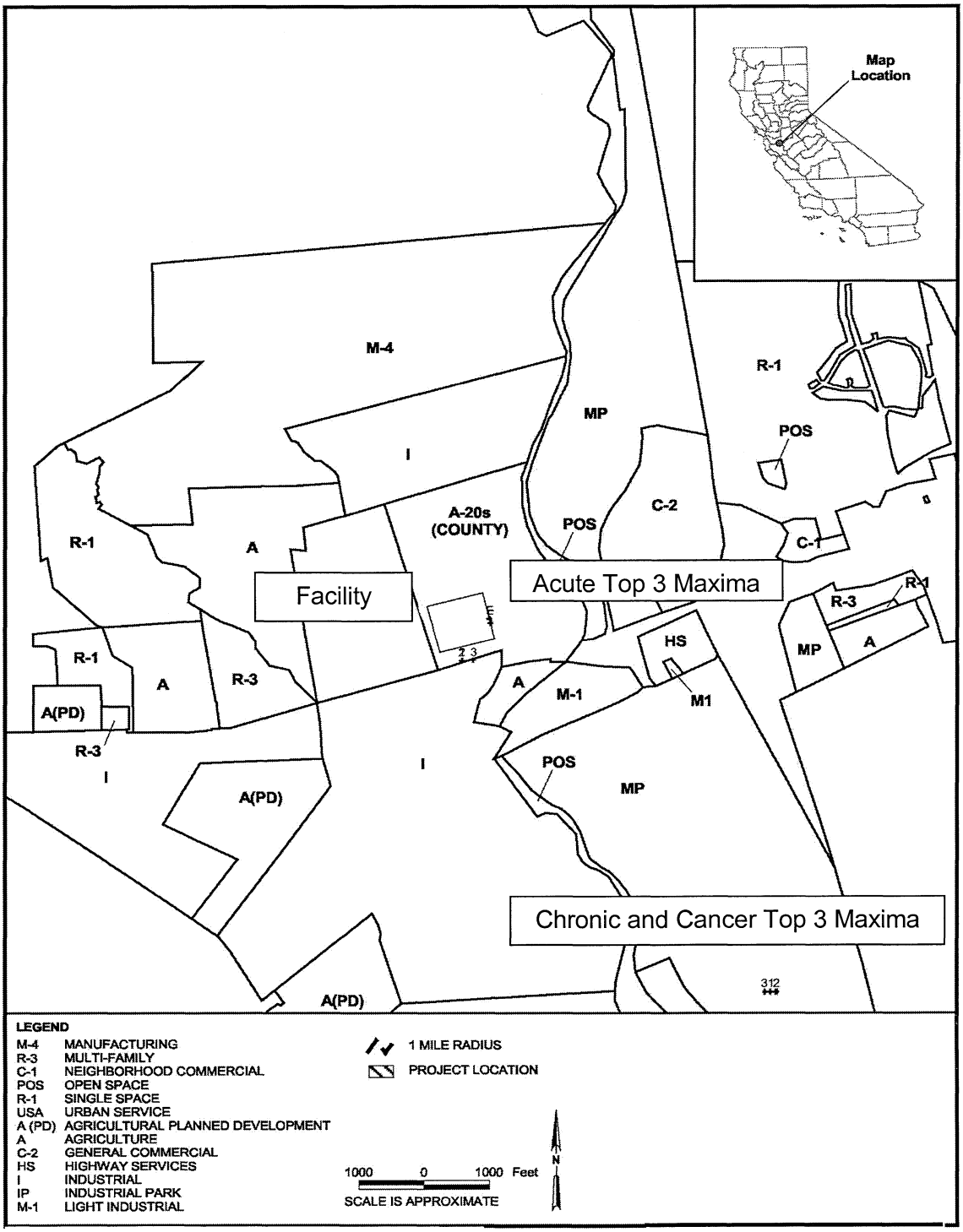


**Table 8.1-C2-1**
**Acute Inhalation Hazard Index**
**Los Esteros Critical Energy Facility: Phase 2**

| Pollutant Name | Max. Modeled 1-hr Conc, | Acute REL, ug/m3 (1) | Toxicological Endpoints | Acute Inhalation |
|---|---|---|---|---|
| Acrolein | 1.55E-02 | 1.90E-01 | Eye irritation | 8.16E-02 |
| Ammonia | 5.78E+01 | 3.20E+03 | Eye and respiratory irritation | 1.81E-02 |
| Benzene | 1.39E-02 | 1.30E+03 | Reproductive/ Developmental | 1.07E-05 |
| Formaldehyde | 1.54E+00 | 9.40E+01 | Eye irritation | 1.64E-02 |
| Propylene oxide | 1.13E-01 | 3.10E+03 | Eye and respiratory irritation | 3.65E-05 |
| Toluene | 5.57E-01 | 3.70E+04 | CNS (mild); Eye and respiratory irritation | 1.51E-05 |
| Xylenes | 2.73E-01 | 2.20E+04 | Eye and respiratory irritation | 1.24E-05 |
| **Total Acute Hazard Index** | | | | **0.116** |

**Table 8.1-C2-2**
**Chronic Inhalation Hazard Index**
**Los Esteros Critical Energy Facility: Phase 2**

| | Pathway (1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Resp | CV/BL | CNS | Skin | Repro | Kidn | GI/LV | Immun |
| **Total Chronic** | 0.0073 | <.0001 | <.0001 | 0.0052 | <.0001 | <.0001 | <.0001 | -- |

Notes:

(1) Resp: respiratory; CV/BL: cardiovascular/blood; CNS: central nervous system; Repro: reproductive system; Kidn: renal system; GI/LV: gastrointestinal/liver; Immun: immunological system

**Table 8.1-C2-3**
**Individual Cancer Risk**
**Los Esteros Critical Energy Facility: Phase 2**

| | Air | Soil | Skin | Garden | Mmilk | Other |
|---|---|---|---|---|---|---|
| CTGs/HRSGs | 7.88E-08 | 8.38E-09 | 5.32E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **TOTAL RISK** | **0.093 in one million** | | | | | |

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# ACUTE INHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros Phase 2

Dec. 17, 2003

Pollutant Database Date : Nov. 15, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: ONEHOUR.M96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| ACROLEIN | 1.550E-02 |
| AMMONIA | 5.780E+01 |
| BENZENE | 1.390E-02 |
| FORMALDEHYDE | 1.537E+00 |
| PROPYLENE OXIDE | 1.130E-01 |
| TOLUENE | 5.570E-01 |
| XYLENES | 2.730E-01 |

ACUTE INHALATION HAZARD INDEX

| Pollutant | Resp | CV/BL | CNS | Eye | Repro | Kidn | GI/LV | Immun |
|---|---|---|---|---|---|---|---|---|
| ACROLEIN | 0.0816 | -- | -- | 0.0816 | -- | -- | -- | -- |
| AMMONIA | 0.0181 | -- | -- | 0.0181 | -- | -- | -- | -- |
| BENZENE | -- | <.0001 | -- | -- | <.0001 | -- | -- | <.0001 |
| FORMALDEHYDE | 0.0164 | -- | -- | 0.0164 | -- | -- | -- | 0.0164 |
| PROPYLENE OXIDE | <.0001 | -- | -- | <.0001 | <.0001 | -- | -- | -- |
| TOLUENE | <.0001 | -- | <.0001 | <.0001 | <.0001 | -- | -- | -- |
| XYLENES | <.0001 | -- | -- | <.0001 | -- | -- | -- | -- |
| Total Acute | 0.1161 | <.0001 | <.0001 | 0.1161 | <.0001 | -- | -- | 0.0164 |

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# CHRONIC INHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros Phase 2

Dec. 17, 2003

Pollutant Database Date : Nov. 15, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 1.250E-05 |
| ACETALDEHYDE | 1.160E-03 |
| ACROLEIN | 1.050E-04 |
| AMMONIA | 3.790E-01 |
| BENZENE | 9.460E-05 |
| ETHYL BENZENE | 9.260E-04 |
| FORMALDEHYDE | 1.040E-02 |
| N-HEXANE | 7.360E-03 |
| NAPHTHALENE | 4.720E-05 |
| PAH:BENZO(A)PYRENE | 5.090E-06 |
| PROPYLENE (PROPENE) | 2.190E-02 |
| PROPYLENE OXIDE | 7.640E-04 |
| TOLUENE | 3.780E-03 |
| XYLENES | 1.860E-03 |

CHRONIC INHALATION HAZARD INDEX

| Pollutant | Resp | CV/BL | CNS | Skin | Repro | Kidn | GI/LV | Immun |
|---|---|---|---|---|---|---|---|---|
| 1,3-BUTADIENE | -- | -- | -- | -- | <.0001 | -- | -- | -- |
| ACETALDEHYDE | 0.0001 | -- | -- | -- | -- | -- | -- | -- |
| ACROLEIN | 0.0018 | -- | -- | 0.0018 | -- | -- | -- | -- |
| AMMONIA | 0.0019 | -- | -- | -- | -- | -- | -- | -- |
| BENZENE | -- | <.0001 | <.0001 | -- | <.0001 | -- | -- | -- |
| ETHYL BENZENE | -- | -- | -- | -- | <.0001 | <.0001 | <.0001 | -- |
| FORMALDEHYDE | 0.0035 | -- | -- | 0.0035 | -- | -- | -- | -- |
| N-HEXANE | -- | -- | <.0001 | -- | -- | -- | -- | -- |
| NAPHTHALENE | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| PROPYLENE (PROP | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| PROPYLENE OXIDE | <.0001 | -- | -- | -- | -- | -- | -- | -- |
| TOLUENE | <.0001 | -- | <.0001 | -- | <.0001 | -- | -- | -- |
| XYLENES | <.0001 | -- | <.0001 | -- | -- | -- | -- | -- |
| Total Chronic | 0.0073 | <.0001 | <.0001 | 0.0052 | <.0001 | <.0001 | <.0001 | -- |

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros Phase 2

Dec. 17, 2003

Pollutant Database Date : Nov. 15, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 1.250E-05 |
| ACETALDEHYDE | 1.160E-03 |
| ACROLEIN | 1.050E-04 |
| AMMONIA | 3.790E-01 |
| BENZENE | 9.460E-05 |
| ETHYL BENZENE | 9.260E-04 |
| FORMALDEHYDE | 1.040E-02 |
| N-HEXANE | 7.360E-03 |
| NAPHTHALENE | 4.720E-05 |
| PAH:BENZO(A)PYRENE | 5.090E-06 |
| PROPYLENE (PROPENE) | 2.190E-02 |
| PROPYLENE OXIDE | 7.640E-04 |
| TOLUENE | 3.780E-03 |
| XYLENES | 1.860E-03 |

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

---

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

CHRONIC NONINHALATION EXPOSURE

| Pollutant | Avg. Dose (mg/kg-d) | REL (mg/kg-d) | Avg Dose/REL |
|---|---|---|---|
| 1,3-BUTADIENE | --- | --- | --- |
| ACETALDEHYDE | --- | --- | --- |
| ACROLEIN | --- | --- | --- |
| AMMONIA | --- | --- | --- |
| BENZENE | --- | --- | --- |
| ETHYL BENZENE | --- | --- | --- |
| FORMALDEHYDE | --- | --- | --- |
| N-HEXANE | --- | --- | --- |
| NAPHTHALENE | 2.02E-08 | --- | --- |
| PAH:BENZO(A)PYRENE | 1.14E-09 | --- | --- |
| PROPYLENE (PROPENE) | --- | --- | --- |
| PROPYLENE OXIDE | --- | --- | --- |
| TOLUENE | --- | --- | --- |
| XYLENES | --- | --- | --- |

California Air Resources Board

And

Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

# INDIVIDUAL CANCER RISK REPORT

Run Made By

nlm

Sierra Research

Project : Los Esteros Phase 2

Dec. 17, 2003

Pollutant Database Date : Nov. 15, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

| Pollutant Name | Emission Rate (g/s) |
|---|---|
| 1,3-BUTADIENE | 1.250E-05 |
| ACETALDEHYDE | 1.160E-03 |
| ACROLEIN | 1.050E-04 |
| AMMONIA | 3.790E-01 |
| BENZENE | 9.460E-05 |
| ETHYL BENZENE | 9.260E-04 |
| FORMALDEHYDE | 1.040E-02 |
| N-HEXANE | 7.360E-03 |
| NAPHTHALENE | 4.720E-05 |
| PAH:BENZO(A)PYRENE | 5.090E-06 |
| PROPYLENE (PROPENE) | 2.190E-02 |
| PROPYLENE OXIDE | 7.640E-04 |
| TOLUENE | 3.780E-03 |
| XYLENES | 1.860E-03 |

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

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Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

| Pollutant | Air | Soil | Skin | Garden | MMilk | Other |
|---|---|---|---|---|---|---|
| 1,3-BUTADIENE | 1.34E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ACETALDEHYDE | 1.97E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BENZENE | 1.72E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FORMALDEHYDE | 3.92E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZO(A)PYR | 3.52E-09 | 5.42E-09 | 3.44E-09 | 0.00E+00 | 1.39E-08 | 0.00E+00 |
| PROPYLENE OXIDE | 1.78E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Route Total | 4.95E-08 | 5.42E-09 | 3.44E-09 | 0.00E+00 | 1.39E-08 | 0.00E+00 |

TOTAL RISK: 7.23E-08

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

| Pollutant | Air | Soil | Skin | Garden | MMilk | Other |
|---|---|---|---|---|---|---|
| 1,3-BUTADIENE | 2.13E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ACETALDEHYDE | 3.13E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BENZENE | 2.74E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FORMALDEHYDE | 6.24E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PAH:BENZO(A)PYR | 5.60E-09 | 8.38E-09 | 5.32E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PROPYLENE OXIDE | 2.83E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Route Total | 7.88E-08 | 8.38E-09 | 5.32E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

TOTAL RISK: 9.25E-08

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-D2*
# *Construction Emissions and Impact Analysis for the Phase 2 Combined-Cycle Facility*

***December 2003***

# APPENDIX 8.1-D2

# CONSTRUCTION EMISSIONS AND IMPACT ANALYSIS FOR THE PHASE 2 COMBINED CYCLE FACILITY

## 8.1-D2.1 Onsite Construction

Construction of the second phase of the project is expected to last approximately 19 months. The onsite construction will be performed in the following five main phases:

- Site preparation;
- Foundation work;
- Installation of major equipment;
- Construction/installation of major structures; and
- Start up and commissioning.

Site preparation includes clearing, grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of the Project will result from:

- Dust entrained during site preparation and grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines, electric generators, air compressors, water pumps, etc.;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and
- Exhaust from automobiles and trucks used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily dust and exhaust emissions are expected to occur during months five, six and seven of the

construction schedule. Annual emissions are based on the average equipment mix during the 19-month construction period that was used as the basis for this analysis.

### 8.1-D2.2 Natural Gas/Wastewater Pipelines and Transmission Lines

No additional natural gas or wastewater pipelines or transmission lines construction will occur as part of the Phase 2 conversion. All necessary infrastructure was installed during the construction of Phase 1.

### 8.1-D2.3 Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of the Project:

- Operational measures, such as limiting engine idling time and shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of ultra-low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- Use of low-emitting Diesel engines meeting federal emissions standards for construction equipment if available.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from unpaved surface travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Cover all trucks hauling soil, sand, and other loose materials, or require all trucks to maintain at least two feet of freeboard;
- Limit traffic speeds on unpaved surfaces to 25 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Re-plant vegetation in disturbed areas as quickly as possible;
- As needed, use gravel pads along with wheel washers or wash tires of all trucks exiting construction site that carry track-out dirt from unpaved surfaces; and
- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant and/or use of wind breaks.

## 8.1-D2.4 Estimation of Emissions with Mitigation Measures

### *8.1-D2.4.1 Onsite Construction*

Tables 8.1-D2-1 and 8.1-D2-2 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures for onsite construction activities. Detailed emission calculations are included as Attachment 8.1-D2-1.

**TABLE 8.1-D2-1**
Maximum Daily Emissions During Onsite Construction
(Months 5, 6 and 7), Pounds Per Day

| | $NO_x$ | CO | POC | $SO_x$ | $PM_{10}$ |
|---|---|---|---|---|---|
| **Onsite** | | | | | |
| Construction Equipment | 48.5 | 23.5 | 5.0 | 0.05 | 3.0 |
| Fugitive Dust | -- | -- | -- | -- | 24.3 |
| Offsite | | | | | |
| Worker Travel, Truck Deliveries | 57.6 | 288.4 | 24.4 | 1.5 | 2.4 |
| Total Emissions | | | | | |
| Total | 106.1 | 311.9 | 29.4 | 1.5 | 29.8 |

**TABLE 8.1-D2-2**
Annual Emissions During Onsite Construction, Tons Per Year

| | $NO_x$ | CO | VOC | $SO_x$ | $PM_{10}$ |
|---|---|---|---|---|---|
| **Onsite** | | | | | |
| Construction Equipment | 4.1 | 2.2 | 0.5 | <0.01 | 0.3 |
| Fugitive Dust | -- | -- | -- | -- | 2.5 |
| Offsite | | | | | |
| Worker Travel, Truck Deliveries | 2.2 | 15.9 | 1.3 | 0.04 | 0.1 |
| **Total Emissions** | | | | | |
| Total | 6.3 | 18.1 | 1.8 | 0.04 | 2.9 |

## 8.1-D2.5 Analysis of Ambient Impacts from Onsite Construction

Ambient air quality impacts from emissions during construction of Phase 2 of the project were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

### *8.1-D2.5.1 Dispersion Model*

As in the analysis of project operating impacts, the EPA-approved Industrial Source

Complex Short Term (ISCST3) model was used to estimate ambient impacts from construction activities. A detailed discussion of the ISCST3 dispersion model is included in Section 8.1.3 of the AFC.

The emission sources for the construction site were grouped into three categories: exhaust emissions, construction dust emissions, and wind blown dust emissions. The exhaust and construction dust emissions were modeled as volume sources. The wind blown dust emissions were modeled as an area source. For the volume sources, the vertical dimension was set to 6 meters. For combustion sources in the construction modeling analysis, the horizontal dimension was set to 31.04 meters, based on the width of the construction area (equivalent diameter of the area where the six-cell cooling tower and steam turbine will be installed (square root of four times the area, divided by pi, and then divided again by 2.15, according to ISCST3 guidance).

For the wind blown dust area source, the area covers the entire site plan. An effective plume height of 0.5 meters was used in the modeling analysis. The construction impacts modeling analysis used the same receptor locations as used for the project operating impact analysis. A detailed discussion of the receptor locations is included in Section 8.1.3 of the AFC.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Table 8.1-D2-1 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1-D2-2 were used. The same meteorological data set and background ambient levels used for the project operating modeling analysis were used for the construction emission impacts analysis.

### *8.1-D2.5.2 Modeling Results*

Based on the emission rates of $NO_x$, $SO_2$, CO, and $PM_{10}$ and the meteorological data, the ISCST3 model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour, 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of $NO_x$, $SO_2$, CO, and $PM_{10}$. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of $NO_2$ were computed following the revised EPA guidance for computing these concentrations (August 9, 1995 *Federal Register,* 60 FR 40465). The OLM_ISC model was used for the one-hour average $NO_2$ impacts. The annual average was calculated using the ambient ratio method (ARM) with the EPA default value of 0.75 for the annual average $NO_2/NO_x$ ratio.

The modeling analysis results for the large and small volume source modeling approaches are shown in Table 8.1-D2-4. Also included in the table are the maximum background levels that have occurred during the past few years and the resulting total ambient impacts. As shown in Table 8.1-D2-4, with the exception of 24-hr $PM_{10}$ impacts, construction impacts alone for all modeled pollutants are expected to be below the most stringent state and national standards. With the exception of 24-hour and annual $PM_{10}$ impacts, construction activities are not expected to cause the violation of any state or federal ambient air quality standard. However, the state 24-hour and annual average $PM_{10}$ standards are exceeded in the absence of the construction emissions for the project.

**TABLE 8.1-D2-4**
Modeled Maximum Construction Impacts for Phase 2 Combined Cycle Conversion

| Pollutant | Averaging Time | Maximum Construction Impacts (μg/m³) | Background (μg/m³) | Total Impact (μg/m³) | State Standard (μg/m³) | Federal Standard (μg/m³) |
|---|---|---|---|---|---|---|
| $NO_2$[a] | 1-Hour | 184 | 214 | 398 | 470 | -- |
| | Annual | 11.5 | 47 | 59 | -- | 100 |
| $SO_2$ | 1-Hour | 0.85 | 138 | 139 | 650 | -- |
| | 3-Hour | 0.42 | 52 | 52 | -- | 1300 |
| | 24-Hour | 0.09 | 21 | 21 | 109 | 365 |
| | Annual | 0.02 | 5.3 | 5.3 | -- | 80 |
| CO | 1-Hour | 381.9 | 11,125 | 11,507 | 23,000 | 40,000 |
| | 8-Hour | 110.2 | 7,811 | 7,921 | 10,000 | 10,000 |
| $PM_{10}$ | 24-Hour | 45.6 | 77 | 123 | 50 | 150 |
| | Annual | 10.6 | 28 | 39 | 20 | 50 |
| $PM_{2.5}$ | 24-Hour | 45.6 | 64 | 110 | - | 65 |
| | Annual | 10.6 | 14 | 25 | 12 | 15 |

a. OLM_ISC used for 1-hr average impact and ARM applied for annual average, using EPA default ratio of 0.75.

The dust mitigation measures already proposed by the applicant are expected to be very effective in minimizing fugitive dust emissions. The attached isopleth diagrams show the extent of the modeled impacts from construction $PM_{10}$ for the 24-hour and annual averaging periods. As shown on these isopleths, while maximum impacts occur next to the project site fenceline, concentrations decrease rapidly at locations only a couple of hundred meters away from the project site. For example, as shown on the isopleths for 24-hr average $PM_{10}$ impacts, along the fenceline $PM_{10}$ impacts are approximately 46 μg/m³. However, at locations only 400 meters way from the fenceline $PM_{10}$ impacts decrease to approximately 10 μg/m³ (less than 25% of the level at the fenceline).

It is also important to note that emissions in an exhaust plume are dispersed through the entrainment of ambient air, which dilutes the concentration of the emissions as they are carried away from the source by winds. The process of mixing the pollutants with greater and greater volumes of cleaner air is controlled primarily by the turbulence in the atmosphere. This dispersion occurs both horizontally, as the exhaust plume rises above the emission point, and vertically, as winds carry the plume horizontally away from its source.

The rise of a plume above its initial point of release is a significant contributing factor to the reductions in ground-level concentrations, both because a rising plume entrains more ambient air as it travels downwind, and because it travels farther downwind (and thus also undergoes more horizontal dispersion) before it impacts the ground. Vertical plume rise occurs as a result of buoyancy (plume is hotter than ambient air, and hot air, being less dense, tends to rise) and/or momentum (plume has an initial vertical velocity).

In ISCST3, area sources are not considered to have either buoyant or momentum plume rise, and therefore the model assumes that there is no vertical dispersion taking place. Thus a significant source of plume dilution is ignored when sources are modeled as area

sources in ISCST3.

The project construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

### *8.1-D2.5.3 Health Risk from Diesel Exhaust*

The combustion portion of annual $PM_{10}$ emissions from Table 8.1-D2-2 above were modeled separately to determine the annual average Diesel $PM_{10}$ exhaust concentration. This was used with the ARB-approved unit risk value of 300 in one million for a 70-year lifetime to determine the potential carcinogenic risk from Diesel exhaust during construction. The exposure was also adjusted by a factor of 1.58/70, or 0.0226, to correct for the 19-month exposure during the construction period.

The maximum-modeled annual average concentration of Diesel exhaust $PM_{10}$ is approximately 1.01 ug/m$^3$. Using the unit risk value and adjustment factors described above, the carcinogenic risk due to exposure to Diesel exhaust during construction activities is expected to be approximately 6.8 in one million. This is below the 10 in one million level considered to be significant under the BAAQMD's HRA guidelines.

It is also important to note that these impacts are highly localized near the project site. At the nearest residence the annual average concentration of Diesel exhaust $PM_{10}$ is approximately 0.02 ug/m$^3$ resulting in a carcinogenic risk of approximately 0.14 in one million. As shown in the attached annual average Diesel combustion $PM_{10}$ isopleth diagrams, the area in which the risk may exceed 1 in one million (Diesel $PM_{10}$ impact equal to or greater than 0.15 ug/m$^3$) extends about 200 meters from the facility fenceline. This analysis remains conservative because, as discussed above, the modeled $PM_{10}$ concentrations from construction operations are overpredicted by the ISCST3 model.

**Figure 8.1-D2-1**

24-Hour Average $PM_{10}$ Impacts from Construction (in $\mu g/m^3$)

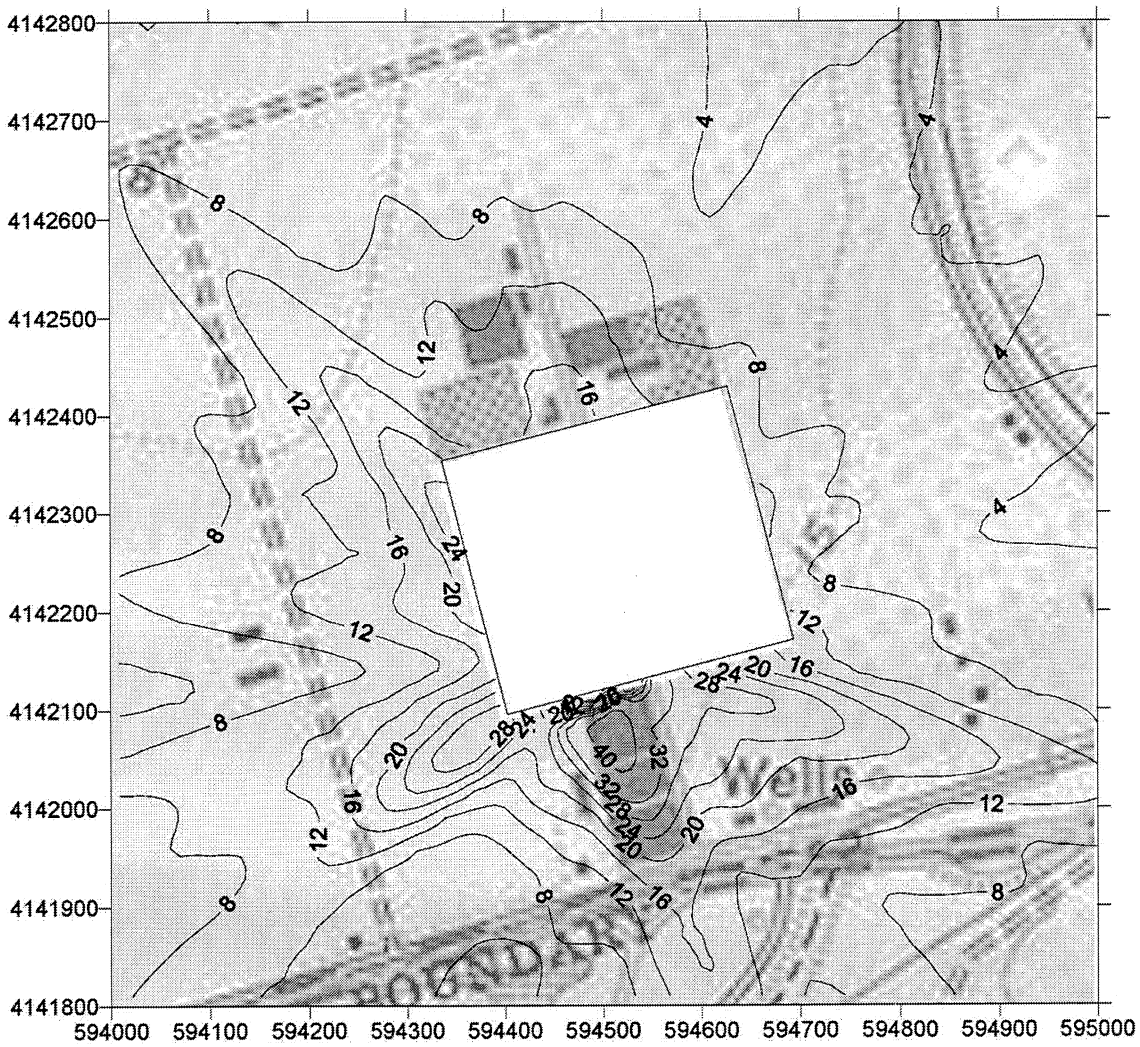


**Figure 8.1-D2-2**

Annual Average $PM_{10}$ Impacts from Construction (in $\mu g/m^3$)

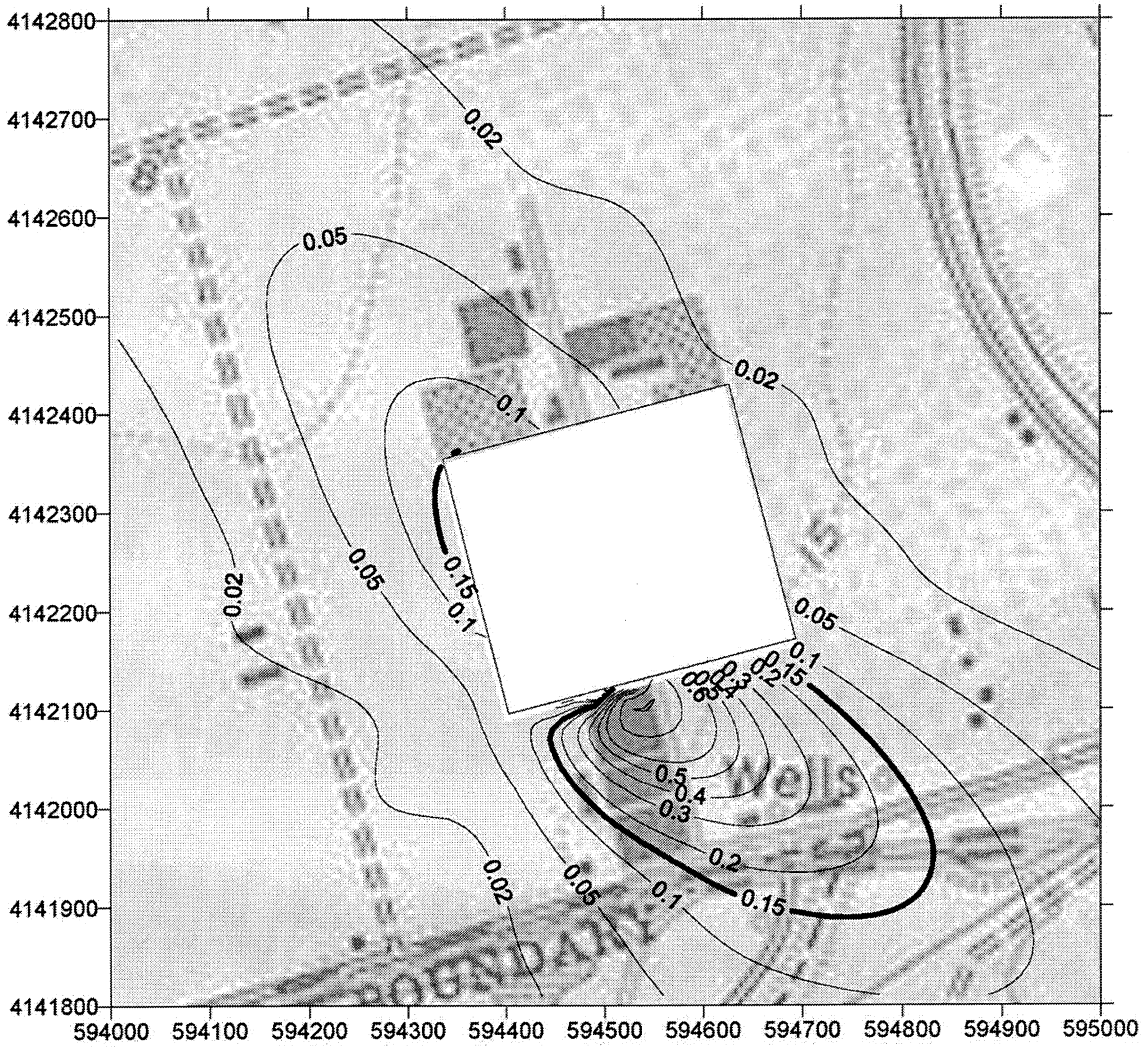
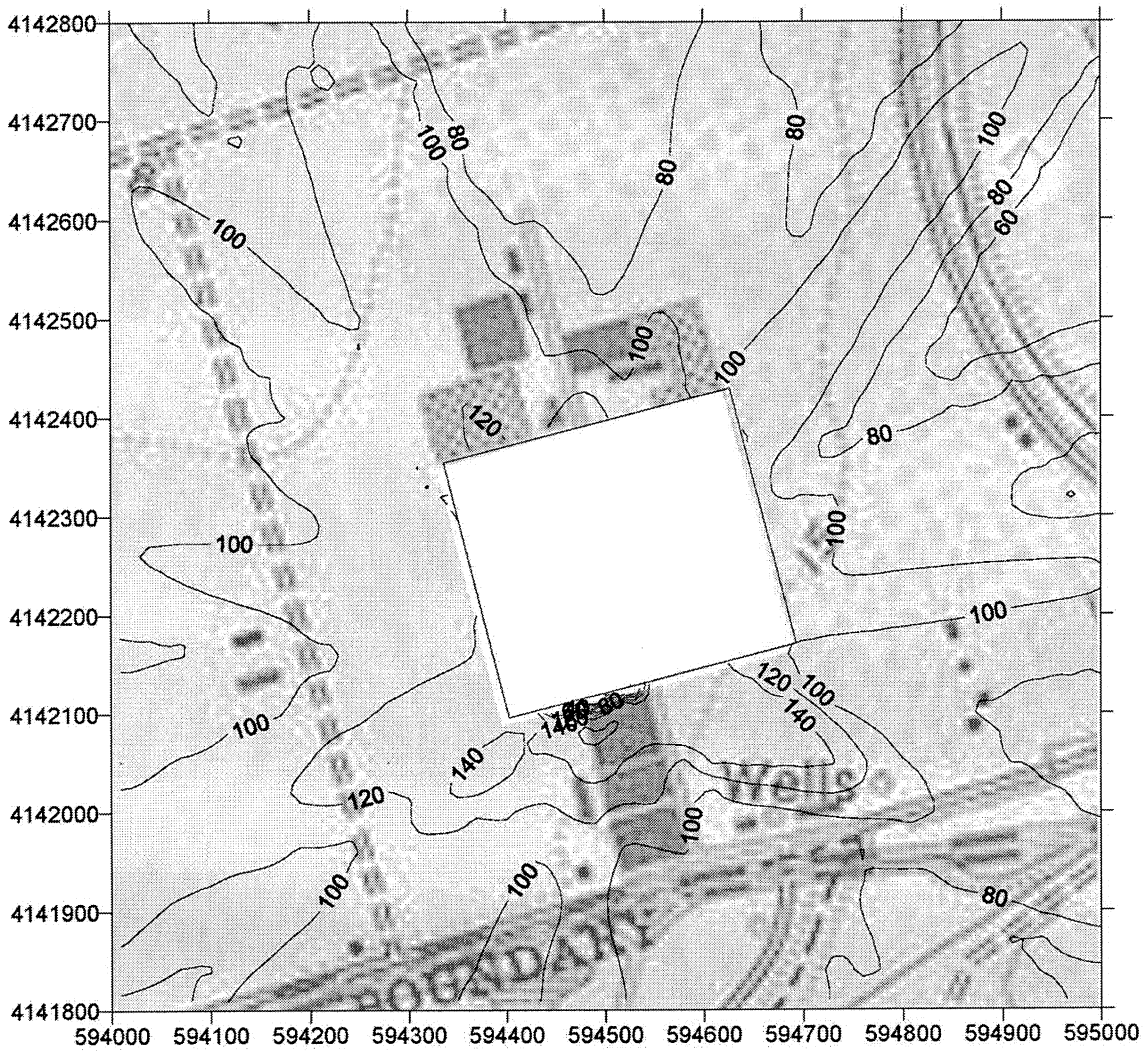


**Figure 8.1-D2-3**

One-Hour Average $NO_2$ Impacts from Construction (in $\mu g/m^3$)



**ATTACHMENT 8.1-D2-1**

**Combustion Emission Ranking**

| Equipment | Hrs/Day Per Unit | Gals/Hr Per Unit | Month 1 | Month 2 | Month 3 | Month 4 | Month 5 | Month 6 | Month 7 | Month 8 | Month 9 | Month 10 | Month 11 | Month 12 | Month 13 | Month 14 | Month 15 | Month 16 | Month 17 | Month 18 | Month 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Forklift, Cat 930T | 10 | 2.50 | 0 | 0 | 0 | 0 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 0 |
| Loader, Cat 966F | 7 | 6.00 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Water Truck | 10 | 3.13 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dump Truck | 7 | 3.13 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoe, Cat 416C | 10 | 1.70 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crane, Rough Terraine 18Ton | 10 | 4.00 | 0 | 0 | 0 | 0 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 0 | 0 | 0 | 0 |
| Welder, Lincloln | 10 | 0.25 | 0 | 0 | 0 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 0 |
| Truck, Flatbed | 10 | 1.56 | 16 | 16 | 16 | 16 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 16 | 16 | 16 | 0 | 0 | 0 |
| | | Total = | 167 | 167 | 167 | 172 | 252 | 252 | 252 | 188 | 188 | 135 | 135 | 101 | 101 | 86 | 86 | 46 | 30 | 25 | 0 |
| | | 12-month Total = | | | | | | | | | | | | 2177 | 2112 | 2031 | 1950 | 1823 | 1601 | 1374 | 1121 |

**Dust Emission Ranking**

| Equipment | Hrs/Day Per Unit | PM10 lbs/hr Per Unit | Month 1 | Month 2 | Month 3 | Month 4 | Month 5 | Month 6 | Month 7 | Month 8 | Month 9 | Month 10 | Month 11 | Month 12 | Month 13 | Month 14 | Month 15 | Month 16 | Month 17 | Month 18 | Month 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Forklift, Cat 930T | 10 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 1.32 | 0.00 |
| Loader, Cat 966F | 7 | 0.20 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Water Truck | 10 | 0.46 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dump Truck | 7 | 0.48 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 6.71 | 3.35 | 3.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Backhoe, Cat 416C | 10 | 0.19 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 3.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Crane, Rough Terraine 18Ton | 10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Welder, Lincloln | 10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Truck, Flatbed | 10 | 0.10 | 1.04 | 1.04 | 1.04 | 1.04 | 2.07 | 2.07 | 2.07 | 2.07 | 2.07 | 2.07 | 2.07 | 2.07 | 2.07 | 1.04 | 1.04 | 1.04 | 0.00 | 0.00 | 0.00 |
| | | Total = | 18 | 18 | 18 | 18 | 20 | 20 | 20 | 15 | 15 | 7 | 7 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 0 |
| | | | 100% | 100% | 100% | 100% | 113% | 113% | 113% | 86% | 86% | 41% | 41% | 19% | 19% | 13% | 13% | 13% | 8% | 8% | 0% |
| | | 12-month Total = | | | | | | | | | | | | 178 | 164 | 149 | 133 | 118 | 100 | 81 | 61 |

| Construction Equipment Daily Fuel Use (peak period) | | | | | |
|---|---|---|---|---|---|
| Equipment | Gasoline/ Diesel | Number of Units | Hrs/Day Per Unit | Gals/Hr Per Unit | Total Fuel Use (Gals/day) |
| | | | | | |
| Crane - Mobile | D | 1 | 10 | 4.00 | 40.00 |
| Excavator- Backhoe | D | 2 | 10 | 1.70 | 34.00 |
| Excavator - loader | D | 1 | 7 | 6.00 | 42.00 |
| Truck- Water | D | 1 | 10 | 3.13 | 31.30 |
| Forklift | D | 1 | 10 | 2.50 | 25.00 |
| Dump Truck | D | 2 | 7 | 3.13 | 43.82 |
| Trucks- 3 ton | D | 2 | 10 | 1.56 | 31.20 |
| Diesel Powered Welder | D | 2 | 10 | 0.25 | 5.00 |
| Total | | | | | 252.32 |

Construction Equipment Daily and Annual Combustion Emissions

| | | | Base Factors g/bhp, if Tier 1 >50 hp (1) | | | | | | Appendix A Table A3 Adjustment (2) | | | | | | Adjustment (3) | Adjusted Factors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Equipment | HP Cat. | Tier | BSFC lb/hp-hr | NOx | CO | POC | SOx | PM10 | Adj. Type | NOx | CO | POC | SOx | PM10 | PM10 Fuel S | BSFC | NOx | CO | POC | SOx | PM10 |
| Cranes - Mobile | 100-175 | 1 | 0.367 | 5.6523 | 0.8667 | 0.3384 | 0.00499 | 0.2799 | None | 1 | 1 | 1 | 1 | 1 | -0.086 | 0.367 | 5.65 | 0.87 | 0.34 | 0.0049 | 0.19 |
| Excavator- backhoe | 50-100 | 1 | 0.408 | 5.5988 | 2.3655 | 0.5213 | 0.00555 | 0.473 | Lo LF | 1.1 | 2.57 | 2.29 | 1.18 | 1.97 | -0.113 | 0.481 | 6.16 | 6.08 | 1.19 | 0.0064 | 0.82 |
| Excavator - loader | 175-300 | 1 | 0.367 | 5.5772 | 0.7475 | 0.3085 | 0.00499 | 0.2521 | Hi LF | 0.95 | 1.53 | 1.05 | 1.01 | 1.23 | -0.087 | 0.371 | 5.30 | 1.14 | 0.32 | 0.0049 | 0.22 |
| Truck- Water | Onroad | na | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad |
| Forklift | 100-175 | 1 | 0.367 | 5.6523 | 0.8667 | 0.3384 | 0.00499 | 0.2799 | None | 1 | 1 | 1 | 1 | 1 | -0.086 | 0.367 | 5.65 | 0.87 | 0.34 | 0.0049 | 0.19 |
| Dump Truck | Onroad | na | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad |
| Trucks- 3 ton | Onroad | na | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad | Onroad |
| Diesel Powered Welder | 25-50 | 0 | 0.408 | 6.9 | 5 | 1.8 | 0.00555 | 0.8 | Lo LF | 1.1 | 2.57 | 2.29 | 1.18 | 1.97 | -0.094 | 0.40 | 7.59 | 12.85 | 4.12 | 0.0052 | 1.48 |

| | | Adjusted factors lbs/gallon (4) | | | | | Total Daily Fuel Use(5) (Gals/day) | Daily Emissions Lbs/day | | | | | Total Annual Fuel Use(6) (Gals/yr) | Annual Emissions Lbs/yr | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Equipment | Tier | NOx | CO | POC | SOx | PM10 | | NOx | CO | POC | SOx | PM10 | | NOx | CO | POC | SOx | PM10 |
| Cranes - Mobile | 1 | 241.07 | 36.96 | 14.43 | 0.21 | 8.28 | 40.00 | 9.64 | 1.48 | 0.58 | 0.01 | 0.33 | 6,400 | 1542.85 | 236.57 | 92.37 | 1.33 | 52.97 |
| Excavator- backhoe | 1 | 200.23 | 197.65 | 38.81 | 0.21 | 26.63 | 34.00 | 6.81 | 6.72 | 1.32 | 0.01 | 0.91 | 7,480 | 1497.73 | 1478.43 | 290.31 | 1.55 | 199.22 |
| Excavator - loader | 1 | 223.74 | 48.29 | 13.68 | 0.21 | 9.43 | 42.00 | 9.40 | 2.03 | 0.57 | 0.01 | 0.40 | 5,880 | 1315.57 | 283.97 | 80.43 | 1.22 | 55.46 |
| Truck- Water | na | 170.68 | 106.79 | 15.33 | 0.21 | 9.59 | 31.30 | 5.34 | 3.34 | 0.48 | 0.01 | 0.30 | 5,634 | 961.62 | 601.64 | 86.35 | 1.18 | 54.04 |
| Forklift | 1 | 241.07 | 36.96 | 14.43 | 0.21 | 8.28 | 25.00 | 6.03 | 0.92 | 0.36 | 0.01 | 0.21 | 4,000 | 964.28 | 147.86 | 57.73 | 0.83 | 33.10 |
| Dump Truck | na | 170.68 | 106.79 | 15.33 | 0.21 | 9.59 | 43.82 | 7.48 | 4.68 | 0.67 | 0.01 | 0.42 | 7,011 | 1196.69 | 748.70 | 107.45 | 1.47 | 67.26 |
| Trucks- 3 ton | na | 74.40 | 59.47 | 5.57 | 0.21 | 4.83 | 31.20 | 2.32 | 1.86 | 0.17 | 0.01 | 0.15 | 6,240 | 464.29 | 371.06 | 34.73 | 1.31 | 30.16 |
| Diesel Powered Welder | 0 | 297.01 | 502.84 | 161.30 | 0.20 | 58.01 | 5.00 | 1.49 | 2.51 | 0.81 | 0.00 | 0.29 | 900 | 267.31 | 452.55 | 145.17 | 0.18 | 52.21 |
| Total = | | | | | | | 252.32 | 48.50 | 23.54 | 4.96 | 0.05 | 3.00 | 43,545.20 | 8,210.34 | 4,320.79 | 894.55 | 9.08 | 544.42 |
| | | | | | | | | | | | | | | 4.11 | 2.16 | 0.45 | 0.00 | 0.27 tons/yr |

(1) - Steady State Emission Factors from Table A2 of EPA November 2002 NR-009b Publication.
(2) - In use adjustment factors per Table A3 EPA November 2002 NR-009b Publication.
(3) - PM10 and SO2 adjustments due to Equation 5 and Equation 7 on pages 18 and 19, Respectively of EPA Report No. NR-009b
(4) - Calculation uses adjusted BSFC and assumed 7.1 lbs/gallon. The onroad emission factors are not adjusted.
(5) - Daily fuel use based on peak month equipment schedule.
(6) - Annual fuel use based on average level during peak 12-month period.

| Daily Fugitive Dust Emissions (peak months) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equipment | Number of Units | Daily Process Rate Per Unit | Total Process Rate | Units | PM10 Emission Factor(1) (lbs/unit) | Control Factor(1) (%) | PM10 Emissions (lbs/day) |
| Excavator- Backhoe Excavation | 2 | 1,260.0 | 2,520.0 | tons | 0.0015 | 0% | 3.80 |
| Excavator - Loader Excavation | 1 | 3,500.0 | 3,500.0 | tons | 0.0001 | 0% | 0.35 |
| Excavator - Loader Unpaved Road Travel | 1 | 6.3 | 6.3 | vmt | 1.9201 | 92% | 1.03 |
| Water Truck Unpaved Road Travel | 1 | 19.1 | 19.1 | vmt | 2.8400 | 92% | 4.60 |
| Forklift Unpaved Road Travel | 1 | 9.1 | 9.1 | vmt | 1.7100 | 92% | 1.32 |
| Dump Truck Unpaved Road Travel | 2 | 13.3 | 26.5 | vmt | 2.9806 | 92% | 6.71 |
| Dump Truck Unloading | 2 | 1,750.0 | 3,500.0 | tons | 0.0001 | 0% | 0.35 |
| 3 ton Truck Unpaved Road Travel | 2 | 8.5 | 17.0 | vmt | 1.4328 | 92% | 2.07 |
| Windblown Dust (active construction area) | N/A | 845,693.0 | 845,693.0 | sq.ft. | 1.682E-05 | 92% | 1.21 |
| Worker Gravel Road Travel | 144 | 0.2 | 21.8 | vmt | 0.7705 | 92% | 1.43 |
| Delivery Truck Gravel Road Travel | 18 | 0.3 | 5.7 | vmt | 2.3088 | 92% | 1.12 |
| Delivery Truck Unpaved Road Travel | 18 | 0.1 | 1.4 | vmt | 2.9806 | 92% | 0.34 |
| Total = | | | | | | | 24.34 |

Notes:
(1) See notes for fugitive dust emission calculations.

| Annual Fugitive Dust Emissions | | | |
|---|---|---|---|
| Activity | Average Daily PM10 Emissions(1) (lbs/day) | Days per Year | Annual PM10 Emissions (tons/yr) |
| Construction Activities | 19.56 | 240 | 2.35 |
| Windblown Dust | 1.02 | 336 | 0.17 |
| Total = | | | 2.52 |

Notes:
(1) Based on average of daily emissions during peak 12-month construction period.

| Delivery Truck Daily Emissions (Maximum Monthly) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of Deliveries Per Day(1) | Average Round Trip Haul Distance (miles) | Vehicle Miles Traveled Per Day | Emission Factors (lbs/vmt)(1) | | | | | Daily Emissions (lbs/day) | | | | |
| | | | NOx | CO | POC | SOx | PM10 | NOx | CO | POC | SOx | PM10 |
| | | | | | | | | | | | | |
| 18 | 70 | 1260 | 0.0280 | 0.0175 | 0.0025 | 0.0012 | 0.0016 | 35.30 | 22.09 | 3.17 | 1.46 | 1.98 |
| Idle exhaust (2) | | | | | | | | | | | | 0.0756 |

Notes:
(1) See notes for combustion emissions.
(2) 10 trucks per day times 1 hr idle time per visit times 0.0042 lb/hr.

| Delivery Truck Annual Emissions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Number of Deliveries Per Year | Average Round Trip Haul Distance (miles) | Vehicle Miles Traveled Per Year | Emission Factors (lbs/vmt)(1) | | | | | Annual Emissions (tons/yr) | | | | |
| | | | NOx | CO | POC | SOx | PM10 | NOx | CO | POC | SOx | PM10 |
| | | | | | | | | | | | | |
| 960 | 70 | 67200.00 | 0.0280 | 0.0175 | 0.0025 | 0.0012 | 0.0016 | 0.94 | 0.59 | 0.08 | 0.04 | 0.05 |
| Idle exhaust (2,3) | | | | | | | | | | | | 0.00202 |

Notes:
(1) See notes for combustion emissions.
(2) Annual average of 4 trucks per day, 240 days per year times 1 hr idle time per visit times 0.0042 lb/hr
(3) Based on 1.91 g/hr idle emission rate for the composite HDD truck fleet in 2001 from EPA's PART5 model.

| Worker Travel Daily Emissions (Maximum Monthly) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of Workers Per Day(1) | Average Vehicle Occupancy (person/veh.) | Number of Round Trips Per Day | Average Round Trip Haul Distance (Miles) | Vehicle Miles Traveled Per Day (Miles) | Emission Factors (lbs/vmt)(1) | | | | | Daily Emissions (lbs/day) | | | | |
| | | | | | NOx | CO | POC | SOx | PM10 | NOx | CO | POC | SOx | PM10 |
| 144 | 1.3 | 111 | 70 | 7754 | 0.0029 | 0.0343 | 0.0027 | 0.0000 | 0.0001 | 22.28 | 266.30 | 21.27 | 0.01 | 0.45 |

Notes:
(1) See notes for combustion emissions.

| Worker Travel Annual Emissions | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Number of Workers Per Day | Average Vehicle Occupancy (person/veh.) | Number of Round Trips Per Day | Average Round Trip Haul Distance (Miles) | Days per Year | Vehicle Miles Traveled Per Year | Emission Factors (lbs/vmt)(1) | | | | | Annual Emissions (tons/yr) | | | | |
| | | | | | | NOx | CO | POC | SOx | PM10 | NOx | CO | POC | SOx | PM10 |
| 83 | 1.3 | 64 | 70 | 200 | 892,146 | 0.0029 | 0.0343 | 0.0027 | 0.0000 | 0.0001 | 1.28 | 15.32 | 1.22 | 0.00 | 0.03 |

Notes:
(1) See notes for combustion emissions.

Notes - Combustion Emissions

(1) For Construction Equipment
For Diesel construction equipment, emission factors based on equipment meeting EPA Tier I off-road Diesel standards and use of CARB ultra low-sulfur fuel.
For trucks, depending on size of truck, emissions factors based on MVE17G version 1.0c for heavy-heavy duty or medium duty Diesel trucks, fleet average for calendar year 2000.

(2) For Delivery Trucks
From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000.

(3) For Worker Travel
From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000.

| | Emission Factors (1) | | | | |
|---|---|---|---|---|---|
| | NOx | CO | POC | SOx | PM10 |
| Truck Hauling (lbs/vmt) | 0.02802 | 0.01753 | 0.00252 | 0.00116 | 0.00157 |
| Truck Hauling (lbs/1000 gals) | 170.68 | 106.79 | 15.33 | 7.06 | 9.59 |

Notes:
(1) From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.

| | Emission Factors | | | | |
|---|---|---|---|---|---|
| | NOx | CO | POC | SOx | PM10 |
| Light Duty Trucks/Cars (lbs/vmt)(1) | 0.00287 | 0.03434 | 0.00274 | 0.00000 | 0.00006 |
| Light Duty Trucks (lbs/1000 gals)(2) | 62.81 | 677.30 | 46.28 | 0.27 | 1.56 |
| Medium Duty Trucks (lbs/1000 gals)(3) | 74.40 | 59.47 | 5.57 | 7.03 | 4.83 |

Notes:
(1) From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000, San Franciso Air Basin.
(2) From MVE17G version 1.0c, light duty trucks (gasoline), fleet average for calendar year 2002, San Joaquin Valley Air Basin.
(3) From MVE17G version 1.0c, medium duty trucks (Diesel), fleet average for calendar year 2000, San Franciso Air Basin.

Gasoline Equipment Factors - Small Engines

| | | | (gm/bhp-hr) | | |
|---|---|---|---|---|---|
| | NOx | CO | POC | SO2 | PM10 |
| Small Equipment(1) (g/bhp-hr) | 2.03 | 353.00 | 19.13 | 0.00 | 0.06 |
| Small Equipment(1) (lb/1000 gal) | 79.44 | 13813.38 | 748.58 | 0.00 | 2.35 |

Notes:

(1) From EPA's "Non-road Engine and Vehicle Emission Study Report", 11/91, Table 2-07, for generator sets, welders, pumps, and air compressors less than 50 hp.

Notes - Fugitive Dust Emission Calculations

(1) Wind erosion of active construction area - 'Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996

| | | |
|---|---|---|
| Level 2 Emission Factor = | 0.011 | ton/acre-month |
| Construction Schedule = | 30 | days/month |
| = | 0.7 | lbs/acre-day |
| = | 1.682E-05 | lbs/scf-day |

(2) Material Unloading - Source: AP-42, p. 13.2.4-3, 1/95

E = (k)(0.0032)[(U/5)^1.3]/[(M/2)^1.4]

| | | |
|---|---|---|
| k = particle size constant = | 0.35 | for PM10 |
| U = average wind speed = | 3.07 | m/sec (based on onsite wind data 5-yr average) |
| = | 6.87 | mph |
| M = moisture content = | 15.0% | (SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil) |
| E = emission factor = | 0.0001 | lb/ton |

(3) Loader Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03

E = (k)[(s/12)^0.9][(W/3)^0.45]

| | | |
|---|---|---|
| k = particle size constant = | 1.5 | |
| s = surface silt content = | 8.50 | (AP-42, Table 13.2.2-1, 12/03, construction haul route) |
| W = avg. vehicle weight = | 10.35 | tons (avg. of loaded and unloaded weights, 966F loader, Caterpillar Performance Handbook, 10/97) |
| E = emission factor = | 1.92 | lb PM10/VMT |
| Soil Density = | 1.05 | ton/yd3 (Caterpillar Performance Handbook, 10/89) |
| Loader Bucket Capacity = | 5 | yd3 (966F loader, Caterpillar Performance Handbook, 10/97) |
| = | 5.25 | ton/load |
| Daily Soil Transfer Rate = | 3,500 | ton/day (Caterpillar Performance Handbook, 10/97, 966F loader, 7 hrs/day) |
| Daily Loader Trips = | 667 | loading trips/day |
| Loading Travel Distance = | 50 | ft/load (estimated) |
| Daily Loader Travel Distance = | 33,333 | ft/day |
| = | 6.3 | mi/day |

(4) Backhoe Trenching - Source: AP-42, Table 11.9-1 (dragline operations), 7/98

E = (0.75)(0.0021)(d^0.7)/(M^0.3)

| | | |
|---|---|---|
| d = drop height = | 3 | ft (estimated) |
| M = moisture content = | 15.0% | (SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil) |
| E = emission factor = | 0.0015 | lb/ton |
| Backhoe Excavating Rate = | 120.0 | yd3/hr (based on 1 yd3 bucket on a 416C backhoe and a 30 sec. Cycle time) |
| = | 1,200 | yd3/day for 1 backhoe @ 10 hr/day |
| Soil Density = | 1.0500 | ton/yd3 (Caterpillar Performance Handbook, 10/89) |
| Daily Soil Transfer Rate = | 1260.0000 | ton/day (estimated) |

(5) Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

| | | |
|---|---|---|
| k = particle size constant = | 1.5 | |
| s = silt fraction = | 8.50 | (AP-42, Table 13.2.2-1, 12/03, construction haul route) |
| W = water truck avg. veh. weight = | 10.0 | tons empty (estimated) |
| = | 39.4 | tons loaded (estimated with 8,000 gallon water capacity) |
| = | 24.7 | tons average |
| W = dump truck avg. veh. weight = | 15.0 | tons (for heavy duty Diesel trucks) |
| = | 40.0 | tons (for heavy duty Diesel trucks) |
| = | 27.5 | tons (for heavy duty Diesel trucks) |
| W = forklift avg. veh. weight = | 8.0 | tons empty (estimated) |
| W = auto/pickup avg. vehicle weight = | 2.4 | tons (CARB Area Source Manual, 9/97) |
| W = delivery truck avg. veh. wt. = | 27.5 | tons (for heavy duty Diesel trucks) |
| W = 3 ton truck avg. veh. Wt = | 5.4 | tons (estimate) |
| E = water truck emission factor = | 2.84 | lb PM10/VMT |
| E = dump truck emission factor = | 2.98 | lb PM10/VMT |
| E = forklift emiss. factor = | 1.71 | lb PM10/VMT |
| E = auto/pickup emiss. factor = | 0.99 | lb PM10/VMT |
| E = delivery truck emiss. factor = | 2.98 | lb PM10/VMT |
| E = 3-ton truck emiss. factor = | 1.43 | lb PM10/VMT |

Gravel Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

| | | |
|---|---|---|
| k = particle size constant = | 1.5 | |
| s = silt fraction = | 6.40 | (AP-42, Table 13.2.2-1, 12/03, gravel roa |
| W = water truck avg. veh. weight = | 10.0 | tons empty (estimated) |
| = | 39.4 | tons loaded (estimated with 8,000 gallon water capacity) |
| = | 24.7 | tons average |
| W = dump truck avg. veh. weight = | 15.0 | tons (for heavy duty Diesel trucks) |
| = | 40.0 | tons (for heavy duty Diesel trucks) |
| = | 27.5 | tons (for heavy duty Diesel trucks) |
| W = forklift avg. veh. weight = | 8.0 | tons empty (estimated) |
| W = auto/pickup avg. vehicle weight = | 2.4 | tons (CARB Area Source Manual, 9/97) |
| W = delivery truck avg. veh. wt. = | 27.5 | tons (for heavy duty Diesel trucks) |
| E = auto/pickup emiss. factor = | 0.77 | lb PM10/VMT |
| E = delivery truck emiss. factor = | 2.31 | lb PM10/VMT |

(6) Unpaved Road Travel and Active Excavation Area Control - Source: Control of Open Fugitive Dust Sources, U.S EPA, 9/88

C = 100 - (0.8)(p)(d)(t)/(i)

| | | |
|---|---|---|
| p = potential average hourly daytime evaporation rate = | 0.39 | mm/hr (EPA document, Figure 3-2, summer) |
| evaporation rate = | 0.294 | mm/hr (EPA document, Figure 3-2, annual) |
| d = average hourly daytime traffic rate = | 37.0 | vehicles/hr (estimated) |
| t = time between watering applications = | 1.00 | hr/application (estimated) |
| i = application intensity = | 1.4 | L/m2 (typical level in EPA document, page 3-23) |
| C = average summer watering control efficienc | 91.5% | |
| C = average annual watering control efficiency | 93.6% | |

Notes - Fugitive Dust Emission Calculations

(1) Wind erosion emission factor for active construction area is based on "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996.
(2) Material unloading emission factors are based on AP-42, p. 13.2.4-3, 1/95.
(Based on average annual wind speed recorded onsite and default soil moisture contents.)
(3) Trenching emission factor is based on AP-42, Table 11.9-2 (dragline operations), 1/95.
(Based on default soil moisture content.)
(4) Unpaved surface travel emission factors for water trucks, loaders, dump trucks, forklifts, delivery trucks, are based on AP-42, Section 13.2.2, 12/2003.
(Based on default soil silt content.)
(5) Dust control efficiency for unpaved road travel and active excavation area is based on "Control of Open Fugitive Dust Sources", U.S. EPA, 9/88.
(Based on default evaporation rate shown in EPA document, Figure 3-2, 9/88, and typical water application rate shown in EPA document, page 3-23, 9/88.)

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-E2*
# *Evaluation of Best Available Control Technology for the Phase 2 Combined-Cycle Facility*

***December 2003***

## APPENDIX 8.1-E2

## EVALUATION OF BEST AVAILABLE CONTROL TECHNOLOGY FOR THE PHASE 2 COMBINED CYCLE FACILITY

Rule 2-2-301 requires the application of BACT to any new or modified emissions unit if the new unit or modification results in an increase in permitted daily emissions greater than 10 pounds per day. BACT is defined in Rule 2-2-206 as the most stringent emission limitation or control technique of the following:

206.1 The most effective emission control device or technique which has been successfully utilized for the type of equipment comprising such a source; or

206.2 The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source; or

206.3 Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO; or

206.4 The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations.

The proposed turbine modifications for Phase 2 result in increases in emissions in excess of 10 lb/day for NOx, POC, CO, $PM_{10}$, and SOx. Therefore, BACT will be required for these pollutants. The emission rates determined to be BACT for this project are summarized below. The information considered in making these determinations is discussed in detail in the following sections.

- NOx emission limit of 2.5 ppmv @ 15% $O_2$ constitutes BACT for natural gas-fired LM6000 combustion gas turbines in combined cycle. At a design exhaust NOx concentration of 2.5 ppmv at 15% $O_2$, the proposed project will comply with the BACT NOx emission limit.
- POC emission limit of 2 ppmv @ 15% $O_2$ constitutes BACT for natural gas-fired combined cycle combustion gas turbines. At a design exhaust POC concentration of 2 ppmv at 15% $O_2$, the proposed modification will comply with the BACT VOC emission limit.
- CO emission limit of 4 ppmv @ 15% $O_2$ constitutes BACT for natural gas-fired combined cycle combustion gas turbines. At a design exhaust CO concentration of 4 ppmv at 15% $O_2$, the proposed project will comply with the BACT CO emission limit.
- The use of natural gas with an annual average sulfur content of 0.33 grains per 100 scf constitutes BACT for this project. District BACT Guideline 89.1.6 specifies BACT 2 (achieved in practice) for $SO_2$ for combined cycle gas turbines with an output rating of > 50 MW as the exclusive use of natural gas with a sulfur content not to exceed 1.0 gr/100 scf.
- BACT for $PM_{10}$ is the use of natural gas as the fuel source.

## 8.1-E2.1 Top-Down BACT Analysis for Control of Nitrogen Oxides

The following "top-down" BACT analysis for $NO_x$ has been prepared in accordance with EPA's 1990 Draft New Source Review Workshop Manual. A "top-down" BACT analysis takes into account energy, environmental, economic, and other costs associated with each alternative technology.

### *8.1-E2.1.1 Identify All Control Technologies*

The baseline NOx emission rate for this analysis is considered to be 75 ppmvd @ 15% $O_2$, based on the governing new source performance standard (40 CFR 60 Subpart GG). This emission rate provides the frame of reference for the evaluation of control effectiveness and feasibility. The maximum degree of control, resulting in the minimum emission rate, is a combination of dry low-NOx combustors and either selective catalytic reduction or SCONOx to achieve a long-term NOx limit of approximately 2.0 ppmvd. Several intermediate levels of control are also evaluated.

There are three basic means of controlling NOx emissions from combustion turbines: wet combustion controls, dry combustion controls, and post-combustion controls. Wet and dry combustion controls act to reduce the formation of NOx during the combustion process, while post-combustion controls remove NOx from the exhaust stream. Potential NOx control technologies for combustion gas turbines include the following:

**Wet combustion controls**

Water injection

Steam injection

**Dry combustion controls**

Dry low-NOx combustor design

Catalytic combustors (e.g., XONON)

Other combustion modifications

**Post-combustion controls**

Selective non-catalytic reduction (SNCR)

Non-selective catalytic reduction (NSCR)

Selective catalytic reduction (SCR)

SCONOx

### *8.1-E.1.2Eliminate Technically Infeasible Options*

The performance and technical feasibility of available NOx control technologies are discussed in more detail below.

**Combustion Modifications**

***Wet Combustion Controls***

Steam or water injection directly into the turbine combustor is one of the most common NOx control techniques for combustion turbines. These wet injection techniques lower the flame temperature in the combustor and thereby reduce thermal NOx formation. The water or steam-to-fuel injection ratio is the most significant factor affecting the performance of wet

controls. Steam injection techniques can reduce NOx emissions in gas-fired turbines to between 15 and 25 ppmv at 15% $O_2$; the practical limit of water injection has been demonstrated at approximately 25-42 ppmv @ 15% $O_2$ before combustor damage becomes significant. Higher diluent:fuel ratios (especially with steam) not only result in greater NOx reductions, but also increase emissions of CO and hydrocarbons, reduce turbine efficiency, and may increase turbine maintenance requirements. The principal NOx control mechanisms are identical for water and steam injection. Water or steam is injected into the primary combustion chamber to act as a heat sink, lowering the peak flame temperature of combustion and thus lowering the quantity of thermal NOx formed. The injected water or steam exits the turbine as part of the exhaust.

Because water has a higher heat absorbing capacity than steam (due to the temperature and to the latent heat of vaporization associated with water), it takes more steam than water to achieve an equivalent level of NOx control. Typical steam injection ratios are 0.5 to 2.0 pounds steam per pound fuel; water injection ratios are generally below 1.0 pound water per pound fuel.

Although the lower peak flame temperature has a beneficial effect on NOx emissions, it can also reduce combustion efficiency and prevent complete combustion. As a result, CO and VOC emissions increase as water/steam-to-fuel ratios increase. Thus, the higher steam-to-fuel ratio required for NOx control will tend to cause higher CO and VOC emissions from steam-injected turbines than from water-injected turbines, due to the kinetic effect of the water molecules interfering with the combustion process. However, steam injection can reduce the heat rate of the turbine so that equivalent power output can be achieved with reduced fuel consumption and reduced $SO_2$ emission rates.

Water and steam injection have been in use on both oil- and gas-fired turbines in all size ranges for many years, so these NOx control technologies are clearly technologically feasible and widely available.

#### *Dry Combustion Controls*

Combustion modifications that lower NOx emissions without wet injection include lean combustion, reduced combustor residence time, lean premixed combustion, and two-stage rich/lean combustion. Lean combustion uses excess air (greater than stoichiometric air-to-fuel ratio) in the combustor primary combustion zone to cool the flame, thereby reducing the rate of thermal NOx formation. Reduced combustor residence times are achieved by introducing dilution air between the combustor and the turbine sooner than with standard combustors. The combustion gases are at high temperatures for a shorter time, which also has the effect of reducing the rate of thermal NOx formation.

The most advanced combination of combustion controls for NOx is referred to as dry low-NOx (DLN) combustors. DLN technology uses lean, premixed combustion to keep peak combustion temperatures low, thus reducing the formation of thermal NOx. This technology is effective in achieving NOx emission levels comparable to levels achieved using wet injection without the need for large volumes of purified water and without the increases in CO and VOC emissions that result from wet injection. However, this control technology does not result in lower NOx emissions than can be achieved using water injection on the LM6000 turbine.

Catalytic combustors use a catalytic reactor bed mounted within the combustor to burn a very lean fuel-air mixture. This technology has been commercially demonstrated under the trade name XONON in a 1.5 MW natural gas-fired turbine in Santa Clara, California, and commercial availability of the technology for a 200 MW GE Frame 7 natural gas-fired turbine

was recently announced for one project. (The technology has also been announced as commercially available for some models of small gas turbines, generally 10 MW in size and less.) The technology has not been announced commercially for the engines used at LECEF. No turbine vendor, other than General Electric, has indicated the commercial availability of catalytic combustion systems at the present time; therefore, catalytic combustion controls are not available for this specific application and are not discussed further.

#### *Post-Combustion Controls*

SCR is a post-combustion technique that controls both thermal and fuel NOx emissions by reducing NOx with a reagent (generally ammonia or urea) in the presence of a catalyst to form water and nitrogen. NOx conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask the catalyst (sulfur compounds, particulates, heavy metals, and silica). SCR is used in numerous gas turbine installations throughout the United States, almost exclusively in conjunction with other wet or dry NOx combustion controls. SCR requires the consumption of a reagent (ammonia or urea) and requires periodic catalyst replacement. Estimated levels of NOx control are in excess of 90%.

Selective non-catalytic reduction (SNCR) involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1200° to 2000° F and is most commonly used in boilers. The exhaust temperature for the LECEF gas turbine are in the 800° F range, which is well below the minimum SNCR operating temperature. Some method of exhaust gas reheat, such as additional fuel combustion, would be required to achieve exhaust temperatures compatible with SNCR operations, and this requirement makes SNCR technologically infeasible for this application. Even when technically feasible, SNCR is unlikely to achieve NOx reductions in excess of 80%-85%.

Nonselective catalytic reduction (NSCR) uses a catalyst without injected reagents to reduce NOx emissions in an exhaust gas stream. NSCR is typically used in automobile exhaust and rich-burn stationary IC engines, and employs a platinum/rhodium catalyst. NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen, and this condition does not occur in turbine exhaust where the oxygen concentrations are typically between 14 and 16%. For this reason, NSCR is not technologically feasible for this application.

SCONOx is a proprietary catalytic oxidation and adsorption technology that uses a single catalyst for the control of NOx, CO, and VOC emissions. The catalyst is a monolithic design, made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The catalyst simultaneously oxidizes NO to $NO_2$, CO to $CO_2$, and VOCs to $CO_2$ and water, while $NO_2$ is adsorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. The SCONOx potassium carbonate layer has a limited adsorption capability and requires regeneration approximately every 12-15 minutes in normal service.[1] Each regeneration cycle requires approximately 3-5 minutes. At any point in time, approximately 20% of the compartments in a SCONOx system would be in regeneration mode, and the remaining 80% of the compartments would be in oxidation/absorption mode.[2]

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[1] Personal communication, ABB Environmental, 1/18/00.

[2] Stone & Webster, "Independent Technical Review – SCONOx Technology and Design Review", February 2000.

Regeneration of the adsorption layer requires exposure of the catalyst to hydrogen gas. In practice, this is accomplished by reforming natural gas with high-pressure steam to produce a gas mixture consisting of methane, carbon dioxide, and hydrogen that is passed over the catalyst beds.[3] Initial attempts by the developer of the process to create regeneration gases from natural gas and steam within the SCONOx catalyst bed (internal autothermal regeneration) failed to produce consistent results; this approach was abandoned in favor of the current offering, which uses an external steam-heated reformer that partially reforms the natural gas to produce the gas mixture that is introduced into the catalyst bed.[4] The reformation reaction continues to some extent within the catalyst bed due to the presence of steam and the temperature of the catalyst surface, but some methane and VOCs from the natural gas remain.

Because the active regenerant gas is hydrogen, the regeneration process must be performed in an atmosphere of low oxygen to prevent dilution of the hydrogen. In practice, the oxygen present in the exhaust gas of combustion turbines is excluded from the catalyst bed by dividing the catalyst bed into a number of individual cells or compartments that are equipped with front and rear dampers that are closed at the beginning of each regeneration cycle. Proper regeneration of the SCONOx catalyst system depends upon the proper functioning and sealing of these sets of dampers approximately 4 times per hour so that an adequate concentration of hydrogen can be maintained in each module to accomplish complete regeneration of the catalyst before the dampers are opened and the compartment is placed back in service.

Because the SCONOx catalyst can be "poisoned" or rendered inactive by even the very small amounts of sulfur compounds present in natural gas, a SCOSOx catalyst bed (or "guard bed") that is intended to remove trace quantities of sulfur-bearing compounds from the exhaust gas stream is installed upstream of the SCONOx catalyst bed. Like the SCONOx catalyst, the SCOSOx catalyst must be regenerated. Regeneration of the two catalyst types occurs at the same time, with the same regeneration gas supply provided to both; however, the sulfur-bearing regeneration gases for the SCOSOx catalyst exit the SCONOx modules separately from the SCONOx regeneration gases to avoid contaminating the SCONOx catalyst beds. Both regeneration gas streams are returned to the gas turbine exhaust stream downstream of the SCONOx module.[5]

The external reformer used to create the regeneration gases is supplied with steam and natural gas. For one F-class turbine, an estimated 15,000 to 20,000 lbs/hr of 600°F steam is required, along with approximately 100 pounds per hour (2.2 MMbtu/hr) of natural gas.[6] These quantities would be expected to be lower for the smaller LM6000 turbines used in this project. To avoid poisoning the reformer catalyst, the natural gas supplied to the reformer passes through an activated carbon filter to remove some of the sulfur-bearing compounds that are added to natural gas to facilitate leak detection.[7]

The regeneration cycle time is expected to be controlled using a feedback system based on NOx emission rates.[8] That is, the higher the NOx emissions are relative to the design level, the shorter the absorption cycle, and regeneration cycles will occur more frequently. This is

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[3] Stone & Webster, op cit
[4] ABB Environmental, op cit
[5] ABB Environmental, op cit
[6] Ibid
[7] Stone & Webster, op cit
[8] Ibid

analogous to the use of feedback systems for controlling reagent (ammonia or urea) flow rates in an SCR system.

Maintenance requirements for SCONOx systems are expected to include periodic replacement of the reformer fuel sulfur carbon unit, periodic replacement of the reformer catalyst, periodic washings of the SCOSOx and SCONOx catalyst beds, and periodic replacement of the SCOSOx and SCONOx catalyst beds. The replacement frequency for the reformer sulfur carbon unit and reformer catalyst is unknown to LECEF at present. The SCOSOx catalyst is expected to require washing several times per year. The lead (upstream) SCONOx catalyst bed is also expected to require washing several times per year, while the trailing (downstream) SCONOx catalyst bed(s) are expected to require washing less frequently. The annual catalyst washing process is expected to take approximately three days for an F-class machine, at an estimated annual cost of $200,000.[9] For the smaller LM6000 CTG, the time requirement and cost can be estimated to be approximately one-third of this, or one day and $65,000. The estimated catalyst life is reported to be 7 washings;[10] the guaranteed catalyst life is 3 years.[11]

The adsorption temperature operating range for the SCONOx system is 300°F to 700°F, with an optimal temperature of approximately 600°F.[12] However, regeneration cycles are not initiated unless the catalyst bed temperature is above 450°F to avoid the creation of hydrogen sulfide during the regeneration of the SCOSOx catalyst.[13]

Estimates of control system efficiency vary. ABB Environmental has indicated that the SCONOx system is capable of achieving a 90% reduction in NOx; a 90% reduction in CO, to a level of 2 ppm; and an 80%-85% reduction in VOC emissions.[14] (This VOC reduction is not likely to be achieved with low VOC inlet concentrations, in the 1–2 ppm range.[15]) Commercially quoted NOx emission rates for the SCONOx system range from 2.0 ppm on a 3-hour average basis, representing a 78% reduction,[16] to 1.0 ppm with no averaging period specified (96% reduction).[17] The SCONOx system does not control or reduce emissions of sulfur oxides or particulate matter from the combustion device.[18]

The SCONOx system has been applied at the Sunlaw Federal Cogeneration Plant in Vernon California since December 1996, and at the Genetics Institute Facility in Massachusetts. The Sunlaw facility uses an LM-2500 gas turbine, rated at a nominal 23 MW, and the Genetics Institute facility has a 5 MW Solar gas turbine.

The SCONOx system was proposed for use by PG&E Generating Company at its La Paloma facility; however, PG&E Generating no longer plans to use the SCONOx system at that site.[19] The SCONOx system was also proposed for demonstration by PG&E Generating Company at the Otay Mesa Generating Project; however, PG&E Generating Company sold the project

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[9] Ibid
[10] Ibid
[11] Letter from ABB Alstom Power to Bibb & Associates dated May 5, 2000. (ABB Three Mountain Power or ABB TMP)
[12] Ibid
[13] ABB Environmental, op cit. Stone & Webster, op cit
[14] ABB Environmental, op cit
[15] Ibid
[16] ABB TMP, op cit
[17] Letter from ABB Alstom Power to Sunlaw Energy Corporation dated February 11, 2000. (ABB Sunlaw)
[18] ABB Environmental, op cit
[19] Ibid

to Calpine and Calpine has indicated that it no longer plans to use SCONOx. Although the technology's co-developer, Sunlaw, proposed to use the technology in conjunction with ABB gas turbines at the Nueva Azalea site in Southern California, the Nueva Azalea project has been withdrawn from the CEC licensing process.

The University of California, San Diego, operates two SoLoNox Titan 130S combustion turbines that are equipped with SCONOx. Each CTG is rated at approximately 13 MW and has NOx and CO emissions limits of 2.5 and 5.0 ppmvd @ 15% $O_2$, 3-hour average, respectively. Quarterly emission reports for the first 3 quarters of 2002 showed that Unit 1 had 5219 hours of operation with 9 3-hour periods of excess emissions, while Unit 2 had 5294 hours of operation with no exceedances of the 2.5 ppm NOx limit. In 2002, the SCONOx catalyst had to be washed three times, with the units taken off-line each time.

Redding Electric Utility operates a 43 MW Alstom Power Model GTX 100 CTG that is equipped with SCONOx at its Redding power plant. The unit has NOx and CO limits of 2.5 and 6.0 ppmvd @ 15% $O_2$, one-hour average basis, respectively, with a "demonstration" NOx limit of 2.0 ppm. Despite initial compliance problems, the turbine is currently operating in compliance with the 2.5 ppm NOx limit, but the operator is having to wash the catalyst more often than expected. The unit has not been able to consistently meet the 2.0 ppm "demonstration" limit.

As discussed further below, there are serious questions about the probability of a successful commercial demonstration and the commercial availability of the technology for application to LECEF, as well as the levels of emission control that can be consistently achieved. However, based on the preceding discussion, the SCONOx system will be considered as technologically feasible for the purposes of this analysis.

Based on the discussions above, the following NOx control technologies are available and potentially technologically feasible for the proposed project:

- Water injection
- Selective Catalytic Reduction
- SCONOx

### *8.1-E2.1.3 Rank Remaining Control Technologies by Control Effectiveness*

The remaining technically feasible control technologies are ranked by NOx control effectiveness in Table 8.1-E2-1.

**TABLE 8.1-E2-1**
NOx Control Alternatives

| NOx Control Alternative | Available? | Technically Feasible? | NOx Emissions (@ 15% $O_2$) | Environmental Impact | Energy Impacts |
|---|---|---|---|---|---|
| Water Injection | Yes | Yes | 25 ppm | Increased CO/VOC | Decreased Efficiency |
| Steam Injection | No | No | 15 – 25 ppm | Increased CO/VOC | Increased Efficiency |
| Dry Low-NOx Combustors | No | No | 9-25 ppm | Reduced CO/VOC | Increased Efficiency |
| Selective Catalytic Reduction | Yes | Yes | >90% reduction 1 – 2.5 ppm | Ammonia slip | Decreased Efficiency |
| SCONOx | Yes[a] | Yes | >90% reduction 1 – 2.5 ppm | Reduced CO; potential reduction in VOC | Decreased Efficiency |

a. There are no standard, commercial guarantees for LM6000 projects for this technology available in the public domain.

### *8.1-E2.1.4 Available Control Options and Technical Feasibility*

In a March 24, 2000 letter sent to local air pollution control districts, EPA Region 9 stated that the SCONOx Catalytic Adsorption System should be included in any BACT/LAER analysis for combined cycle gas turbine power plant projects since it can achieve the BACT/LAER emission specification for $NO_x$ of 2.5 ppmvd @ 15% $O_2$, averaged over one hour or 2.0 ppmvd @ 15% $O_2$, averaged over three hours. In this letter, EPA stated that ABB Alstom Power, the exclusive licensee for SCONOx applications, has conducted "full-scale damper testing" that demonstrates that SCONOx is technically feasible for utility-scale gas turbines. Stone & Webster Management Consultants, Inc. of Denver, Colorado was subsequently hired by ABB to conduct an independent technical review of the SCONOx technology as well as the full-scale damper testing program. According to the report by Stone & Webster, modifications to the actuators, fiberglass seals, and louver shaft-seal interface are being incorporated to resolve unacceptable reliability and leakage problems. However, no subsequent testing of the redesigned components has occurred to determine if the problems have been solved. Because the feasibility of the "scale-up" of the SCONOx system for large turbines has not been demonstrated, SCONOx is not considered to be a demonstrated $NO_x$ control technology for projects of the size of the Los Esteros Critical Energy Facility.

Although SCONOx is not considered to be a demonstrated control alternative for this project, it may be considered a technically feasible technology, and thus we have analyzed the collateral impacts of both SCR and SCONOx. Because SCONOx does not offer any emission control benefits over SCR control technology, the following analysis compares the cost-effectiveness and collateral impacts of the two technologies. The analysis shown in Table 8.1-E2-2 applies to four GE LM6000 gas turbines equipped with water injection and an uncontrolled $NO_x$ emission rate of 25 ppmvd @ 15% $O_2$.

**TABLE 8.1-E2-2**
Top-Down BACT Analysis Summary for NOx

| Control Technology | Controlled Emissions, tpy[a] | Emissions Controlled, tpy[b] | Average Cost-Effectiveness, $/ton[c] | Electricity Cost Impact, $/kwh[d] | Collateral Toxic Impacts? | Incremental Energy Impact, MMBtu/yr[e] |
|---|---|---|---|---|---|---|
| SCONOx | 99.0 | 905 | $3,942 | 0.482 | No | 416,120 |
| SCR | 99.0 | 905 | $1,743 | 0.204 | No | 279,750 |

a. From Table 8.1-A2-5, based on 2.5 ppmvd controlled emission rate. Total, four turbines.
b. Based on 25 ppmvd uncontrolled emission rate from turbines. Total, four turbines.
c. Total annual costs from ONSITE SYCOM Energy Corporation report for US DOE: "Cost Analysis of NOx Control Alternatives for Stationary Gas Turbines, Contract No. DE-FC02-97CHIO877," October 15, 1999. Tables A-5 and A-7.
d. Electricity cost from Ref c.
e. "Towantic Energy Project Revised BACT Analysis", RW Beck, February 18, 2000; based upon increased fuel use required to overcome catalyst bed back pressure. Scaled by ratio of Frame 7FA unit to LM6000 unit, or 200 MW/50 MW.

#### Energy Impacts

As shown in Table 8.1-E2-2, the use of SCR does not result in any significant or unusual energy penalties or benefits when compared to SCONOx. Although the operation and maintenance of SCONOx does result in a greater energy penalty when compared to that of SCR, this is not considered significant enough to eliminate SCONOx as a control alternative.

#### Economic Impacts

According to EPA's 1990 Draft New Source Review Workshop Manual, "Average and incremental cost effectiveness are the two economic criteria that are considered in the BACT analysis."

As shown in Table 8.1-E2-2, the average cost-effectiveness of both SCR and SCONOx meet the current District cost-effectiveness guideline of $17,500 per ton of $NO_x$ abated. However, the average cost-effectiveness of SCR is approximately 40% of the average cost-effectiveness of SCONOx. These figures are based on total annualized cost figures from a cost analysis conducted by ONSITE SYCOM Energy Corporation.[20] Although SCONOx will result in greater economic impact as quantified by average cost effectiveness, this impact is not considered adverse enough to eliminate SCONOx as a control alternative. However, it is important to note that this cost-effectiveness analysis is based on the assumption that both control technologies are being installed on a new project. Since LECEF Phase 2 is a modification to an existing project that already has SCR installed, much of the capital cost has already been incurred and the true cost of SCR for Phase 2 of the project is much lower than the cost shown here.

Incremental cost-effectiveness does not apply since SCR and SCONOx both achieve the BACT standard for $NO_x$ of 2.5 ppmvd @ 15% $O_2$, averaged over three hours and therefore achieve the same $NO_x$ emission reduction in tons per year.

#### Environmental Impacts

The use of SCR will result in ammonia emissions due to an allowable ammonia slip limit of

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[20] ONSITE SYCOM Energy Corporation for US DOE: "Cost Analysis of NOx Control Alternatives for Stationary Gas Turbines," Contract No. DE-FC02-97CHIO877, October 15, 1999.

10 ppmvd @ 15% $O_2$. A health risk screening analysis of the proposed project using air dispersion modeling showed an acute hazard index and a chronic hazard index to be each much less than 1, resulting from an ammonia slip limit of 10 ppmv @ 15% $O_2$. In accordance with the District Toxic Risk Management Policy and currently accepted practice, a hazard index of less than 1.0 or above is considered not significant. Therefore, the toxic impact of the ammonia slip resulting from the use of SCR is deemed to be not significant and is not a sufficient reason to eliminate SCR as a control alternative.

The ammonia emissions resulting from the use of SCR may have another environmental impact through its potential to form secondary particulate matter such as ammonium nitrate. Because of the complex nature of the chemical reactions and dynamics involved in the formation of secondary particulates, it is difficult to estimate the amount of secondary particulate matter that will be formed from the emission of a given amount of ammonia. However, the Research and Modeling section of the BAAQMD Planning Division has stated in previous CEC proceedings that the formation of ammonium nitrate in the Bay Area air basin is limited by the formation of nitric acid and not driven by the amount of ammonia in the atmosphere. Therefore, ammonia emissions from the proposed SCR system are not expected to contribute significantly to the formation of secondary particulate matter within the BAAQMD.

A second potential environmental impact that may result from the use of SCR involves the storage and transport of aqueous ammonia. Although ammonia is toxic if swallowed or inhaled and can irritate or burn the skin, eyes, nose, or throat, it is a commonly used material that is typically handled safely and without incident. In fact, aqeous ammonia is currently being handled and stored at LECEF without incident. LECEF is required to maintain a Risk Management Plan (RMP) and implement a Risk Management Program to prevent accidental releases (see Section 8.5 of the AFC). The RMP provides information on the hazards of the substance handled at the facility and the programs in place to prevent and respond to accidental releases. The accident prevention and emergency response requirements reflect existing safety regulations and sound industry safety codes and standards. In addition, the modeling analyses of the health impacts arising from a catastrophic release of ammonia due to spontaneous storage tank failure at LECEF shows that the impact would not be significant. Thus the potential environmental impact due to aqueous ammonia storage at LECEF does not justify the elimination of SCR as a control alternative.

#### Conclusion

Because both SCR and SCONOx can achieve the proposed BACT $NO_x$ emission limit of 2.5 ppmvd @ 15% $O_2$ averaged over three hours and neither will cause significant energy, economic, or environmental impacts, neither can be eliminated as viable control alternatives. The concern remains regarding the long-term effectiveness of SCONOx as a control technology as the technology has not been demonstrated on the turbines used in this project. For this reason, and because SCR is already in use at the facility, SCR has been selected as the NOx control technology to be used for the LECEF combined cycle project.

### 8.1-E2.2 Determination of BACT Emission Rates

#### *8.1-E2.2.1 Nitrogen Oxides – Combustion Gas Turbine*

The BACT analysis performed for NOx control includes the following:

- Review of published BACT guidelines for natural gas-fired combined cycle gas turbines;

- Review of recent BACT decisions for natural gas-fired combined-cycle gas turbines;
- Review of continuous NOx emissions monitoring data for natural gas-fired combined-cycle gas turbines obtained from EPA's acid rain website;
- Review of federal NSPS for natural gas-fired gas turbines; and
- Review of published prohibitory rules for natural gas-fired gas turbines.

#### Published BACT Guidelines

Published BACT determinations from the following agencies were reviewed to identify relevant previously established BACT guidelines:

- California Air Resources Board (ARB);
- Bay Area Air Quality Management District (BAAQMD);
- San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD); and
- South Coast Air Quality Management District (SCAQMD).

ARB's BACT Clearinghouse contained determinations by the Sacramento Metropolitan Air Quality Management District (SMAQMD) that specified water injection and SCR achieving an emission limit of 5 ppmv @ 15% $O_2$ as BACT for the following facilities:

- Carson Energy Group cogeneration plant in Sacramento, California; and
- Sacramento Cogeneration Authority cogeneration plant in Sacramento, California.

This clearinghouse has not been updated since 2000. ARB is also in the process of developing a new guideline document for power plant permitting. The most recent available ARB document on this subject[21] indicated that BACT for NOx from combined cycle gas turbines rated at > 50 MW was 2.5 ppmv @ 15% $O_2$ on a 1-hour average basis or 2.0 ppmv @ 15% $O_2$ on a 3-hour average basis. However, the report indicates that the most stringent permitted NOx level found by ARB staff was 3.5 ppmvd @ 15% $O_2$ for an LM6000 gas turbine operating in combined cycle (Modesto Irrigation District, 1994).

The BAAQMD's BACT guidelines specify that, for combined cycle combustion gas turbines greater than 40 MW, a NOx limit of 2.5 ppmv @ 15% $O_2$ has been "achieved in practice." The guideline document also indicates that 2.0 ppm has been achieved in practice for a 50 MW LM6000 combined cycle unit; however, this conclusion is discussed in more detail below.

The SJVUAPCD's BACT guidelines contained a determination for gas turbines rated at greater than 50 MW with uniform load and with heat recovery. The SJVUAPCD concluded that a NOx exhaust concentration of 2.5 ppmv @ 15% $O_2$ constituted BACT that had been achieved in practice and 2.0 ppmv @ 15% $O_2$ constituted BACT that is technologically feasible.

#### Recent BACT Decisions

The BAAQMD has recently issued two permits for LM6000 combined cycle projects: Valero Cogeneration in Benicia and Silicon Valley Power's Pico Power Project in Santa Clara. The

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[21] ARB Guidance for the Permitting of Electrical Generation Technologies, July 2002.

Valero project was permitted at 2.5 ppmvd. The District used three months of CEMS data and information from an analysis of CEMS data from the ANP Blackstone power plant in Massachusetts to conclude that an emission limit of 2.0 ppmvd has been achieved in practice and should be considered BACT. However, we believe that there are several additional factors that need to be considered in making a NOx BACT determination for the LECEF Phase 2 project.

The ANP Blackstone turbines have been in operation for several years, and their compliance with the 2.0 ppm NOx limit has improved each year. However, in their first years of operation each unit experienced a significant number of exceedances of the limit. This indicates that such a low limit is difficult to meet consistently, although compliance may improve over time. The performance of several units with extremely low NOx emission limits is summarized in Table 8.1-E2-3.

The District also uses three months of early performance data from the Valero Cogeneration facility to conclude that an LM6000 unit in combined cycle with supplemental firing can meet a 2.0 ppm limit. However, we believe that three months is too short a period on which to base a performance limit that a unit will be required to comply with over its lifetime. We note that the SCAQMD generally requires a technology to be demonstrated for at least six months before concluding that it should be considered BACT. Further, the limited CEM data suggested that the Valero turbines operated constantly with few if any startups/ shutdowns or load changes. The BAAQMD considered that in their BACT determination for Pico Power by including an allowance for up to 160 hours per year of excursions beyond the 2.0 ppm limit. This is significantly more hours of excursions than have been provided for other projects that have been permitted using this approach: a typical number of hours of excursions is between 10 and 30 hours per year. The need to provide such a large number of excursion hours suggests a great deal of uncertainty regarding the ability of the turbine to comply with the 2.0 ppm limit and indicates to us that such a limit is therefore not actually technically feasible.

Finally, it is important to consider that the LECEF Phase 2 project is the conversion of an existing simple cycle project to combined cycle, not the construction of a new project. LECEF can add additional catalyst material to the HRSGs, but does not have the flexibility to redesign the HRSGs because the HRSGs have already been constructed.

#### Review of NOx CEMS Data

Real-time hourly NOx CEMS data are available on EPA's Acid Rain website for generating units that are subject to acid rain reporting requirements. The reported NOx data for the West Springfield Redevelopment Project simple-cycle gas turbines were analyzed for compliance with the original permit limit of 2.0 ppmvd @ 15% $O_2$, 1-hour average basis. Five quarters of monitoring data were available for each of the two West Springfield Redevelopment Project units. Analysis of these data showed that when low-load, startup/shutdown and commissioning periods were excluded, the turbines operated in compliance with the 2.0 ppm, 1-hour average permit limit only between 10 and 20% of the time (see Table 8.1-E2-4). Even a 3.0 ppm, 3-hour average limit would have been exceeded almost 10% of the time. The NOx limit for these turbines was recently revised to 3.5 ppmvd @ 15% $O_2$. Based on this, we conclude that <u>permitted</u> emission levels cannot necessarily be relied upon to make a determination regarding <u>achievable</u> emission rates.

**Table 8.1-E2-3**
Comparison of Unit Performance - 1hr Average Compliance Basis

| Facility | Unit | Review Period From | Review Period To | Total Hours in Period | Operating Hours in Period | Operating Hours Above Min Load | Unit Starts | NOx Permit Limit ppmc | Period Mean NOx ppmc | Maximum Valid Hour NOx ppmc | Actual Hours Above Limit | Exceedance Rate | Expected Exceedances Based on 8760 Hrs/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANP Blackstone | 1 | 1/1/2001 | 12/31/2001 | 8760 | 1793 | 1207 | 43 | 2.0 | 1.81 | 71.96 | 17 | 1.41% | 123 |
| | | 1/1/2002 | 12/31/2002 | 8760 | 4490 | 3477 | 140 | 2.0 | 1.66 | 8.38 | 5 | 0.14% | 13 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 2701 | 1859 | 106 | 2.0 | 1.67 | 1.79 | 0 | 0.00% | 0 |
| ANP Blackstone | 2 | 4/1/2001 | 12/31/2001 | 6600 | 2012 | 1505 | 38 | 2.0 | 1.39 | 9.36 | 13 | 0.86% | 76 |
| | | 1/1/2002 | 12/31/2002 | 8760 | 4903 | 3798 | 125 | 2.0 | 1.66 | 4.03 | 6 | 0.16% | 14 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 2572 | 1729 | 101 | 2.0 | 1.66 | 2.80 | 1 | 0.06% | 5 |
| El Paso Milford | 1 | 7/1/2002 | 12/31/2002 | 4416 | 122 | 7 | 22 | 2.0 | 1.51 | 1.55 | 0 | 0.00% | 0 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 0 | 0 | 0 | 2.0 | | - | 0 | | |
| El Paso Milford | 2 | 4/1/2002 | 12/31/2002 | 6600 | 223 | 109 | 10 | 2.0 | 1.50 | 1.84 | 0 | 0.00% | 0 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 0 | 0 | 0 | 2.0 | | - | 0 | | |
| Lake Road | 1 | 7/1/2001 | 12/31/2001 | 4416 | 226 | 140 | 9 | 2.0 | 1.92 | 5.45 | 26 | 18.57% | 1627 |
| | | 1/1/2002 | 12/31/2002 | 8760 | 5254 | 4045 | 68 | 2.0 | 1.36 | 7.17 | 4 | 0.10% | 9 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 2144 | 923 | 62 | 2.0 | 1.39 | 3.98 | 6 | 0.65% | 57 |
| Lake Road | 2 | 1/1/2002 | 12/31/2002 | 8760 | 6117 | 4746 | 44 | 2.0 | 1.30 | 7.02 | 3 | 0.06% | 6 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 1228 | 723 | 66 | 2.0 | 1.06 | 10.53 | 3 | 0.41% | 36 |
| Lake Road | 3 | 4/1/2002 | 12/31/2002 | 6600 | 5119 | 4054 | 44 | 2.0 | 1.40 | 1.79 | 0 | 0.00% | 0 |
| | | 1/1/2003 | 6/30/2003 | 4344 | 988 | 528 | 31 | 2.0 | 1.38 | 7.30 | 2 | 0.38% | 33 |

**Table 8.1-E2-4**
Summary of NOx Emissions Performance: West Springfield Redevelopment Project LM6000 Simple Cycle Gas Turbines

| Unit/Period | Averaging Prd | Exceedance Frequency Based on NOx Limit, ppmvd @ 15% $O_2$ | | |
|---|---|---|---|---|
| | | 3.0 | 2.5 | 2.0 |
| **Unit 1** | | | | |
| 5/1 to 12/31/2002 | 1 hour | 14% | 43% | 84% |
| | 3 hours | 11% | 37% | 82% |
| 1/1 to 6/30/2003 | 1 hour | 20% | 34% | 98% |
| | 3 hours | 13% | 27% | 99% |
| **Unit 2** | | | | |
| 5/1 to 12/31/2002 | 1 hour | 11% | 53% | 79% |
| | 3 hours | 9% | 56% | 77% |
| 1/1 to 6/30/2003 | 1 hour | 7% | 16% | 90% |
| | 3 hours | 5% | 18% | 91% |

#### Federal NSPS

The NSPS applicable to new natural gas-fired combustion gas turbines are found in Title 40 CFR Part 60 Subpart GG. The NOx emission limit applicable to the proposed combustion gas turbines will be 121 ppmv @ 15% $O_2$.

#### District Prohibitory Rules

Published prohibitory rules from the BAAQMD, SMAQMD, San Diego County Air Pollution Control District (SDCAPCD), SJVUAPCD, and SCAQMD were reviewed to identify the NOx standards that govern existing natural gas-fired simple cycle combustion gas turbines.

- BAAQMD adopted Rule 9-9 (Nitrogen Oxides from Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 9-9 specifies an efficiency-adjusted NOx emission limit of 13.0 ppmv @ 15% $O_2$ for natural gas-fired combustion gas turbines rated at no less than 10 MW, rated at 9,353 Btu/kW-hr (HHV), and equipped with SCR.
- The SMAQMD adopted Rule 413 (Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 413 specifies a NOx emission limit of 9 ppmv @ 15% $O_2$ for natural gas-fired combustion gas turbines rated at no less than 10 MW and equipped with SCR.
- The SJVUAPCD adopted Rule 4703 (Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 4703 specifies an enhanced Tier II NOx emission limit of 3 ppmv @ 15% $O_2$ for natural gas-fired combustion gas turbines rated at no less than 10 MW and equipped with SCR (April 30, 2008 deadline).
- The SCAQMD adopted Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 1134 specifies an efficiency-adjusted NOx emission limit of 13 ppmv @ 15% $O_2$ for natural gas-fired combustion gas turbines rated no less than 10 MW, rated at 9,353 Btu/kW-hr, and equipped with SCR.

#### Conclusions

BACT must be at least as stringent as the most stringent level achieved in practice, federal

NSPS, or district prohibitory rule. Based upon the results of this analysis, a NOx BACT level of 2.5 ppm @ 15% $O_2$ on a 3-hour average basis reflects the most stringent achievable NOx emission limit. Therefore, BACT for NOx emissions for natural gas-fired simple cycle combustion gas turbines is 2.5 ppmv @ 15% $O_2$. The LECEF Phase 2 facility will meet a NOx level of 2.5 ppmv @ 15% $O_2$ on a 3-hour average basis.

### *8.1-E2.2.2 Carbon Monoxide*

The BACT analysis performed for CO control includes the following:

- Review of published BACT guidelines for natural gas-fired combined cycle combustion gas turbines;
- Review of recent BACT decisions for natural gas-fired combined-cycle gas turbines;
- Review of federal NSPS for natural gas-fired combustion gas turbines; and
- Review of published prohibitory rules for natural gas-fired combustion gas turbines.

#### Published BACT Guidelines

As discussed in the previous section, published BACT determinations from the following agencies were reviewed to identify any previously established BACT guidelines:

- ARB;
- BAAQMD; and
- SJVUAPCD.

The ARB's BACT guidance document for electric generating units rated at more than 50 MW[22] indicates that BACT for the control of CO emissions from stationary gas turbines rated at over 50 MW used in electrical generation is 6 ppmvd @ 15% $O_2$.

The BAAQMD's BACT guidelines specify that, for natural gas-fired combined cycle combustion gas turbines, a CO limit of 4 ppmv @ 15% $O_2$ has been "achieved in practice." A BACT guideline of 6 ppmv @ 15% $O_2$ was established in CARB's Guidance for Power Plant Sitting and Best Available Control Technology (June 1999).

The SJVUAPCD's BACT guidelines contained a determination for gas turbines with heat recovery. The SJVUAPCD concluded that a CO exhaust concentration of 6 ppmv @ 15% $O_2$ constituted BACT that had been achieved in practice.

#### Recent BACT Decisions

The ARB staff has prepared a draft table of NOx emission control requirements and permitted emission levels for simple-cycle power plant gas turbines. This table, which includes information regarding limits for VOC, CO, $PM_{10}$, $SO_2$ and ammonia, shows that most of the recently-permitted combined-cycle gas turbine projects in California have been required to meet CO BACT limits of 4 to 6 ppmvd @ 15% $O_2$.

The SCAQMD database included a December 2001 determination for Mountainview power plant that BACT for CO for a combined cycle gas turbine was 6 ppm on a 1-hour average basis. However, recently permitted combined cycle projects in the BAAQMD have been required to meet a 4 ppm CO limit and that limit is proposed for this project.

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[22] Ibid, Table I-1.

#### Federal NSPS

The NSPS applicable to new natural gas-fired combustion gas turbines are found in Title 40 CFR Part 60 Subpart GG. This NSPS does not specify an emission limit for CO.

#### District Prohibitory Rules

Published prohibitory rules from the BAAQMD, SMAQMD, SDCAPCD, SJVUAPCD, and SCAQMD were reviewed to identify the CO standards that govern existing natural gas-fired combustion gas turbines. Of the five prohibitory rules reviewed, the SJVUAPCD prohibitory rule for combustion gas turbines is the only one that includes an emission limit for CO (200 ppmv @ 15% $O_2$). Generic prohibitory rules (i.e., not device specific) from each of these districts were also reviewed; emission limits are 2000 ppmv at actual operating conditions.

#### Conclusions

BACT must be at least as stringent as the most stringent level required in a permit, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the BAAQMD BACT determination for natural gas-fired combined cycle combustion gas turbines reflects the most stringent CO emission limit. Therefore, BACT for CO emissions from natural gas-fired combined cycle combustion gas turbines is 4 ppmv @ 15% $O_2$. The proposed CO emission limit of 4 ppmvd @ 15% $O_2$ on a 3-hour average basis is expected to be achievable in practice.

### *8.1-E2.2.3 Volatile Organic Compounds*

The BACT analysis performed for VOC control includes the following:

- Review of published BACT guidelines for natural gas-fired combined cycle combustion gas turbines;
- Review of recent BACT decisions for natural gas-fired combined-cycle gas turbines;
- Review of federal NSPS for natural gas-fired combustion gas turbines; and
- Review of published prohibitory rules for natural gas-fired combustion gas turbines.

#### Published BACT Guidelines

As discussed previously, published BACT determinations from the following agencies were reviewed to identify any previously established BACT guidelines:

- ARB;
- BAAQMD; and
- SJVUAPCD.

The ARB's BACT guidance document for electric generating units rated at more than 50 MW[23] indicates that BACT for the control of POC emissions from stationary combined cycle gas turbines rated at more than 50 MW used in electrical generation is 2 ppmvd @ 15% $O_2$.

ARB's BACT Clearinghouse contained SMAQMD determinations that specified an oxidation catalyst achieving an emission limit of 2.1 ppmv @ 15% $O_2$ as BACT for the following facilities:

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[23] Ibid, Table I-1.

- Carson Energy Group cogeneration plant in Sacramento, California; and
- Sacramento Cogeneration Authority cogeneration plant in Sacramento, California.

The BAAQMD's BACT guidelines specify that, for natural gas-fired combined cycle combustion gas turbines, a VOC limit of 2 ppmv @ 15% $O_2$ has been "achieved in practice." This BACT guideline was established in CARB's Guidance for Power Plant Sitting and Best Available Control Technology (June 1999).

The SJVUAPCD's BACT guidelines contained a determination for gas turbines rated at more than 50 MW with heat recovery. The SJVUAPCD concluded that a VOC exhaust concentration of 2.0 ppmv @ 15% $O_2$ constituted BACT that had been achieved in practice.

#### Recent BACT Decisions

The ARB staff has prepared a draft table summarizing NOx emission control requirements and permitted emission levels for simple-cycle power plant gas turbines. This table, which includes information regarding limits for VOC, CO, $PM_{10}$, $SO_2$ and ammonia, shows that most of the recently-permitted combined-cycle gas turbine projects in California have been required to meet VOC BACT limits of 2 ppmvd @ 15% $O_2$ on a 1- or a 3-hour average basis. In recent determinations made by the SJVUAPCD for combined cycle gas turbines, VOC BACT was determined to be 1.4 to 2 ppmvd @ 15% $O_2$ on a 3-hour average basis.

#### Federal NSPS

The NSPS applicable to new natural gas-fired combustion gas turbines are found in Title 40 CFR Part 60 Subpart GG. This NSPS does not specify an emission limit for VOC.

#### District Prohibitory Rules

Published prohibitory rules from the BAAQMD, SMAQMD, SDCAPCD, SJVUAPCD, and SCAQMD were reviewed to identify the VOC standards that govern existing natural gas-fired cycle combustion gas turbines. None of the prohibitory rules for combustion gas turbines, discussed previously in Section IV.A.3, specify an emission limit for VOC. Generic prohibitory rules (i.e., not device specific) from each of these districts were also reviewed; none contain an emission limit for VOC.

#### Conclusions

BACT must be at least as stringent as the most stringent BACT determination, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the BAAQMD BACT determination for natural gas-fired combined cycle combustion gas turbines, obtained from CARB's Guidance for Power Plant Sitting and Best Available Control Technology, reflects the most stringent VOC emission limit. The BAAQMD established VOC emission limits of 2 ppmv @ 15% $O_2$ for natural gas-fired combined cycle combustion gas turbines. Therefore, BACT for VOC emissions for this project is 2 ppmv @ 15% $O_2$.

### *8.1-E2.2.4 Particulate Matter Less Than 10 Microns in Diameter ($PM_{10}$)*

The BACT analysis performed for $PM_{10}$ includes the following:

- Review of published BACT guidelines for comparable natural gas-fired combined cycle combustion turbines;
- Review of recent BACT decisions for natural gas-fired combined-cycle gas turbines;
- Review of federal NSPS for small natural gas-fired combustion gas turbines; and

- Review of published prohibitory rules for comparable natural gas-fired combustion gas turbines.

#### Published BACT Guidelines

Published BACT determinations from the following agencies were reviewed to identify any previously established BACT guidelines:

- ARB;
- BAAQMD; and
- SJVUAPCD.

The ARB BACT Clearinghouse, as well as the BAAQMD and SJVUAPCD BACT guidelines, identify the use of natural gas as the primary fuel as "achieved in practice" for the control of $PM_{10}$ for combustion gas turbines.

The ARB's BACT guidance document for electric generating units rated at more than 50 MW[24] indicates that BACT for the control of PM emissions from stationary gas turbines rated at over 50 MW used in electrical generation is an emission limit corresponding to natural gas with fuel sulfur content of no more than 1 grain/100 standard cubic foot.

#### Recent BACT Decisions

The ARB staff has prepared a draft table summarizing NOx emission control requirements and permitted emission levels for simple-cycle power plant gas turbines. This table, which includes information regarding limits for VOC, CO, $PM_{10}$, $SO_2$ and ammonia, shows that most of the recently-permitted combined-cycle gas turbine projects in California have been required to meet $PM_{10}$ limits much higher than those being proposed here; however, most of the turbines on this table are much larger than the LM6000 units used for this project. The only comparable project is the Las Vegas Cogeneration project, which is permitted with a $PM_{10}$ limit of 2.5 lb/hr.

Phase 1 of LECEF was permitted with a $PM_{10}$ limit of 2.5 lb/hr per turbine. The initial source tests indicated that the actual $PM_{10}$ emissions from the turbines were only slightly below 2.5 lb/hr due to test method variability. LECEF is proposing to increase the hourly $PM_{10}$ emission limit to 3.0 lb/hr per turbine to ensure the ability to continuously comply with the limit.

### Federal NSPS

Title 40 CFR Part 60 Subpart GG contains the applicable NSPS for combustion gas turbines. Section III.H previously identified the requirements of Subpart GG applicable to the proposed combustion gas turbine; Subpart GG does not regulate $PM_{10}$ emissions.

### District Prohibitory Rules

Published prohibitory rules from the District, SCAQMD, SJVUAPCD, SMAQMD, and SDCAPCD were reviewed to identify the $PM_{10}$ standards that govern existing small natural gas-fired combustion gas turbines:

- BAAQMD adopted Rule 9-9 (Nitrogen Oxides from Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 9-9 does not regulate $PM_{10}$ emissions.

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[24] Ibid, Table I-1.

- BAAQMD Regulation 6 (Particulate Matter and Visible Emissions) specifies a PM emission limit of 0.15 gr/dscf for sources of PM emissions.
- The SMAQMD adopted Rule 413 (Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 413 does not regulate $PM_{10}$ emissions.
- SMAQMD Rule 404 (Particulate Matter) specifies a PM emission limit of 0.1 gr/dscf for sources of PM emissions.
- SMAQMD Rule 406 (Specific Contaminants) specifies a PM emission limit of 0.1 gr/dscf @ 12% $CO_2$ for combustion sources.
- The SDCAPCD adopted Rule 69.3.1 (Stationary Gas Turbine Engines – Best Available Retrofit Control Technology) to limit NOx emissions from these devices. Rule 69.3.1 does not regulate $PM_{10}$ emissions.
- SDCAPCD Rule 52 (Particulate Matter) specifies a $PM_{10}$ emission limit of 0.1 gr/dscf for sources of PM emissions.
- SDCAPCD Rule 53 (Specific Air Contaminants) specifies a PM emission limit of 0.1 gr/dscf @ 12% $CO_2$ for combustion sources.
- The SJVUAPCD adopted Rule 4703 (Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 4703 does not regulate $PM_{10}$ emissions.
- SJVUAPCD Rule 4201 (Particulate Matter - Concentration) specifies a PM emission limit of 0.1 gr/dscf for sources of PM emissions.
- SJVUAPCD Rule 4301 (Fuel Burning Equipment) specifies a PM emission limit of 0.1 gr/dscf @ 12% $CO_2$ for combustion sources.
- The SCAQMD adopted Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines) to limit NOx emissions from these devices. Rule 1134 does not regulate $PM_{10}$ emissions.
- SCAQMD Rule 404 (Particulate Matter - Concentration) specifies a PM emission limit of 0.0437 gr/dscf for sources of PM emissions.
- SCAQMD Rule 409 (Combustion Contaminants) specifies a PM emission limit of gr/dscf @ 12% $CO_2$ for combustion sources.

#### Conclusions

BACT must be at least as stringent as the most stringent BACT determination, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the BAAQMD BACT guideline reflects the most stringent $PM_{10}$ emission limit. The District established a requirement for the use of natural gas as the primary fuel to control $PM_{10}$ emissions from combustion gas turbines. Therefore, the use of natural gas as the primary fuel source constitutes BACT for $PM_{10}$ emissions from combined cycle combustion gas turbines. Through the use of natural gas, the turbines are expected to be able to meet the proposed emission limit of 3.0 lb/hr per turbine.

### *8.1-E2.2.5 Sulfur Oxides*

The BACT analysis performed for SOx included the following:

- Review of published BACT guidelines for small natural gas-fired combined cycle

combustion turbines;

- Review of recent BACT decisions for natural gas-fired combined-cycle gas turbines;
- Review of federal NSPS for small natural gas-fired combustion gas turbines; and
- Review of published prohibitory rules for natural gas-fired combustion gas turbines.

#### Published BACT Guidelines

Published BACT determinations from the following agencies were reviewed to identify any previously established BACT guidelines:

- ARB;
- BAAQMD; and
- SJVUAPCD.

The CARB BACT Clearinghouse, as well as the BAAQMD and SJVUAPCD BACT guidelines, identify the use of PUC-quality natural gas or natural gas with a limit on the sulfur content (i.e., 1 grain/100 scf) as the primary fuel as "achieved in practice" for the control of SOx for combined cycle combustion gas turbines.

#### Recent BACT Decisions

The ARB staff has prepared a draft table of NOx emission controls required for power plant gas turbines. This table, which includes information regarding limits for VOC, CO, $PM_{10}$, $SO_2$ and ammonia) showed that most of the recently-permitted gas turbine projects in California have been required to meet hourly $SO_2$ limits that correspond to fuel sulfur content limits of between 0.33 and 1.0 gr/100 scf.

#### Federal NSPS

Title 40 CFR Part 60 Subpart GG contains the applicable NSPS for combustion gas turbines. Section III.B previously identified the requirements of Subpart GG applicable to the proposed combustion gas turbine. A combustion gas turbine is subject to a $SO_2$ emission limit of 0.015% by volume (150 ppmv) @ 15% $O_2$. The NSPS also limits the sulfur content of fuel to 0.8% by weight.

#### District Prohibitory Rules

Published prohibitory rules from the BAAQMD, SJVUAPCD, and SCAQMD were reviewed to identify the $SO_2$ standards that govern existing gas turbines.

- BAAQMD Rule 9-9 (Nitrogen Oxides from Stationary Gas Turbines) is the BAAQMD's only prohibitory rule that specifically addresses gas turbines but does not limit $SO_2$ emissions. The BAAQMD adopted Rule 9-1 (Sulfur Dioxide) to limit $SO_2$ emissions from all sources. Rule 9-1 prohibits $SO_2$ emissions in excess of 300 ppm. No other BAAQMD Rule or Regulation contains a relevant prohibitory rule regulating either the sulfur content in the fuel or the emission of $SO_2$ from gas turbines.
- SJVUAPCD Rule 4703 (Stationary Gas Turbines) is the SJVUAPCD's only prohibitory rule that specifically addresses gas turbines but does not limit $SO_2$ emissions. The SJVUAPCD adopted Rule 4301 (Fuel Burning Equipment) to limit $SO_2$ emissions from these devices. Rule 4301 specifies a $SO_2$ emission limit of 200 pounds per hour. The SJVUAPCD also adopted Rule 4801 (Sulfur Compounds) to limit emissions of sulfur compounds. Rule 4801 specifies a $SO_2$ emission limit of 0.2%, or 2,000 ppm.

- SCAQMD Rule 1134 (Emissions of Oxides of Nitrogen from Stationary Gas Turbines) is the SCAQMD's only prohibitory rule that specifically addresses gas turbines but does not limit $SO_2$ emissions. The SCAQMD adopted Rule 431.1 (Sulfur Content of Gaseous Fuels) to reduce SOx emissions from the burning of gaseous fuels in stationary equipment. Rule 431.1 specifies a sulfur limit of 16 grains/100 scf (as $H_2S$) in natural gas sold within the SCAQMD. The SCAQMD also adopted Rule 407 (Liquid and Gaseous Air Contaminants) to limit $SO_2$ emissions from all sources. Rule 407 specifies an emission limit of 2,000 ppm for sulfur compounds (calculated as $SO_2$).

#### Conclusions

BACT must be at least as stringent as the most stringent BACT determination, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the CARB database and BAAQMD and SJVUAPCD BACT guidelines reflect the most stringent SOx emission limit. These sources established a requirement for the use of natural gas as the primary fuel to control SOx emissions from combustion gas turbines. Therefore, the use of natural gas as the primary fuel source constitutes BACT for SOx emissions from combustion gas turbines.

### 8.1-E2.3 Summary

The criteria that constitute BACT for the proposed natural gas-fired combined cycle combustion gas turbine are summarized in Table 8.1-E2-5 and compared against the design criteria for the proposed combustion gas turbine.

**TABLE 8.1-E2-5**
Summary of Emission Limits and BACT Requirements

| Pollutant | BACT | Proposed Control Level |
|---|---|---|
| NOx | Emission Limit = 2.5 ppmv @ 15% $O_2$ | Design Exhaust Concentration = 2.5 ppmv @ 15% $O_2$ |
| CO | Emission Limit = 6 ppmv @ 15% $O_2$ | Design Exhaust Concentration = 4 ppmv @ 15% $O_2$ |
| VOC | Emission Limit = 2 ppmv @ 15% $O_2$ | Design Exhaust Concentration = 2 ppmv @ 15% $O_2$ |
| SOx | Natural gas fuel | Natural gas fuel |
| $PM_{10}$ | Natural gas fuel | Natural gas fuel |

# *Los Esteros Critical Energy Facility*

# *Appendix 8.1-F2*
# *Protocol for a Cumulative Impacts Analysis for the Phase 2 Combined-Cycle Facility*

***December 2003***

## APPENDIX 8.1-F2

## PROTOCOL FOR A CUMULATIVE IMPACTS ANALYSIS FOR THE PHASE 2 COMBINED CYCLE FACILITY

Potential cumulative air quality impacts that might be expected to occur resulting from the conversion of Los Esteros Critical Energy Facility to a combined-cycle facility and other reasonably foreseeable projects are both regional and localized in nature. These cumulative impacts will be evaluated as follows.

Cumulative impacts from LECEF could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted $PM_{10}$. To ensure that other projects that might have significant cumulative impacts in conjunction with LECEF are identified, a search area with a radius of 6 km will be used for the cumulative impacts analysis.

Within this search area, three categories of projects with combustion sources will be used as criteria for identification:

- Projects that are existing and have been in operation since at least 2002.
- Projects for which air pollution permits to construct have been issued and that began operation after 2002.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

Projects that are existing and have been in operation since at least 2002 are already reflected in the ambient air quality data that has been used to represent background concentrations; consequently, no further analysis of the emissions from this category of facilities will be performed. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational by 2002 will be identified through a request of permit records from the Bay Area AQMD. The search has been requested to be performed at two levels. Projects that had a permit to construct issued after January 1, 2000, will be included in the cumulative air quality impacts analysis. The January 1, 2000 date was selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the 2002 ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 10 pounds per day will be assumed to be *de minimis*, and will not be included in the dispersion modeling analysis.

A list of projects within the area for which air pollution permits to construct have not yet been issued, but that are reasonably foreseeable, has also been requested from the BAAQMD staff.

# *Los Esteros Critical Energy Facility*

## *Appendix 8.2-A*
## *Biological Resources Resumes*
## *• Eric Htain*

***December 2003***

| Eric Htain | Tetra Tech FW Inc. |
|---|---|
| **Assignment:** Environmental Scientist<br>**Years of Experience:** 5 | **Education:**<br>BA, UC Irvine, Environmental Analysis and Design |

## Selected Project Experience:

**Roseville Energy Park, Roseville, CA**—Assisting in the licensing of a power plant in Roseville, CA. Preparing the water resources and biological resources sections of the application for certification. Assisting in the permitting of the power plant, to obtain Clean Water Act permits from the Army Corps of Engineers and permits from US Fish and Wildlife Service (USFWS) and California Department of Fish and Game. Conducted a jurisdictional wetland delineation for the approximately 40-acre parcel.

**Gilroy Energy Center, Gilroy, CA**—Assisted in the licensing of a power plant in Gilroy, CA. Conducted research and field visits for general land use and agricultural practices in the vicinity of the project. Prepared text and figures for the agriculture and soils section of the Gilroy Phase I Power Project Application for Certification. Prepared the biology and Agriculture and Soils sections of the Gilroy Phase II Power Project Application for Certification. Conducted general biological surveys for the vicinity of the project. Conducted focused surveys for native trees and raptor nests at the project site. Conducted USFWS protocol level surveys for California red-legged frog. Assisted client in consultation with USFWS and CDFG. Prepared text and figures for the biology section of the Gilroy Phase II Power Project Application for Certification. Assisted the project manager in coordinating an interdisciplinary team of authors to create supplements to the CEC application.

**North Baja Natural Gas Pipeline Project, Blythe, CA**—Assisted project biologist in surveys of approximately 90 miles of creosote bush scrub for a proposed natural gas pipeline. Surveys were conducted for federal and state endangered, threatened, and rare plant species as well as noxious weeds known from the Sonoran Desert.

**Biological Assessment for Site 25, Moffett Federal Airfield, CA**—Assisted project biologist in conducting and preparing a Biological Assessment (BA) for Site 25. Site 25 is a diked seasonal salt marsh located in Moffett Federal Airfield, in the south San Francisco Bay. The U.S. Navy plans to implement remediation efforts for PCB contamination in Site 25. Responsibilities included conducting biological surveys , habitat mapping, and assisting in writing of the BA.

**Creed, Lambie, and Goosehaven Energy Centers, Suisun City, CA**—Assisted the project biologist in compliance monitoring of a power plant in Suisun City, CA. Monitored construction of the 230 kV transmission lines for the energy centers. Delineated vernal pools in the transmission line ROW and monitored construction practices to ensure that construction equipment and vehicles did not infringe upon the USFWS established buffer to protect the vernal pools and vernal pool species such as Delta green ground beetle. Prepared summary biological monitoring report.

**Tesla Energy Project, Tracy, CA** —Assisted in the licensing of a power plant in Tracy, CA. Conducted surveys for burrowing owls and Big tarplant within the proposed plant site and linear facilities.

**King City Energy Center, King City, CA**—Assisted in compliance monitoring of a power plant in King City, CA. Surveyed a parcel adjacent to the existing plant for placement of a new turbine. Met with CEC staff to discuss the feasibility of using the site.

### Experience Relevant to Projects:

- Experience with CEC AFCs and CEQA
- Experience with surveys and assessments of listed and sensitive species
- Experience with Threatened, Endangered & Sensitive wildlife survey protocols
- Experience with biological monitoring of power plants and related features


*Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.*

# *Los Esteros Critical Energy Facility*

# *Appendix 8.2-B Federal Endangered and Threatened Species that may be Affected by Projects in the Milpitas 7.5-Minute Quad - U.S. Fish and Wildlife Service (USFWS)*

***December 2003***

# Federal Endangered and Threatened Species that may be Affected by Projects in the MILPITAS 7 1/2 Minute Quad

**Database Last Updated: October 21, 2003**

**Today's Date is: December 19, 2003**

## Listed Species

### Invertebrates

*Euphydryas editha bayensis* - bay checkerspot butterfly (T)

*Lepidurus packardi* - vernal pool tadpole shrimp (E)

### Fish

*Hypomesus transpacificus* - delta smelt (T)

*Oncorhynchus mykiss* - Central California Coastal steelhead (T) (NMFS)

*Oncorhynchus tshawytscha* - winter-run chinook salmon (E) (NMFS)

### Amphibians

*Rana aurora draytonii* - California red-legged frog (T)

### Reptiles

*Masticophis lateralis euryxanthus* - Alameda whipsnake (T)

### Birds

*Haliaeetus leucocephalus* - bald eagle (T)

*Rallus longirostris obsoletus* - California clapper rail (E)

*Sterna antillarum (=albifrons) browni* - California least tern (E)

### Mammals

*Reithrodontomys raviventris* - salt marsh harvest mouse (E)

*Sylvilagus bachmani riparius* - riparian brush rabbit (E)

*Vulpes macrotis mutica* - San Joaquin kit fox (E)

### Plants

*Lasthenia conjugens* - Contra Costa goldfields (E)

## Proposed Species

### Amphibians

*Ambystoma californiense* - California tiger salamander (PT)

## Candidate Species

### Fish

*Oncorhynchus tshawytscha* - Central Valley fall/late fall-run chinook salmon (C) (NMFS)

## Species of Concern

### Invertebrates

*Adela oplerella* - Opler's longhorn moth (SC)

*Hydrochara ricksecker*i - Ricksecker's water scavenger beetle (SC)

### Fish

*Pogonichthys macrolepidotus* - Sacramento splittail (SC)

*Spirinchus thaleichthys* - longfin smelt (SC)

### Amphibians

*Rana boylii* - foothill yellow-legged frog (SC)

*Spea hammondii* - western spadefoot toad (SC)

### Reptiles

*Anniella pulchra pulchra* - silvery legless lizard (SC)

*Clemmys marmorata marmorata* - northwestern pond turtle (SC)

*Clemmys marmorata pallida* - southwestern pond turtle (SC)

*Phrynosoma coronatum frontale* - California horned lizard (SC)

### Birds

*Agelaius tricolor* - tricolored blackbird (SC)

*Amphispiza belli belli* - Bell's sage sparrow (SC)

*Athene cunicularia hypugaea* - western burrowing owl (SC)

*Buteo regalis* - ferruginous hawk (SC)

*Calypte costae* - Costa's hummingbird (SC)

*Carduelis lawrencei* - Lawrence's goldfinch (SC)

*Chaetura vauxi* - Vaux's swift (SC)

*Cypseloides niger* - black swift (SC)

*Elanus leucurus* - white-tailed (=black shouldered) kite (SC)

*Empidonax traillii brewsteri* - little willow flycatcher (CA)

*Falco peregrinus anatum* - American peregrine falcon (D)

*Geothlypis trichas sinuosa* - saltmarsh common yellowthroat (SC)

*Lanius ludovicianus* - loggerhead shrike (SC)

*Melanerpes lewis* - Lewis' woodpecker (SC)

*Melospiza melodia pusillula* - Alameda (South Bay) song sparrow (SC)

*Numenius americanus* - long-billed curlew (SC)

*Riparia riparia* - bank swallow (CA)

*Selasphorus rufus* - rufous hummingbird (SC)

*Selasphorus sasin* - Allen's hummingbird (SC)

**Mammals**

*Corynorhinus (=Plecotus) townsendii townsendii* - Pacific western big-eared bat (SC)

*Eumops perotis californicus* - greater western mastiff-bat (SC)

*Myotis ciliolabrum* - small-footed myotis bat (SC)

*Myotis evotis* - long-eared myotis bat (SC)

*Myotis thysanodes* - fringed myotis bat (SC)

*Myotis volans* - long-legged myotis bat (SC)

*Myotis yumanensis* - Yuma myotis bat (SC)

*Neotoma fuscipes annectens* - San Francisco dusky-footed woodrat (SC)

*Sorex vagrans halicoetes* - salt marsh vagrant shrew (SC)

**Plants**

*Astragalus tener var. tener* - alkali milk-vetch (SC)

*Atriplex joaquiniana* - San Joaquin spearscale (=saltbush) (SC)

*Castilleja ambigua ssp. ambigua* - salt marsh owl's clover (=johnny-nip) (SLC)

*Cordylanthus maritimus ssp. palustris* - northcoast (=Point Reyes) bird's-beak (SC)

*Eryngium aristulatum var. hooveri* - Hoover's button-celery (SC)

*Hemizonia parryi ssp. congdonii* - Congdon's tarplant (SC)

*Malacothamnus arcutatus (=M. fasciculat)* - arcuate bush mallow (SLC)

*Navarretia prostrata* - prostrate navarretia (=prostrate pincushionplant) (SC)

## Species with Critical Habitat Proposed or Designated in this Quad

Alameda whipsnake (T)

Central Valley fall/late fall-run chinook (C)

vernal pool invertebrates (X)

vernal pool plants (X)

---

**Key:**

(E) Endangered - Listed (in the Federal Register) as being in danger of extinction.

(T) Threatened - Listed as likely to become endangered within the foreseeable future.

(P) Proposed - Officially proposed (in the Federal Register) for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Marine Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.

(C) Candidate - Candidate to become a proposed species.

(CA) Listed by the State of California but not by the Fish & Wildlife Service.

(D) Delisted - Species will be monitored for 5 years.

(SC) Species of Concern/(SLC) Species of Local Concern - Other species of concern to the Sacramento Fish & Wildlife Office.

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Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

This is *not* an official list for formal consultation under the Endangered Species Act. *However, it may be used to update official lists.*

If you have a project that may affect endangered species, please contact the Endangered Species Division, Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.2-C*
# *California Department of Fish and Game's CNDDB Report*

***December 2003***

## *Agelaius tricolor*

tricolored blackbird

**Element Code:** ABPBXB0020

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G2G3
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (NESTING COLONY) HIGHLY COLONIAL SPECIES, MOST NUMBEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.
**Micro:** REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

---

**Occurrence No.** 26 **Map Index:** 36914 **EO Index:** 5641

**Dates Last Seen**
**Element:** 1971-05-11
**Site:** 1971-05-11
**Record Last Updated:** 1999-09-17

* SENSITIVE *

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** HOSEA, R. 1986 (OBS)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

* SENSITIVE *

**Lat/Long:**
**UTM:**
**Radius:**
**Elevation:**
**Mapping Precision:**
**Symbol Type:**
**Township:**
**Range:**
**Section:**
**Meridian:**
**Qtr:**

**Location:** *SENSITIVE* Location information suppressed.
**Location Detail:** Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
**Ecological:** THISTLE, MUSTARD; NO WATER PRESENT.
**Owner/Manager:**

---

**Occurrence No.** 257 **Map Index:** 24012 **EO Index:** 26496

**Dates Last Seen**
**Element:** 1985-05-05
**Site:** 1985-05-05
**Record Last Updated:** 1993-10-19

* SENSITIVE *

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BEEDY, E. ET AL 1991 (LIT)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

* SENSITIVE *

**Lat/Long:**
**UTM:**
**Radius:**
**Elevation:**
**Mapping Precision:**
**Symbol Type:**
**Township:**
**Range:**
**Section:**
**Meridian:**
**Qtr:**

**Location:** *SENSITIVE* Location information suppressed.
**Location Detail:** Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
**Ecological:** NESTING SUBSTRATE INCLUDES YELLOW STAR THISTLE, BULL THISTLE, AND WILD RADISH, ALTHOUGH THE MAJORITY OF NESTS IS FOUND IN A WALNUT TREE.
**Threat:** POTENTIAL THREATS INCLUDE ANNUAL MOWING (FIRE PROTECTION) AND POTENTIAL URBAN DEVELOPMENT.
**Owner/Manager:**

---

**Occurrence No.** 258 **Map Index:** 24013 **EO Index:** 26506

**Dates Last Seen**
**Element:** 1985-05-05
**Site:** 1985-05-05
**Record Last Updated:** 1993-10-19

* SENSITIVE *

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BEEDY, E. ET AL 1991 (LIT)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

* SENSITIVE *

**Lat/Long:**
**UTM:**
**Radius:**
**Elevation:**
**Mapping Precision:**
**Symbol Type:**
**Township:**
**Range:**
**Section:**
**Meridian:**
**Qtr:**

**Location:** *SENSITIVE* Location information suppressed.
**Location Detail:** Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
**Ecological:** NESTING SUBSTRATE CONSISTS OF MILK THSTLE, BULL THISTLE, MUSTARD, WILD RADISH, AND ANNUAL GRASSES.
**Threat:** THREATS INCLUDE MOWING (FOR FIRE CONTROL), HERBICIDES, ANF POTENTIAL DEVELOPMENT.
**Owner/Manager:**

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## *Ambystoma californiense*

California tiger salamander

**Element Code:** AAAAA01147

**Status**
**Federal:** Proposed Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G2G3
**State:** S2S3

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** POPULATIONS IN SANTA BARBARA & SONOMA COUNTIES CURRENTLY LISTED AS ENDANGERED. PROPOSAL TO LIST AS THREATENED STATEWIDE.
**Micro:** NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

---

**Occurrence No.** 41 **Map Index:** 37885 **EO Index:** 32892
**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Unknown
**Main Source:** BRODE, J. 1986 (PERS)

**Dates Last Seen**
**Element:** 1895-01-09
**Site:** 1895-01-09
**Record Last Updated:** 2001-11-14

**Quad Summary:** SAN JOSE EAST (3712137/427D), SAN JOSE WEST (3712138/427C), CALAVERAS RESERVOIR (3712147/427A), MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.33789° / -121.89131°
**UTM:** Zone-10 N4132933 E598210
**Radius:** 5 mile
**Elevation:** 85 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type** POINT
**Township:** 07S
**Range:** 01E
**Section:** 08 **Qtr:** XX
**Meridian:** M

**Location:** SAN JOSE.
**Location Detail:** NO OTHER LOCATIONAL INFORMATION GIVEN.
**General:** HISTORIC RECORD. MUSEUM COLLECTION SU 879. JENNINGS CONSIDERS THIS SITE EXTIRPATED.
**Owner/Manager:** UNKNOWN

---

**Occurrence No.** 390 **Map Index:** 34781 **EO Index:** 29336
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ALBERTSON, J. ET AL 1993 (OBS)

**Dates Last Seen**
**Element:** 1994-02-07
**Site:** 1994-02-07
**Record Last Updated:** 1996-09-19

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48468° / -121.96811°
**UTM:** Zone-10 N4149141 E591228
**Area:** 21.6 ac
**Elevation:** 7 ft
**Mapping Precision** SPECIFIC
**Symbol Type** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** XX
**Meridian:** M

**Location:** WSW OF FREMONT, IN SALT EVAPORATORS; 2.1 KM SOUTHEAST OF ALBRAE.
**Location Detail:** SOUTHEAST PONDS OF WARM SPRINGS SEASONAL WETLANDS. POTENTIAL HABITAT MAY EXIST ON SURROUNDING PRIVATE PROPERTY.
**Ecological:** HABITAT CONSISTS OF VERNAL POOL/GRASSLAND COMMUNITIES; PLANT SPECIES VARIED WITH SALINITY AND DEPTH OF POND; PERIPHERY OF POND USUSALLY DOMINATED BY COTULA CORONOPIFOLIA AND THE DEEPER AREAS BY OEDOGONIUM SP. EXOTIC VEGETATION ALSO ON SITE.
**General:** 1993: 1 LARVA OBSERVED ON 3/12 AND 12 LARVAE OBSERVED ON 4/9, MOSTLY IN POND 4. LEPIDURUS PACKARDI ALSO OBSERVED IN POND AREA. 2/7/1994-2 ADULTS OBSERVED ON EDGE OF VERNAL POOL IN BURROW.
**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

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**Occurrence No.** 391 **Map Index:** 34780 **EO Index:** 19323
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ALBERTSON, J. ET AL 1995 (OBS)

**Dates Last Seen**
**Element:** 1995-03-23
**Site:** 1995-03-23
**Record Last Updated:** 1996-09-19

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48834° / -121.97377°
**UTM:** Zone-10 N4149542 E590723
**Area:** 11.6 ac
**Elevation:** 7 ft
**Mapping Precision** SPECIFIC
**Symbol Type** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** XX
**Meridian:** M

**Location:** WSW OF FREMONT IN THE SALT EVAPORATORS; 1.5 KM SOUTHEAST OF ALBRAE.
**Location Detail:** NORTHWEST PONDS OF WARM SPRINGS SEASONAL WETLANDS. POTENTIAL HABITAT ON SURROUNDING PRIVATE PROPERTY.
**Ecological:** HABITAT CONSISTS OF VERNAL POOLS/GRASSLAND COMMUNITIES; PLANT SPECIES VARY WITH SALINITY AND DEPTH OF POND; PERIPHERY OF POND USUALLY DOMINATED BY COTULA CORONOPIFOLIA, AND DEEPER AREAS BY OEDOGONIUM SPECIES. EXOTIC VEGETATION ALSO ON SITE.
**General:** 3/19/1993-1 LARVA OBSERVED; 3/23/1995-21 LARVAE OBSERVED.
**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

## *Ambystoma californiense*

California tiger salamander

**Element Code:** AAAAA01147

**Status**
**Federal:** Proposed Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G2G3
**State:** S2S3

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** POPULATIONS IN SANTA BARBARA & SONOMA COUNTIES CURRENTLY LISTED AS ENDANGERED. PROPOSAL TO LIST AS THREATENED STATEWIDE.
**Micro:** NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

**Occurrence No.** 397 **Map Index:** 36109 **EO Index:** 31106
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Decreasing
**Main Source:** MONK, J. & S. LYNCH 1997 (OBS)

**Dates Last Seen**
**Element:** 1999-04-06
**Site:** 1999-04-06
**Record Last Updated:** 2001-12-03

**Quad Summary:** MILPITAS (3712148/427B), NILES (3712158/446C)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49610° / -121.96591°
**UTM:** Zone-10 N4150411 E591409
**Area:** 598.1 ac
**Elevation:** 15 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 15 **Qtr:** XX
**Meridian:** M

**Location:** SOUTH OF DURHAM ROAD (AUTO MALL PARKWAY), FREMONT.
**Location Detail:** CTS PRESUMED TO BE DISTRIBUTED THROUGHOUT THE 840-ACRE PARCEL PROPOSED FOR DEVELOPMENT.
**Ecological:** HABITAT CONSISTS OF NON-NATIVE GRASSLAND/SEASONAL WETLANDS, WITH CALIFORNIA GROUND SQUIRREL AND BOTTA'S POCKET GOPHER BURROWS PROVIDING AESTIVATION SITES. SITE IS AN AGRICULTURAL AREA LEFT FALLOW.
**Threat:** THREATENED BY A PROPOSED DEVELOPMENT (PACIFIC COMMONS PROJECT). OVER HALF OF THIS SITE TO BE DEVELOPED.
**General:** 18 ADULT CTS CAPTURED ON 2 DIFFERENT NIGHTS (2 MARCH & 17 MARCH 1997). CTS LARVAE FOUND IN 24 POOLS DURING 3-26 MARCH 1997. CTS ABUNDANT IN POOL 26. 110 MIGRATING CTS CAPTURED IN DRIFT FENCES & RELOCATED BETWEEN 16 DEC 1998 & 6 APR 1999.
**Owner/Manager:** PVT

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**Occurrence No.** 446 **Map Index:** 40554 **EO Index:** 35561
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** JENNINGS, M. 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-05-09
**Site:** 1998-05-09
**Record Last Updated:** 2002-09-05

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49006° / -121.89088°
**UTM:** Zone-10 N4149816 E598050
**Radius:** 80 meters
**Elevation:** 1,280 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01E
**Section:** 20 **Qtr:** XX
**Meridian:** M

**Location:** 1.75 MILES EAST OF LEITCH SCHOOL, 1.8 MILES NNE OF SCOTT CREEK ROAD AND I-680 JUNCTION, FREMONT.
**Location Detail:** SITE CONSISTS OF AN ARTIFICIAL POND IN FREMONT OPEN SPACE.
**Ecological:** HABITAT CONSISTS OF AN ARTIFICIAL POND IN OPEN, GRAZED ANNUAL GRASSLAND, CREATED AS MITIGATION (WITH A CATTLE EXCLUSION FENCE AROUND IT) FOR DEVELOPMENT.
**Threat:** THREATENED BY THE PRESENCE OF INTRODUCED PIGS IN THE AREA.
**General:** 1 LARVA COLLECTED (MRJ #1376) ON 9 MAY 1998 AND DEPOSITED AT CAS (CAS #207148).
**Owner/Manager:** CITY OF FREMONT

## *Ambystoma californiense*

California tiger salamander

**Element Code:** AAAAA01147

**Status**
**Federal:** Proposed Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G2G3
**State:** S2S3

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** POPULATIONS IN SANTA BARBARA & SONOMA COUNTIES CURRENTLY LISTED AS ENDANGERED. PROPOSAL TO LIST AS THREATENED STATEWIDE.
**Micro:** NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

**Occurrence No.** 447 **Map Index:** 40555 **EO Index:** 35562
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** JENNINGS, M. 1998 (OBS)

**Dates Last Seen**
**Element:** 2001-11-22
**Site:** 2001-11-22
**Record Last Updated:** 2002-10-15

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48197° / -121.90129°
**UTM:** Zone-10 N4148908 E597139
**Radius:** 80 meters
**Elevation:** 440 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01E
**Section:** 19 **Qtr:** XX
**Meridian:** M

**Location:** ALONG TOROGES CREEK, 1 MILE NORTH OF THE I-680/SCOTT CREEK ROAD JUNCTION, FREMONT
**Location Detail:** SITE IS LOCATED ADJACENT TO THE AVALON HOMES DEVELOPMENT, IN THE DOUBLE WOOD GOLF COURSE SITE.
**Ecological:** HABITAT CONSISTS OF A VERNAL POOL ON A HILLSIDE COVERED WITH GRAZED RUDERAL VEGETATION; WILLOWS ARE PRESENT ON ONE SIDE OF THE POOL. MUCH OF THE DRAIAGE HAS BEEN ELIMINATED BY DEVELOPMENT.
**Threat:** THREATENED BY BOTH PREVIOUS AND FUTURE DEVELOPMENT (MITIGATION ESTABLISHED).
**General:** HUNDREDS OF LARVAE OBSERVED ON 3 MAY 1998. 1 ADULT COLLECTED/DEPOSITED AT CAS (CAS #1260). 1 DEAD ADULT COLLECTED/DEPOSITED AT CAS (CAS #1285).
**Owner/Manager:** PVT

**Occurrence No.** 523 **Map Index:** 45080 **EO Index:** 45080
**Occ Rank:** Poor
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** TATARIAN, T. 1995 (OBS)

**Dates Last Seen**
**Element:** 1995-05-01
**Site:** 1995-05-01
**Record Last Updated:** 2001-03-13

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.47053° / -121.90142°
**UTM:** Zone-10 N4147638 E597143
**Radius:** 1/10 mile
**Elevation:** 200 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01E
**Section:** 30 **Qtr:** XX
**Meridian:** M

**Location:** NNE OF THE INTERSECTION OF SCOTT CREEK ROAD AND I-680, FREMONT
**Ecological:** HABITAT CONSISTS OF NON-NATIVE GRASSLAND THAT WAS PREVIOUSLY GRAZED (ABOUT 5 YEARS PAST).
**Threat:** THREATENED BY DEVELOPMENT.
**General:** 3 LARVAE CAPTURED/RELEASED ON 1 MAY 1995.
**Owner/Manager:** PVT

## *Ambystoma californiense*

California tiger salamander

**Element Code:** AAAAA01147

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Proposed Threatened | **Global:** G2G3 | **CDFG Status:** SC |
| **State:** None | **State:** S2S3 | |

**Habitat Associations**

**General:** POPULATIONS IN SANTA BARBARA & SONOMA COUNTIES CURRENTLY LISTED AS ENDANGERED. PROPOSAL TO LIST AS THREATENED STATEWIDE.

**Micro:** NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

**Occurrence No.** 636 **Map Index:** 24673 **EO Index:** 46671

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** WETLANDS RESEARCH ASSOCIATES 1999 (LIT)

**Dates Last Seen**
**Element:** 1999-04-06
**Site:** 1999-04-06

**Record Last Updated:** 2001-12-03

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48852° / -121.98027°
**UTM:** Zone-10 N4149556 E590149
**Area:** 28.7 ac
**Elevation:** 10 ft

**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON

**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** NW
**Meridian:** M

**Location:** ALBRAE, ALONG RAILROAD TRACKS ABOUT 1 MILE SOUTHWEST OF FREMONT RACEWAYS, WEST OF FREMONT.

**Location Detail:** THIS AREA IS KNOWN AS THE PACIFIC COMMONS PRESERVE STEM SITE.

**Ecological:** NON-NATVIE ANNUAL GRASSLAND WITH INTERSPERSED SEASONAL WETLANDS.

**General:** FOUR MIGRATING CTS CAPTURED IN DRIFT FENCES IN THE PACIFIC COMMONS DEVELOPMENT SITE (OCC 397) RELEASED IN STEM POOL 5.

**Owner/Manager:** PVT

## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G4 | **CDFG Status:** SC |
| **State:** None | **State:** S2 | |

**Habitat Associations**

**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.

**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

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**Occurrence No.** 24 **Map Index:** 09797 **EO Index:** 25484

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** BLAKE, C. 1983 (PERS)

**Dates Last Seen**
**Element:** XXXX-XX-XX
**Site:** XXXX-XX-XX
**Record Last Updated:** 1999-09-24

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.45321° / -122.00923°
**UTM:** Zone-10 N4145611 E587629
**Radius:** 3/5 mile
**Elevation:**
**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT
**Township:** 05S
**Range:** 01W
**Section:** 31 **Qtr:** XX
**Meridian:** M

**Location:** SOUTHEAST OF JUNCTION OF COYOTE CREEK AND ALVISO SLOUGH, NORTH OF SUNNYVALE.

**General:** COLONY INACTIVE OR EXTIRPATED; DATE OWLS LAST OBSERVED UNKNOWN.

**Owner/Manager:** PVT

---

**Occurrence No.** 132 **Map Index:** 21008 **EO Index:** 9205

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** FREAS, K. 1992 (OBS)

**Dates Last Seen**
**Element:** 1992-04-01
**Site:** 1992-04-01
**Record Last Updated:** 2003-03-10

**Quad Summary:** SAN JOSE WEST (3712138/427C), MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.37451° / -121.92095°
**UTM:** Zone-10 N4136965 E595538
**Radius:** 1/10 mile
**Elevation:** 40 ft
**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT
**Township:** 06S
**Range:** 01W
**Section:** 25 **Qtr:** S
**Meridian:** M

**Location:** NW OF THE JUNCTION OF KARINA COURT AND NORTH FIRST STREET, SAN JOSE

**Ecological:** HABITAT CONSISTS OF FAIRLY OPEN ULAND/RUDERAL, MADE UP PRIMARILY OF ANNUAL GRASSES. CHUNKS OF CONCRETE AT THE SITE SERVE AS PERCHES. MANY GROUND SQUIRRELS INHABIT THE SITE.

**Threat:** MAIN THREAT TO THIS SITE IS DEVELOPMENT, AS ADVERTISED ON SIGNS AROUND THE PROPERTY.

**General:** SITE APPEARS TO HAVE BEEN DISCED PRIOR TO 1992, BUT NO DISCING HAD TAKEN PLACE AS OF 12 APRIL 1992. TWO ADULT BIRDS OBSERVED.

**Owner/Manager:** PVT

---

**Occurrence No.** 176 **Map Index:** 24086 **EO Index:** 26508

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BEARD, B. 1993 (OBS)

**Dates Last Seen**
**Element:** 1993-08-04
**Site:** 1993-08-04
**Record Last Updated:** 1993-10-19

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42326° / -121.95493°
**UTM:** Zone-10 N4142340 E592469
**Radius:** 1/5 mile
**Elevation:** 5 ft
**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT
**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** AT THE END OF NORTECH PARKWAY, WITHIN THE SAN JOSE CITY LIMITS, 1 MILE EAST OF ALVISO.

**Ecological:** HABITAT CONSISTS OF NON-NATIVE GRASSLAND AND WEEDY SPECIES.

**Threat:** THREATENEND BY PROPOSED DEVELOPMENT.

**General:** MANY GROUND SQUIRRELS ARE PRESENT IN THE AREA. 4 OWLS OBSERVED AT ENTRANCE TO DEN.

**Owner/Manager:** UNKNOWN

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## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 212 **Map Index:** 30027 **EO Index:** 5403

**Dates Last Seen**
**Element:** 2002-06-10
**Site:** 2002-06-10
**Record Last Updated:** 2003-03-11

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** DESMOND, M. 1993 (OBS)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.39263° / -121.98108°
**UTM:** Zone-10 N4138916 E590192
**Radius:** 2/5 mile
**Elevation:** 20 ft
**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** MISSION COLLEGE CAMPUS, SANTA CLARA
**Location Detail:** BURROWS ARE LOCATED IN FRONT OF THE MAIN BUILDING AND ALL THE WAY AROUND TO THE BASEBALL FIELD.
**Ecological:** HABITAT CONSISTS OF MOWED HERBACEOUS VEGETATION, WITH GROUND SQUIRREL BURROWS IN DESIGNATED BUOW HABITAT AREAS.
**Threat:** THREATENED BY THE HIGH LEVEL OF HUMAN ACTIVITIES, INCLUDING RECREATION AND DEVELOPMENT.
**General:** 14 ADULT BIRDS AND AN UNKNOWN NUMBER OF JUVENILES OBSERVED IN 1993; 7 BIRDS WERE CAPTURED (TO OBTAIN A BLOOD SAMPLE), THEN RELEASED. 2 PAIRS NESTED, PRODUCING 3 YOUNG, IN 2002; OTHER PAIRS NESTED IN OTHER AREAS, AS WELL.
**Owner/Manager:** MISSION COLLEGE

**Occurrence No.** 340 **Map Index:** 42062 **EO Index:** 42062

**Dates Last Seen**
**Element:** 1999-06-10
**Site:** 1999-06-10
**Record Last Updated:** 1999-12-23

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BLAND, D. 1999 (OBS)

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41567° / -122.00033°
**UTM:** Zone-10 N4141454 E588461
**Area:** 12.8 ac
**Elevation:** 0 ft
**Mapping Precision:** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 17 **Qtr:** XX
**Meridian:** M

**Location:** TWIN CREEKS BASEBALL FIELD COMPLEX, OFF CARIBEAN DR, ~0.5 MILE NORTH OF JUNCTION LAWRENCE EXPY & HWY 237, SUNNYVALE.
**Location Detail:** OUTSIDE EDGE AREA AROUND BALL FIELDS.
**Ecological:** NON-NATIVE GRASSLAND
**Threat:** EXPANSION OF SPORTS FIELD COMPLEX
**General:** 2 PAIR OBSERVED, 1 PAIR ARE BANDED & OCCUPY A BURROW AT THE SW CORNER OF PARKING LOT. OTHER PAIR, NOT BANDED, IS IN UNDEVELOPED GRASSLAND S & E OF EXISTING BALL FIELDS & PARKING LOT. NO YOUNG OBSERVED.
**Owner/Manager:** PVT

## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 341 **Map Index:** 42084 **EO Index:** 42084

**Occ Rank:** Excellent
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BARCLAY, J. 1999 (OBS)

**Dates Last Seen**
**Element:** 2002-07-06
**Site:** 2002-07-06
**Record Last Updated:** 2003-03-11

**Quad Summary:** SAN JOSE WEST (3712138/427C), MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.36360° / -121.92987°
**UTM:** Zone-10 N4135746 E594762
**Area:** 868.1 ac
**Elevation:** 56 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 36 **Qtr:** NE
**Meridian:** M

**Location:** SAN JOSE INTERNATIONAL AIRPORT, SAN JOSE

**Location Detail:** SITE IS PART OF AN ON-GOING BURROWING OWL MONITORING/MANAGEMENT PROGRAM (SINCE 1990), OWLS UTILIZING BOTH ARTIFICIAL AND NATURAL BURROWS.

**Ecological:** HABITAT CONSISTS OF MOWED HERBACEOUS VEGETATION BETWEEN THE RUNWAYS AND TAXIWAYS OF THE AIRPORT. AIRPORT IS SURROUNDED BY URBAN DEVELOPMENT.

**General:** 28 ADS/19 JUVS OBS, 1990. 12 ADS/11 JUVS OBS, 1991. 30 ADS/68 JUVS OBSERVED, 1997. 50 ADS/92 JUVS OBSERVED, 1998. 48 ADS/101 JUVS OBSERVED, 1999. 62 ADS/129 JUVS OBSERVED, 2001. 82 ADS/126 JUVS OBSERVED, 2002.

**Owner/Manager:** CITY OF SAN JOSE.

**Occurrence No.** 345 **Map Index:** 42263 **EO Index:** 42263

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BRIONES, K. 1999 (OBS)

**Dates Last Seen**
**Element:** 2001-07-02
**Site:** 2001-07-02
**Record Last Updated:** 2002-01-23

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.40305° / -121.96785°
**UTM:** Zone-10 N4140085 E591351
**Area:** 69.3 ac
**Elevation:** 5 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 22 **Qtr:** XX
**Meridian:** M

**Location:** SE OF THE JUNCTION OF SAN TOMAS AQUINAS CREEK WITH TASMAN DRIVE, EAST OF GREAT AMERICA AMUSEMENT PARK, SANTA CLARA

**Location Detail:** BURROWS ARE LOCATED IN A CORPORATION YARD, ALONG THE BASE OF FLOOD CONTROL LEVEES, AND ALONG HETCH-HETHY PIPELINE.

**Ecological:** HABITAT SURROUNDING BURROW SITES CONSISTS OF A MIX OF FRESH EMERGENT WETLAND VEGETATION AND RUDERAL; HEAVILY VEGETATED BY ANNUAL GRASSES.

**Threat:** THREATENED BY URBAN DEVELOPMENT AND FLOOD CONTROL LEVEE MAINTENANCE.

**General:** 1 ADULT AND 1 JUVENILE OBSERVED AT THE BURROW SITE ON 16 JUN 1999. 3 ADULTS/1 JUVENILE AND 4 BURROWS OBSERVED ON 2 JUL 2001.

**Owner/Manager:** CITY OF SANTA CLARA

## *Athene cunicularia*

burrowing owl — **Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 359 **Map Index:** 43164 **EO Index:** 43164
**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Unknown
**Main Source:** BRIDGMAN, R. 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-09-15
**Site:** 1998-09-15
**Record Last Updated:** 2000-10-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41975° / -121.89869°
**UTM:** Zone-10 N4142007 E597450
**Radius:** 80 meters
**Elevation:**
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01E
**Section:** 07 **Qtr:** XX
**Meridian:** M

**Location:** JUST SOUTH OF CURTIS AVENUE AND 0.3 MILE EAST OF SOUTH MAIN, MILPITAS

**Location Detail:** SITE IS LOCATED IN AN OLD DETENTION BASIN, ADJACENT TO (NORTH OF) THE GREAT MALL OF THE SAN FRANCISCO BAY AREA (OLD FORD PLANT).

**Ecological:** HABITAT SURROUNDING BURROW IS RUDERAL, WITH RUSSIAN THISTLE, NON-NATIVE GRASSES, AND OTHER THISTLES. NUMEROUS GROUND SQUIRREL BURROWS IN THE AREA.

**Threat:** THREATENED BY DEVELOPMENT.

**General:** 2 ADULTS AND 1 JUVENILE OBSERVED AT THE BURROW, 15 SEP 1998. OWLS WERE "PASSIVELY EXCLUDED" ON 26 OCT 1998; SITE WAS SUBSEQUENTLY DEVELOPED.

**Owner/Manager:** PVT

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**Occurrence No.** 360 **Map Index:** 43165 **EO Index:** 43165
**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** BRIDGMAN, R. 1999 (OBS)

**Dates Last Seen**
**Element:** 1999-10-18
**Site:** 1999-10-18
**Record Last Updated:** 2000-06-29

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42040° / -121.91771°
**UTM:** Zone-10 N4142060 E595766
**Radius:** 80 meters
**Elevation:** 20 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** 12 **Qtr:** XX
**Meridian:** M

**Location:** ALONG BARBER LANE, WEST OF I-880, MILPITAS.

**Location Detail:** OWLS OBSERVED BOTH EAST AND WEST OF BARBER LANE, BUT BREEDING TOOK PLACE ON THE WEST SIDE.

**Ecological:** HABITAT CONSISTS OF RUDERAL; AN OPEN SITE VEGETATED BY RUSSIAN THISTLE AND NON-NATIVE GRASSES

**Threat:** THREATENED BY DEVELOPMENT.

**General:** 2-3 ADULTS OBSERVED ON 15 SEP 1999; BIRDS LAST SEEN ON 18 OCT 1999. OWLS EXCLUDED, SITE GRADED, AND SUBSEQUENTLY DEVELOPED.

**Owner/Manager:** PVT

## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G4 | **CDFG Status:** SC |
| **State:** None | **State:** S2 | |

**Habitat Associations**

**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.

**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 392 **Map Index:** 44143 **EO Index:** 44143

**Dates Last Seen**
**Element:** 2001-01-XX
**Site:** 2001-01-XX
**Record Last Updated:** 2002-01-29

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BRIDGMAN, R. 2000 (OBS)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42527° / -121.96160°
**UTM:** Zone-10 N4142556 E591876
**Area:** 38.1 ac
**Elevation:** 20 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 10 **Qtr:** XX
**Meridian:** M

**Location:** NORTH OF HIGHWAY 237, SOUTH OF LOS ESTEROS ROAD, AND EAST OF NORTH FIRST STREET, ALVISO

**Location Detail:** ONE BURROW IS LOCATED ON A DEVELOPED CHURCH SITE, ON THE EAST SIDE OF DISK DRIVE, NORTH OF NORTECH PARKWAY. SEVERAL OTHER BURROWS FOUND ON A PARCEL PROPOSED FOR DEVELOPMENT BY CISCO.

**Ecological:** CHURCH SITE BURROW IS LOCATED WITHIN A PARKING DIVIDER, LANDSCAPED WITH PROSTRATE FLOWERING PLANTS; ADJACENT LOT IS DENSE WITH RUDERAL VEGETATION, LARGELY MUSTARD AND ANNUAL GRASSES.

**Threat:** THREATENED BY FURTHER DEVELOPMENT OF THE ADJACENT VACANT LOT.

**General:** 2 ADULTS AND 3+ JUVENILES OBSERVED AT THE CHURCH SITE BURROW ON 14 JUN 2000. 4 OWLS AND NUMEROUS GROUND SQUIRREL BURROWS OBSERVED IN JAN 2001.

**Owner/Manager:** PVT-JUBILEE CHURCH, OTHER PVT

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**Occurrence No.** 466 **Map Index:** 48223 **EO Index:** 48223

**Dates Last Seen**
**Element:** 2002-06-20
**Site:** 2002-06-20
**Record Last Updated:** 2003-05-14

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** DAKIN, R. 2002 (OBS)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41729° / -121.91101°
**UTM:** Zone-10 N4141721 E596363
**Area:** 26.4 ac
**Elevation:** 25 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01E
**Section:** 18 **Qtr:** XX
**Meridian:** M

**Location:** 600 FEET EAST OF THE NIMITZ FREEWAY AND 0.6 MILE SOUTH OF CALAVERAS BOULEVARD, MILPITAS

**Location Detail:** LOCATED NORTH AND WEST OF THE ELMWOOD CORRECTIONAL FACILITY.

**Ecological:** HABITAT CONSISTS OF RUDERAL AND DISKED GRASSLAND; SURROUNDING AREAS HEAVILY DEVELOPED.

**Threat:** THREATS INCLUDE THE DISKING OF SOME AREAS, HEAVY DEVELOPMENT OF SURROUNDING AREAS, AND PROXIMITY OF SITE TO MAJOR ROADS.

**General:** 1 ADULT OBSERVED ROOSTING ON 25 JUN 1999. 12 ADULTS OBSERVED AT 8 BURROW LOCATIONS ON 20 JUN 2002; UNKNOWN NUMBER OF TOTAL BURROWS LOCATED AT THIS SITE.

**Owner/Manager:** ELMWOOD CORRECTIONAL FACILITY

## *Athene cunicularia*

burrowing owl — **Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

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**Occurrence No.** 480 **Map Index:** 48650 **EO Index:** 48650
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1971 (LIT)

**Dates Last Seen**
**Element:** 1971-XX-XX
**Site:** 1971-XX-XX
**Record Last Updated:** 2002-08-22

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41714° / -121.97518°
**UTM:** Zone-10 N4141641 E590685
**Radius:** 2/5 mile
**Elevation:** 5 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** 16 **Qtr:** NE
**Meridian:** M

**Location:** 0.5 MILE SSW OF ALVISO.
**General:** 8 - 10 PAIRS NESTED IN THIS AREA DURING 1971.
**Owner/Manager:** UNKNOWN

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**Occurrence No.** 481 **Map Index:** 48651 **EO Index:** 48651
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1971 (LIT)

**Dates Last Seen**
**Element:** 1971-XX-XX
**Site:** 1971-XX-XX
**Record Last Updated:** 2002-08-22

**Quad Summary:** MILPITAS (3712148/427B), NILES (3712158/446C)
**County Summary:** ALAMEDA

**Lat/Long:** 37.50240° / -121.98408°
**UTM:** Zone-10 N4151092 E589795
**Radius:** 2/5 mile
**Elevation:** 15 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** 16 **Qtr:** NW
**Meridian:** M

**Location:** SE OF NEWARK; 0.25 MILE WEST OF WEST END OF DURHAM ROAD.
**Location Detail:** LOCATED ALONG THE BANK OF A SALT POND LEVEE.
**General:** 3 PAIRS NESTED IN THIS AREA DURING 1971.
**Owner/Manager:** UNKNOWN

---

**Occurrence No.** 491 **Map Index:** 48691 **EO Index:** 48691
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** H. T. HARVEY & ASSOC. 1992 (LIT)

**Dates Last Seen**
**Element:** 1992-05-XX
**Site:** 1992-05-XX
**Record Last Updated:** 2002-08-28

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41360° / -121.98288°
**UTM:** Zone-10 N4141241 E590008
**Radius:** 80 meters
**Elevation:** 5 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** 16 **Qtr:** XX
**Meridian:** M

**Location:** SUNNYVALE; SOUTH OF STATE ROUTE 237, 800 FT WEST OF GUADALUPE SLOUGH.
**Location Detail:** BERM SOUTH OF AND BORDERING STATE ROUTE 237
**Threat:** WIDENING OF STATE ROUTE 237
**General:** 1 ADULT & 4 JUV OBS USING 2-3 BURROWS 5-16 AUGUST 1991. ON 31 AUG 1991, 1 OF 2 OWLS CAPTURED. OWL WAS RELOCATED ON 12 SEP 1991 TO SHORELINE PARK (OCCURRENCE #494) IN MOUNTAIN VIEW. 1 PAIR OBS NOV 1991-JAN 1992. LAST OBS MAY 1992.
**Owner/Manager:** UNKNOWN

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## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 493 **Map Index:** 48695 **EO Index:** 48695
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** H. T. HARVEY & ASSOC. 1992 (LIT)

**Dates Last Seen**
**Element:** 1991-XX-XX
**Site:** 1991-XX-XX
**Record Last Updated:** 2002-08-28

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41219° / -121.98951°
**UTM:** Zone-10 N4141078 E589423
**Area:** 22.0 ac
**Elevation:** 5 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 17
**Meridian:** M
**Qtr:** XX

**Location:** SUNNYVALE; NORTH SIDE OF STATE ROUTE 237, 0.3 MILE EAST OF LAWRENCE EXPRESSWAY TO GUADALUPE SLOUGH.
**Threat:** THREAT CONSISTS OF POSSIBLE CONSTRUCTION ACTIVITY.
**General:** 1 PAIR AND 4 ACTIVE BURROWS OBSERVED DURING 1991. 1 BURROW WAS ELIMINATED ON 10 AUG 1991.
**Owner/Manager:** PVT, UNKNOWN

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**Occurrence No.** 494 **Map Index:** 48694 **EO Index:** 48694
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** H. T. HARVEY & ASSOC. 1992 (LIT)

**Dates Last Seen**
**Element:** 1991-XX-XX
**Site:** 1991-XX-XX
**Record Last Updated:** 2002-08-28

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41189° / -121.97897°
**UTM:** Zone-10 N4141055 E590355
**Radius:** 80 meters
**Elevation:** 5 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** 16
**Meridian:** M
**Qtr:** XX

**Location:** SUNNYVALE; 0.2 MILE SOUTH OF STATE ROUTE 237, ALONG EAST SIDE OF SAN TOMAS AQUINAS CREEK, WEST OF GREAT AMERICA PARKWAY.
**General:** UNKNOWN NUMBER OF ACTIVE OWL BURROWS PRESENT AT SITE.
**Owner/Manager:** UNKNOWN

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**Occurrence No.** 552 **Map Index:** 50564 **EO Index:** 50564
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BARCLAY, J. 2003 (OBS)

**Dates Last Seen**
**Element:** 2003-01-22
**Site:** 2003-01-22
**Record Last Updated:** 2003-03-11

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.37737° / -121.92627°
**UTM:** Zone-10 N4137277 E595063
**Radius:** 1/10 mile
**Elevation:** 33 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** 25
**Meridian:** M
**Qtr:** XX

**Location:** SE SIDE OF GUADALUPE PARKWAY, BETWEEN O'NEL DRIVE AND HIGHWAY 101, SAN JOSE
**Location Detail:** 235 GROUND SQUIRREL BURROWS COUNTED ON THIS SITE.
**Ecological:** HABITAT IS FLAT, WITH MIXED HERBACEOUS SPECIES.
**Threat:** THREATENED BY DEVELOPMENT, PREDATORS, AND INVASIVE TALL VEGETATION.
**General:** 2 ADULTS OBSERVED AT A CLUSTER OF BURROWS ON THE NORTH CORNER OF THE VACANT LOT.
**Owner/Manager:** CITY OF SAN JOSE

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## *Athene cunicularia*

burrowing owl

**Element Code:** ABNSB10010

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
**Micro:** SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

**Occurrence No.** 555 **Map Index:** 50572 **EO Index:** 50572

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BARCLAY, J. 2002 (OBS)

**Dates Last Seen**
**Element:** 2002-11-21
**Site:** 2002-11-21
**Record Last Updated:** 2003-03-12

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41961° / -121.96123°
**UTM:** Zone-10 N4141929 E591916
**Radius:** 80 meters
**Elevation:** 132 ft

**Mapping Precision** SPECIFIC
**Symbol Type:** POINT

**Township:** 06S
**Range:** 01W
**Section:** 10 **Qtr:** XX
**Meridian:** M

**Location:** NW CORNER OF THE INTERSECTION OF NORTH FIRST STREET AND HIGHWAY 237, ALVISO

**Location Detail:** THIS SITE BORDERS A GATED, PAVED ACCESS ROAD TO THE WEST.

**Ecological:** HABITAT CONSISTS OF A WEST-FACING SLOPE CONTAINING NUMEROUS GROUND SQUIRREL BURROWS AND CONSISTING OF MIXED HERBACEOUS VEGETATION, LOW-GROWING SHRUBS, & BARE SOIL. SURROUNDED BY URBAN DEVELOPMENT, ROADS/HIGHWAYS, & FALLOW LAND TO THE SOUTH.

**Threat:** THREATS INCLUDE CONSTRUCTION/DEVELOPMENT AND VEHICLE TRAFFIC.

**General:** 2 OWLS WERE OBSERVED DURING NOV-DEC 2002; OWLS HAVE BEEN OBSERVED USING ALTERNATE BURROWS.

**Owner/Manager:** UNKNOWN

## *Charadrius alexandrinus nivosus*

western snowy plover

**Element Code:** ABNNB03031

**Status**
**Federal:** Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G4T3
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (NESTING) FEDERAL LISTING APPLIES ONLY TO THE PACIFIC COASTAL POPULATION.
**Micro:** SANDY BEACHES, SALT POND LEVEES & SHORES OF LARGE ALKALI LAKES. NEEDS SANDY, GRAVELLY OR FRIABLE SOILS FOR NESTING.

**Occurrence No.** 3 **Map Index:** 09896 **EO Index:** 25777

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1971 (OBS)

**Dates Last Seen**
**Element:** 1971-07-16
**Site:** 1971-07-16
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42604° / -121.97329°
**UTM:** Zone-10 N4142630 E590841
**Radius:** 1/5 mile
**Elevation:** 10 ft

**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT

**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** ALVISO.
**General:** FROM NORTH AMERICAN NEST RECORD CARD PROGRAM.
**Owner/Manager:** UNKNOWN

**Occurrence No.** 127 **Map Index:** 44374 **EO Index:** 44374

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** RYAN, T. 1999 (OBS)

**Dates Last Seen**
**Element:** 1999-11-05
**Site:** 1999-11-05
**Record Last Updated:** 2000-11-22

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42307° / -121.98921°
**UTM:** Zone-10 N4142286 E589436
**Area:** 382.6 ac
**Elevation:** 0 ft

**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POLYGON

**Township:** 06S
**Range:** 01W
**Section:** 08 **Qtr:** XX
**Meridian:** M

**Location:** SALT EVAPORATOR POND, BETWEEN ALVISO SLOUGH AND GUADALUPE SLOUGH, JUST WEST OF ALVISO.
**Location Detail:** ALVISO SALT POND NUMBER A8, CARGILL SALT PROPERTY. BIRDS OBSERVED OVER THE SPRING & SUMMER BUT NEVER STATED THAT NESTS WERE OBSERVED.
**Ecological:** BOTH ACTIVE AND INACTIVE SALT EVAPORATOR POND AREA, SURROUNDING AREA IS SALT PONDS AND BRACKISH MARSH
**General:** 1999 SAMPLING: JAN 6: 4 BIRDS; MAR 12: 18 BIRDS; APR 14: 5 BIRDS; APR 29: 3 BIRDS; MAY 6: 6 BIRDS; MAY 13: 2 BIRDS; JUN 5: 2 BIRDS; JUN 9: 2 BIRDS; NOV 5: 3 BIRDS.
**Owner/Manager:** PVT

## *Geothlypis trichas sinuosa*

saltmarsh common yellowthroat — **Element Code:** ABPBX1201A

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G5T2 | **CDFG Status:** SC |
| **State:** None | **State:** S2 | |

**Habitat Associations**

**General:** RESIDENT OF THE SAN FRANCISCO BAY REGION, IN FRESH AND SALT WATER MARSHES.

**Micro:** REQUIRES THICK, CONTINUOUS COVER DOWN TO WATER SURFACE FOR FORAGING; TALL GRASSES, TULE PATCHES, WILLOWS FOR NESTING.

**Occurrence No.** 45 **Map Index:** 09857 **EO Index:** 24818

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

**Dates Last Seen**
**Element:** 1999-06-30
**Site:** 1999-06-30
**Record Last Updated:** 2000-01-26

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41851° / -121.99637°
**UTM:** Zone-10 N4141773 E588808
**Area:** 397.6 ac
**Elevation:** 5 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 08
**Meridian:** M
**Qtr:** XX

**Location:** SALT PONDS, GUADALUPE SLOUGH, & CONFLUENCE OF SAN THOMAS AQUINAS & CALABAZAS CREEKS, N OF HIGHWAY 237.

**Location Detail:** ALVISO SALT PONDS A8 AND A4, CALABAZAS CREEK MARSH (OBS MADE FROM 11 POINTS ALONG CREEK)

**Ecological:** NESTS IN TIDAL, BRACKISH MARSH. VEGETATION TYPES: ALKALI BULRUSH(SCIRPUS ROBUSTUS), CALIFORNIA BULRUSH (S. CALIFORNICUS), PEPPERGRASS (LEPIDIUM LATIFOLIUM), TYPHA SP

**General:** 1999: POND A4, 1-6 OBS EACH TIME FROM 3/10-6/30 (10 SAMPLE DAYS=SD); POND A8, 1-6 OBS FROM 5/13-6/30 (8 SD); MARSH, 15-32 OBS (8 SD). 6 PAIRS OBSERVED ALONG GUADALUPE CREEK DURING MARCH TO JULY 1985 SURVEY.

**Owner/Manager:** SANTA CLARA VALLEY WATER DIST

**Occurrence No.** 71 **Map Index:** 40300 **EO Index:** 35307

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** LYNCH, S. & G. MONK 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-08-11
**Site:** 1998-08-11
**Record Last Updated:** 1998-12-03

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA, SANTA CLARA

**Lat/Long:** 37.46339° / -121.93160°
**UTM:** Zone-10 N4146815 E594483
**Area:** 29.9 ac
**Elevation:** 1 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 25
**Meridian:** M
**Qtr:** XX

**Location:** IRRIGATION CHANNEL "B," AT THE SOUTH END OF BAYSIDE BUSINESS PARK, OFF OF WARREN AVENUE, WEST SIDE OF I-880, FREMONT.

**Location Detail:** LOCATED IMMEDIATELY ADJACENT TO DON EDWARDS NATIONAL WILDLIFE REFUGE. SITE SURROUNDED BY LANDFILL TO THE SOUTH AND A USFWS REFUGE TO THE NORTH.

**Ecological:** HABITAT CONSISTS OF BULRUSH GROWING ALONG THE IRRIGATION CHANNEL, WITH COYOTE BRUSH ON THE ADJACENT UPLANDS.

**General:** 5 ADULTS AND 1 JUVENILE MALE OBSERVED FORAGING BETWEEN 0700 AND 0800 HOURS, BUT NO BIRDS WERE FOUND LATER IN THE MORNING.

**Owner/Manager:** UNKNOWN

***Geothlypis trichas sinuosa***

saltmarsh common yellowthroat

**Element Code:** ABPBX1201A

**Status**

**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**

**Global:** G5T2
**State:** S2

**Other Lists**

**CDFG Status:** SC

**Habitat Associations**

**General:** RESIDENT OF THE SAN FRANCISCO BAY REGION, IN FRESH AND SALT WATER MARSHES.

**Micro:** REQUIRES THICK, CONTINUOUS COVER DOWN TO WATER SURFACE FOR FORAGING; TALL GRASSES, TULE PATCHES, WILLOWS FOR NESTING.

**Occurrence No.** 72 **Map Index:** 41564 **EO Index:** 41564

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

**Dates Last Seen**

**Element:** 1985-XX-XX
**Site:** 1985-XX-XX

**Record Last Updated:** 1999-09-07

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42309° / -121.97818°
**UTM:** Zone-10 N4142299 E590412
**Radius:** 80 meters
**Elevation:** 5 ft

**Mapping Precision**SPECIFIC
**Symbol Type:**POINT

**Township:** 06S
**Range:** 01W
**Section:** 09 **Qtr:** XX
**Meridian:** M

**Location:** ALVISO SLOUGH AT ALVISO.

**Ecological:** NESTS IN TIDAL, BRACKISH MARSH.

**General:** 1 BREEDING PAIR OBSERVED ALONG ALVISO SLOUGH DURING MARCH TO JULY 1985 SURVEY.

**Owner/Manager:** UNKNOWN

## *Rana aurora draytonii*

California red-legged frog

**Element Code:** AAABH01022

**Status**
**Federal:** Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G4T2T3
**State:** S2S3

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
**Micro:** REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

**Occurrence No.** 210 **Map Index:** 36040 **EO Index:** 31037

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** COOK, D. 1996 (OBS)

**Dates Last Seen**
**Element:** 1996-07-30
**Site:** 1996-07-30
**Record Last Updated:** 1997-07-09

**Quad Summary:** MILPITAS (3712148/427B), NILES (3712158/446C)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49816° / -121.91857°
**UTM:** Zone-10 N4150686 E595591
**Area:** 29.6 ac
**Elevation:** 180 ft

**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON

**Township:** 05S
**Range:** 01W
**Section:** 13 **Qtr:** XX
**Meridian:** M

**Location:** AGUA CALIENTE CREEK, JUST NE OF THE INTERSECTION OF I-680 AND MISSION BLVD, FREMONT.

**Ecological:** HABITAT CONSISTS OF A PERMANENT STREAM SURROUNDED BY SYCAMORE RIPARIAN FOREST, WITH AN EXOTIC UNDERSTORY CONSISTING OF HIMALAYAN BLACKBERRY, BAMBOO, AND WATERCRESS.

**General:** 1 ADULT FROG AND 1 NEWLY-METAMORPHOSED JUVENILE FROG OBSERVED ON 30 JULY 1996.

**Owner/Manager:** UNKNOWN

## *Sorex vagrans halicoetes*

salt-marsh wandering shrew

**Element Code:** AMABA01071

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G5T1
**State:** S1

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** SALT MARSHES OF THE SOUTH ARM OF SAN FRANCISCO BAY.
**Micro:** MEDIUM HIGH MARSH 6-8 FT ABOVE SEA LEVEL WHERE ABUNDANT DRIFTWOOD IS SCATTERED AMONG SALICORNIA.

**Occurrence No.** 1 **Map Index:** 09894 **EO Index:** 24365

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Decreasing
**Main Source:** U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

**Dates Last Seen**
**Element:** 1976-XX-XX
**Site:** 1980-XX-XX
**Record Last Updated:** 1998-12-28

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43469° / -121.96582°
**UTM:** Zone-10 N4143597 E591492
**Area:** 451.5 ac
**Elevation:** 0 ft
**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 03
**Meridian:** M
**Qtr:** XX

**Location:** NEW CHICAGO MARSH, 1 TO 1.75 MI NE OF ALVISO ON N SIDE OF LOS ESTEROS RD.
**Ecological:** DIKED SALT MARSH W/SOME PORTIONS BECOMING INCREASINGLY BRACKISH.
**General:** MVZ SPECIMENS COLLECTED FROM 1950-51 & 1970: 139194-95, 114979-115052, 115512-16, 115521-39. LAST KNOWN RECORD OF A SHREW CAPTURE WAS IN 1976, LISTED ONLY AS S. VAGRANS. AREA TRAPPED IN 1975, 1977 & 1980 W/NO SHREWS RECORDED.
**Owner/Manager:** USFWS, PVT-LESLIE SALT CO

**Occurrence No.** 10 **Map Index:** 09825 **EO Index:** 5638

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Unknown
**Main Source:** U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

**Dates Last Seen**
**Element:** 1951-08-05
**Site:** 1951-08-05
**Record Last Updated:** 1994-05-09

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41243° / -121.99330°
**UTM:** Zone-10 N4141101 E589087
**Radius:** 1 mile
**Elevation:** 5 ft
**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** XX
**Meridian:** M
**Qtr:** XX

**Location:** ONE MILE SSW OF ALVISO.
**Ecological:** NO SUITABLE HABITAT REMAINS DUE TO URBANIZATION.
**General:** MVZ SPECIMENS #115053-55 COLLECTED IN 1951.
**Owner/Manager:** UNKNOWN

## *Astragalus tener var. tener*

alkali milk-vetch

**Element Code:** PDFAB0F8R1

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G1T1 | **CNPS List:** 1B |
| **State:** None | **State:** S1.1 | **R-E-D Code:** 3-2-3 |

**Habitat Associations**

**General:** ALKALI PLAYA, VALLEY AND FOOTHILL GRASSLAND, VERNAL POOLS.

**Micro:** LOW GROUND, ALKALI FLATS, AND FLOODED LANDS; IN ANNUAL GRASSLAND OR IN PLAYAS OR VERNAL POOLS. 1-170M.

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**Occurrence No.** 6 **Map Index:** 24671 **EO Index:** 5637

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Unknown
**Main Source:** LISTON, A. 1988 (PERS)

**Dates Last Seen**
**Element:** 1905-04-04
**Site:** 2002-03-07
**Record Last Updated:** 1994-03-21

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43287° / -121.90694°
**UTM:** Zone-10 N4143454 E596703
**Radius:** 1 mile
**Elevation:** 20 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01E
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** MILPITAS.

**General:** ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1905 COLLECTION BY R.M.SMITH (COLLECTION # AND HERBARIUM UNKNOWN). NO HABITAT OR PLANTS OBSERVED IN IMMEDIATE VICINITY OF MILPITAS; ALL URBANIZED AND LIGHT INDUSTRIAL DEVELOPMENT.

**Owner/Manager:** UNKNOWN

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**Occurrence No.** 7 **Map Index:** 24673 **EO Index:** 6950

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GREER, P. 1999 (OBS)

**Dates Last Seen**
**Element:** 2002-XX-XX
**Site:** 2002-03-07
**Record Last Updated:** 2003-07-08

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48852° / -121.98027°
**UTM:** Zone-10 N4149556 E590149
**Area:** 28.7 ac
**Elevation:** 10 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** NW
**Meridian:** M

**Location:** ALBRAE, ALONG RAILROAD TRACKS ABOUT 1 MILE SOUTHWEST OF FREMONT RACEWAYS, WEST OF FREMONT.

**Location Detail:** MAPPED ALONG EAST SIDE OF RR TRACKS ABOUT 0.5-0.8 MILE SOUTHEAST OF ALBRAE STATION.

**Ecological:** UPPER EXTENT OF INUNDATION OF VERNAL POOLS CREATED IN 1998. GROWING WITH MELILOTUS INDICA, LOLIUM MULTIFLORUM, PSILOCARPHUS TENELLUS, PLAGIOBOTHRYS STIPITATUS VAR. MICRANTHUS AND ERYNGIUM ARISTULATUM VAR. ARISTULATUM.

**Threat:** COMPETITION FROM NON-NATIVE ANNUALS MAY THREATEN FUTURE RECURRENCE.

**General:** 35-40 PLANTS IN 1999, 264 IN 2001, 130 IN 2002. AREA = PACIFIC COMMONS PRESERVE, STEM SITE. PLANTS COLLECTED AT "ALBRAE, GROWING ALONG EDGES OF SALT MARSHES" BY SMITH (#3747, HERB UNK) IN 1923. ATRIPLEX JOAQUINIANA ALSO HERE.

**Owner/Manager:** PVT-CATELLUS COMMON

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**Occurrence No.** 68 **Map Index:** 09936 **EO Index:** 51724

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** SMITH, R. SN UC #596747 (HERB)

**Dates Last Seen**
**Element:** 1905-04-XX
**Site:** 1905-04-XX
**Record Last Updated:** 2003-07-08

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43489° / -121.96536°
**UTM:** Zone-10 N4143620 E591532
**Radius:** 1 mile
**Elevation:**
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** ALVISO.

**Location Detail:** MAPPED IN GENERAL VICINITY OF ALVISO BY CNDDB.

**Threat:** MUCH OF THIS AREA IS NOW DEVELOPED.

**General:** ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1905 COLLECTION BY SMITH.

**Owner/Manager:** UNKNOWN

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## *Atriplex joaquiniana*

San Joaquin saltbush — **Element Code:** PDCHE041F3

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G2 | **CNPS List:** 1B |
| **State:** None | **State:** S2.1 | **R-E-D Code:** 2-2-3 |

**Habitat Associations**

**General:** CHENOPOD SCRUB, ALKALI MEADOW, VALLEY AND FOOTHILL GRASSLAND.

**Micro:** IN SEASONAL ALKALI WETLANDS OR ALKALI SINK SCRUB WITH DISTICHLIS SPICATA, FRANKENIA, ETC. 1-250M.

**Occurrence No.** 54 **Map Index:** 46060 **EO Index:** 46060

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** LUCAS, S. 1999 (OBS)

**Dates Last Seen**
**Element:** 2001-08-10
**Site:** 2001-08-10
**Record Last Updated:** 2003-01-03

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48941° / -121.97826°
**UTM:** Zone-10 N4149656 E590326
**Area:** 4.6 ac
**Elevation:** 6 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** NW
**Meridian:** M

**Location:** PACIFIC COMMONS PRESERVE, 0.7 AIRMILE ESE OF ALBRAE, EAST OF THE SOUTHERN PACIFIC RAILROAD TRACKS, WEST OF FREMONT.

**Location Detail:** PROPERTY KNOWN AS PACIFIC COMMONS PRESERVE, STEM SITE, PHASE 1. ON UPLAND EDGE OF CREATED VERNAL POOLS ADJACENT TO SEASONAL WETLAND UNIT, DON EDWARDS SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE. MAPPED WITHIN THE NE 1/4 NW 1/4 SECTION 21.

**Ecological:** GROWING ALONG THE UPLAND EDGE OF CREATED VERNAL POOLS IN ALKALINE GRASSLAND, WITH LOLIUM MULTIFLORUM, BRASSICA NIGRA, AND MELILOTUS INDICA.

**Threat:** COMPETITION FROM NON-NATIVE ANNUALS MAY THREATEN FUTURE RECURRENCE.

**General:** 30 PLANTS OBSERVED IN 1999. POOLS CREATED IN FALL 1998 (WHICH?). GERMINATION LIKELY STIMULATED BY GRADING FOR POOL CREATION. LOW COMPETITION FOLLOWING GRADING MAY HAVE FAVORED GROWTH. 300 INDIVIDUALS OBS IN 2001 W/IN 4 ADDITIONAL POOLS.

**Owner/Manager:** PVT-CATELLUS CORP

**Occurrence No.** 65 **Map Index:** 49795 **EO Index:** 49795

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** JEPSON, W. SN JEPS #59619 (HERB)

**Dates Last Seen**
**Element:** 1896-06-25
**Site:** 1896-06-25
**Record Last Updated:** 2003-01-07

**Quad Summary:** MILPITAS (3712148/427B), NILES (3712158/446C)
**County Summary:** ALAMEDA

**Lat/Long:** 37.50259° / -121.90585°
**UTM:** Zone-10 N4151191 E596709
**Radius:** 1 mile
**Elevation:**
**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT
**Township:** 05S
**Range:** 01E
**Section:** 18 **Qtr:** XX
**Meridian:** M

**Location:** WARM SPRINGS, ALAMEDA COUNTY.

**Location Detail:** MAPPED IN VICINITY OF WARM SPRINGS.

**General:** ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1896 COLLECTION BY JEPSON. NEEDS FIELDWORK.

**Owner/Manager:** UNKNOWN

## *Centromadia parryi ssp. congdonii*

Congdon's tarplant — **Element Code:** PDAST4R0P1

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G4?T2 | **CNPS List:** 1B |
| **State:** None | **State:** S2.1 | **R-E-D Code:** 3-3-3 |

**Habitat Associations**

**General:** VALLEY AND FOOTHILL GRASSLAND.

**Micro:** ALKALINE SOILS, SOMETIMES DESCRIBED AS HEAVY WHITE CLAY. 1-230M.

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**Occurrence No.** 16 **Map Index:** 10086 **EO Index:** 5639

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Stable
**Main Source:** PRESTON, R. 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-10-03
**Site:** 1998-10-03
**Record Last Updated:** 2000-02-07

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48956° / -121.94992°
**UTM:** Zone-10 N4149700 E592830
**Area:** 9.6 ac
**Elevation:** 10 ft
**Mapping Precision:** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 23 **Qtr:** NW
**Meridian:** M

**Location:** WARM SPRINGS DISTRICT, WEST OF THE NIMITZ FREEWAY (I-880) AT CUSHING PARKWAY, FREMONT.

**Location Detail:** MAPPED SOUTHWEST OF INTERSECTION OF FREMONT BLVD AND CUSHING PARKWAY.

**Ecological:** ANNUAL GRASSLAND WITH LOLIUM MULTIFLORUM, FRANKENIA SALINA, DISTICHLIS SPICATA, LACTUCA SERRIOLA, AND RUMEX CRISPUS. SOILS MAPPED AS MARVIN SILT LOAM.

**Threat:** COMMERICAL DEVELOPMENT SURROUNDS ON ALL SIDES.

**General:** ABOUT 7000 PLANTS OBSERVED IN 1998. HISTORIC COLLECTIONS BY JEPSON (#35030 JEPS) IN 1896 AND SHARSMITH (#5866 SJSU) IN 1951 ARE ATTRIBUTED TO THIS SITE.

**Owner/Manager:** UNKNOWN

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**Occurrence No.** 17 **Map Index:** 24671 **EO Index:** 5636

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** KECK, D. #455 CAS (HERB)

**Dates Last Seen**
**Element:** 1928-09-28
**Site:** 1998-10-03
**Record Last Updated:** 1994-05-09

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43287° / -121.90694°
**UTM:** Zone-10 N4143454 E596703
**Radius:** 1 mile
**Elevation:** 20 ft
**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 06S
**Range:** 01E
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** NORTH CITY LIMITS OF MILPITAS.

**Ecological:** SALINE SOILS WITH DISTICHLIS SPICATA, SALICORNIA AMBIGUA, CHENOPODIUM CALIFORNICUM. SALINE SEASONAL WETLAND/MEADOW WITH SALICORNIA, DISTICHLIS, POLYPOGON, AND PARAPHOLIS INCURVA SEARCHED IN 1998.

**Threat:** FREEWAY, LANDFILL, AND COMMERCIAL DEVELOPMENT IN THE AREA.

**General:** MAIN SOURCE OF INFORMATION FOR THIS SITE IS 1928 COLLECTION BY KECK. AREA SEARCHED IN 1998 BY R. PRESTON BUT NO PLANTS SEEN. HABITAT APPEARED TO BE GOOD.

**Owner/Manager:** UNKNOWN

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## *Centromadia parryi ssp. congdonii*

Congdon's tarplant — **Element Code:** PDAST4R0P1

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G4?T2 | **CNPS List:** 1B |
| **State:** None | **State:** S2.1 | **R-E-D Code:** 3-3-3 |

**Habitat Associations**

**General:** VALLEY AND FOOTHILL GRASSLAND.

**Micro:** ALKALINE SOILS, SOMETIMES DESCRIBED AS HEAVY WHITE CLAY. 1-230M.

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**Occurrence No.** 18 **Map Index:** 08777 **EO Index:** 5640

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Stable
**Main Source:** PRESTON, R. 1998 (OBS)

**Dates Last Seen**
**Element:** 2002-08-05
**Site:** 2002-08-05
**Record Last Updated:** 2002-10-17

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.41057° / -121.99697°
**UTM:** Zone-10 N4140891 E588764
**Area:** 5.6 ac
**Elevation:** 5 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 17 **Qtr:** XX
**Meridian:** M

**Location:** SUNNYVALE BAYLANDS PARK, NORTHEAST OF JUNCTION OF HIGHWAY 237 AND LAWRENCE EXPRESSWAY (G2), SUNNYVALE.

**Location Detail:** PLANTS LOCATED IN LOW GROUND ALMOST AT SEA LEVEL, BEYON A PLANTED GRASSLAND (GREAT MEADOW) USED AS A PLAYFIELD. POPULATION EXTENDS TO A WETLAND JUST NORTH OF THE WAVE WALK. LARGEST CONCENTRATION OF PLANTS FOUND IN SEASONAL WETLAND SWALE.

**Ecological:** SITE PRESENTLY RUDERAL AND SEASONAL WETLAND WITH LOTUS CORNICULATUS, HORDEUM MARINUM SSP GUSSONEANUM, CRYPSIS SCHOENOIDES, POLYPOGON MONSPELIENSIS, AND FRANKENIA SALINA. PLANTS ALSO FOUND IN ANNUAL GRASSLAND WITH LOLIUM MULTIFLORUM.

**Threat:** PLANTS IN PARK ARE ARE PERIODICALLY MOWED. SITE IS BEST PROTECTED SITE IN SANTA CLARA COUNTY.

**General:** 6000 PLANTS OBSERVED IN 1998. MOST PLANTS WITHIN 'NATIVE GRASSLAND' RESTORATION AREA. 8000 PLANTS ESTIMATED BY SANTA CLARA VALLEY CNPS AS REPORTED BY OLIVER IN 2002. HISTORIC COLLECTION BY D. KECK (#2472 UC) IS FROM THIS VICINITY.

**Owner/Manager:** CITY OF SUNNYVALE

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**Occurrence No.** 40 **Map Index:** 42346 **EO Index:** 42346

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Unknown
**Main Source:** PRESTON, R. 1998 (OBS)

**Dates Last Seen**
**Element:** 1908-09-19
**Site:** 1998-10-04
**Record Last Updated:** 2000-02-07

**Quad Summary:** SANTA TERESA HILLS (3712127/407A), LOS GATOS (3712128/407B), SAN JOSE EAST (3712137/427D), SAN JOSE WEST (3712138/427C), CALAVERAS RESERVOIR (3712147/427A), MILPITAS (3712148/427B)

**County Summary:** SANTA CLARA

**Lat/Long:** 37.31441° / -121.86207°
**UTM:** Zone-10 N4130359 E600832
**Radius:** 5 mile
**Elevation:** 100 ft
**Mapping Precision**NON-SPECIFIC
**Symbol Type:**POINT
**Township:** 07S
**Range:** 01E
**Section:** 21 **Qtr:** XX
**Meridian:** M

**Location:** EAST SAN JOSE.

**Location Detail:** EXACT LOCATION NOT KNOWN. MAPPED IN GENERAL AREA OF EASTERN SAN JOSE. TOPOGRAPHY AND SOILS OF AREA AROUND ALUM ROCK AVENUE AND SILVER CREEK ARE APPROPRIATE FOR H. PARRYI SSP. CONGDONII (R. PRESTON 1998)

**Threat:** URBAN RESIDENTIAL, COMMERCIAL, AND RETAIL DEVELOPMENT HAVE ELIMINATED APPROPRIATE HABITAT.

**General:** SITE BASED UPON 1908 COLLECTION BY MCMURPHY (SN DS). AREA SEARCHED IN 1998 BUT HABITAT IS GONE.

**Owner/Manager:** UNKNOWN

## *Centromadia parryi ssp. congdonii*

Congdon's tarplant

**Element Code:** PDAST4R0P1

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G4?T2
**State:** S2.1

**Other Lists**
**CNPS List:** 1B
**R-E-D Code:** 3-3-3

**Habitat Associations**
**General:** VALLEY AND FOOTHILL GRASSLAND.
**Micro:** ALKALINE SOILS, SOMETIMES DESCRIBED AS HEAVY WHITE CLAY. 1-230M.

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**Occurrence No.** 41 **Map Index:** 42347 **EO Index:** 42347

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Decreasing
**Main Source:** BUXTON, E. 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-09-01
**Site:** 1998-09-01
**Record Last Updated:** 2000-02-07

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42807° / -121.96353°
**UTM:** Zone-10 N4142865 E591702
**Area:** 40.6 ac
**Elevation:** 10 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 10 **Qtr:** XX
**Meridian:** M

**Location:** ALVISO, NORTH OF HIGHWAY 237 AND EAST OF NORTH 1ST STREET, WEST OF MILPITAS.

**Location Detail:** IN FIELD BOUNDED BY GRAND AVENUE, WILSON WAY, NORTECH PARKWAY, AND DISK DRIVE.

**Ecological:** ANNUALLY DISKED RUDERAL FIELD AND NON-NATIVE GRASSLAND WITH LOLIUM MULTIFLORUM, PHALARIS PARADOXA, LACTUCA SERRIOLA, AND MALVELLA LEPROSA.

**Threat:** ANNUAL DISKING, PROPOSED DEVELOPMENT.

**General:** 2500 PLANTS OBSERVED IN 1998. 1998 COLLECTION BY ZANDER FROM "0.5 MI E OF N FIRST ST NEAR ROUTE 237," ATTRIBUTED TO THIS SITE.

**Owner/Manager:** PVT

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**Occurrence No.** 56 **Map Index:** 24673 **EO Index:** 49062

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** LUCAS, S. & C. LEVINE 2001 (OBS)

**Dates Last Seen**
**Element:** 2001-08-10
**Site:** 2001-08-10
**Record Last Updated:** 2002-10-16

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48852° / -121.98027°
**UTM:** Zone-10 N4149556 E590149
**Area:** 28.7 ac
**Elevation:** 10 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** NW
**Meridian:** M

**Location:** ALBRAE, ALONG RAILROAD TRACKS ABOUT 1 MILE SOUTHWEST OF FREMONT RACEWAYS, WEST OF FREMONT.

**Location Detail:** THIS AREA IS KNOWN AS THE PACIFIC COMMONS PRESERVE STEM SITE. MAPPED ALONG EAST SIDE OF RR TRACKS ABOUT 0.5-0.8 MILE SOUTHEAST OF ALBRAE STATION.

**Ecological:** PLANTS FOUND ALONG DIRT ROADS AND ALONG THE UPPER MARGINS OF CREATED VERNAL POOLS IN ALKALINE GRASSLAND, ASSOCIATED WITH HEMIZONA CONGESTA SSP. LUZULIFOLIA, LOLIUM MULTIFLORUM, DISTICHLIS SPICATA, MELILOTUS INDICA, ET AL.

**Threat:** COMPETITION FROM NON-NATIVE ANNUALS MAY THREATEN FUTURE RECURRENCE.

**General:** 16,000 PLANTS OBSERVED IN 2001. ANNUAL MOWING DOES NOT SEEM TO HAVE A DETRIMENTAL EFFECT ON THE POPULATION. THE RARE ASTRAGALUS TENER VAR. TENER, ATRIPLEX JOAQUINIANA, AND NAVARRETIA PROSTRATA ALSO OCCUR AT THIS SITE.

**Owner/Manager:** PVT

***Chorizanthe robusta var. robusta***

robust spineflower

**Element Code:** PDPGN040Q2

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G2T1 | **CNPS List:** 1B |
| **State:** None | **State:** S1.1 | **R-E-D Code:** 3-3-3 |

**Habitat Associations**

**General:** CISMONTANE WOODLAND, COASTAL DUNES, COASTAL SCRUB.

**Micro:** SANDY TERRACES AND BLUFFS OR IN LOOSE SAND. 3-120M.

**Occurrence No.** 19 **Map Index:** 37885 **EO Index:** 41067

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** PARRY SN MO (HERB)

**Dates Last Seen**
**Element:** 1882-XX-XX
**Site:** 1882-XX-XX

**Record Last Updated:** 1999-05-18

**Quad Summary:** SAN JOSE EAST (3712137/427D), SAN JOSE WEST (3712138/427C), CALAVERAS RESERVOIR (3712147/427A), MILPITAS (3712148/427B)

**County Summary:** SANTA CLARA

**Lat/Long:** 37.33789° / -121.89131°
**UTM:** Zone-10 N4132933 E598210
**Radius:** 5 mile
**Elevation:** 85 ft

**Mapping Precision** NON-SPECIFIC
**Symbol Type** POINT

**Township:** 07S
**Range:** 01E
**Section:** 08 **Qtr:** XX
**Meridian:** M

**Location:** SAN JOSE.

**Location Detail:** EXACT LOCATION NOT KNOW; SITE MAPPED IN GENERAL VICINITY OF SAN JOSE.

**General:** ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1882 COLLECTION BY PARRY. THIS SPECIMEN WAS NOT REVIEWED BY B. ERTTER ET AL. IN 1990.

**Owner/Manager:** UNKNOWN

## *Cordylanthus maritimus ssp. palustris*

Point Reyes bird's-beak

**Element Code:** PDSCR0J0C3

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Species of Concern | **Global:** G4?T2 | **CNPS List:** 1B |
| **State:** None | **State:** S2.2 | **R-E-D Code:** 2-2-2 |

**Habitat Associations**

**General:** COASTAL SALT MARSH.

**Micro:** USUALLY IN COASTAL SALT MARSH WITH SALICORNIA, DISTICHLIS, JAUMEA, SPARTINA, ETC. 0-15M.

**Occurrence No.** 22 **Map Index:** 09936 **EO Index:** 17542

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SMITH, R. SN RSA (HERB)

**Dates Last Seen**
**Element:** 1905-05-XX
**Site:** 1905-05-XX
**Record Last Updated:** 1989-08-11

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43489° / -121.96536°
**UTM:** Zone-10 N4143620 E591532
**Radius:** 1 mile
**Elevation:**

**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT

**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** NEAR ALVISO.

**General:** NONE. EXTIRPATED ACCORDING TO D. SMITH (1996).

**Owner/Manager:** UNKNOWN

## *Lasthenia conjugens*

Contra Costa goldfields

**Element Code:** PDAST5L040

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G1 | **CNPS List:** 1B |
| **State:** None | **State:** S1.1 | **R-E-D Code:** 3-3-3 |

**Habitat Associations**

**General:** VALLEY AND FOOTHILL GRASSLAND, VERNAL POOLS, CISMONTANE WOODLAND. EXTIRPATED FROM MOST OF ITS RANGE; EXTREM. ENDANGERED.

**Micro:** VERNAL POOLS, SWALES, LOW DEPRESSIONS, IN OPEN GRASSY AREAS. 1-445M.

**Occurrence No.** 29 **Map Index:** 35476 **EO Index:** 30917

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHERAR, J. 1996 (OBS)

**Dates Last Seen**
**Element:** 2001-04-26
**Site:** 2001-04-26
**Record Last Updated:** 2003-01-06

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49194° / -121.95742°
**UTM:** Zone-10 N4149957 E592164
**Area:** 28.6 ac
**Elevation:** 10 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 15
**Qtr:** SE
**Meridian:** M

**Location:** SKY SAILING AIRPORT, 0.4 MILE WEST OF NIMITZ FWY, ABOUT 0.4-0.8 MILE WNW OF JCT CUSHING ROAD AND LANDING ROAD, FREMONT.

**Location Detail:** 3 COLONIES: 2 NORTH COLONIES ARE ALONG THE NE-SIDE OF THE RUNWAY. SOUTH COLONY IS JUST SOUTH OF RUNWAY.

**Ecological:** SEASONAL WETLANDS IN A DISTURBED AREA. WITH DOWNINGIA PULCHELLA, PSILOCARPHUS BREVISSIMUS BREVISSIMUS, COTULA CORONOPIFOLIA, MYOSURUS MINIMUS MINIMUS, PLAGIOBOTHRYS STIPITATUS STIPITATUS, AND ERYNGIUM ARISTULATUM HOOVERI.

**Threat:** INVASION BY LOLIUM MULTIFLORUM AND LACTUCA SERRIOLA THREATENS. GRAZING AND GRAVEL YARD ALSO LISTED AS THREATS.

**General:** 1000 PLANTS IN N-COLONY IN 1996, 2600 IN 1999. 3100 IN S-COLONY IN 1997. IN 2001 2400 PLANTS AT N-COLONY, FEWER INDIVIDUALS THAN IN 1999 BUT DISTRIBUTION HAD INCREASED. 9 PLANTS FOUND IN AN ADDITIONAL POOL 100 METERS NE OF PREVIOUS SITE.

**Owner/Manager:** PVT-CATELLUS CORP

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**Occurrence No.** 30 **Map Index:** 36471 **EO Index:** 31468

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ANDERSON, B. 1997 (OBS)

**Dates Last Seen**
**Element:** 1997-03-31
**Site:** 1997-03-31
**Record Last Updated:** 1997-08-22

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48662° / -121.96885°
**UTM:** Zone-10 N4149356 E591161
**Area:** 34.5 ac
**Elevation:** 5 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21
**Qtr:** XX
**Meridian:** M

**Location:** FREMONT; DON PEDRO SAN FRANCISCO NWR, 0.15-0.5 MI W OF CUSHING RD.

**Ecological:** VERNAL POOLS AND SWALES IN GRASSLAND WITH SPARSE NASSELLA PULCHRA. ALSO WITH DOWNINGIA PULCHELLA, PLAGIOBOTHRYS STIPITATA, PLEUROPOGON CALIFORNICA, AND ERYNGIUM ARISTULATUM.

**Threat:** INVASIVE SPECIES SUCH AS LOLIUM COULD BE A THREAT.

**General:** 10,000 PLANTS IN 1997.

**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

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## *Navarretia prostrata*

prostrate navarretia

**Element Code:** PDPLM0C0Q0

**Status**
**Federal:** Species of Concern
**State:** None

**NDDB Element Ranks**
**Global:** G2?
**State:** S2.1?

**Other Lists**
**CNPS List:** 1B
**R-E-D Code:** 2-3-3

**Habitat Associations**
**General:** COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, VERNAL POOLS.
**Micro:** ALKALINE SOILS IN GRASSLAND, OR IN VERNAL POOLS. 15-700M.

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**Occurrence No.** 26 **Map Index:** 24673 **EO Index:** 47977

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** FRASER, T. 2001 (OBS)

**Dates Last Seen**
**Element:** 2001-04-26
**Site:** 2001-04-26
**Record Last Updated:** 2002-10-21

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48852° / -121.98027°
**UTM:** Zone-10 N4149556 E590149
**Area:** 28.7 ac
**Elevation:** 10 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** NW
**Meridian:** M

**Location:** PACIFIC COMMONS PRESERVE, NORTH OF ALBRAE.

**Location Detail:** SOUTH OF ALBRAE, ALONG RR LINE.

**Ecological:** IN SEASONAL WETLANDS AND CREATED VERNAL POOLS; WITH ASTRAGALUS TENER VAR TENER, LASTHENIA CONJUGENS, ATRIPLEX JOAQUINIANA, CENTROMADIA PARRYI SSP CONGDONII, DOWNINGIA PULCHELLA, PSILOCARPHUS TENELLUS, PLAGIOBOTHRYS STIPITATUS, ETC.

**Threat:** ENCROACHMENT OF NON-NATIVES.

**General:** 950 PLANTS TOTAL FROM THIS SITE AND EO #27 ESTIMATED IN 2001. ADJACENT TO SEASONAL WETLAND UNIT, DON EDWARDS SAN FRANCISCO BAY NWR, AND INDUSTRIAL/COMMERCIAL DEVELOPMENTS.

**Owner/Manager:** PVT-CATELLUS CORP

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**Occurrence No.** 27 **Map Index:** 47979 **EO Index:** 47979

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** FRASER, T. 2001 (OBS)

**Dates Last Seen**
**Element:** 2001-04-26
**Site:** 2001-04-26
**Record Last Updated:** 2002-05-21

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49560° / -121.96066°
**UTM:** Zone-10 N4150360 E591873
**Area:** 1.7 ac
**Elevation:** 10 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 15 **Qtr:** S
**Meridian:** M

**Location:** PACIFIC COMMONS PRESERVE.

**Location Detail:** TWO COLONIES MAPPED BY SKY SAILING AIRPORT.

**Ecological:** IN SEASONAL WETLANDS AND CREATED VERNAL POOLS; WITH ASTRAGALUS TENER VAR TENER, LASTHENIA CONJUGENS, ATRIPLEX JOAQUINIANA, CENTROMADIA PARRYI SSP CONGDONII, DOWNINGIA PULCHELLA, PSILOCARPHUS TENELLUS, PLAGIOBOTHRYS STIPITATUS, ETC.

**Threat:** ENCROACHMENT OF NON-NATIVES.

**General:** 950 PLANTS TOTAL FROM THIS SITE AND EO #26 ESTIMATED IN 2001. ADJACENT TO SEASONAL WETLAND UNIT, DON EDWARDS SAN FRANCISCO BAY NWR, AND INDUSTRIAL/COMMERCAIL DEVELOPMENTS.

**Owner/Manager:** PVT-CATELLUS CORP

## *Suaeda californica*

California seablite

**Element Code:** PDCHE0P020

**Status**
**Federal:** Endangered
**State:** None

**NDDB Element Ranks**
**Global:** G1
**State:** S1.1

**Other Lists**
**CNPS List:** 1B
**R-E-D Code:** 3-3-3

**Habitat Associations**
**General:** MARSHES AND SWAMPS.
**Micro:** MARGINS OF COASTAL SALT MARSHES. 0-5M.

**Occurrence No.** 14 **Map Index:** 49214 **EO Index:** 49214

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** HECKARD, L. #6253 JEPS #86406 (HERB)

**Dates Last Seen**
**Element:** 1986-05-13
**Site:** 1986-05-13
**Record Last Updated:** 2002-10-30

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48161° / -121.96108°
**UTM:** Zone-10 N4148807 E591853
**Radius:** 1 mile
**Elevation:**

**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT

**Township:** 05S
**Range:** 01W
**Section:** 22 **Qtr:** XX
**Meridian:** M

**Location:** NORTH OF MUD SLOUGH, EAST OF SP RAILROAD TRACKS, FREMONT, EAST OF SAN FRANCISCO BAY.

**Location Detail:** EXACT LOCATION UNKNOWN, MAPPED BY CNDDB NORTH OF MUD SLOUGH, EAST OF WESTERNMOST SP RAIL TRACKS, SOUTHWEST OF FREMONT.

**General:** MAIN SOURCE OF INFORMATION FOR THIS SITE IS 1986 COLLECTION BY HECKARD. 1951 COLLECTION BY SHARSMITH FROM "5 MILES N OF MILPITAS" IS ATTRIBUTED TO THIS SITE. NEEDS FIELDWORK.

**Owner/Manager:** UNKNOWN

## *Charadrius alexandrinus nivosus*

western snowy plover

**Element Code:** ABNNB03031

**Status**
**Federal:** Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G4T3
**State:** S2

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** (NESTING) FEDERAL LISTING APPLIES ONLY TO THE PACIFIC COASTAL POPULATION.
**Micro:** SANDY BEACHES, SALT POND LEVEES & SHORES OF LARGE ALKALI LAKES. NEEDS SANDY, GRAVELLY OR FRIABLE SOILS FOR NESTING.

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**Occurrence No.** 3 **Map Index:** 09896 **EO Index:** 25777

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1971 (OBS)

**Dates Last Seen**
**Element:** 1971-07-16
**Site:** 1971-07-16
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42604° / -121.97329°
**UTM:** Zone-10 N4142630 E590841
**Radius:** 1/5 mile
**Elevation:** 10 ft

**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POINT

**Township:** 06S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** ALVISO.
**General:** FROM NORTH AMERICAN NEST RECORD CARD PROGRAM.
**Owner/Manager:** UNKNOWN

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**Occurrence No.** 127 **Map Index:** 44374 **EO Index:** 44374

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** RYAN, T. 1999 (OBS)

**Dates Last Seen**
**Element:** 1999-11-05
**Site:** 1999-11-05
**Record Last Updated:** 2000-11-22

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.42307° / -121.98921°
**UTM:** Zone-10 N4142286 E589436
**Area:** 382.6 ac
**Elevation:** 0 ft

**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POLYGON

**Township:** 06S
**Range:** 01W
**Section:** 08 **Qtr:** XX
**Meridian:** M

**Location:** SALT EVAPORATOR POND, BETWEEN ALVISO SLOUGH AND GUADALUPE SLOUGH, JUST WEST OF ALVISO.
**Location Detail:** ALVISO SALT POND NUMBER A8, CARGILL SALT PROPERTY. BIRDS OBSERVED OVER THE SPRING & SUMMER BUT NEVER STATED THAT NESTS WERE OBSERVED.
**Ecological:** BOTH ACTIVE AND INACTIVE SALT EVAPORATOR POND AREA, SURROUNDING AREA IS SALT PONDS AND BRACKISH MARSH
**General:** 1999 SAMPLING: JAN 6: 4 BIRDS; MAR 12: 18 BIRDS; APR 14: 5 BIRDS; APR 29: 3 BIRDS; MAY 6: 6 BIRDS; MAY 13: 2 BIRDS; JUN 5: 2 BIRDS; JUN 9: 2 BIRDS; NOV 5: 3 BIRDS.
**Owner/Manager:** PVT

## *Chorizanthe robusta var. robusta*

robust spineflower

**Element Code:** PDPGN040Q2

**Status**
**Federal:** Endangered
**State:** None

**NDDB Element Ranks**
**Global:** G2T1
**State:** S1.1

**Other Lists**
**CNPS List:** 1B
**R-E-D Code:** 3-3-3

**Habitat Associations**
**General:** CISMONTANE WOODLAND, COASTAL DUNES, COASTAL SCRUB.
**Micro:** SANDY TERRACES AND BLUFFS OR IN LOOSE SAND. 3-120M.

**Occurrence No.** 19 **Map Index:** 37885 **EO Index:** 41067

**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Possibly Extirpated
**Trend:** Unknown
**Main Source:** PARRY SN MO (HERB)

**Dates Last Seen**
**Element:** 1882-XX-XX
**Site:** 1882-XX-XX
**Record Last Updated:** 1999-05-18

**Quad Summary:** SAN JOSE EAST (3712137/427D), SAN JOSE WEST (3712138/427C), CALAVERAS RESERVOIR (3712147/427A), MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.33789° / -121.89131°
**UTM:** Zone-10 N4132933 E598210
**Radius:** 5 mile
**Elevation:** 85 ft

**Mapping Precision:** NON-SPECIFIC
**Symbol Type:** POINT

**Township:** 07S
**Range:** 01E
**Section:** 08 **Qtr:** XX
**Meridian:** M

**Location:** SAN JOSE.
**Location Detail:** EXACT LOCATION NOT KNOW; SITE MAPPED IN GENERAL VICINITY OF SAN JOSE.
**General:** ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1882 COLLECTION BY PARRY. THIS SPECIMEN WAS NOT REVIEWED BY B. ERTTER ET AL. IN 1990.
**Owner/Manager:** UNKNOWN

## *Lasthenia conjugens*

Contra Costa goldfields — **Element Code:** PDAST5L040

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G1 | **CNPS List:** 1B |
| **State:** None | **State:** S1.1 | **R-E-D Code:** 3-3-3 |

**Habitat Associations**

**General:** VALLEY AND FOOTHILL GRASSLAND, VERNAL POOLS, CISMONTANE WOODLAND. EXTIRPATED FROM MOST OF ITS RANGE; EXTREM. ENDANGERED.

**Micro:** VERNAL POOLS, SWALES, LOW DEPRESSIONS, IN OPEN GRASSY AREAS. 1-445M.

**Occurrence No.** 29 **Map Index:** 35476 **EO Index:** 30917

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHERAR, J. 1996 (OBS)

**Dates Last Seen**
**Element:** 2001-04-26
**Site:** 2001-04-26
**Record Last Updated:** 2003-01-06

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49194° / -121.95742°
**UTM:** Zone-10 N4149957 E592164
**Area:** 28.6 ac
**Elevation:** 10 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 15 **Qtr:** SE
**Meridian:** M

**Location:** SKY SAILING AIRPORT, 0.4 MILE WEST OF NIMITZ FWY, ABOUT 0.4-0.8 MILE WNW OF JCT CUSHING ROAD AND LANDING ROAD, FREMONT.

**Location Detail:** 3 COLONIES: 2 NORTH COLONIES ARE ALONG THE NE-SIDE OF THE RUNWAY. SOUTH COLONY IS JUST SOUTH OF RUNWAY.

**Ecological:** SEASONAL WETLANDS IN A DISTURBED AREA. WITH DOWNINGIA PULCHELLA, PSILOCARPHUS BREVISSIMUS BREVISSIMUS, COTULA CORONOPIFOLIA, MYOSURUS MINIMUS MINIMUS, PLAGIOBOTHRYS STIPITATUS STIPITATUS, AND ERYNGIUM ARISTULATUM HOOVERI.

**Threat:** INVASION BY LOLIUM MULTIFLORUM AND LACTUCA SERRIOLA THREATENS. GRAZING AND GRAVEL YARD ALSO LISTED AS THREATS.

**General:** 1000 PLANTS IN N-COLONY IN 1996, 2600 IN 1999. 3100 IN S-COLONY IN 1997. IN 2001 2400 PLANTS AT N-COLONY, FEWER INDIVIDUALS THAN IN 1999 BUT DISTRIBUTION HAD INCREASED. 9 PLANTS FOUND IN AN ADDITIONAL POOL 100 METERS NE OF PREVIOUS SITE.

**Owner/Manager:** PVT-CATELLUS CORP

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**Occurrence No.** 30 **Map Index:** 36471 **EO Index:** 31468

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ANDERSON, B. 1997 (OBS)

**Dates Last Seen**
**Element:** 1997-03-31
**Site:** 1997-03-31
**Record Last Updated:** 1997-08-22

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48662° / -121.96885°
**UTM:** Zone-10 N4149356 E591161
**Area:** 34.5 ac
**Elevation:** 5 ft
**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21 **Qtr:** XX
**Meridian:** M

**Location:** FREMONT; DON PEDRO SAN FRANCISCO NWR, 0.15-0.5 MI W OF CUSHING RD.

**Ecological:** VERNAL POOLS AND SWALES IN GRASSLAND WITH SPARSE NASSELLA PULCHRA. ALSO WITH DOWNINGIA PULCHELLA, PLAGIOBOTHRYS STIPITATA, PLEUROPOGON CALIFORNICA, AND ERYNGIUM ARISTULATUM.

**Threat:** INVASIVE SPECIES SUCH AS LOLIUM COULD BE A THREAT.

**General:** 10,000 PLANTS IN 1997.

**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

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## *Lepidurus packardi*

vernal pool tadpole shrimp

**Element Code:** ICBRA10010

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G2G3 | **CDFG Status:** |
| **State:** None | **State:** S2S3 | |

**Habitat Associations**

**General:** INHABITS VERNAL POOLS AND SWALES IN THE SACRAMENTO VALLEY CONTAINING CLEAR TO HIGHLY TURBID WATER.

**Micro:** POOLS COMMONLY FOUND IN GRASS BOTTOMED SWALES OF UNPLOWED GRASSLANDS. SOME POOLS ARE MUD-BOTTOMED & HIGHLY TURBID.

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**Occurrence No.** 60 **Map Index:** 34780 **EO Index:** 24353

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SFBNWR 1993 (MAP)

**Dates Last Seen**
**Element:** 1995-03-23
**Site:** 1995-03-23
**Record Last Updated:** 1996-09-05

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48834° / -121.97377°
**UTM:** Zone-10 N4149542 E590723
**Area:** 11.6 ac
**Elevation:** 7 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21
**Qtr:** XX
**Meridian:** M

**Location:** WSW OF FREMONT IN THE SALT EVAPORATORS; 1.5 KM SE OF ALBRAE.

**Location Detail:** NORTHWEST DUCK PONDS ON WARM SPRINGS SEASONAL WETLAND; SURROUNDING AREA IS IDLE.

**Ecological:** VERNAL POOL/GRASSLAND COMMUNITY.

**Threat:** POSSIBLE THREAT: EXOTIC VEGETATION.

**General:** LOCATION OF PONDS WHERE TADPOLE SHRIMP WERE FOUND BY SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE: 3/19/93-1+ BREEDING ADULTS OBSERVED AND L. SERPA COLLECTED, 3/23/95-5 BREEDING ADULTS OBSERVED.

**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

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**Occurrence No.** 61 **Map Index:** 34781 **EO Index:** 29337

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ALBERTSON, J. ET AL 1993 (OBS)

**Dates Last Seen**
**Element:** 1997-03-31
**Site:** 1997-03-31
**Record Last Updated:** 1999-10-14

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48468° / -121.96811°
**UTM:** Zone-10 N4149141 E591228
**Area:** 21.6 ac
**Elevation:** 7 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 21
**Qtr:** XX
**Meridian:** M

**Location:** 1.1 MILES WSW OF CUSHING RO AND HIGHWAY 880 FREMONT, JUST NORTH OF SALT EVAPORATORS, 1.3 MILES SE OF ALBRAE, SFBNR.

**Location Detail:** SOUTHEAST PONDS OF WARM SPRINGS SEASONAL WETLANDS. 1997 OBS IN SEASONAL WETLANDS FORMED BY SCRAPING 6 YEARS AGO, SOME VERNAL POOL PLANTS MANY WEEDY NON-NATIVES.

**Ecological:** HABITAT CONSISTS OF VERNAL POOL/GRASSLAND COMMUNITIES; VEGETATION VARIED ON SALINITY AND DEPTH OF POND; PERIPHERY OF SHALLOW POND AREAS USUSALLY DOMINATED BY COTULA CORONOPIFOLIA, AND DEEPER AREAS BY OEDOGONIUM SP.

**Threat:** EXOTIC VEGETATION.

**General:** 1993: 3/5, 3/12, AND 3/15-BREEDING LEPIDURUS PACKARDI ADULTS OBSERVED IN THE SE PONDS OF REFUGE; MAP PROVIDED THAT SHOWS LOCATIONS OF PONDS DURING THE SPRING OF 1993; AMBYSTOMA CALIFORNIENSE OBSERVED IN POND AREAS. MANY OBSERVED IN 1997.

**Owner/Manager:** USFWS-SAN FRANCISCO BAY NWR

## *Lepidurus packardi*

vernal pool tadpole shrimp

**Element Code:** ICBRA10010

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G2G3 | **CDFG Status:** |
| **State:** None | **State:** S2S3 | |

**Habitat Associations**

**General:** INHABITS VERNAL POOLS AND SWALES IN THE SACRAMENTO VALLEY CONTAINING CLEAR TO HIGHLY TURBID WATER.

**Micro:** POOLS COMMONLY FOUND IN GRASS BOTTOMED SWALES OF UNPLOWED GRASSLANDS. SOME POOLS ARE MUD-BOTTOMED & HIGHLY TURBID.

**Occurrence No.** 73 **Map Index:** 34806 **EO Index:** 12714

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** BASTIN, E. 1996 (OBS)

**Dates Last Seen**
**Element:** 1996-03-22
**Site:** 1996-03-22
**Record Last Updated:** 1998-06-15

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49197° / -121.97830°
**UTM:** Zone-10 N4149940 E590318
**Radius:** 80 meters
**Elevation:** 9 ft

**Mapping Precision** SPECIFIC
**Symbol Type:** POINT

**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** WEST OF FREMONT; APPROX. 1.0 KM SOUTHEAST OF ALBRAE.

**Ecological:** SEASONAL MARSH HABITAT SURROUNDED BY NON-NATIVE ANNUAL GRASSLAND.

**Threat:** POSSIBLE THREAT: CATTLE GRAZING.

**General:** 4 ADULT TADPOLE SHRIMP OBSERVED IN 2 SMALL POOLS NEARBY A LARGE POOL; HABITAT SLIDES CONTAINED IN DFG-CNDDB ZOOLOGY ELEMENT FILES.

**Owner/Manager:** PVT

## *Rallus longirostris obsoletus*

California clapper rail

**Element Code:** ABNME05016

**Status**
**Federal:** Endangered
**State:** Endangered

**NDDB Element Ranks**
**Global:** G5T1
**State:** S1

**Other Lists**
**CDFG Status:**

**Habitat Associations**
**General:** SALT-WATER & BRACKISH MARSHES TRAVERSED BY TIDAL SLOUGHS IN THE VICINITY OF SAN FRANCISCO BAY.
**Micro:** ASSOCIATED WITH ABUNDANT GROWTHS OF PICKLEWEED, BUT FEEDS AWAY FROM COVER ON INVERTEBRATES FROM MUD-BOTTOMED SLOUGHS.

**Occurrence No.** 20 **Map Index:** 36915 **EO Index:** 25861

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1979 (LIT)

**Dates Last Seen**
**Element:** 1975-XX-XX
**Site:** 1975-XX-XX
**Record Last Updated:** 1999-09-17

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.44579° / -122.01375°
**UTM:** Zone-10 N4144783 E587239
**Area:** 167.4 ac
**Elevation:**
**Mapping Precision** NON-SPECIFIC
**Symbol Type** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 06 **Qtr:** XX
**Meridian:** M

**Location:** LARGER FRINGING MARSHES OF ALVISO SLOUGH.

**Owner/Manager:** UNKNOWN

**Occurrence No.** 35 **Map Index:** 09815 **EO Index:** 25850

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** GILL, R. 1979 (LIT)

**Dates Last Seen**
**Element:** 1975-XX-XX
**Site:** 1975-XX-XX
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** ALAMEDA, SANTA CLARA

**Lat/Long:** 37.46632° / -121.99858°
**UTM:** Zone-10 N4147075 E588556
**Radius:** 1 mile
**Elevation:**
**Mapping Precision** NON-SPECIFIC
**Symbol Type** POINT
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** MARSHES FRINGING MUD SLOUGH.

**General:** BREEDING NOT KNOWN FROM AREA EAST OF DRAWBRIDGE, BUT INDIVIDUALS HAVE NOT BEEN SEEN FROM NEAR MOUTH OF ALVISO SLOUGH AND EAST TO THE ABANDONED TOWN OF DRAWBRIDGE.

**Owner/Manager:** UNKNOWN

## *Rana aurora draytonii*

California red-legged frog

**Element Code:** AAABH01022

**Status**
**Federal:** Threatened
**State:** None

**NDDB Element Ranks**
**Global:** G4T2T3
**State:** S2S3

**Other Lists**
**CDFG Status:** SC

**Habitat Associations**
**General:** LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
**Micro:** REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

**Occurrence No.** 210 **Map Index:** 36040 **EO Index:** 31037

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** COOK, D. 1996 (OBS)

**Dates Last Seen**
**Element:** 1996-07-30
**Site:** 1996-07-30
**Record Last Updated:** 1997-07-09

**Quad Summary:** MILPITAS (3712148/427B), NILES (3712158/446C)
**County Summary:** ALAMEDA

**Lat/Long:** 37.49816° / -121.91857°
**UTM:** Zone-10 N4150686 E595591
**Area:** 29.6 ac
**Elevation:** 180 ft

**Mapping Precision**SPECIFIC
**Symbol Type:**POLYGON

**Township:** 05S
**Range:** 01W
**Section:** 13 **Qtr:** XX
**Meridian:** M

**Location:** AGUA CALIENTE CREEK, JUST NE OF THE INTERSECTION OF I-680 AND MISSION BLVD, FREMONT.

**Ecological:** HABITAT CONSISTS OF A PERMANENT STREAM SURROUNDED BY SYCAMORE RIPARIAN FOREST, WITH AN EXOTIC UNDERSTORY CONSISTING OF HIMALAYAN BLACKBERRY, BAMBOO, AND WATERCRESS.

**General:** 1 ADULT FROG AND 1 NEWLY-METAMORPHOSED JUVENILE FROG OBSERVED ON 30 JULY 1996.

**Owner/Manager:** UNKNOWN

## *Reithrodontomys raviventris*

salt-marsh harvest mouse

**Element Code:** AMAFF02040

**Status**
**Federal:** Endangered
**State:** Endangered

**NDDB Element Ranks**
**Global:** G1G2
**State:** S1S2

**Other Lists**
**CDFG Status:**

**Habitat Associations**
**General:** ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.
**Micro:** PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

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**Occurrence No.** 80 **Map Index:** 10006 **EO Index:** 23855
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** JENNINGS, V. 1985 (LIT)

**Dates Last Seen**
**Element:** 1985-10-30
**Site:** 1985-10-30
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.47965° / -121.94968°
**UTM:** Zone-10 N4148601 E592864
**Radius:** 1/5 mile
**Elevation:** 3 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** END OF N-MOST EXTENSION OF MUD SLOUGH CLOSE TO OLD LANDING RD, FREMONT.
**Location Detail:** 4 SMHM CAPTURES, ONE RECAPTURE.
**Ecological:** NON-TIDAL SITE IS BORDERED ON NORTH BY A CLOSED SEWAGE DISPOSAL PLANT AND ON EAST, WEST, AND SOUTH BY LEVEE ROADS.
**Owner/Manager:** UNKNOWN

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**Occurrence No.** 81 **Map Index:** 09811 **EO Index:** 14551
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHELLHAMMER, H. 1984 (LIT)

**Dates Last Seen**
**Element:** 1984-XX-XX
**Site:** 1984-XX-XX
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** ALAMEDA

**Lat/Long:** 37.47758° / -122.00492°
**UTM:** Zone-10 N4148319 E587982
**Area:** 130.7 ac
**Elevation:** 3 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** ALBRAE SLOUGH, TRIB TO COYOTE CRK, JUST W OF MUD SLOUGH, FREMONT.
**Location Detail:** SMHM CAPTURE(S) BTWN 3 JULY AND 9 SEPT. ALSO TRAPPED AUGUST 22 AND 25, 2 CAPTURES IN 200 TRAPNIGHTS.
**Ecological:** PICLKLEWEED COMMUNITY AT UPPER END OF LONG, NARROW SLOUGH.
**Owner/Manager:** UNKNOWN

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**Occurrence No.** 91 **Map Index:** 09884 **EO Index:** 14547
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ANDERSON, J. & V. JENNINGS 1986 (LIT)

**Dates Last Seen**
**Element:** 1990-10-26
**Site:** 1990-10-26
**Record Last Updated:** 1997-12-08

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.45706° / -121.97948°
**UTM:** Zone-10 N4146066 E590257
**Area:** 79.3 ac
**Elevation:** 3 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** TRIANGLE MARSH, TWO MI N OF ALVISO SW OF WHERE SP RR TRACKS CROSS COYOTE CREEK.
**Location Detail:** 5 CAPTURES DURING 600 TRAPNIGHTS: 300 FROM 6/26 TO 6/28, 1986, AND 300 FROM 8/15 TO 8/17, 1986. 2 CAPTURES DURING 300 TRAPNIGHTS FROM 7/30 TO 8/1, 1983 AND 2 CAPTURED DURING 384 TRAPNIGHTS (TRAPPED 8/1, 8/2, 8/4, & 8/6, 1983).
**Ecological:** PICKLEWEED / ALKALI BULRUSH COMBINATION ON MARSH
**Threat:** LESLIE SALT DIKE HEIGHTENING ACTIVITIES IMPACTING HABITAT
**General:** MAY 1990, 14 AND 18 INDIVIDUALS WERE CAPTURED, IN OCTOBER 10 WERE CAPTURED.
**Owner/Manager:** SAN FRANCISCO BAY NWR

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## *Reithrodontomys raviventris*

salt-marsh harvest mouse

**Element Code:** AMAFF02040

**Status**
**Federal:** Endangered
**State:** Endangered

**NDDB Element Ranks**
**Global:** G1G2
**State:** S1S2

**Other Lists**
**CDFG Status:**

**Habitat Associations**
**General:** ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.
**Micro:** PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

**Occurrence No.** 92 **Map Index:** 09810 **EO Index:** 14548
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** ANDERSON, J. & V. JENNINGS 1986 (LIT)

**Dates Last Seen**
**Element:** 1986-08-XX
**Site:** 1986-08-XX
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B), MOUNTAIN VIEW (3712241/428A)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.46239° / -121.99972°
**UTM:** Zone-10 N4146638 E588460
**Area:** 53.3 ac
**Elevation:** 3 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** COYOTE CREEK MARSH, 2.3 MI NNW OF ALVISO.
**Location Detail:** THIS SITE WAS TRAPPED IN 1981 WITH NO CAPTURES; IN 1986, 2 SMHM WERE CAPTURED DURING 300 TRAPNIGHTS.

**Owner/Manager:** UNKNOWN

**Occurrence No.** 93 **Map Index:** 09918 **EO Index:** 23849
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Decreasing
**Main Source:** ANDERSON, J. & V. JENNINGS 1986 (LIT)

**Dates Last Seen**
**Element:** 1981-XX-XX
**Site:** 1986-08-XX
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.46743° / -121.97079°
**UTM:** Zone-10 N4147225 E591013
**Radius:** 1/5 mile
**Elevation:** 3 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** BOTH SIDES OF MUD SLOUGH JUST E OF DRAWBRIDGE (SPRR TRACKS),2.2 MI N ALVISO.
**Location Detail:** 6 SMHM CAPTURES IN 1981; ZERO SMHM CAPTURES DURING 300 TRAPNIGHTS IN 1986.
**Ecological:** THIS SITE UNDERWENT EXTENSIVE DREDGE SPOIL DUMPING SINCE THE 1981 TRAPPING. IT IS UNKNOWN WHETHER SUFFICIENT VEGETATION WAS AVAILABLE IMMEDIATELY FOLLOWING THE DREDGING TO SUSTAIN SMHM.
**Owner/Manager:** UNKNOWN

**Occurrence No.** 97 **Map Index:** 10051 **EO Index:** 23846
**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** HARVEY & STANLEY ASSOC. 1985 (LIT)

**Dates Last Seen**
**Element:** 1985-XX-XX
**Site:** 1985-XX-XX
**Record Last Updated:** 1989-08-10

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA, SANTA CLARA

**Lat/Long:** 37.46354° / -121.93552°
**UTM:** Zone-10 N4146828 E594136
**Radius:** 1/5 mile
**Elevation:** 4 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** WARM SPRINGS SITE, 2 MI S OF FREMONT BTWN COYOTE CREEK AND NIMITZ FWY.
**Location Detail:** ONE INDIV CAPTURED IN THE DRIER, SPARSER WESTERN AREA OF THE SITE.
**General:** DURING PROJECT NEGOTIATIONS, THIS AREA WAS SET ASIDE AS A PRESERVE FOR THE SMHM BUT IT IS UNKNOWN IF THERE IS A MANAGEMENT PLAN.
**Owner/Manager:** PVT

***Reithrodontomys raviventris***

salt-marsh harvest mouse

**Element Code:** AMAFF02040

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G1G2 | **CDFG Status:** |
| **State:** Endangered | **State:** S1S2 | |

**Habitat Associations**

**General:** ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.

**Micro:** PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

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**Occurrence No.** 98 **Map Index:** 10068 **EO Index:** 23844

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** HARVEY & STANLEY ASSOC. 1985 (LIT)

**Dates Last Seen**
**Element:** 1998-08-10
**Site:** 1998-08-10
**Record Last Updated:** 1998-12-03

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.45974° / -121.93074°
**UTM:** Zone-10 N4146411 E594564
**Area:** 28.7 ac
**Elevation:**
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** SAN FRANCISCO BAY NMR, MARSHLAND ADJACENT TO OLD FREMONT AIRPORT RUNWAY, BETWEEN COYOTE CREEK AND NIMITZ (880) FREEWAY.

**Location Detail:** SITE TRAPPED MAY 3-14, 1986 (900 TRAPNIGHTS) WITH 5 SMHM CAPTURED. SITE TRAPPED SEPT 12-OCT 1, 1986 (2400 TRAPNIGHTS) WITH 27 SMHM CAPTURED.

**Ecological:** HABITAT CONSISTS OF NORTHERN COASTAL SALTMARSH, VEGETATED BY PICKLEWEED, WITH VARYING AMOUNTS OF ALKALI HEATH, SALT GRASS, AND OTHER MARSH SPECIES.

**General:** 7 ADULT MICE OBSERVED 1989. THIS AREA HAS BEEN DESIGNATED AS A SALT MARSH HARVEST MOUSE PRESERVE AND WILL BE MANAGED ACCORDINGLY. 1 ADULT AND 1 JUVENILE TRANSPLANTED HERE ON 10 AUG 98 FROM A SITE LOST DUE TO WIDENING OF DIXON LANDING ROAD.

**Owner/Manager:** USFWS, PVT

---

**Occurrence No.** 110 **Map Index:** 09902 **EO Index:** 14540

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHELLHAMMER, H. ET AL 1985 (LIT)

**Dates Last Seen**
**Element:** 1985-09-14
**Site:** 1985-09-14
**Record Last Updated:** 1996-01-02

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.47741° / -121.97330°
**UTM:** Zone-10 N4148330 E590778
**Area:** 54.5 ac
**Elevation:** 3 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** XX **Qtr:** XX
**Meridian:** M

**Location:** NEW FREMONT AIRPORT SITE, ALONG SPRR TRACKS JUST N OF MUD SLOUGH, FREMONT.

**Location Detail:** 13 CAPTURES AND 3 RECAPTURES DURING 900 TRAPNIGHTS.

**Ecological:** HABITAT CONSISTS OF NARROW BANDS OF VEGETATION BORDERING THE SPRR TRACKS AND SALT EVAPORATORS. VEGETATION CONSISTS OF SPARSE TO DENSE SALICORNIA, WITH NARROW UPLAND BORDERS OF MISC GRASSES, FRANKENIA GRANDIFOLIA, AND DISTICHLIS SPICATA.

**Owner/Manager:** PVT-CARUFF CORP

## *Reithrodontomys raviventris*

salt-marsh harvest mouse

**Element Code:** AMAFF02040

| Status | NDDB Element Ranks | Other Lists |
|---|---|---|
| **Federal:** Endangered | **Global:** G1G2 | **CDFG Status:** |
| **State:** Endangered | **State:** S1S2 | |

**Habitat Associations**

**General:** ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.

**Micro:** PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

---

**Occurrence No.** 115 **Map Index:** 09894 **EO Index:** 14539

**Dates Last Seen**
**Element:** 1990-12-16
**Site:** 1990-12-16
**Record Last Updated:** 1997-12-09

**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHELLHAMMER, H. 1986 (LIT)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.43469° / -121.96582°
**UTM:** Zone-10 N4143597 E591492
**Area:** 451.5 ac
**Elevation:** 0 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 06S
**Range:** 01W
**Section:** 03 **Qtr:** XX
**Meridian:** M

**Location:** NEW CHICAGO MARSH, JUST N OF ALVISO, SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE AND OWENS CORNING PROPERTY.

**Location Detail:** SMHM TRAPPING OVER THE PAST 25 YEARS HAS YIELDED FEW MICE. DURING 3.5 MONTHS OF TRAPPING DURING 1986, 65 SMHM WERE CAPTURED A TOTAL OF 360 TIMES.

**Ecological:** DIKED-OFF MARSH BISECTED W/DEEP TIDAL SLOUGH REMNANTS (FOR ABOUT 35 YEARS). SITE IS RAIN-SOAKED, OFTEN ALGAE-COATED PICKLEWEED-DOMINATED MARSH. LOWER, SE PORTION DRY, SPARCE PICKLEWEED.

**Threat:** DUMP EXPANSION (PVT LAND). BETTER WATER MANAGEMENT COULD HELP THIS SITE.

**General:** 8 ADULT MICE OBSERVED 12/16/1990 IN REFUGE, ALSO 6 CAPTURED 5/7-11/1990 ON PVT (SE) PORTION OF THE SITE.

**Owner/Manager:** USFWS, PVT

---

**Occurrence No.** 116 **Map Index:** 10047 **EO Index:** 23836

**Dates Last Seen**
**Element:** 1990-10-05
**Site:** 1990-10-05
**Record Last Updated:** 1997-12-08

**Occ Rank:** Fair
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHELLHAMMER, H. ET AL 1985 (LIT)

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.44847° / -121.92742°
**UTM:** Zone-10 N4145164 E594871
**Area:** 134.0 ac
**Elevation:** 3 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 36 **Qtr:** XX
**Meridian:** M

**Location:** N END OF THE SAN JOSE-SANTA CLARA SEWAGE DISPOSAL PONDS, DIXON ROAD AND HIGHWAY 880 AND COYOTE CREEK, SAN JOSE.

**Location Detail:** TRAPS SET ALONG EDGES OF SLUDGE LAGOONS AND FLOOD CONTROL CHANNEL. ONE LOCATION TRAPPED 6/4 TO 6/6, 1985 WITH ONE SMHM CAPTURE IN 450 TRAPNIGHTS. OTHER SITE TRAPPED 6/20 TO 6/22, 1985 WITH 10 CAPTURES IN 450 TRAPNIGHTS.

**Ecological:** MOST OF TRAPPING SITE SPARSELY VEGETATED WITH SALICORNIA AND/OR MIXED WITH GRASSES AND OTHER SALTMARSH VEGETATION.

**Threat:** FLOOD CONTROL CHANNEL.

**General:** AT FLOOD CONTROL CHANNEL SITE (NE PORTION OF THE SITE) 7 SMHM TRAPPED 10/1-5/1990.

**Owner/Manager:** SANTA CLARA VALLEY WATER DIST

## *Reithrodontomys raviventris*

salt-marsh harvest mouse

**Element Code:** AMAFF02040

**Status**
**Federal:** Endangered
**State:** Endangered

**NDDB Element Ranks**
**Global:** G1G2
**State:** S1S2

**Other Lists**
**CDFG Status:**

**Habitat Associations**
**General:** ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.
**Micro:** PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

**Occurrence No.** 147 **Map Index:** 37655 **EO Index:** 32657
**Occ Rank:** Poor
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** SHELLHAMMER, H. 1990 (OBS)

**Dates Last Seen**
**Element:** 1990-06-29
**Site:** 1990-06-29
**Record Last Updated:** 1997-12-08

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.45932° / -121.95146°
**UTM:** Zone-10 N4146344 E592732
**Area:** 19.8 ac
**Elevation:** 0 ft
**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POLYGON
**Township:** 05S
**Range:** 01W
**Section:** 34 **Qtr:** XX
**Meridian:** M

**Location:** NEWBY ISLAND MARSH, 2.5 MILES NE OF ALVISO, COYOTE CREEK AREA, SOUTH SAN FRANCISCO BAY.
**Location Detail:** SW DIKE ON NEWBY ISLAND MARSH.
**Ecological:** DIKE MAINLY OF NON-PERIPHERAL HALOPHYTE VEGETATION FAR FROM EXTENSIVE PICKLEWEED OR OTHER PERIPHERAL HALOPHYTES.
**General:** 2 CAPTURED 1990.
**Owner/Manager:** UNKNOWN

---

**Occurrence No.** 159 **Map Index:** 38008 **EO Index:** 33015
**Occ Rank:** Good
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** MONK, J. & S. LYNCH 1996 (OBS)

**Dates Last Seen**
**Element:** 1996-10-29
**Site:** 1996-10-29
**Record Last Updated:** 1998-02-02

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.46437° / -121.92785°
**UTM:** Zone-10 N4146928 E594814
**Radius:** 80 meters
**Elevation:** 5 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** 25 **Qtr:** XX
**Meridian:** M

**Location:** AT PG&E UTILITY TOWER ADJACENT TO HIGHWAY 880 AND FLOOD CONTROL CHANNEL B, APPROX 1000 FT NNE OF OLD FREMONT AIRPORT.
**Ecological:** SITE NO LONGER TIDALLY INFLUENCED, ALTHOUGH FLOOD CHANNEL B APPROX. 80 FT N IS. TOTAL PLANT COVER: SALCORNIA VIRGINICA ~40%, LOLIUM MULTIFLORUM ~20%, HARDEUM MARINUM ~20%, BARE GROUND ~18%.
**Threat:** BUSINESS PARK IMMEDIATELY NORTH OF CAPTURE SITE; THIS SITE IS PROPOSED FOR A NEW BUSINESS PARK.
**General:** 2 JUVENILES CAPTURED 1996.
**Owner/Manager:** PVT

---

**Occurrence No.** 160 **Map Index:** 40303 **EO Index:** 35310
**Occ Rank:** None
**Origin:** Natural/Native occurrence
**Presence:** Extirpated
**Trend:** Decreasing
**Main Source:** MONK, J. & S. LYNCH 1998 (OBS)

**Dates Last Seen**
**Element:** 1998-08-10
**Site:** 1998-08-10
**Record Last Updated:** 1998-12-03

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** SANTA CLARA

**Lat/Long:** 37.45434° / -121.92330°
**UTM:** Zone-10 N4145820 E595228
**Radius:** 80 meters
**Elevation:** 5 ft
**Mapping Precision** SPECIFIC
**Symbol Type:** POINT
**Township:** 05S
**Range:** 01W
**Section:** 36 **Qtr:** XX
**Meridian:** M

**Location:** WEST END OF DIXON LANDING ROAD, JUST WEST OF HWY 17, MILPITAS.
**Ecological:** HABITAT CONSISTS OF DIKED SALTMARSH, VEGETATED BY SALICORNIA AND DISTICHLIS; PILES OF CONCRETE RUBBLE PROVIDED HOUSE MOUSE HABITAT.
**Threat:** SITE LOST DUE TO WIDENING OF DIXON LANDING ROAD FOR MCCARTHY RANCH.
**General:** 1 ADULT AND 1 JUVENILE CAPTURED BETWEEN 3-10 AUGUST 1998. BOTH MICE WERE RELOCATED TO THE USFWS "WARM SPRINGS MOUSE PASTURE UNIT" OF DON EDWARDS S.F.BAY NWR.
**Owner/Manager:** PVT-MCCARTHY RANCH

---

## *Suaeda californica*

California seablite

**Element Code:** PDCHE0P020

**Status**
**Federal:** Endangered
**State:** None

**NDDB Element Ranks**
**Global:** G1
**State:** S1.1

**Other Lists**
**CNPS List:** 1B
**R-E-D Code:** 3-3-3

**Habitat Associations**
**General:** MARSHES AND SWAMPS.
**Micro:** MARGINS OF COASTAL SALT MARSHES. 0-5M.

**Occurrence No.** 14 **Map Index:** 49214 **EO Index:** 49214

**Occ Rank:** Unknown
**Origin:** Natural/Native occurrence
**Presence:** Presumed Extant
**Trend:** Unknown
**Main Source:** HECKARD, L. #6253 JEPS #86406 (HERB)

**Dates Last Seen**
**Element:** 1986-05-13
**Site:** 1986-05-13
**Record Last Updated:** 2002-10-30

**Quad Summary:** MILPITAS (3712148/427B)
**County Summary:** ALAMEDA

**Lat/Long:** 37.48161° / -121.96108°
**UTM:** Zone-10 N4148807 E591853
**Radius:** 1 mile
**Elevation:**

**Mapping Precision** NON-SPECIFIC
**Symbol Type:** POINT

**Township:** 05S
**Range:** 01W
**Section:** 22 **Qtr:** XX
**Meridian:** M

**Location:** NORTH OF MUD SLOUGH, EAST OF SP RAILROAD TRACKS, FREMONT, EAST OF SAN FRANCISCO BAY.

**Location Detail:** EXACT LOCATION UNKNOWN, MAPPED BY CNDDB NORTH OF MUD SLOUGH, EAST OF WESTERNMOST SP RAIL TRACKS, SOUTHWEST OF FREMONT.

**General:** MAIN SOURCE OF INFORMATION FOR THIS SITE IS 1986 COLLECTION BY HECKARD. 1951 COLLECTION BY SHARSMITH FROM "5 MILES N OF MILPITAS" IS ATTRIBUTED TO THIS SITE. NEEDS FIELDWORK.

**Owner/Manager:** UNKNOWN

# *Los Esteros Critical Energy Facility*

# *Appendix 8.3-A*
# *Native American Consultation Letters – LECEF Phase 1*

***December 2003***

STATE OF CALIFORNIA Gray Davis, Governor

**NATIVE AMERICAN HERITAGE COMMISSION**
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390
Web Site www.nahc.ca.gov

July 12, 2001

James C. Bard
CH2Mhill
2300 NW Walnut Blvd.
Corvallis, OR 97330-3538

RE: Proposed North San Jose Energy Center Application for Certification, Santa Clara County.

Sent By Fax: (541) 752-0276
Pages Sent: 3

Dear Mr. Bard:

A record search of the sacred lands file has failed to indicate the presence of Native American cultural resources in the immediate project area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Enclosed is a list of Native Americans individuals/organizations who may have knowledge of cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

# NATIVE AMERICAN CONTACTS
## Santa Clara County
## July 12, 2001

Ella Rodriguez
PO Box 1411
Salinas, CA 93902
(831) 632-0490

Ohlone/Costanoan
Esselen

Thomas P. Soto
PO Box 269
Foresthill, CA 95631
(530) 367-4402
(530) 367-5083

Ohlone/Costanoan

Jakki Kehl
5461 Beaver Lane
Byron, CA 94514
(925) 516-1670

Ohlone/Costanoan

Amah San Juan Band
Charles Higuera
1316 Buena Vista Ave.
Pacific Grove, CA 93950
(831) 375-9581 - work
(831) 375-5045- home
matuzwest@aol,com

Ohlone/Costanoan

Katherine Erolinda Perez
1234 Luna Lane
Stockton, CA 95206
(209) 941-1900 work

Ohlone/Costanoan
Northern Valley Yokut

Bay Miwok

Amah San Juan Band
Marion Martinez
26206 Coleman Avenue
Hayward, CA 94544
(510) 732-6806 - home
comncompy@hotmail.com - email

Ohlone/Costanoan

Marjorie Ann Reid
19279 Lexington Lane
Redding, CA 96003

Ohlone/Coastanoan

Amah/MutsunTribal Band
Irene Zwierlein
789 Canada Road
Woodside, CA 94062
(650) 851-7747 - Home
(650) 851-7489 - Fax
(408) 364-1393 - Cell

Ohlone/Costanoan

Michelle Zimmer
4952 McCoy Avenue
San Jose, CA 95130
(408) 364-1391 - Home
(408) 364-1393 - Fax
(408) 210-8061 - Cell

Ohlone/Costanoan

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayer, Chairperson
P.O. Box 28
Hollister, CA 95024-0
(510) 637-4238

Ohlone/Costanoan

**This list is current only as of the date of this document.**

**Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.**

**This list is only applicable for contacting local Native Americans with regards to the cultural assessment for the proposed North San Jose Energy Center Application for Certification, Santa Clara County.**

# NATIVE AMERICAN CONTACTS
## Santa Clara County
## July 12, 2001

The Ohlone Indian Tribe
Andrew Galvan
PO Box 3152 Ohlone/Costanoan
Mission San Jose , CA 94539
(510) 656-0787 - Voice
(510) 882-0527 - Cell
(510) 656-0780 - Fax
chochenyo@AOL.com

Trina Marine Ruano Family
Ramona Garibay, Representative
37974 Canyon Hts. Drive Ohlone/Costanoan
Fremont, CA 94536
(510) 792-1642
(510) 673-5029 - Cell

**This list is current only as of the date of this document.**

**Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.**

**This list is only applicable for contacting local Native Americans with regards to the cultural assessment for the proposed North San Jose Energy Center Application for Certification, Santa Clara County.**

# *Los Esteros Critical Energy Facility*

# *Appendix 8.3-B*
# *Native American Consultation Letters – LECEF Phase 2*

***December 2003***

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

**NATIVE AMERICAN HERITAGE COMMISSION**
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

December 23, 2003

Douglas Davey
Tetra Tech FW, Inc.
3947 Lennane Drive, Suite 200
Sacramento, CA 95834

RE: Native American Contact List: Los Esteros Critical Energy Facility, Santa Clara County

SENT VIA FAX: (916) 928-0594
# of Pages: 3

Dear Mr. Davey:

I recommend that you contact the Native Americans contacts on the attached list for this project. They may be able to provide input concerning the project site and assist in the mitigation measures. It is with the understanding that the list is to be used only to determine possible areas of cultural sensitivity

The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest that all of those indicated be contacted, if they cannot supply information, they may recommend others with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

# NATIVE AMERICAN CONTACTS
## Santa Clara County
## December 23, 2003

Amah/MutsunTribal Band
Irene Zwierlein, Chairperson
789 Canada Road
Woodside , CA 94062
(650) 851-7747 - Home
(650) 851-7489 - Fax
(408) 364-1393 - Cell

Ohlone/Costanoan

Trina Marine Ruano Family
Ramona Garibay, Representative
16101 5th Street
Lathrop , CA 95330
(510) 792-1642
(510) 673-5029 - Cell

Ohlone/Costanoan
Bay Miwok
Plains Miwok
Patwin

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28
Hollister , CA 95024
(831) 637-4238

Ohlone/Costanoan

The Ohlone Indian Tribe
Andrew Galvan
PO Box 3152
Mission San Jose , CA 94539
(510) 656-0787 - Voice
(510) 882-0527 - Cell
(510) 656-0780 - Fax
chochenyo@AOL.com

Ohlone/Costanoan
Bay Miwok
Plains Miowk
Patwin

Thomas P. Soto
Howard S. Soto
P.O. Box 56802
Hayward , CA 94541
(530) 889-2444
sotoland@sbcglobal.net
(510) 733-6158 Fax
hss001@aol.com

Ohlone/Costanoan

**This list is current only as of the date of this document.**

**Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.**

**This list is only applicable for contacting local Native Americans with regards to cultural resources assessment for the proposed Los Esteros Critical Enenergy Facility, Santa Clara County**

# NATIVE AMERICAN CONTACTS
## Santa Clara County
## December 23, 2003

Ella Rodriguez
PO Box 1411
Salinas , CA 93902
(831) 632-0490 - home
(831) 261-5827 - cell

Ohlone/Costanoan
Esselen

Amah San Juan Band
Marion Martinez
26206 Coleman Avenue
Hayward , CA 94544
(510) 732-6806 - home
comncompy@hotmail.com - email

Ohlone/Costanoan

Jakki Kehl
720 North 2nd Street
Patterson , CA 95363
(209) 892-2436
(209) 892-2435 - Fax
jakki@bigvalley.net

Ohlone/Costanoan

Amah San Juan Band
Quirina Luna
3534 Katie Lane
Ceres , CA 95307
(209) 204-4554

Ohlone/Costanoan

Katherine Erolinda Perez
1234 Luna Lane
Stockton , CA 95206
(209) 462-2680

Ohlone/Costanoan
Northern Valley Yokut
Bay Miwok

Amah San Juan Band
Valentin Lopez
3095 Eastern Ave
Sacramento , CA 95821
(916) 481-5785

Ohlone/Costanoan

Amah San Juan Band
Edward Ketchum
35867 Yosemite Ave
Davis , CA 95616
aerieways@aol.com

Ohlone/Costanoan
Northern Valley Yokut

Amah/Mutsun Tribal Band
Michelle Zimmer
4952 McCoy Avenue
San Jose , CA 95130
(408) 378-7705

Ohlone/Costanoan

**This list is current only as of the date of this document.**

**Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.**

**This list is only applicable for contacting local Native Americans with regards to cultural resources assessment for the proposed Los Esteros Critical Enenergy Facility, Santa Clara County**

TETRA TECH FW, INC.

December 16, 2003
SO-2832-121603-DD

Ms. Debbie Pilas-Treadway
Native American Heritage Commission
915 Capital Mall, Room 364
Sacramento, California 95814

SUBJECT: REQUEST FOR NATIVE AMERICAN REFERRALS AND SACRED LANDS FILE REVIEW FOR THE LOS ESTEROS CRITICAL ENERGY FACILITY (LECEF) IN SANTA CLARA COUNTY, CALIFORNIA

Dear Ms. Pilas-Treadway:

The Los Esteros Critical Energy Facility (LECEF) is a 180 megawatt natural gas-fired peaking power plant located in north San Jose, California at 800 Thomas Foon Chew Way just north of State Route 237 near Coyote Creek (see attached map). The LECEF consists of four simple-cycle combustion turbine generators and associated equipment on a 21-acre site.

The LECEF was constructed and became operational in March 2003. Calpine Corporation will be seeking approval from the California Energy Commission (CEC) to continue operation of the LECEF, and to convert and operate the simple-cycle LECEF to a more efficient combined-cycle generation facility. For this combined-cycle conversion, Calpine would add a steam turbine-generator, six-cell cooling tower, and ancillary equipment. Construction of these additional facilities would require disturbance within the fenceline of the existing 21-acre facility site, and the use of an adjacent, 13-acre parcel for a construction laydown area. There would be no new pipelines or other linear facilities associated with the combined-cycle conversion.

You previously conducted a record search of the Sacred Lands Inventory for the LECEF. In a letter to CH2M Hill dated July 12, 2001 you responded that: "A record search of the sacred lands file failed to indicate the presence of Native American and cultural resources in the immediate project area," and you provided a list of Native American individuals or organizations who may have knowledge of cultural resources in the project area.

We are requesting that you provide us with the names and addresses of potentially affected and interested Native American individuals and organizations to include in a mailing list for notification of the project. Please also notify us if there are any locations that are included in your Sacred Lands Inventory within the project vicinity.

3947 Lennane Drive, Suite 200, Sacramento, CA 95834
Tel 916.928.0202 Fax 916.928.0594
www.ttfwi.com

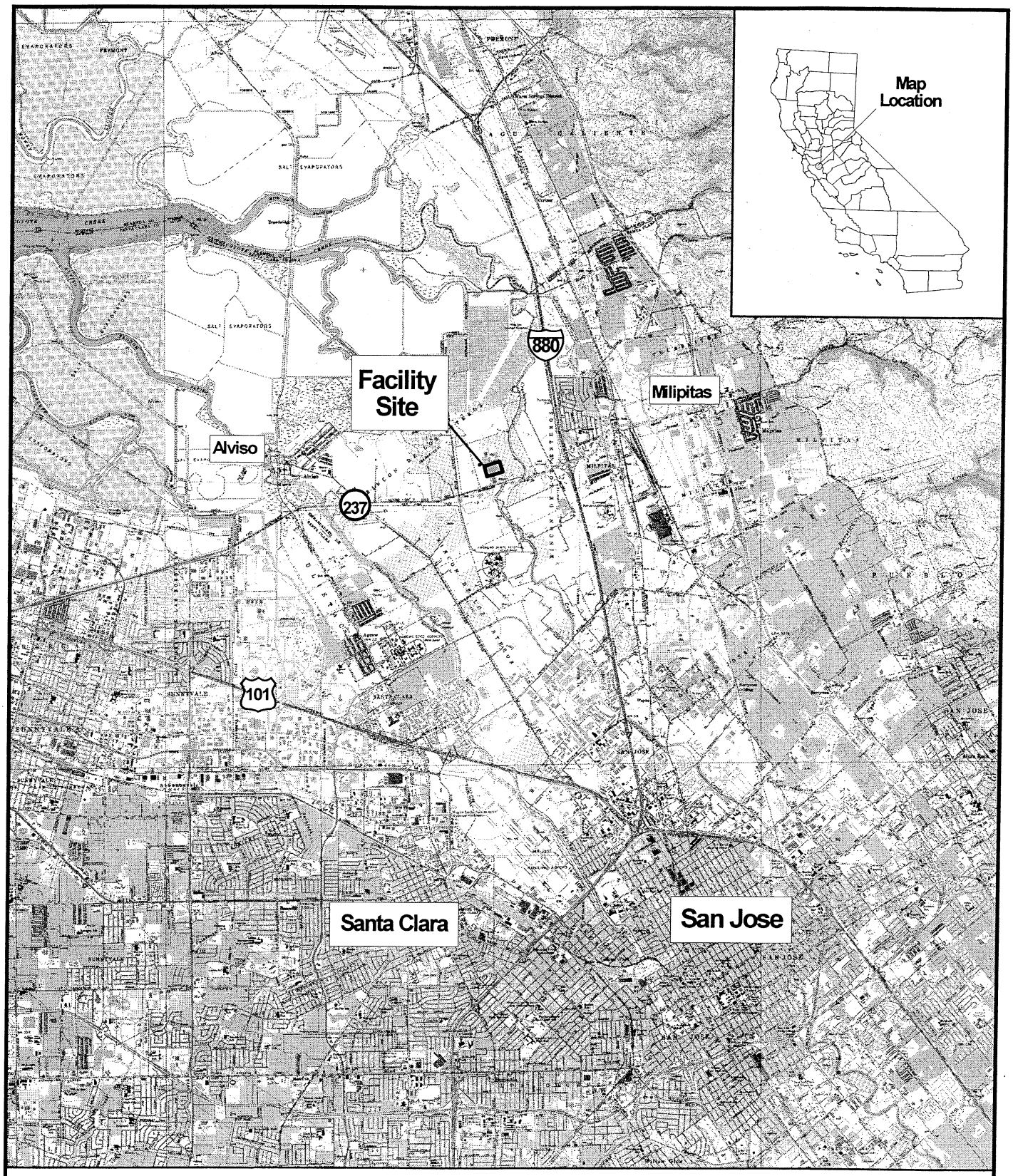
The project is located in the USGS 7.5-minute Milpitas quadrangle, in the Rincon de Los Esteros land grant. The geographical location is: Township 6 South, Range 1 West; Latitude 37° 25'30", Longitude 121° 55' 50"; UTM zone 10, easting 594,500, northing 4,142,530 (NAD 27, UTM Zone 10).

Please reference the Los Esteros Critical Energy Facility (LECEF) in your correspondence, and send the information to Tetra Tech FW, Incorporated; 3947 Lennane Drive, Suite. 200; Sacramento, CA 95834 or fax it to (916) 928-0594. Please contact me at ddavy@ttfwi.com if you have any questions. We greatly appreciate your immediate attention to this matter.

Sincerely,

Douglas Davy
Project Manager

Attachment




**Legend**

Project Site

N

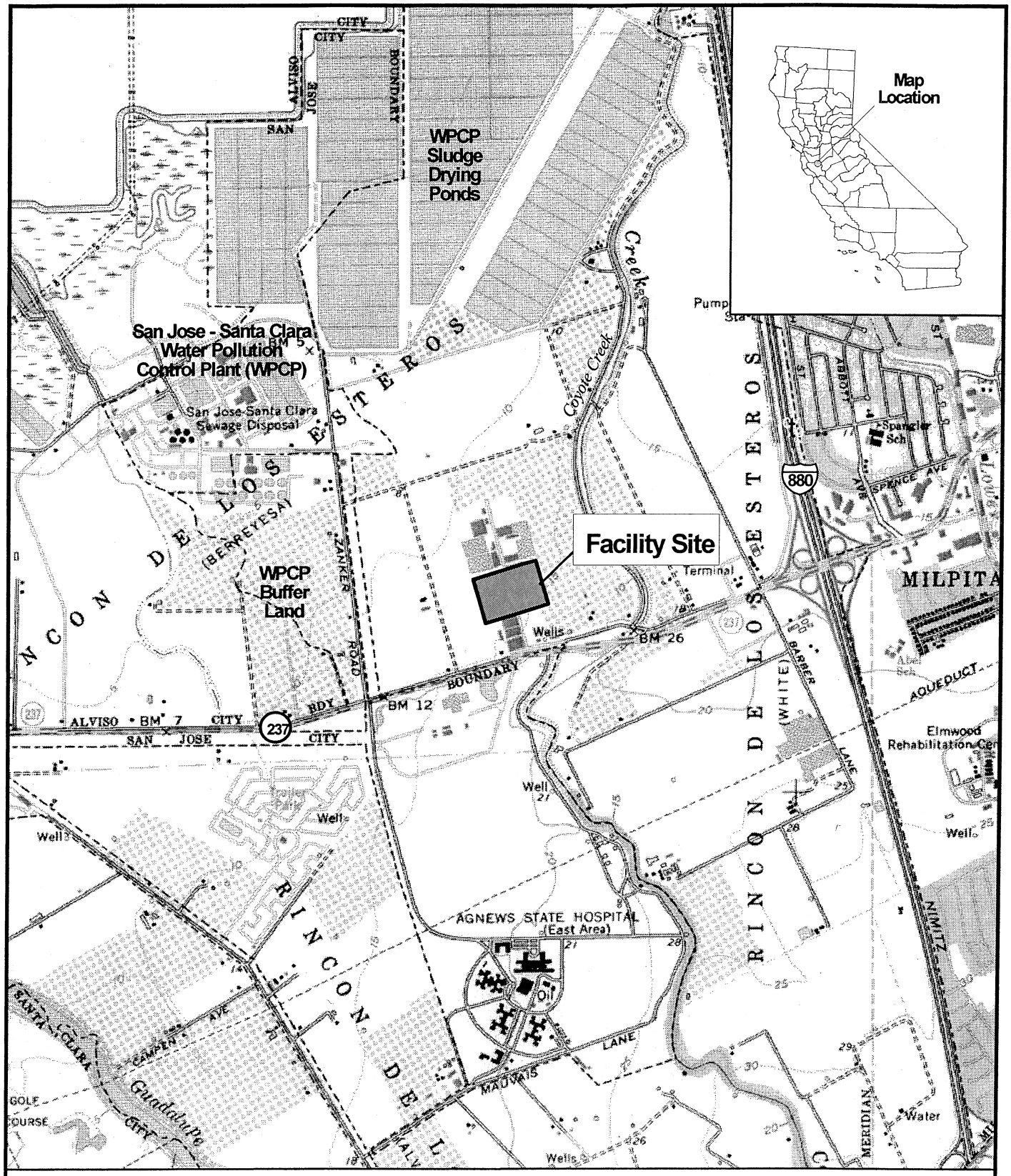
5000 0 5000 Feet

1:100000

**Figure 1.1-1**
**General Vicinity**

**Calpine Corporation**
**Los Esteros Critical Energy Facility**

I:/Calpine Los Esteros CEF/Los Esteros GIS/San_Jose/basemap.apr




Legend

Project Site

N

1000 0 1000 Feet

1:24000

**Figure 1.1-2**
**Site Location**

**Calpine Corporation**
**Los Esteros Critical Energy Facility**

q:/projects_2003/sanJose/basemap.apr

# *Los Esteros Critical Energy Facility*

## *Appendix 8.5-A*
## *Material Safety Data Sheets –*
## *LECEF Phase 1*

***December 2003***

# AMMONIUM HYDROXIDE (10 - 35% NH3)

**MSDS Number: A5916 --- *Effective Date: 03/04/99***

## 1. Product Identification

**Synonyms:** Ammonium hydroxide solutions; ammonia aqueous; ammonia solutions
**CAS No.:** 1336-21-6
**Molecular Weight:** 35.05
**Chemical Formula:** NH4OH in H2O
**Product Codes:**
J.T. Baker: 4807, 5019, 5350, 5358, 5604, 5817, 5820, 5838, 5891, 7847, 9718, 9719, 9721, 9730, 9731, 9733, 9741, 9742
Mallinckrodt: 0124, 0127, 1177, 3248, 3256, 5318, 6665, H007, H010, H893, H894, V044, V066, V592, V649, V893

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Ammonium Hydroxide | 1336-21-6 | 21 - 72% | Yes |
| Water | 7732-18-5 | 28 - 79% | No |
| Contains between 10 and 35% ammonia. | | | |

## 3. Hazards Identification

**Emergency Overview**
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**POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)
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Health Rating: 3 - Severe (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)
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**Potential Health Effects**
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**Inhalation:**
Vapors and mists cause irritation to the respiratory tract. Higher concentrations can cause burns, pulmonary edema and death. Brief exposure to 5000 ppm can be fatal.
**Ingestion:**
Toxic! May cause corrosion to the esophagus and stomach with perforation and peritonitis. Symptoms may include pain in the mouth, chest, and abdomen, with coughing, vomiting and collapse. Ingestion of as little as 3-4 mL may be fatal.
**Skin Contact:**
Causes irritation and burns to the skin.
**Eye Contact:**
Vapors cause irritation. Splashes cause severe pain, eye damage, and permanent blindness.
**Chronic Exposure:**
Repeated exposure may cause damage to the tissues of the mucous membranes, upper respiratory tract, eyes and skin.
**Aggravation of Pre-existing Conditions:**
Persons with pre-existing eye disorders or impaired respiratory function may be more susceptible to the effects of this material.

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# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.
**Eye Contact:**
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately. Immediate action is critical to minimize possibility of blindness.

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# 5. Fire Fighting Measures

**Fire:**

Autoignition temperature: 651C (1204F)
Flammable limits in air % by volume:
lel: 16; uel: 25
**Explosion:**
Flammable vapors may accumulate in confined spaces.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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# 6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 42 they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
-OSHA Permissible Exposure Limit (PEL):
50 ppm (NH3)
-ACGIH Threshold Limit Value (TLV):
25 ppm (NH3) (TWA) 35 ppm (STEL)
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded, a full facepiece respirator with an ammonia/methylamine cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials. Polyvinyl alcohol is not recommended.
**Eye Protection:**
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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# 9. Physical and Chemical Properties

**Appearance:**
Clear, colorless solution.
**Odor:**
Ammonia odor.
**Solubility:**
Infinitely soluble.
**Specific Gravity:**
0.9 (28% NH4OH)
**pH:**
11.6 (1.0N)
**% Volatiles by volume @ 21C (70F):**
No information found.
**Boiling Point:**
ca. 36C (ca. 97F)
**Melting Point:**
-72C (-98F)
**Vapor Density (Air=1):**
0.60 NH3
**Vapor Pressure (mm Hg):**
115 @ 20C (68F)
**Evaporation Rate (BuAc=1):**
No information found.

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# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Burning may produce ammonia, nitrogen oxides.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Acids, acrolein, dimethyl sulfate, halogens, silver nitrate, propylene oxide, nitromethane, silver oxide, silver permanganate, oleum, beta-propiolactone. Most common metals.
**Conditions to Avoid:**
Heat, sunlight, incompatibles, sources of ignition.

# 11. Toxicological Information

For ammonium hydroxide:
oral rat LD50: 350 mg/kg; eye, rabbit, standard Draize, 250 ug; severe, investigated as a mutagen.
For ammonia:
inhalation rat LC50: 2000 ppm/4-hr; investigated as a tumorigen, mutagen.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | No | No | None |
| Water (7732-18-5) | No | No | None |

# 12. Ecological Information

**Environmental Fate:**
This material is not expected to significantly bioaccumulate.
**Environmental Toxicity:**
This material is expected to be very toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l. The EC50/48-hour values for daphnia are less than 1 mg/l.

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
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**Proper Shipping Name:** AMMONIA SOLUTIONS (WITH 10-35% AMMONIA)
**Hazard Class:** 8
**UN/NA:** UN2672

Packing Group: III
**Information reported for product/size:** 385LB

**International (Water, I.M.O.)**
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**Proper Shipping Name:** AMMONIA SOLUTIONS (WITH 10-35% AMMONIA)
**Hazard Class:** 8
**UN/NA:** UN2672
Packing Group: III
**Information reported for product/size:** 385LB

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# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia | |
|---|---|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | Yes | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes | |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | No | No | No | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | 1000 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 2P
**Poison Schedule:** S6
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **1** Reactivity: **0**

**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. IMMEDIATE ACTION IS ESSENTIAL FOR EYE EXPOSURES. In all cases call a physician immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 8.
**Disclaimer:**
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**Prepared by:** Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

The MSDS format adheres to the standards and regulatory requirements of Canada and may not meet regulatory requirements in other countries.



"SUVA" 123
CEF00123 Revised 31-OCT-2003

## CHEMICAL PRODUCT/COMPANY IDENTIFICATION

### Material Identification

Corporate MSDS Number : DU002798
CAS Number : 306-83-2
Formula : CHCl2CF3
CAS Name : 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123)

### Product Use

Refrigerant

### Tradenames and Synonyms

DICHLOROTRIFLUOROETHANE
"SUVA" 123
Refrigerant
SUVA(R) is a registered trademark of E.I. du Pont de Nemours and Company. DuPont Canada Inc. is a licensee.

### Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Canada, Inc.
P.O. Box 2200
Streetsville
Mississauga, Ontario L5M 2H3

PHONE NUMBERS
Product Information : 1-800-387-2122
Transport Emergency : 1-613-348-3616 (24 HOURS)
Medical Emergency : 1-613-348-3616 (24 HOURS)

## COMPOSITION/INFORMATION ON INGREDIENTS

### Components

| Material | CAS Number | % |
|---|---|---|
| *ETHANE, 2,2-DICHLORO-1,1,1-TRIFLUORO- (HCFC 123) | 306-83-2 | 100 WT% |

* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

## HAZARDS IDENTIFICATION

### Potential Health Effects

HCFC-123

Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse or deliberate inhalation may cause death without warning. Vapor reduces oxygen available for breathing and is heavier than air. Product causes mild eye irritation. Decomposition products are hazardous.

HEALTH HAZARDS:

Eye contact may cause irritation with discomfort, tearing, or blurring of vision.

Overexposure by inhalation may cause liver damage with altered enzyme levels, and temporary nervous system depression with anesthetic effects such as dizziness, weakness, headache, confusion, incoordination, and loss of consciousness. With overexposure (>2%), possibly temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation.

Increased susceptibility to the effects of this material may observed in persons with pre-existing disease of the central nervous system, cardiovascular system, and liver.

### Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

## FIRST AID MEASURES

### First Aid

INHALATION

If high concentrations are inhaled, immediately remove to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

In case of contact, flush with water. Get medical attention if irritation is present.

EYE CONTACT

(FIRST AID MEASURES - Continued)

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

Material poses an aspiration hazard. If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration.

Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS. Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

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## FIRE FIGHTING MEASURES

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Flammable Properties

Flash Point : No flash point

Flammable Limits in air, % by Volume:
LEL : None per ASTM E681
UEL : None per ASTM E681
Autoignition: Not determined

Fire and Explosion Hazards:

Containers may rupture under fire conditions. Decomposition may occur.

Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and color of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limits, therefore, stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames.

HCFC-123 is not flammable in air at temperatures up to 100 deg. C (212 deg. F) at atmospheric pressure. However, mixtures of HCFC-123 with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. HCFC-123 can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing HCFC-123 and air, or HCFC-123 in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure,

(FIRE FIGHTING MEASURES - Continued)

and 3) the proportion of oxygen in the mixture. In general, HCFC-123 should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example, HCFC-123 should NOT be mixed with air under pressure for leak testing or other purposes.

Extinguishing Media

Use media appropriate for surrounding material.

Fire Fighting Instructions

Cool tank/container with water spray. Self-contained breathing apparatus (SCBA) is required if drums rupture and contents are spilled under fire conditions.

Water runoff should be contained and neutralized prior to release.

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ACCIDENTAL RELEASE MEASURES

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Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Ventilate spill area.

DuPont Emergency Exposure Limits (EEL) are established to facilitate site or plant emergency evacuation and specify airborne concentrations of brief durations which should not result in permanent adverse health effects or interfere with escape. EEL's are expressed as airborne concentration multiplied by time (CxT) for up to a maximum of 60 minutes and as a ceiling airborne concentration. These limits are used in conjunction with engineering controls/monitoring and as an aid in planning for episodic releases and spills. For more information on the applicability of EEL's, contact DuPont.

The DuPont Emergency Exposure Limit (EEL) for HCFC-123 is 1000 ppm for up to 60 minutes with a 1 minute not-to-exceed ceiling of 2500 ppm.

Initial Containment

Dike spill. Prevent material from entering sewers, waterways, or low areas.

(ACCIDENTAL RELEASE MEASURES - Continued)

Spill Clean Up

Collect on absorbent material and transfer to steel drums for recovery/disposal. Comply with Federal, State, and local regulations for reporting releases.

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## HANDLING AND STORAGE

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Handling (Personnel)

Avoid breathing high concentrations of vapor. Provide adequate ventilation for storage, handling, and use, especially for enclosed or low spaces. Avoid contact of liquid with eyes and prolonged skin exposure.

Handling (Physical Aspects)

Do not allow product to contact open flame or electrical heating elements because dangerous decomposition products may form.

Storage

Store in a clean, dry place.

Do not heat above 52 deg C to avoid over pressurizing the container.

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## EXPOSURE CONTROLS/PERSONAL PROTECTION

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Engineering Controls

Use only with adequate ventilation. Keep container tightly closed. Vapors are heavier than air posing a hazard of asphyxia if they are trapped in enclosed or low places.

Personal Protective Equipment

EYE/FACE PROTECTION

Wear safety glasses or coverall chemical splash goggles.

RESPIRATORS

Where there is potential for airborne exposures in excess of applicable limits, wear NIOSH/MSHA approved respiratory protection.

PROTECTIVE CLOTHING

Where there is potential for skin contact have available and wear as appropriate impervious gloves, apron, pants, and jacket.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

# Exposure Guidelines

Exposure Limits
"SUVA" 123

| | | |
|---|---|---|
| PEL | (OSHA) | : None Established |
| TLV | (ACGIH) | : None Established |
| AEL * | (DuPont) | : 50 ppm, 8 & 12 Hr. TWA |
| WEEL | (AIHA) | : 50 ppm, 8 Hr. TWA |

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

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## PHYSICAL AND CHEMICAL PROPERTIES

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Physical Data

| | |
|---|---|
| Boiling Point | : 27.6 C (81.7 F) @ 760 mm Hg |
| Vapor Pressure | : 13 psia @ 25 C (77 F) |
| Vapor Density | : 5.3 (Air=1.0) |
| % Volatiles | : 100 WT% |
| Evaporation Rate | : <1 ($CCl_4$=1.0) |
| Solubility in Water | : 0.39 WT% @ 25 C (77 F) |
| pH | : Neutral |
| Odor | : Ether (slight). |
| Form | : Liquid. |
| Color | : Clear, Colorless. |
| Liquid Density | : 1.46 g/cm3 @ 25 C (77 F) |

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## STABILITY AND REACTIVITY

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Chemical Stability

Stable.

Conditions to Avoid

Avoid open flames and high temperatures.

Incompatibility with Other Materials

Incompatible with alkali or alkaline earth metals - powdered Al, Zn, Be, etc.

Decomposition

Decomposition products are hazardous. This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids, and possibly carbonyl halides.

(STABILITY AND REACTIVITY - Continued)

These materials are toxic and irritating. Contact should be avoided.

Polymerization

Polymerization will not occur.

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TOXICOLOGICAL INFORMATION

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Animal Data

HCFC-123

Dermal ALD, rabbit: >2000 mg/kg
Oral ALD, rat: 9000 mg/kg
Inhalation 4 hour, LC50, rat: 32,000 ppm

Animal testing indicates that HCFC-123 is not a skin irritant or skin sensitizer, but is a mild to moderate eye irritant.

Toxic effects noted in animals from single exposure by inhalation at concentrations of 5000 ppm or greater include effects on unconditioned reflexes, locomotor activity and coordination, suggesting anesthetic effects. Single inhalation exposures caused central nervous system effects, such as anesthesia, and nonspecific clinical signs and organ pathology changes. Cardiac sensitization occurred in dogs at concentrations of 20,000 ppm and greater.

Repeated exposures to 300 ppm and higher resulted in decreased cholesterol, triglycerides or glucose, and increased urinary fluoride levels. At 5000 ppm or greater, anesthetic effects, reduced lymphocyte counts, organ weight changes, including increased liver weight, and enzyme alterations, and decreased body weight gain were observed. Exposure to dogs, guinea pigs or monkeys at 1000 ppm or greater induced slight or mild liver damage. HCFC-123 was not neurotoxic in animals repeatedly exposed by inhalation at concentrations up to 5,000 ppm, but did cause a slight decrease in arousal at this concentration.

Long-term exposure caused decreased body weight, decreased cholesterol, triglycerides and glucose, and increased urinary fluoride concentrations in rats. Inhalation of 300, 1000 or 5000 ppm for two years caused an increase in benign testicular tumors in male rats. An increase in benign pancreatic and liver tumors was observed in rats exposed to 1000 or 5000 ppm. The tumors were late-occurring and none were judged to be life-threatening. The biological significance of these tumors to man is considered to be limited. Additionally, evidence of retinal atrophy was observed in this two-year study in both treated and control

(TOXICOLOGICAL INFORMATION - Continued)

animals, although the toxicological significance is undetermined.

Animal data indicate that HCFC-123 does not affect reproductive performance in rats or harm the unborn animal. HCFC-123 does not produce genetic damage in bacterial cell cultures or in animals. In two studies, genetic damage was produced in mammalian cell cultures, but did not produce genetic damage in another study. Overall weight of evidence indicates that HCFC-123 is not mutagenic.

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## ECOLOGICAL INFORMATION

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### Ecotoxicological Information

AQUATIC TOXICITY:
Slightly toxic.
96 hour LC50 - Fathead minnows: > 77 mg/L

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## DISPOSAL CONSIDERATIONS

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### Waste Disposal

Recover by distillation or remove to a permitted waste disposal facility. Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations.

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## TRANSPORTATION INFORMATION

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### Shipping Information

Not regulated as a hazardous material by DOT or IMO.

Shipping Containers

Tank Cars.
Tank Trucks.
Pails.
Drums.

### Shipping Information -- Canada

This material is Not Regulated.

## REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : Yes
Fire : No
Reactivity : No
Pressure : No

HAZARDOUS CHEMICAL LISTS

SARA Extremely
Hazardous Substance - No
CERCLA Hazardous Substance - No
SARA Toxic Chemical - See Components Section

Canadian Regulations

CEPA Status : Compliant.

WHMIS Classification:

This is not a WHMIS Controlled Product.

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

## OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 1
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS

(Continued)

FLUOROPRODUCTS
DuPont Canada Inc.
Box 2200, Streetsville
Mississauga, Ontario, L5M 2H3
(905) 821-5925.

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS

**Ergon Refining, Inc.**
*a company that works*

# *Material Safety Data Sheet*

**HYVOLT II**

Date of Preparation: June 5, 2003

## Section 1 - Chemical Product and Company Identification

**Product Name:** Hyvolt II
**Chemical Name:** Severely Hydrotreated Light Naphthenic Distillate
**Chemical Family:** Petroleum Distillate
**Chemical Formula:** Not Applicable
**CAS Number:** 64742-53-6
**Other Designations:** Contains Oil
**Manufacturer:** Ergon Refining, Inc., P.O. Box 309, Vicksburg, MS 39181
**Company Contact:** Will Poe, Phone (601) 630-8319

**EMERGENCY TELEPHONE NUMBERS:**
Ergon Refining, Inc. (601) 638-4960 Normal Business Hours
Chemtrec (800) 424-9300 After Business Hours

## Section 2 - Composition / Information on Ingredients

A complex combination of hydrocarbons obtained by treating a petroleum fraction with hydrogen in the presence of a catalyst. It consists of hydrocarbons having carbon numbers predominantly in the range of C15 through C30 and produces finished oil with a viscosity near 60 SUS @ 100°F (9 cSt @ 40°C).

| Ingredient Name | CAS Number | % |
|---|---|---|
| Severely Hydrotreated Light Naphthenic Petroleum Oil | 64742-53-6 | > 99.7 |
| Butylated Hydroxytoluene (BHT) or 2,6-Di-*tert*-butyl-*p*-cresol (DBPC) | 128-37-0 | < 0.3 |

**Trace Impurities:**

| Ingredient | OSHA PEL TWA | OSHA PEL STEL | ACGIH TLV TWA | ACGIH TLV STEL | NIOSH REL TWA | NIOSH REL STEL | NIOSH IDLH |
|---|---|---|---|---|---|---|---|
| Severely Hydrotreated Light Naphthenic Petroleum Oil | 5 mg/m$^3$ (oil mist) | None estab. | 5 mg/m$^3$ (oil mist) | 10 mg/m$^3$ (oil mist) | none estab. | none estab. | none estab. |

## Section 3 - Hazards Identification

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆
**Not Expected to cause a severe emergency hazard.**

**HMIS**
**H** 1
**F** 1
**R** 0
**PPE**† B
†Sec. 8

### Potential Health Effects

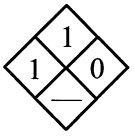
**Primary Entry Routes:** Skin
**Inhalation**: Inhalation of vapors or mist may be irritating to respiratory passages. Prolonged exposure may result in dizziness and nausea. Target Organ for mineral oil mist is lungs.
**Eye:** Eye contact may result in slight irritation and redness.
**Skin:** Short term contact with skin is unlikely to cause any problems; excessive or prolonged and repeated contact and poor hygiene conditions may result in dryness, dermatitis, erythema, oil acne, cracking and defatting of the skin.
**Ingestion:** May result in nausea or stomach discomfort.
**Carcinogenicity:** Based on OSHA 1910.1200 and IARC study requirements, this product does not require labeling. Meets EU requirement of less than 3% (w/w) DMSO extract for total polycyclic aromatic compound (PAC) using IP 346. NTP and OSHA do not list this product as a potential carcinogen.
**Mutagenicty:** This product gives negative mutagenic results from Modified Ames Assay.
**Medical Conditions Aggravated by Long-Term Exposure:** Personnel with pre-existing skin disorders should avoid contact with this product.

## Section 4 - First Aid Measures

**Eye Contact:** Wash with water. If irritation or redness persists seek medical help.
**Skin Contact:** Wash thoroughly with soap and water. Remove contaminated clothing. Reuse only after cleaning.
**Inhalation:** Remove to fresh air. Assist breathing if necessary. Seek medical help.
**Aspiration:** If there is any suspicion of aspiration into the lungs obtain medical advise.
**Ingestion:** If swallowed, observe for signs of stomach discomfort or nausea. If symptoms persist, seek medical help. Do not induce vomiting.

## Section 5 - Fire-Fighting Measures

NFPA




**Flash Point:** > 295°F ( > 145 °C)
**Flash Point Method:** COC
**Burning Rate:** Not available
**Autoignition Temperature:** > 600 °F (> 315 °C)
**Lower Explosive Level (LEL):** Not determined
**Upper Explosive Limit (UEL):** Not determined
**Flammability Classification:** OSHA Class III-B Combustible Liquid
**Extinguishing Media:** Halon, dry chemical, foam, CO2 and water mist or fog. Water may be used to cool below flash point.
**Unusual Fire or Explosion Hazards:** Do not use forced stream as this could cause fire to spread.
**Combustion Products:** Fumes, smoke and carbon monoxide.
**Fire-Fighting Instructions and Equipment:** Use water to cool containers exposed to flames. Do not enter enclosed or a confined workspace without proper protective equipment. Fire fighting personnel should wear respiratory protection (positive pressure if available).

## Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Stop spill at source if possible without risk. Contain spill. Eliminate sources of ignition. Spill area will be slick. Recover all possible material for reclamation. Use non-flammable absorbent material to pick up remainder of spill.

**Spill to Navigable Waters:** If this material is spilled into navigable waters and creates a visible sheen, it is reportable to the National Response Center.

## Section 7 - Handling and Storage

**Handling and Storage Precautions:** Keep away from flames, sparks or hot surfaces. Never use a torch to cut or weld on or near container. Empty oil containers can contain explosive vapors. NFPA Class IIIB storage. Wash thoroughly after handling.

**Work / Hygienic Practices:** Wash hands with soap and water before eating, drinking, smoking or use of toilet facilities. Do not use gasoline, solvents, kerosene, or harsh abrasive skin cleaners for washing exposed skin areas. Take a shower after work if general contact occurs. Remove oil-soaked clothing and launder before reuse. Discard contaminated shoes and leather gloves.

**Shelf Life**: Product should be stored in clean, dry containers at ambient temperatures and it should remain stable with exception of slight color stability loss unless it is contaminated.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Adequate ventilation is required where excessive heating or agitation may occur to maintain concentration below exposure limits.
**Eye / Face Protection:** Safety glasses or face shield where splashing is possible.
**Skin Protection:** As needed to prevent repeated skin contact. Solvent resistant gloves should be used if needed.
**Respiratory Protection:** Not Normally Needed. Respirator should be used in areas where vapor concentrations are excessive due to high temperatures or where oil misting occurs.

## Section 9 - Physical and Chemical Properties

**Physical State:** Liquid
**Appearance:** Clear & bright
**Color:** Water white to pale
**Odor:** Mild Petroleum Odor
**Odor Threshold:** Not determined
**Vapor Pressure:** Not applicable
**Vapor Density (Air=1):** > 5
**Specific Gravity ($H_2O$=1):** 0.88

**Water Solubility:** Nil
**Boiling Point:** 500-700°F (260-370°C)
**Melting Point:** - 65°F ( - 55°C)
**% Volatile:** Nil LVP-VOC
**Evaporation Rate:** Not available
**pH:** Not applicable

## Section 10 - Stability and Reactivity

**Stability:** Stable
**Polymerization:** Polymerization will not occur.
**Chemical Incompatibilities:** Strong Oxidizers.
**Conditions to Avoid (Stability):** Sources of ignition.
**Hazardous Decomposition Products:** Combustion products include carbon dioxide and carbon monoxide.

## Section 11- Toxicological Information

**Acute Studies:** Tests on similar materials show a low order of acute oral and dermal toxicity.

**Eye Effects:** Minimal irritation on contact.

**Skin Effects:** Practically non-toxic if absorbed. May cause mild irritation with prolonged and repeated exposure.

**Acute Oral Effects:** Tests on similar materials indicate low order of acute oral toxicity.

**Acute Inhalation Effects:** Low acute toxicity expected on inhalation.

This product is severely hydrotreated. Severely hydrotreated naphthenic petroleum oils have not been found to be carcinogenic or potential carcinogens.

## Section 12 - Ecological Information

Aquatic Release: Advise authorities if product has entered or may enter watercourses or sewer drains.

## Section 13 - Disposal Considerations

Follow Federal, State, and Local regulations. Not a RCRA hazardous waste if uncontaminated. If "used", RCRA criteria must be determined. Do not flush to drain / storm sewer. Contract to authorized disposal service. If permitted incineration may be practical. Consider recycling.

## Section 14 - Transport Information

**Proper Shipping Name:** Not regulated by DOT (Contains Oil)
**Hazard Class:** Not Applicable
**DOT ID No.:** Not Applicable
**DOT Shipping Label:** Not regulated by DOT

## Section 15 - Regulatory Information

**U.S. Federal Regulatory Information:**

CERCLA / SARA

| | | |
|---|---|---|
| 302/303/304 Categories: | Extremely Hazardous Substances | None |
| 311/312 Categories: | Immediate (Acute) Health Effects | No |
| | Delayed (Chronic) Health Effects | No |
| | Fire Hazard | No |
| | Sudden Release of Pressure Hazard | No |
| | Reactivity Hazard | No |
| 313 Categories: | Toxic Chemicals (40 CFR 372) | None |
| Clean Air Act: | Hazardous Air Pollutants (HAPS) | None |
| | Ozone Depleting Compounds (ODC) | None |

Clean Water Act: (40 CFR 116; 401.15) — If spilled into navigable waters it is reportable to National Response Center, 800-424-8802
Reportable Quantity = Oil Sheen present on navigable water surface

OSHA (29 CFR 1910): This product is not hazardous under Hazard Communication Standard 29 CFR 1910.1200

RCRA (40 CFR 261.33) This product does not meet hazardous waste criteria.

**State Regulations:**

| | |
|---|---|
| California Prop 65 | No Proposition 65 chemicals exists in this product, no labeling required. |
| Florida | No listed ingredients are present |
| Massachusetts RTK | No listed ingredients are present |
| Minnesota RTK | No listed ingredients are present |
| New Jersey RTK | Lists petroleum oil, but this product does not contain hazardous ingredients. |
| Pennsylvania RTK | Lists petroleum oil, but this product does not contain hazardous ingredients greater than 3%. |
| Illinois DOL TSL | No listed ingredients are present |

**Other Regulations:**

CONEG Metals: Since cadmium, chromium, lead and mercury are not detectable and it does not exceed 100 ppm total in this product, it is compliant with CONEG Metals regulation.

EEC (Europe): This product is not known to be a dangerous good internationally, unlabeled

EPA/TSCA Inventory: The components of this product are listed on the EPA/TSCA inventory of chemicals. CAS No. 64742-53-6

Foreign Inventories: The components of this product are listed under the following foreign inventories:

European Union's EINICS No. 265-156-6
Korea's ECL No. KE-12552
Australia's AICS No. 64742-53-6
Canada's DSL No. 64742-53-6
Philippines' PICCS – on List

## Section 16 - Other Information

| | | |
|---|---|---|
| **NFPA Hazard Rating** | **- Health** | **1 Slight** |
| | **- Fire** | **1 Slight** |
| | **- Reactivity** | **0 Least** |

**Prepared By:** Will Poe **Phone:** (601) 630-8319

| | | |
|---|---|---|
| **Supersedes MSDS Dated:** | March 28, 2001 | Added additional regulatory references, color |
| | January 1, 2000 | Change from 100% to > 99.7 %, add BHT in Section 2 |
| | May 21, 1999 | Change date |

This MSDS complies with OSHA Hazard Communication Standard (HCS) 29 CFR 1910.1200 and conforms to ANSI Z 400.1 16-Section Format.

**Disclaimer:** Ergon Refining, Inc. believes this information is accurate but not all-inclusive in all circumstances. It is the responsibility of the user to determine suitability of the material for their purposes. No warranty, expressed or implied, is given.

# Material Safety Data Sheet

## Chevron Special LS Diesel 2

**MSDS:** 7098
**Revision #:** 1 **Revision Date:** 06/12/01

**Click here to search the product data sheet database**

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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SPECIAL LS DIESEL 2

PRODUCT NUMBER(S): CPS225116 CPS225119 CPS272105 CPS272111
CPS272116 CPS272127 CPS272128 CPS272193
CPS272393 CPS272596
SYNONYM: CALCO SPECIAL LS DIESEL 2
CHEVRON SPECIAL LS DIESEL 2

COMPANY IDENTIFICATION

Chevron Products Company
Marketing, MSDS Coordinator
6001 Bollinger Canyon Road
San Ramon, CA 94583

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or
(510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC
(800)424-9300 or (703)527-3887
Emergency Information Centers
are located in U.S.A.
Int'l collect calls accepted

PRODUCT INFORMATION: MSDS Requests
(800) 689-3998
(510) 242-5357 Technical Information
SPECIAL NOTES: This MSDS covers all Chevron and Calco CARB Low Sulfur Diesel No.2 Fuels. Red dye is added to non-taxable fuel.

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2. COMPOSITION/INFORMATION ON INGREDIENTS

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100.0 % SPECIAL LS DIESEL 2

CONTAINING

| COMPONENTS | AMOUNT | LIMIT/QTY | AGENCY/TYPE |
|---|---|---|---|
| DIESEL FUEL NO. 2 | | | |
| Chemical Name: FUELS, DIESEL, NO. 2 | | | |
| CAS68476346 | 100.00% | 350 mg/m3 | Chevron TWA |
| | | 1000 mg/m3 | Chevron STEL |

POTENTIALLY

INCLUDING

HDS DISTILLATE, MIDDLE
Chemical Name: DISTILLATES, HYDRODESULFURIZED MIDDLE
CAS64742809 NONE NA

GAS OIL, LIGHT
Chemical Name: DISTILLATES, STRAIGHT RUN MIDDLE
CAS64741442 NONE NA

KEROSENE
Chemical Name: KEROSINE
CAS8008206 NONE NA

HYDRODESULFURIZED KEROSINE
Chemical Name: KEROSINE, HYDRODESULFURIZED
CAS64742810 NONE NA

CAT CRACKED DISTILLATE, LIGHT
Chemical Name: DISTILLATES, LIGHT CATALYTIC CRACKED
CAS64741599 NONE NA

TOTAL SULFUR
< 500.00PPM

COMPOSITION COMMENT:
All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

## 3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********

Clear to pale yellow liquid if undyed, red liquid if dyed, with a faint petreoleum hydrocarbon odor.

- COMBUSTIBLE LIQUID AND VAPOR
- HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
- CAUSES SKIN IRRITATION
- POSSIBLE CANCER HAZARD - CONTAINS MATERIAL THAT MAY CAUSE CANCER BASED ON ANIMAL DATA

**********

IMMEDIATE HEALTH EFFECTS
EYE:
Not expected to cause prolonged or significant eye irritation.
SKIN:
Contact with the skin causes irritation.
INGESTION:
Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death.
INHALATION:

Excessive or prolonged breathing of this material may cause central nervous system effects. Mists of this material may cause respiratory irritation.
SIGNS AND SYMPTOMS OF EXPOSURE:
Skin irritation: may include pain, reddening, swelling, and blistering.
Respiratory irritation: may include coughing and difficulty breathing.
Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.
CARCINOGENICITY:
Prolonged or repeated skin contact with this material may cause cancer based on animal data. Risk of cancer depends on duration and level of exposure. See Section 11 for additional information.

Whole diesel engine exhaust was reviewed by the International Agency for Research on Cancer (IARC) in their Monograph 46 (1989). Evidence for causing cancer was considered sufficient in animals and limited in humans. IARC placed diesel exhaust in category 2A, considering it probably carcinogenic to humans.

Diesel exhaust is known to the State of California to cause cancer.

## 4. FIRST AID MEASURES

EYE:
No specific first aid measures are required because this material is not expected to cause eye irritation. As a precaution remove contact lenses, if worn, and flush eyes with water.
SKIN:
Wash skin immediately with soap and water and remove contaminated clothing and shoes. Get medical attention if irritation persists. Discard contaminated clothing and shoes or thoroughly clean before reuse.
INGESTION:
If swallowed, do not induce vomiting. Give the person a glass of water or milk to drink and get immediate medical attention. Never give anything by mouth to an unconscious person.
INHALATION:
Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms continue.
NOTE TO PHYSICIANS:
Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid which can cause pneumonitis.

## 5. FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Combustible liquid. See section 7 for appropriate handling and storage conditions.
FLAMMABLE PROPERTIES:
FLASH POINT: (P-M) 125F (52C) Minimum
AUTOIGNITION: 494F (257C) NFPA 325M, FO #2
FLAMMABILITY LIMITS (% by volume in air): Lower: 0.6 Upper: 4.7
EXTINGUISHING MEDIA:

CO2, Dry Chemical, AFFF Foam.
NFPA RATINGS: Health 0; Flammability 2; Reactivity 0.
FIRE FIGHTING INSTRUCTIONS:
Use water spray to cool fire-exposed containers and to protect personnel. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
COMBUSTION PRODUCTS:
Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

## 6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (703)527-3887
International Collect Calls Accepted
ACCIDENTAL RELEASE MEASURES:
Eliminate all sources of ignition in the vicinity of the spill or released vapor.

Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in Exposure Controls/Personal Protection. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

## 7. HANDLING AND STORAGE

Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 85F.

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, "Flammable and Combustible Liquids", National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity", and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of

Static, Lightning, and Stray Currents".

Do not use or store near heat, sparks, or open flames. Use or store only in a well-ventilated area. Keep container closed when material is not in use. Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner, or properly disposed of.

WARNING! Do not use as portable heater or appliance fuel. Toxic fumes may accumulate and cause death.

Do not taste or swallow. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Keep out of reach of children.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS
If user operations generate airborne material, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

PERSONAL PROTECTIVE EQUIPMENT
EYE/FACE PROTECTION:
No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
SKIN PROTECTION:
No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: <Nitrile> <Viton> <Chlorinated Polyethylene (or Chlorosulfonated Polyethylene or CPE)> <Polyurethane>
RESPIRATORY PROTECTION:
If user operations generate harmful levels of airborne material that is not adequately controlled by ventilation, wear a NIOSH approved respirator that provides adequate protection. Use the following respirators: Organic Vapor.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Clear to pale yellow liquid if undyed, red liquid if dyed, with a faint petreoleum hydrocarbon odor.

| | |
|---|---|
| pH: | NA |
| VAPOR PRESSURE: | 0.04 PSIA @ 40C |
| VAPOR DENSITY (AIR=1): | >1 |
| BOILING POINT: | 176 - 370C (348 - 698F) |
| FREEZING POINT: | NA |
| MELTING POINT: | NA |
| SOLUBILITY: | Soluble in hydrocarbon solvents; insoluble in water. |
| SPECIFIC GRAVITY: | 0.84 @ 15.6/15.6C (Typical) |
| VISCOSITY: | 1.9 - 4.1 cSt @ 40C |

## 10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:
None known
CHEMICAL STABILITY:
Stable.
CONDITIONS TO AVOID:
See section 7.
INCOMPATIBILITY WITH OTHER MATERIALS:
May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
HAZARDOUS POLYMERIZATION:
Polymerization will not occur.

## 11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:
Minimal effects clearing in less than 24 hours.
SKIN EFFECTS:
Moderate irritation at 72 hours. (Moderate erythema). The acute dermal LD50 in rabbits is >5 ml/kg. This material did not cause skin sensitization reactions in a Buehler guinea pig test.
ACUTE ORAL EFFECTS:
The acute oral LD50 in rats is > 5 ml/kg.
ACUTE INHALATION EFFECTS:
The 4-hour inhalation LC50 in rats is > 5 mg/l.

The data above is obtained from studies sponsored by the American Petroleum Institute.
CHRONIC EFFECTS/CARCINOGENICITY:
This product contains a mixture of petroleum hydrocarbons called middle distillates (which means they boil between approximately 350F and 700F). Because of this broad description, many products are considered middle distillates yet they are produced by a variety of different petroleum refining processes. Examples of middle distillates include kerosene, diesel fuel and jet fuel. Dermal treatment with some middle distillates resulted in the formation of skin tumors when repeatedly applied to mice over most of their lifetime. Other studies indicate that pure middle distillates are not genotoxic and that chronic skin irritation is necessary for the skin tumor response to occur. Petroleum middle distillates are not listed as carcinogenic by the IARC, EPA, NTP, or OSHA. This product may contain significant amounts of polynuclear aromatic hydrocarbons (PAH's) which have been shown to cause skin cancer after

prolonged and frequent contact with the skin of test animals. Brief or intermittent skin contact with this product is not expected to have serious effects if it is washed from the skin. While skin cancer is unlikely to occur in human beings following use of this product, skin contact and breathing of mists or vapors should be reduced to a minimum.

This product contains kerosene. CONCAWE (product dossier 94/106) has summarized current health, safety and environmental data available for a number of kerosenes (typically straight-run kerosene, CAS 8008-20-6, or hydrodesulfurized kerosene, CAS 64742-81-0). Following acute exposure to kerosene, signs observed in rats and rabbits were of a low order of toxicity: central nervous system depression occurred following oral exposure, skin irritation (ranging from slight to severe irritation) occurred with dermal exposure, and respiratory tract irritation occurred with inhalation exposure. None of the kerosenes tested produced more than slight eye irritation and none were skin sensitizers. However, intratracheal administration or artificial aspiration of small volumes (0.1 to 0.2 ml) of kerosene into the lungs of rats, chickens and primates resulted in lung damage and/or death. Chronic (3 to 24 months) mouse dermal toxicity studies of kerosenes and jet fuels produced mild to moderate skin irritation, while long-term (2+ years) studies showed moderate to severe skin damage as well as an increased incidence of tumors after long latency periods (probably due to a secondary mechanism related to skin irritancy). In a study in which rats, mice, rabbits and cats were exposed to kerosene aerosol concentrations in the range 0.05 to 120 mg/l for up to four weeks, reductions in respiratory rate, pulmonary hyperaemia, leucocytosis, monocytosis and decreased erythrocyte sedimentation rate were observed, and histological examination revealed inflammatory changes in the respiratory tract (tracheitis, bronchitis and pneumonia).

Hydrodesulfurized kerosene was tested by the Petroleum Product Stewardship Council in a OECD Guideline 421 Reproductive/Developmental Toxicity Study. The kerosene sample was diluted to 494 (60%), 330 (40%), and 165 (20%) mg/kg/day in food grade mineral oil and applied daily during pre-mating and mating to day 19 of gestation. There was no apparent maternal, reproductive, or developmental toxicity at any dose. Males treated for eight weeks had increased relative kidney weights in the high dose group but no microscopic changes in testes or epididymides. No gross anomalies were observed in the pups.

The National Institute of Occupational Safety and Health (NIOSH) has recommended that whole diesel exhaust be regarded as potentially causing cancer. This recommendation was based on test results showing increased lung cancer in laboratory animals exposed to whole diesel exhaust.

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## 12. ECOLOGICAL INFORMATION

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ECOTOXICITY:
A series of studies on the acute toxicity of 4 diesel fuel samples were conducted by one laboratory using water accommodated fractions. The range of effective (EC50) or lethal concentrations (LC50) expressed as loading rates were: The 96-hour LC50 for rainbow trout (Salmo gairdneri) is 21-210 mg/l. The 48-hour EC50 for daphnia (Daphnia magna) is 20-210 mg/l. The 72-hour EC50 in alga (Raphidocellus subcapitata) is 2.6-25 mg/l.
ENVIRONMENTAL FATE:
On release to the environment the lighter components of diesel fuel will

generally evaporate but depending on local environmental conditions (temperature, wind, mixing or wave action, soil type, etc.) the remainder may become dispersed in the water column or absorbed to soil or sediment. Diesel fuel would not be expected to be "readily biodegradable". In a modified Strum test (OECD method 301B) approximately 40% biodegradation was recorded over 28 days. However, it has been shown that most hydrocarbon components of diesel fuel are degraded in soil in the presence of oxygen. Under anaerobic conditions, such as in anoxic sediments, rates of biodegradation are negligible.

## 13. DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by USEPA under RCRA (40CFR261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

## 14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: GAS OIL
DOT HAZARD CLASS: COMBUSTIBLE LIQUID
DOT IDENTIFICATION NUMBER: UN1202
DOT PACKING GROUP: III

## 15. REGULATORY INFORMATION

| | | |
|---|---|---|
| SARA 311 CATEGORIES: | 1. Immediate (Acute) Health Effects: | YES |
| | 2. Delayed (Chronic) Health Effects: | YES |
| | 3. Fire Hazard: | YES |
| | 4. Sudden Release of Pressure Hazard: | NO |
| | 5. Reactivity Hazard: | NO |

REGULATORY LISTS SEARCHED:

| | | |
|---|---|---|
| 01=SARA 313 | 11=NJ RTK | 22=TSCA Sect 5(a)(2) |
| 02=MASS RTK | 12=CERCLA 302.4 | 23=TSCA Sect 6 |
| 03=NTP Carcinogen | 13=MN RTK | 24=TSCA Sect 12(b) |
| 04=CA Prop 65-Carcin | 14=ACGIH TWA | 25=TSCA Sect 8(a) |
| 05=CA Prop 65-Repro Tox | 15=ACGIH STEL | 26=TSCA Sect 8(d) |
| 06=IARC Group 1 | 16=ACGIH Calc TLV | 27=TSCA Sect 4(a) |
| 07=IARC Group 2A | 17=OSHA PEL | 28=Canadian WHMIS |
| 08=IARC Group 2B | 18=DOT Marine Pollutant | 29=OSHA CEILING |
| 09=SARA 302/304 | 19=Chevron TWA | 30=Chevron STEL |
| 10=PA RTK | 20=EPA Carcinogen | |

The following components of this material are found on the regulatory

lists indicated.

FUELS, DIESEL, NO. 2
  is found on lists: 19,30,
KEROSINE
  is found on lists: 02,10,11,

NEW JERSEY RTK CLASSIFICATION:
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows:
DIESEL FUEL
WHMIS CLASSIFICATION:
Class B, Division 3: Combustible Liquids
Class D, Division 2, Subdivision B: Toxic Material
-Skin or Eye Irritation

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## 16. OTHER INFORMATION

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NFPA RATINGS: Health 0; Flammability 2; Reactivity 0;
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT:
This revision updates Sections 1, 5, & 9.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

| | | | |
|---|---|---|---|
| TLV | - Threshold Limit Value | TWA | - Time Weighted Average |
| STEL | - Short-term Exposure Limit | TPQ | - Threshold Planning Quantity |
| RQ | - Reportable Quantity | PEL | - Permissible Exposure Limit |
| C | - Ceiling Limit | CAS | - Chemical Abstract Service Number |
| A1-5 | - Appendix A Categories | () | - Change Has Been Proposed |
| NDA | - No Data Available | NA | - Not Applicable |

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Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology and Health Risk Assessment Unit, CRTC, P.O. Box 1627, Richmond, CA 94804

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The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modification of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

**********
THIS IS THE LAST PAGE OF THIS MSDS
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# Material Safety Data Sheet

**Chevron Lubricating Oil FM-E**

**MSDS:** 6859
**Revision #:** 5 **Revision Date:** 12/2/2002

**Click here to search the product data sheet database**

# Material Safety Data Sheet

## SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

### Chevron Lubricating Oil FM ISO 100, 220, 460, FM-E ISO 100

**Product Number(s):** CPS232104, CPS232105, CPS232106, CPS255106
**Synonyms:** Chevron Lubricating Oil FM ISO 100, Chevron Lubricating Oil FM ISO 220, Chevron Lubricating Oil FM ISO 460, Chevron Lubricating Oil FM-E ISO 100

**Company Identification**
ChevronTexaco Global Lubricants
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America
www.chevron-lubricants.com

**Transportation Emergency Response**
CHEMTREC: (800) 424-9300 or (703) 527-3887
**Health Emergency**
ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
**Product Information**
email : lubemsds@chevron.com
Product Information: (800) LUBE TEK
MSDS Requests: (800) 414-6737

## SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

| COMPONENTS | CAS NUMBER | AMOUNT |
|---|---|---|
| | | |

| | | |
|---|---|---|
| White mineral oil | 8042-47-5 | 60 - 100 %weight |
| Additives | Mixture | 3 - 7 %weight |

This material complies with Food And Drug Administration Regulation 178.3570 code of Federal Regulations, Title 21.

CHEVRON Lubricating Oil FM ISO 100 is certified by NSF INTERNATIONAL for drinking water system components. Feed rate of oil to pump must not introduce more than 28 ppb into water.

## SECTION 3 HAZARDS IDENTIFICATION

**IMMEDIATE HEALTH EFFECTS**
**Eye:** Not expected to cause prolonged or significant eye irritation.
**Skin:** Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.
**Ingestion:** Not expected to be harmful if swallowed.
**Inhalation:** Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

## SECTION 4 FIRST AID MEASURES

**Eye:** No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.
**Skin:** No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
**Ingestion:** No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.
**Inhalation:** No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

## SECTION 5 FIRE FIGHTING MEASURES

**FIRE CLASSIFICATION:**
OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

**NFPA RATINGS:** Health: 0 Flammability: 1 Reactivity: 0

**FLAMMABLE PROPERTIES:**
**Flashpoint:** (Cleveland Open Cup) 457 °F (236 °C) (Min)
**Autoignition:** NDA
**Flammability (Explosive) Limits (% by volume in air):** Lower: NA Upper: NA

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide ($CO_2$) to extinguish flames.

**PROTECTION OF FIRE FIGHTERS:**
**Fire Fighting Instructions:** This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

## SECTION 6 ACCIDENTAL RELEASE MEASURES

**Protective Measures:** Eliminate all sources of ignition in vicinity of spilled material.
**Spill Management:** Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
**Reporting:** Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

## SECTION 7 HANDLING AND STORAGE

**General Handling Information:** Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.
**Container Warnings:** Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

## SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

**GENERAL CONSIDERATIONS:**
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

**ENGINEERING CONTROLS:**
Use in a well-ventilated area.

**PERSONAL PROTECTIVE EQUIPMENT**
**Eye/Face Protection:** No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
**Skin Protection:** No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Neoprene, Nitrile Rubber, Silver Shield, Viton.

**Respiratory Protection:** No respiratory protection is normally required.
If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.
Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

**Occupational Exposure Limits:**

| Component | Limit | TWA | STEL | Ceiling | Notation |
|---|---|---|---|---|---|
| White mineral oil | ACGIH_TLV | 5 mg/m3 | 10 mg/m3 | | |
| White mineral oil | ACGIH | 5 mg/m3 | 10 mg/m3 | | |

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**Attention: the data below are typical values and do not constitute a specification.**

**Color:** Colorless
**Physical State:** Liquid
**Odor:** Petroleum odor
**pH:** NA
**Vapor Pressure:** <0.01 mmHg @ 100 °F
**Vapor Density (Air = 1):** >1
**Boiling Point:** >600 °F (315 C)
**Solubility:** Soluble in hydrocarbons; insoluble in water
**Freezing Point:** NA
**Specific Gravity:** 0.87 - 0.88 @ 15.6 °C / 15.6 °C
**Viscosity:** 90 cSt @ 40 °C (Min)

## SECTION 10 STABILITY AND REACTIVITY

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
**Incompatibility With Other Materials:** May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
**Hazardous Decomposition Products:** None known (None expected)
**Hazardous Polymerization:** Hazardous polymerization will not occur.

## SECTION 11 TOXICOLOGICAL INFORMATION

**IMMEDIATE HEALTH EFFECTS**
**Eye Irritation:** The eye irritation hazard is based on evaluation of data for similar materials or product components.
**Skin Irritation:** The skin irritation hazard is based on evaluation of data for similar materials or product components.
**Skin Sensitization:** No product toxicology data available.
**Acute Dermal Toxicity:** The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.
**Acute Oral Toxicity:** The acute oral toxicity hazard is based on evaluation of data for similar materials or product

components.
**Acute Inhalation Toxicity:** The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

## SECTION 12 ECOLOGICAL INFORMATION

**ECOTOXICITY**
The 96 hour(s) LC50 for rainbow trout (Oncorhynchus mykiss) is >1000 mg/l.
This material is not expected to be harmful to aquatic organisms.

**ENVIRONMENTAL FATE**
This material is considered inherently biodegradable. This material is not expected to present any environmental problems other than those associated with oil spills. See Section 6 for Accidental Release Measures.

## SECTION 13 DISPOSAL CONSIDERATIONS

Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

## SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**DOT Shipping Name:** NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR
**DOT Hazard Class:** NOT APPLICABLE
**DOT Identification Number:** NOT APPLICABLE
**DOT Packing Group:** NOT APPLICABLE
**Additional Information:** NOT HAZARDOUS BY U.S. DOT. ADR/RID HAZARD CLASS NOT APPLICABLE.

**IMO/IMDG Shipping Name:** NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORTATION UNDER THE IMDG CODE
**IMO/IMDG Hazard Class:** NOT APPLICABLE
**IMO/IMDG Identification Number:** NOT APPLICABLE
**IMO/IMDG Packing Group:** NOT APPLICABLE

## SECTION 15 REGULATORY INFORMATION

**SARA 311/312 CATEGORIES:**
1. Immediate (Acute) Health Effects: NO
2. Delayed (Chronic) Health Effects: NO
3. Fire Hazard: NO
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

**REGULATORY LISTS SEARCHED:**

4_I1=IARC Group 1 15=SARA Section 313

4_I2A=IARC Group 2A 16=CA Proposition 65

| | |
|---|---|
| 4_I2B=IARC Group 2B | 17=MA RTK |
| 05=NTP Carcinogen | 18=NJ RTK |
| 06=OSHA Carcinogen | 19=DOT Marine Pollutant |
| 09=TSCA 12(b) | 20=PA RTK |

No components of this material were found on the regulatory lists above.

**CHEMICAL INVENTORIES:**
AUSTRALIA: All the components of this material are listed on the Australian Inventory of Chemical Substances (AICS).
CANADA: All the components of this material are on the Canadian DSL or have been notified under the New Substance Notification Regulations, but have not yet been published in the Canada Gazette.
PEOPLE'S REPUBLIC OF CHINA: All the components of this product are listed on the draft Inventory of Existing Chemical Substances in China.
EUROPEAN UNION: All the components of this material are in compliance with the EU Seventh Amendment Directive 92/32/EEC.
JAPAN: All the components of this product are on the Existing & New Chemical Substances (ENCS) inventory in Japan, or have an exemption from listing.
KOREA: This material contains components that require notification before sale or importation into Korea.
PHILIPPINES: All the components of this product are listed on the Philippine Inventory of Chemicals and Chemical Substances (PICCS).
UNITED STATES: All of the components of this material are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

**NEW JERSEY RTK CLASSIFICATION:**
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows:
PETROLEUM OIL (Lubricating oil)
**WHMIS CLASSIFICATION:**
This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

## SECTION 16 OTHER INFORMATION

| | | | |
|---|---|---|---|
| **NFPA RATINGS:** | Health: 0 | Flammability: 1 | Reactivity: 0 |
| **HMIS RATINGS:** | Health: 0 | Flammability: 1 | Reactivity: 0 |

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

**REVISION STATEMENT:** This revision updates the following sections of this Material Safety Data Sheet:1-16

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

| | | | | | |
|---|---|---|---|---|---|
| TLV | - | Threshold Limit Value | TWA | - | Time Weighted Average |
| STEL | - | Short-term Exposure Limit | PEL | - | Permissible Exposure Limit |
| | | | CAS | - | Chemical Abstract Service Number |
| NDA | - | No Data Available | NA | - | Not Applicable |
| <= | - | Less Than or Equal To | >= | - | Greater Than or Equal To |

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

**The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.**

# Material Safety Data Sheet

## SYNTERRA(TM) BIODEGRADABLE HYDRAULIC OIL

### 1. CHEMICAL PRODUCT/COMPANY IDENTIFICATION

SYNTERRA(TM) Biodegradable Hydraulic Oil

MSDS Code: HYDC0230 Revised: 19-Apr-2001

"SYNTERRA" is a trademark of Conoco.

ISO Grades : 32, 46, 68, 100
Conoco Base Codes : 7772, 7773, 7774, 7775
Product Use : Hydraulic Fluid

MANUFACTURER/DISTRIBUTOR
Conoco, Inc.
P.O. Box 2197
Houston, TX 77252

PHONE NUMBERS
Product Information: 1-281-293-5550
Transport Emergency: CHEMTREC 1-800-424-9300 or
1-703-527-3887 (call collect)
Medical Emergency: 1-800-342-5119 or 1-281-493-2767
WEB SITE: www.conoco.com

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

| Components | CAS Number | % |
|---|---|---|
| Esters | 68424-31-7 | 40-90 |
| Proprietary esters | | 10-60 |
| Additives | | 1-2 |

### 3. HAZARDS IDENTIFICATION

--- EMERGENCY OVERVIEW ---

APPEARANCE / ODOR
Straw to light amber liquid / odorless.

OSHA REGULATORY STATUS
This material is not known to be hazardous under OSHA Regulations.

HMIS RATING
Health: 1; Flammability: 1; Reactivity: 0

Potential Health Effects
Primary Routes of Entry: Skin, inhalation

The product may cause minor skin, eye, and lung irritation, but good hygienic practices can minimize these effects.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

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## 4. FIRST AID MEASURES

---

Inhalation

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Skin Contact

Wash skin thoroughly with soap and water. If irritation develops and persists, consult a physician.

If injected under the skin, necrosis could occur. See physician.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Ingestion

If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

Activated charcoal mixture may be administered. To prepare activated charcoal mixture, suspend 50 grams activated charcoal in 400 mL water and mix thoroughly. Administer 5 mL/kg, or 350 mL for an average adult.

High velocity injection under the skin can cause a bloodless puncture wound and result in necrosis. Immediate attention by a surgical specialist is recommended.

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## 5. FIRE FIGHTING MEASURES

---

Flammable Properties

| | | | |
|---|---|---|---|
| Flash Point | (Minimum): | 475 F (246 C) | |
| | (Typical) | 510 F (266 C) | (Grade 32) |
| | | 500 F (260 C) | (Grade 46) |
| | | 530 F (277 C) | (Grade 68) |
| | | 520 F (271 C) | (Grade 100) |
| Method: | | Cleveland Open Cup - COC. | |

Flammable limits in Air, % by Volume

| | |
|---|---|
| LEL: | Not Available |
| UEL: | Not Available |

| | |
|---|---|
| NFPA Classification: | Class IIIB Combustible Liquid. |
| NFPA Rating: | Health 0; Flammability 1; Reactivity 0 |

Extinguishing Media

Water Spray, Foam, Dry Chemical, $CO_2$.

Fire Fighting Instructions

Avoid spreading liquid and fire by water flooding. Use water to keep fire-exposed containers cool. Water spray may be used to flush spills away from exposures.

Products of combustion may contain carbon monoxide, carbon dioxide and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

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## 6. ACCIDENTAL RELEASE MEASURES

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Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment

Dike spill. Prevent material from entering sewers, waterways, or low areas.

Spill Clean Up

Recover free liquid for reuse or reclamation. Soak up with sawdust, sand, oil dry or other absorbent material.

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## 7. HANDLING AND STORAGE

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Handling (Personnel)

Avoid contact with eyes, skin or clothing. Avoid breathing vapors or mist. Wash thoroughly after handling. Wash clothing after use.

Handling (Physical Aspects)

Close container after each use. Empty container retains residue (liquid and/or vapor) and may explode in heat of a fire. Do not pressurize, cut, weld, braze, solder, grind, or drill on or near full or empty container.

Storage

Store in accordance with National Fire Protection Association recommendations. Store in a cool, dry place. Store away from heat, sparks and flames.

---

## # 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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Engineering Controls

VENTILATION

Normal shop ventilation.

Personal Protective Equipment

RESPIRATORY PROTECTION

None normally required except under unusual circumstances such as described under fire fighting measures.

PROTECTIVE GLOVES

Should be worn when the potential exists for prolonged or repeated skin exposure. Recommended glove material: Neoprene or NBR.

EYE PROTECTION

Safety glasses with side shields; chemical splash goggles if

splashing is probable.

OTHER PROTECTIVE EQUIPMENT
Coveralls with long sleeves if splashing is probable.

Exposure Guidelines

| | |
|---|---|
| OSHA PEL | : None Established |
| ACGIH TLV | : None Established |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

| | |
|---|---|
| Boiling Point | : Not Available |
| Vapor Pressure | : Not Available |
| Vapor Density | : Not Available |
| Pour Point | : -50 F (-46 C) (ASTM D 97) |
| % Volatiles | : Not Available |
| Solubility in Water | : Negligible |
| Odor | : Odorless. |
| Form | : Liquid. |
| Color | : Straw to Light Amber. |
| Specific Gravity | : 0.99-1.00 @ 60 F (16 C) |
| Liquid Density | : 8.2-8.3 lb/gal @ 60 F (16 C) |

## 10. STABILITY AND REACTIVITY

Chemical Stability
Stable.

Conditions to Avoid
Heat, sparks, and flames.

Incompatibility with Other Materials
Incompatible or can react with strong oxidizers.

Decomposition
Hazardous gases or vapors can be released, including carbon monoxide.

Polymerization
Polymerization will not occur.

## 11. TOXICOLOGICAL INFORMATION

Animal Data
No information found.

## 12. ECOLOGICAL INFORMATION

Ecotoxicological Information
No specific aquatic data available for this product.

## 13. DISPOSAL CONSIDERATIONS

Waste Disposal
Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Do not flush to surface water or sanitary sewer system.

Container Disposal

Empty drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All other containers should be disposed of in an environmentally safe manner.

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## 14. TRANSPORTATION INFORMATION

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Shipping Information

DOT : Not regulated.
ICAO/IMO : Not restricted.

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## 15. REGULATORY INFORMATION

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U.S. Federal Regulations

OSHA HAZARD DETERMINATION

This material is not known to be hazardous as defined by OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

CERCLA/SUPERFUND

This material is not known to contain any ingredient(s) subject to the Act.

SARA, TITLE III, 302/304

This material is not known to contain extremely hazardous substances.

SARA, TITLE III, 311/312

Acute : No
Chronic : No
Fire : No
Reactivity : No
Pressure : No

SARA, TITLE III, 313

This material is not known to contain any chemical(s) at a level of 1.0% or greater (0.1% for carcinogens) on the list of Toxic Chemicals and subject to release reporting requirements.

TSCA

This material is a mixture as defined by TSCA. The chemical ingredients in this material are in the Section 8(b) Chemical Substances Inventory (40 CFR 710) and/or are otherwise in compliance with TSCA. In the case of ingredients obtained from other manufacturers, Conoco relies on the assurance of responsible third parties in providing this statement.

RCRA

This material has been evaluated for RCRA characteristics and does not meet hazardous waste criteria if discarded in its purchased form. Because of product use, transformation, mixing, processing, etc., which may render the resulting material hazardous, it is the product user's responsibility to determine at the time of disposal whether the material meets RCRA hazardous waste criteria.

CLEAN WATER ACT

This material is not known to contain any ingredient(s) subject to the Act.

State Regulations (U.S.)
CALIFORNIA "PROP 65"
Ingredients subject to Act - None

PENNSYLVANIA WORKER & COMMUNITY RIGHT TO KNOW ACT
Ingredients subject to Act - None

Canadian Regulations
This is not a WHMIS Controlled Product.

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## 16. OTHER INFORMATION

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Additional Information: None.

The date in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.


Responsibility for MSDS : MSDS Coordinator
Address : Conoco Inc.
> : PO Box 2197
> : Houston, TX 77252
Telephone : 1-281-293-5550


# Indicates updated section.

End of MSDS

# MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO 2584**

**EMERGENCY TELEPHONE NUMBER(S)**

**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 2584**

APPLICATION : ALKALINITY SOURCE

COMPANY IDENTIFICATION : Ondeo Nalco Energy Services, L.P.
P.O. Box 87
Sugar Land, Texas
77487-0087

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 3 / 3 FLAMMABILITY : 0 / 0 INSTABILITY : 1 / 1 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Sodium Hydroxide | 1310-73-2 | 0.030.0 - 60.0 |
| Potassium Hydroxide | 1310-58-3 | 0.010.0 - 30.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**DANGER**
Corrosive. May cause tissue damage.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing. Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.
Not flammable or combustible. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Corrosive. Will cause eye burns and permanent tissue damage.

SKIN CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

INGESTION :
Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach.

INHALATION :
Not a likely route of exposure. Irritating, in high concentrations, to the eyes, nose, throat and lungs.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :
Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use.

INGESTION :
DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
Not flammable or combustible. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Avoid generating aerosols and mists. Do not mix with acids. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

STORAGE CONDITIONS :
Store the containers tightly closed. Store separately from acids. Store in suitable labelled containers.

UNSUITABLE CONSTRUCTION MATERIAL :
Aluminum, Zinc, Galvanised metals, Tin

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

Substance(s)

| | |
|---|---|
| Sodium Hydroxide | CEILING: 2 mg/m3 |

| | |
|---|---|
| Potassium Hydroxide | CEILING: 2 mg/m3 |

OSHA/PEL :

Substance(s)

| | |
|---|---|
| Sodium Hydroxide | CEILING: 2 mg/m3 |
| Potassium Hydroxide | CEILING: 2 mg/m3 |

ENGINEERING MEASURES :
General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :
If significant mists, vapors or aerosols are generated an approved respirator is recommended. A dust, mist, fume cartridge may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, PVC gloves, Butyl gloves, Rubber gloves

SKIN PROTECTION :
Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Colorless |
| ODOR | None |
| SPECIFIC GRAVITY | 1.50 - 1.53 @ 70 °F / 21.1 °C |
| DENSITY | 12.5 - 12.7 lb/gal |
| SOLUBILITY IN WATER | Complete |

| | |
|---|---|
| pH (5 %) | 14 |
| FREEZING POINT | -10 °F / -23 °C |
| BOILING POINT | 293 °F / 145 °C |
| VAPOR PRESSURE | 0.5 mm Hg @ 100 °F / |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Gives off hydrogen by reaction with metals.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: None known

## 11. TOXICOLOGICAL INFORMATION

The following results are for the hazardous components.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | 205 mg/kg | Potassium Hydroxide |

Rating : Toxic

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | 1,260 mg/kg | Potassium Hydroxide |

Rating : Non-Hazardous

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: High

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for a similar product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Fathead Minnow | 96 hrs | 102 mg/l | Similar Product |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 180 mg/l | | Similar Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| | 0 mg/l | Product |

The product does not contain any organic substances.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CAUSTIC ALKALI LIQUID, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE, POTASSIUM HYDROXIDE |
| UN/ID No : | UN 1719 |
| Hazard Class - Primary : | 8 |
| Packing Group : | II |
| Flash Point : | None |
| DOT Reportable Quantity (per package) : | 2,900 lbs |
| DOT RQ Component : | SODIUM HYDROXIDE |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CAUSTIC ALKALI LIQUID, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE, POTASSIUM HYDROXIDE |
| UN/ID No : | UN 1719 |
| Hazard Class - Primary : | 8 |
| Packing Group : | II |
| IATA Cargo Packing Instructions : | 813 |
| IATA Cargo Aircraft Limit : | 30 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CAUSTIC ALKALI LIQUID, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE, POTASSIUM HYDROXIDE |
| UN/ID No : | UN 1719 |
| Hazard Class - Primary : | 8 |
| Packing Group : | II |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Hydroxide : Corrosive
Potassium Hydroxide : Corrosive

CERCLA/SUPERFUND, 40 CFR 117, 302 :
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product.

| RQ Substance | RQ |
|---|---|
| Sodium Hydroxide Potassium Hydroxide | 2,900 lbs |

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| - | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product contains the following substances listed in the regulation:

| Substance(s) | Citations |
|---|---|
| • Sodium Hydroxide<br>• Potassium Hydroxide | Sec. 311 |
| | Sec. 311 |

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Potassium Hydroxide | 1310-58-3 |
| Sodium Hydroxide | 1310-73-2 |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

# MATERIAL SAFETY DATA SHEET

PRODUCT

## NALCO 2584

**EMERGENCY TELEPHONE NUMBER(S)**

**(800) 424-9300 (24 Hours) CHEMTREC**

Date issued : 07/25/2001
Replaces : 02/15/2000

# MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO 7396**

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 7396**

APPLICATION : WATER STABILIZATION

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 1 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous.

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Tetrapotassium Pyrophosphate | 7320-34-5 | 60.0 - 100.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**WARNING**
Irritating to eyes. May cause skin irritation.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.
May evolve oxides of phosphorus (POx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Slightly irritating, but will not injure eye tissue.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. No adverse effects expected.

INHALATION :
Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of phosphorus (POx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

UNSUITABLE CONSTRUCTION MATERIAL :
Aluminum, Do not use aluminum or mild steel.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed. Respiratory protection is not normally needed. Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Butyl gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Colorless |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.74 @ 59 °F / 15 °C |
| DENSITY | 14.5 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 10.0 - 11.5 |
| FREEZING POINT | -20 °F / -28.9 °C |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Extremes of temperature

MATERIALS TO AVOID :
None known

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of phosphorus

## 11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | 2,444 mg/kg | Product |

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | > 5,000 mg/kg | Product |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.8 / 8.0 | Product |

Rating : Slightly irritating

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 17.3 / 110.0 | Product |

Rating : Mildly irritating

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | 420 mg/l | Product |
| Rainbow Trout | 96 hrs | 450 mg/l | Product |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | > 100 mg/l | | Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : < 100 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| | 0 mg/l | |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| Flash Point : | None |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

| | |
|---|---|
| IATA Cargo Packing Instructions : | 820 |
| IATA Cargo Aircraft Limit : | 60 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| - | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

U.S. DEPARTMENT OF AGRICULTURE (USDA) :
USDA Inspection and Grading Programs - Food Safety and Inspection Service:
This product is authorized by USDA for use in federally inspected meat and poultry plants. Authorized use is under category : G2, G7

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

NSF INTERNATIONAL :
This product has received NSF/International certification under ANSI/NSF Standard 60 in the corrosion and scale control and sequestering categories. The official name is "Tetrapotassium Pyrophosphate." Maximum product application dosage is : 27 mg/l. Only product manufactured at Plant 101 USA and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 04/04/2003
Replaces : 12/13/2001

# MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO 8338**

**EMERGENCY TELEPHONE NUMBER**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 8338**

APPLICATION : CLOSED SYSTEM CORROSION INHIBITOR

COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 2 FLAMMABILITY : 0 / 0 REACTIVITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Sodium Nitrite | 7632-00-0 | 10.0 - 30.0 |
| Sodium Tolyltriazole | 64665-57-2 | 1.0 - 5.0 |
| Sodium Hydroxide | 1310-73-2 | 0.1 - 1.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**WARNING**
Contains sodium nitrite. May be harmful or fatal if swallowed. Substances in the product can lead to the formation of methemoglobin. Unborn children are particularly sensitive to methemoglobinemia. May cause skin and eye irritation.
Do not get in eyes, on skin, on clothing. Do not take internally. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. If swallowed, seek medical advice immediately and show this container or label.
Protect product from freezing.
Wear suitable protective clothing, gloves and eye/face protection.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. If product is allowed to dry, the sodium nitrite is an oxidizing agent and can initiate the combustion of other materials.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Can cause mild to moderate irritation.

SKIN CONTACT :
Can cause mild irritation.

INGESTION :
Not a likely route of exposure. Large exposures may be fatal. Ingestion of sodium nitrite can cause methemoglobinemia which can lead to cyanosis and possible death. Pregnant women and their fetuses are particularly sensitive to the effects of methemoglobinemia.

INHALATION :
Not a likely route of exposure. Aerosols or product mist may irritate the upper respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
Sodium Nitrite. Pregnant women are particularly sensitive to methemoglobinemia.

HUMAN HEALTH HAZARDS - CHRONIC :
Repeated ingestion of small amounts of sodium nitrite causes drops in blood pressure, rapid pulse, headaches and visual disturbances. It may also react with organic amines in the body to form carcinogenic nitrosamines.

## 4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :
Immediately flush with plenty of water for at least 15 minutes. If symptoms persist, call a physician.

INGESTION :
Induce vomiting if the patient is fully conscious. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition. Measures against circulatory shock, respiratory depression and convulsions may be needed.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. If product is allowed to dry, the sodium nitrite is an oxidizing agent and can initiate the combustion of other materials.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labelled. Keep the containers closed when not in use. Use with adequate ventilation.

STORAGE CONDITIONS :
Store the containers tightly closed. Store in suitable labelled containers.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available. Keep a safety shower available.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Clear Yellow |
| ODOR | Organic |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.16 - 1.20 @ 77 °F / 25 °C |
| DENSITY | 9.7 - 10.0 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 11.5 - 14 |
| VISCOSITY | 3 cps @ 70 °F / 21 °C |
| FREEZING POINT | 2 °F / -16.7 °C |

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with reducing agents (e.g. hydrazine, sulfites, sulfide, aluminum or magnesium dust) may generate heat, fires, explosions and toxic vapors. Do not mix with amines. Sodium nitrite can react with certain amines to produce N-nitrosamines, many of which are cancer-causing agents to laboratory animals. Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen

## 11. TOXICOLOGICAL INFORMATION

The following results are for the active components.

ACUTE ORAL TOXICITY :

| Species | LD50 | Tested Substance |
|---|---|---|
| Rat | 180 mg/kg | Active Substance Sodium Nitrite |

Rating : Toxic

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

TERATOGENICITY :
Experimental animal studies with sodium nitrite have shown reproductive effects in the offspring of treated parents. These effects are not transmissible.

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: High

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Tested Substance |
|---|---|---|---|
| Rainbow Trout | 96 hrs | 38 mg/l | Product |

Rating : Slightly toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Tested Substance |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 250 mg/l | 120 mg/l | Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : 77,600 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Tested Substance |
|---|---|---|
| | < 2 mg/l | |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Moderate
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| Flash Point : | None |
| DOT Reportable Quantity (per package) : | 500 lbs |
| DOT RQ Component : | SODIUM NITRITE |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| IATA Cargo Packing Instructions : | 820 |
| IATA Cargo Aircraft Limit : | 60 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Nitrite : Target Organ Effect - Kidney, Target Organ Effect - Nervous system, Target Organ Effect - Blood
Sodium Tolyltriazole : Irritant
Sodium Hydroxide : Corrosive

CERCLA/SUPERFUND, 40 CFR 117, 302 :
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product.

| RQ Substance | RQ |
|---|---|
| Sodium Nitrite | 500 lbs |

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| X | Delayed (Chronic) Health Hazard |

- Fire Hazard
- Sudden Release of Pressure Hazard
- Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product contains the following substance(s), (with CAS # and % range) which appear(s) on the List of Toxic Chemicals

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Sodium Nitrite | 7632-00-0 | 10.0 - 30.0 |

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710).

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :
This product contains the following substances listed in the regulation:

| Substance(s) | Citations |
|---|---|
| Sodium Nitrite : | Sec. 311 |

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Sodium Nitrate | 7631-99-4 |
| Sodium Nitrite | 7632-00-0 |
| Sodium Tolyltriazole | 64665-57-2 |
| Sodium Hydroxide | 1310-73-2 |
| Water | 7732-18-5 |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
D1B - Materials Causing Immediate and Serious Toxic Effects - Toxic Material, D2A - Materials Causing Other Toxic Effects - Very Toxic Material, E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
All substances in this product are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Moderate

* The environmental risk is: Moderate

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

Prepared By : Product Safety Department
Date issued : 01/17/2001
Replaces : 10/08/1999

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **TRASAR® 23263**

APPLICATION : COOLING WATER TREATMENT

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**CAUTION**
May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water. Protect product from freezing.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. May cause nausea and vomiting.

INHALATION :
Not a likely route of exposure. Repeated or prolonged exposure may irritate the respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Clear Amber |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.1 @ 77 °F / 25 °C |
| DENSITY | 9.1 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 5 |
| VISCOSITY | 10 cps @ 71 °F / 21.66 °C |
| FREEZING POINT | 26 °F / -3.33 °C |
| VAPOR PRESSURE | Same as water |
| VOC CONTENT | 0.00 % |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

## 11. TOXICOLOGICAL INFORMATION

The following results are for the polymer.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | > 5,000 mg/kg | Active Substance |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.0 / 8.0 | Active Substance |

Rating : Practically non-irritating

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 4.7 / 110.0 | Active Substance |

Rating : Minimally irritating

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the polymer. The following results are for a similar product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | > 1,000 mg/l | Active Substance |
| Rainbow Trout | 96 hrs | > 1,000 mg/l | Active Substance |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | > 1,000 mg/l | | Active Substance |
| Mysid Shrimp (M. litoralis) | 96 hrs | > 1,000 mg/l | | Similar Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Total Organic Carbon (TOC) : 18,000 mg/l

Chemical Oxygen Demand (COD) : 43,000 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| | 17,300 mg/l | Similar Product |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Sodium Bisulfate | 7681-38-1 |
| Water | 7732-18-5 |
| Acrylic Polymer | 20507700000-5034P |
| Substituted aliphatic aldehyde | 20507700000-5313P |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

THE PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 07/28/2003
Replaces : 12/15/2000

# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

## PART I *What is the material and what do I need to know in an emergency?*

### 1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **VITEC 3000**

CHEMICAL NAME/CLASS: Not applicable
SYNONYMS: Not applicable
PRODUCT USE: Water Treatment

SUPPLIER/MANUFACTURER'S NAME: **AVISTA TECHNOLOGIES**
ADDRESS: 133 North Pacific Street
San Marcos, CA 92069

CHEMTREC EMERGENCY NO.: 1-800-424-9300 (United States)
1-703-527-3887 (International)

BUSINESS PHONE: (760) 744-0536
DATE OF PREPARATION: July 2, 1999

### 2. COMPOSITION and INFORMATION ON INGREDIENTS

| CHEMICAL NAME | CAS # | % w/w | EXPOSURE LIMITS IN AIR | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ACGIH-TLVs | | OSHA-PELs | | | |
| | | | TWA $mg/m^3$ | STEL $mg/m^3$ | TWA $mg/m^3$ | STEL $mg/m^3$ | IDLH $mg/m^3$ | OTHER $mg/m^3$ |
| Phosphonic Acid Salt | Proprietary | < 20 | NE | NE | NE | NE | NE | NE |
| Alkali Hydroxide | Proprietary | < 9 | NE | 2 (Ceiling) | 2 | NE | 10 | NIOSH REL: STEL = 2 (Ceiling) |
| Aminotrialkylphosphonic Acid | Proprietary | 0-10 | NE | NE | NE | NE | NE | NE |
| Phosphonic Acid | Proprietary | 0-1 | NE | NE | NE | NE | NE | NE |
| Inorganic Acid | Proprietary | 0-0.2 | NE | 7.5 (Ceiling) | NE | 7 (Ceiling) | 50 ppm | NIOSH RELs: STEL- 7 (Ceiling) DFG MAKs: TWA- 7.6 (Ceiling) PEAK = 2 MAK, 5 minute, momentary value CARCINOGENICITY: IARC-3 |
| Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens). | | Balance | None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4). | | | | | |

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS information is included; it is located in appropriate sections based on the ANSI Z400.1-1998 format.

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY UNDERWRITERS LABORATORIES INC.? TO ANSI/NSF 60 ON 12/27/99 OF STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE IN REVERSE OSMOSIS SYSTEMS AT A MAXIMUM LEVEL OF 15 mg/l (11KN)

## 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This product is a clear, amber colored, corrosive solution with a light, disinfectant odor. Depending on the duration of contact, over-exposures can severely irritate the skin or eyes, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, phosphorous oxides, phosphine, and sodium oxide). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product, via route of exposure, are as follows:

INHALATION: If the vapors, mists or sprays of this solution are inhaled, symptoms of exposure may include breathing difficulty, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat. Severe inhalation over-exposures can lead to chemical pneumonitis, pulmonary edema, and death.

CONTACT WITH SKIN or EYES: Depending on the duration of skin contact, skin overexposures may cause reddening, discomfort, severe irritation and chemical burns. Repeated skin overexposures to this product may cause dermatitis (dry, red skin). Direct eye contact with the liquid can cause stinging, tearing and redness. Severe eye overexposures may cause burns, pain, reddening, watering, and possibly, blindness.

SKIN ABSORPTION: Skin absorption is not a significant route of exposure for any component of this product.

INGESTION: Ingestion is not anticipated to be a likely route of exposure to this product. If this product is swallowed, it may cause irritation or burns of the mouth, throat, esophagus and other tissues of the digestive system. Symptoms of such over-exposure can include nausea, vomiting, and diarrhea. Ingestion of large volumes of this product may be fatal.

INJECTION: Accidental injection of this product can cause burning, reddening, and swelling in addition to the wound.

**HAZARDOUS MATERIAL IDENTIFICATION SYSTEM**

| | | |
|---|---|---|
| HEALTH | (BLUE) | 2 |
| FLAMMABILITY | (RED) | 0 |
| REACTIVITY | (YELLOW) | 0 |
| PROTECTIVE EQUIPMENT | | C |

| EYES | RESPIRATORY | HANDS | BODY |
|---|---|---|---|
| | SEE SECTION 8 | | |

For routine industrial applications

**See Section 16 for Definition of Ratings**

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

**ACUTE**: Inhalation exposure may cause coughing, sneezing, and difficulty breathing. Depending on the duration of contact, over-exposures can severely irritate or burn tissues of the eyes, skin, mucous membranes and any other contaminated tissue. Ingestion may cause stomach pains, cramps, and irritation of the tissues of the digestive system.

**CHRONIC**: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Prolonged inhalation of the vapors or mists may lead to respiratory disorders (e.g. bronchitis). Refer to Section 11 (Toxicology Information) for additional information on this product's components.

**TARGET ORGANS: Acute:** Skin, eyes, respiratory system. **Chronic:** Skin, respiratory system.

# PART II *What should I do if a hazardous situation occurs?*

## 4. FIRST-AID MEASURES

SKIN EXPOSURE: If this product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek medical attention.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

## 4. FIRST-AID MEASURES (Continued)

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING unless direct by medical personnel. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to physician or health professional with victim.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting dermatitis, other skin conditions, and respiratory conditions may be aggravated by exposures to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate exposure.

## 5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %):

Lower: Not applicable.
Upper: Not applicable.

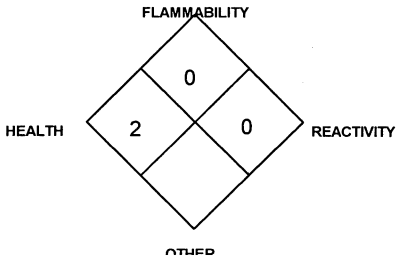
FIRE EXTINGUISHING MATERIALS: This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water Spray: YES  Carbon Dioxide: YES
Foam: YES  Dry Chemical: YES
Halon: YES  Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is corrosive and presents a contact hazard to fire-fighters. When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, phosphorous oxides, phosphine, and sodium oxide).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.

**NFPA RATING**




**See Section 16 for Definition of Ratings**

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

## 6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. Releases of this material may be slippery.

In the event of an incidental release of this product, personnel should wear gloves and safety glasses (or goggles). In the event of a non-incidental release, Minimum Personal Protective Equipment should be **Level C: triple-gloves, chemical resistant apron, boots, and splash goggles and an Air-Purifying respirator with organic vapor cartridge. Level B, which includes the use of Self-Contained Breathing Apparatus, should be worn when oxygen levels are below 19.5% or are unknown.** Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize spill with neutralizer appropriate for acidic solutions. Decontaminate the area thoroughly. Prevent spill rinsate from contamination of storm drains, sewers, soil or groundwater. Place all spill residues in a suitable container and seal. Dispose of in accordance with applicable U.S. Federal, State, or local procedures or appropriate standards of Canada (see Section 13, Disposal Considerations).

# PART III *How can I prevent hazardous situations from occurring?*

## 7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating mists and sprays of this product. Remove contaminated clothing immediately.

## 7. HANDLING and STORAGE (Continued)

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Open containers carefully on a stable surface. Empty containers may contain residual liquid; therefore, empty containers should be handled with care. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers, or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Storage areas should be made of fire-resistant materials. Keep container tightly closed when not in use. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate Canadian standards.

## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: None needed under normal conditions of use. Use NIOSH approved respirators if ventilation is inadequate to control mists. Maintain airborne contaminate concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. Splash goggles with a faceshield may be needed if splash hazards exist.

HAND PROTECTION: Wear chemical impervious gloves (e.g., rubber, Neoprene).

BODY PROTECTION: Use body protection appropriate for task (e.g., Tyvek suit, rubber apron) to protect from splashes and sprays.

HMIS PERSONAL PROTECTIVE EQUIPMENT RATING: C

## 9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): < 1
EVAPORATION RATE (water = 1): Not available.
SPECIFIC GRAVITY: 1.065 – 1.133
MELTING/FREEZING POINT: Not available.
SOLUBILITY IN WATER: Soluble.
BOILING POINT: Not available.
VAPOR PRESSURE, mm Hg @ 20°C: Not available.
pH: 2.2-3
ODOR THRESHOLD: Not available.
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not available.
APPEARANCE, ODOR AND COLOR: This product is a clear, amber liquid with a light disinfectant odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): The color and odor may act as warning properties associated with this product in the event of an accidental release.

## 10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of this product may generate carbon monoxide, carbon dioxide, phosphorous oxides, phosphine and sodium oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong bases, oxidizers, and water reactive materials.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible chemicals.

## 11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology information is available for the product and its components greater than 1 % in concentration.

**AMINOTRIALKYLPHOSPHONIC ACID:**
Standard Draize Test (Skin-Rabbit) 500 mg/24 hours
Standard Draize Test (Eye-Rabbit) 100 mg: Moderate
$LD_{50}$ (Oral-Rat) 2100 mg/kg
$LD_{50}$ (Skin-Rabbit) > 6310 mg/kg
$LD_{50}$ (Oral-Quail) > 2510 mg/kg
$LD_{50}$ (Oral-Duck) > 2510 mg/kg
TDLo (Oral-Rat) 1302 mg/kg/31 days-intermittent: Kidney, Ureter, Bladder: other changes in urine composition; Nutritional and Gross Metabolic: weight loss or decreased weight gain, changes in sodium

**INORGANIC ACID:**
Eye Irritancy (rabbit) = 1% solution/ 20 seconds; corneal scarring
Eye Irritancy (rabbit) = 5 mg/ 30 seconds; mild
Eye Irritancy (rabbit) = 100 mg/ rinse; mild
Skin Irritancy (rabbit) = 0.5 mL/ 17% solution/ 4 hours; corrosive burns
DNA Repair System (Escherichia coli) = 25 ?g/well
Cytogenic Analysis System (parenteral, grasshopper) = 20 mg
TCLo (inhalation, rat) = 450 mg/3/ 1 hour; teratogenic effects
LCLo (inhalation, human) = 1300 ppm/ 30 minutes
LCLo (inhalation, human) = 3000 ppm/ 5 minutes
LDLo (unreported, man) = 81 mg/kg
$LC_{50}$ (inhalation, mouse) = 1180 ppm/ 60 min
$LC_{50}$ (inhalation, mouse) = 2142 ppm/ 30 min; 2644 ppm/ 30 min
$LC_{50}$ (inhalation, mouse) = 13,745 ppm/ 5 min; 11238 ppm/ 5 min
LD50 (intraperitoneal, mouse) = 1449 mg/kg

**INORGANIC ACID (continued):**
$LC_{50}$ (inhalation, rat) = 3124 ppm/ 60 min
$LC_{50}$ (inhalation, rat) = 4701 ppm/ 30 min; 5666 ppm/ 30 min
$LC_{50}$ (inhalation, rat) = 30,000 ppm/ 5 min; 31,008 ppm/ 30 minutes
$LD_{50}$ (oral, rabbit) = 900 mg/kg.
LCLo (inhalation, rabbit) = 4416 ppm/ 30 minutes

**Eye Effects:** Application of a 1% solution for 20 seconds has caused scarring of the cornea. Other studies have reported that applications of 5 mg for 30 seconds caused mild irritation, and that application of a 5% solution caused minimal irritation.

**Skin Effects:** Application of 0.5 mL of a 17% concentrated solution for 4 hours can cause corrosive burns.

**ALKALI HYDROXIDE**:
Standard Draize Test (Eye-Monkey) 1%/24 hours: Severe
Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 400 ?g: Mild
Standard Draize Test (Eye-Rabbit) 1%: Severe
Standard Draize Test (Eye-Rabbit) 50 ?g/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 1 mg/24 hours: Severe
Rinsed with water (Eye-Rabbit) 1 mg/30 seconds: Severe
$LD_{50}$ (Intraperitoneal-Mouse) 40 mg/kg
LDLo (Oral-Rabbit) 500 mg/kg
Cytogenetic Analysis (Parenteral-Grasshopper) 20 mg
Cytogenetic Analysis (Hamster-Lung) 10 mmol/L
Cytogenetic Analysis (Hamster-Ovary) 16 mmol/L

SUSPECTED CANCER AGENT:

Inorganic Acid: IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The other components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA, and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product can be irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be sensitizers with repeated or prolonged use.

TOXICOLOGICAL SYNERGISTIC PRODUCTS: No information is currently available on toxicologically synergistic products of this material.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Human mutation data are available for the Alkali Hydroxide and Inorganic Acid components of this product; these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of the Inorganic Acid component of this product provided teratogenic data.

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of the Inorganic Acid component of this product provided reproductive toxicity data.

*A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.*

BIOLOGICAL EXPOSURES INDICES (BEIs): Currently, there are no Biological Exposure Indices (BEIs) for any component of this product.

## 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product will decompose into other organic and inorganic compounds over time under normal environmental conditions. Additional environmental data are available as follows:

**ALKALI HYDROXIDE**:
Water Solubility = 9 g/0.9 ml water
BOD: None.
Octanol/Water Partition Coefficient: SRP4: Too low to be measured (or possibly virtually 0)
Persistence: Can persist for extended periods of time.

**INORGANIC ACID:**
Water solubility: 56.5 g/ 100 cc (60?C); 82.3 g/ 100 cc (0?C)
Environmental Fate: If spilled onto the soil, this acid will infiltrate the soil. The presence of water will increase the movement through soil. During transport, the acid will dissolve carbonate based material and will be somewhat neutralized by these materials; however, a significant amount of the acid will remain. Overtime the pH will be neutralized by natural alkalinity and carbon dioxide. If released to an aquatic environment, this acid will almost completely dissociates.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to animal life if large volumes of it are released into the environment. Refer to section 11 (Toxicological Information) for information on the effects of components of this product on test animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to contaminated aquatic life (especially if large volumes of it are released into an aquatic environment. Additional aquatic toxicity data are available as follows:

**ALKALI HYDROXIDE:**
Acute Hazard Level:
Lethal pH (goldfish) = 10.9
Lethal pH (bluegill) = 10.5
$LC_{100}$ (*Cyprimus carpio)* 24 hours = 180 ppm/ 25?C
$TL_m$ (mosquito fish) 96 hours = 125 ppm/ fresh water
$TL_m$ (bluegill) 48 hours = 99 mg/L/ tap water

**DIETHYLENETRIAMINE PENTAMETHYLENEPHOSPHONIC ACID, SODIUM SALT**
NOEC (*Daphnia magna*) 48 hours = 125 mg/L
NOEC (Rainbow Trout) 96 hours = 180 mg/L
NOEC (*Selenastrum* algae) 96 hours = 5.2 mg/L
$EC_{50}$ (*Selenastrum* algae) 96 hours = 1.9 mg/L
$EC_{50}$ (*Daphnia magna*) 48 hours = 242 mg/L

**INORGANIC ACID:**
TLm (sunfish) = 96 hours/ pH 3.6/ 20?C
TLm (goldfish) = 96 hours/ pH 4/ 20?C
TLm (*Gambusia affinis*, mosquito fish) 96 hours = 282 ppm (fresh water)
TLm (stickleback) = 96 hours/ pH 4.6/ 20?C
LC (*Lepomis macrochirus*, bluegill sunfish) 48 hours = 3.6 mg/L
$LC_{50}$ (shrimp) 48 hours = 100-330 ppm (salt water)
$LC_{50}$ (starfish) 48 hours = 100-300 mg/L/ 48 hours
$LC_{50}$ (cockle) = 330-1000 mg/L
$LC_{50}$ (*Carassium auratus*, goldfish) = 178 mg/L (1-2 hour survival time)
$LC_{50}$ (shore crab) 48 hours = 240 mg/L
$LC_{50}$ (*Lepomis macrochirus*/bluegill sunfish) 96 hours = pH 3.0-3.5
$LC_{100}$ (trout) 24 hours = 10 mg/L

## 13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.

EPA WASTE NUMBER: Not applicable to wastes consisting only of this product.

## 14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

| | |
|---|---|
| PROPER SHIPPING NAME: | Not Regulated |
| HAZARD CLASS NUMBER and DESCRIPTION: | Not Applicable |
| UN IDENTIFICATION NUMBER: | Not Applicable |
| DOT LABEL(S) REQUIRED: | Not Applicable |
| PACKAGING GROUP: | Not Applicable |

NORTH AMERICAN RESPONSE GUIDEBOOK NUMBER (1996): Not Applicable
NATIONAL MOTOR FREIGHT CLASSIFICATION: LTL: 100; T: 70
MARINE POLLUTANT: No component of this product is listed as a marine pollutant by the D.O.T. (49 CFR 172.101, Appendix B).
TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use above information for Canadian Shipments.

## 15. REGULATORY INFORMATION

**ADDITIONAL U.S. REGULATIONS:**

U.S. SARA REPORTING REQUIREMENTS: None of the components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Inorganic Acid = 5,000 lbs (2,270 kg); Alkali Hydroxide 1,000 lbs (45.4 kgs).

U.S. TSCA INVENTORY STATUS: All components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

**Alaska - Designated Toxic and Hazardous Substances:** Alkali Hydroxide, Inorganic Acid.
**California - Permissible Exposure Limits for Chemical Contaminants:** Alkali Hydroxide, Inorganic Acid.
**Florida - Substance List:** Alkali Hydroxide, Inorganic Acid.
**Illinois - Toxic Substance List:** Alkali Hydroxide, Inorganic Acid.
**Kansas - Section 302/313 List:** Alkali Hydroxide, Inorganic Acid.
**Massachusetts - Substance List:** Alkali Hydroxide, Inorganic Acid.
**Michigan - Critical Materials Register:** No.
**Minnesota - List of Hazardous Substances:** Alkali Hydroxide, Inorganic Acid.
**Missouri - Employer Information/Toxic Substance List:** Alkali Hydroxide, Inorganic Acid.
**New Jersey - Right to Know Hazardous Substance List:** Alkali Hydroxide, Inorganic Acid.
**North Dakota - List of Hazardous Chemicals, Reportable Quantities:** Alkali Hydroxide, Inorganic Acid.
**Pennsylvania - Hazardous Substance List:** Alkali Hydroxide, Inorganic Acid.
**Rhode Island - Hazardous Substance List:** Alkali Hydroxide, Inorganic Acid.
**Texas - Hazardous Substance List:** Alkali Hydroxide, Inorganic Acid.
**West Virginia - Hazardous Substance List:** Alkali Hydroxide, Inorganic Acid.
**Wisconsin - Toxic and Hazardous Substances:** Alkali Hydroxide, Inorganic Acid

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Formaldehyde, a trace component of this product, is on the California Proposition 65 list. WARNING: This product contains a chemical known to the State of California to cause cancer.

ANSI LABELING (Z129.1): **WARNING!** MAY CAUSE SKIN AND EYE IRRITATION OR BURNS. MAY BE IRRITATING IF INHALED. HARMFUL IF SWALLOWED. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing mists or sprays. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, and suitable body protection if necessary. FIRST-AID: In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention if any adverse effects occur. IN CASE OF FIRE: Use water fog, dry chemical, $CO_2$, or "alcohol" foam. IN CASE OF SPILL: Absorb spill with inert material and place in suitable container. Consult Material Safety Data Sheet for additional information.

ENVIRONMENTAL HAZARDS: Do not discharge effluent containing this product into streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

**ADDITIONAL CANADIAN REGULATIONS:**

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are listed on the DSL/NDSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: Formaldehyde, a trace component of this product, is on the Second Priority Substances list under the Canadian Environmental Protection Act (CEPA).

CANADIAN WHMIS SYMBOLS: **Class E:** Corrosive Material

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

# 16. OTHER INFORMATION

**PREPARED BY:** CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

**DATE OF PRINTING** July 30, 2003

## DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**CAS #**: This is the Chemical Abstract Service Number which uniquely identifies each compound.

**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.
**TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
**OSHA** - U.S. Occupational Safety and Health Administration.
**PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
**IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

**HAZARD RATINGS:**
**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:** Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93?C [100-200?F]); **3** (Class IB and IC flammable liquids with flash points below 38?C [100?F]); **4** (Class IA flammable liquids with flash points below 23?C [73?F] and boiling points below 38?C [100?F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

**FLAMMABILITY LIMITS IN AIR**:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

**TOXICOLOGICAL INFORMATION:**
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **$LD_{50}$** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **$LC_{50}$** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **$mg/m^3$** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

**REGULATORY INFORMATION:**
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

## 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM BISULFITE
FORMULA: NAHSO3
FORMULA WT: 104.06
CAS NO.: 07631-90-5
NIOSH/RTECS NO.: VZ2000000
COMMON SYNONYMS: HYDROGEN SULFITE SODIUM; SODIUM ACID SULFITE; SODIUM HYDROGEN SULFITE
PRODUCT CODES: 3556,3557
EFFECTIVE: 08/18/86
REVISION #02

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 2 MODERATE
FLAMMABILITY - 0 NONE
REACTIVITY - 1 SLIGHT
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING
HARMFUL IF SWALLOWED OR INHALED
MAY CAUSE IRRITATION
MAY CAUSE ALLERGIC REACTION.
AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

## 2 - HAZARDOUS COMPONENTS

| COMPONENT | % | CAS NO. |
|---|---|---|
| SODIUM BISULFITE | 90-100 | 7631-90-5 |

## 3 - PHYSICAL DATA

BOILING POINT: N/A VAPOR PRESSURE(MM HG): N/A

MELTING POINT: N/A VAPOR DENSITY(AIR=1): N/A



SPECIFIC GRAVITY: 1.48 (H2O=1) EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): APPRECIABLE (MORE THAN 10 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: WHITE POWDER WITH SO2 ODOR.

## 4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
(POSITIVE PRESSURE IF AVAILABLE) BREATHING APPARATUS WITH FULL FACEPIECE.
MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.
USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE.

TOXIC GASES PRODUCED
SULFUR DIOXIDE

## 5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 5 MG/M3 ( PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 2000
LD50 (IPR-RAT)(MG/KG) - 650
LD50 (IV-RAT) (MG/KG) - 115

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS. ALLERGIC REACTION MAY DEVELOP. EXPOSURES TO SMALL AMOUNTS OF SULFITES HAVE BEEN REPORTED TO CAUSE HYPERSENSITIVITY REACTIONS IN CERTAIN INDIVIDUALS, ESPECIALLY ASTHMATICS. A SEVERE ALLERGIC REATION MAY BE FATAL.

TARGET ORGANS
BRAIN, GI TRACT, RESPIRATORY SYSTEM, SKIN

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MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
ASTHMA

ROUTES OF ENTRY
INHALATION, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

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## 6 - REACTIVITY DATA

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STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG ACIDS, STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: OXIDES OF SULFUR, OXIDES

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## 7 - SPILL AND DISPOSAL PROCEDURES

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STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

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## 8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE RECOMMENDED.

## 9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE
AREA.

## 10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME SODIUM HYDROGEN SULFITE, SOLID
HAZARD CLASS ORM-E
LABELS NONE
REPORTABLE QUANTITY 5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

MSDS Number: **S4106** * * * * * *Effective Date:* ***02/18/03*** * * * * * *Supercedes:* ***05/05/00***

**MSDS** **Material Safety Data Sheet**

*From:* Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# SODIUM HYPOCHLORITE SOLUTION

## 1. Product Identification

**Synonyms:** Bleach; hypochlorous acid, sodium salt; soda bleach; sodium oxychloride
**CAS No.:** 7681-52-9
**Molecular Weight:** 74.44
**Chemical Formula:** NaOCl
**Product Codes:** 9416, P005

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) | 7681-52-9 | 5% | Yes |
| Water | 7732-18-5 | 95% | No |

## 3. Hazards Identification

**Emergency Overview**
---
**WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION**

**TO EYES AND RESPIRATORY TRACT. CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

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Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

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**Potential Health Effects**

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**Inhalation:**
May cause irritation to the respiratory tract, (nose and throat); symptoms may include coughing and sore throat.
**Ingestion:**
May cause nausea, vomiting.
**Skin Contact:**
May irritate skin.
**Eye Contact:**
Contact may cause severe irritation and damage, especially at higher concentration.
**Chronic Exposure:**
A constant irritant to the eyes and throat. Low potential for sensitization after exaggerated exposure to damaged skin.
**Aggravation of Pre-existing Conditions:**
Persons with impaired respiratory function, or heart disorders (or disease) may be more susceptible to the effects of the substance.

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# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**
Consider oral administration of sodium thiosulfate solutions if sodium hypochlorite is ingested. Do not administer neutralizing substances since the resultant exothermic reaction could further damage tissue. Endotracheal intubation could be needed if glottic edema compromises the airway. For individuals with significant inhalation exposure, monitor arterial blood gases and chest x-ray.

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# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard. Substance releases oxygen when heated, which may increase the severity of an existing fire. Containers may rupture from pressure build-up.
**Explosion:**
This solution is not considered to be an explosion hazard. Anhydrous sodium hypochlorite is very explosive.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire. Use water spray to cool fire-exposed containers, to dilute liquid, and control vapor.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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# 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
Sodium Hypochlorite:
AIHA (WEEL) - STEL - 2 mg/m3

-OSHA Permissible Exposure Limit (PEL):
0.5 ppm (TWA), 1 ppm (STEL) as Chlorine

-ACGIH Threshold Limit Value (TLV):
1 ppm (TWA), 3 ppm (STEL) as Chlorine
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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# 9. Physical and Chemical Properties

**Appearance:**
Colorless to yellowish liquid.
**Odor:**
Chlorine-like odor.
**Solubility:**
100% in water.
**Density:**
1.07 - 1.14
**pH:**
9 - 10 (neutral solution-no excess sodium hydroxide)
**% Volatiles by volume @ 21C (70F):**
ca. 95
**Boiling Point:**
40C (104F) Decomposes slightly
**Melting Point:**

-6C (21F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
17.5 @ 20C (68F)
**Evaporation Rate (BuAc=1):**
No information found.

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# 10. Stability and Reactivity

**Stability:**
Slowly decomposes on contact with air. Rate increases with the concentration and temperature. Exposure to sunlight accelerates decomposition. Sodium hypochlorite becomes less toxic with age.
**Hazardous Decomposition Products:**
Emits toxic fumes of chlorine when heated to decomposition. Sodium oxide at high temperatures.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Ammonia (chloramine gas may evolve),amines, ammonium salts, aziridine, methanol, phenyl acetonitrile, cellulose, ethyleneimine, oxidizable metals, acids, soaps, and bisulfates.

**Conditions to Avoid:**
Light, heat, incompatibles.

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# 11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a tumorigen and mutagen. Irritation data: eye, rabbit, 10 mg - Moderate

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | No | No | 3 |
| Water (7732-18-5) | No | No | None |

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# 12. Ecological Information

**Environmental Fate:**
No information found.

**Environmental Toxicity:**
No information found.

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# 13. Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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# 14. Transport Information

Not regulated.

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# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\--------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\--------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | No | No | No | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\--------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | 100 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No

SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** None allocated.
**Poison Schedule:** S5
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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# 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **0** Reactivity: **1**
**Label Hazard Warning:**
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY.
**Label Precautions:**
Avoid contact with eyes, skin and clothing.
Avoid breathing mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 8.
**Disclaimer:**
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**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

# SULFURIC ACID, 52 - 100 %

**MSDS Number: S8234 --- *Effective Date: 09/14/00***

---

## 1. Product Identification

**Synonyms:** Oil of vitriol; Babcock acid; sulphuric acid
**CAS No.:** 7664-93-9
**Molecular Weight:** 98.08
**Chemical Formula:** H2SO4 in H2O
**Product Codes:**
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5889, 5960, 5961, 5971, 6902, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H976, H996, V344, V651

---

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sulfuric Acid | 7664-93-9 | 52 - 100% | Yes |
| Water | 7732-18-5 | 0 - 48% | No |

---

## 3. Hazards Identification

**Emergency Overview**
---
**POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

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**Potential Health Effects**

---

**Inhalation:**
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
**Ingestion:**
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
**Skin Contact:**
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
**Eye Contact:**
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
**Chronic Exposure:**
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
**Aggravation of Pre-existing Conditions:**
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
**Ingestion:**
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician

immediately.
**Eye Contact:**
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
**Explosion:**
Contact with most metals causes formation of flammable and explosive hydrogen gas.
**Fire Extinguishing Media:**
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

---

# 7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues

(vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
1 mg/m3(TWA), 3 mg/m3 (STEL), A2 - suspected human carcinogen for sulfuric acid contained in strong inorganic acid mists.

**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear oily liquid.

**Odor:**
Odorless.

**Solubility:**
Miscible with water, liberates much heat.

**Specific Gravity:**
1.84 (98%), 1.40 (50%), 1.07 (10%)

**pH:**
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
**% Volatiles by volume @ 21C (70F):**
No information found.
**Boiling Point:**
ca. 290C (ca. 554F) (decomposes at 340C)
**Melting Point:**
3C (100%), -32C (93%), -38C (78%), -64C (65%).
**Vapor Density (Air=1):**
3.4
**Vapor Pressure (mm Hg):**
1 @ 145.8C (295F)
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
**Hazardous Decomposition Products:**
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
**Conditions to Avoid:**
Heat, moisture, incompatibles.

---

# 11. Toxicological Information

**Toxicological Data:**
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
**Carcinogenicity:**
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sulfuric Acid (7664-93-9) | No | No | None |
| Water (7732-18-5) | No | No | None |

# 12. Ecological Information

**Environmental Fate:**
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
**Environmental Toxicity:**
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** SULFURIC ACID (WITH MORE THAN 51% ACID)
**Hazard Class:** 8
**UN/NA:** UN1830
Packing Group: II
**Information reported for product/size:** 440LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** SULPHURIC ACID (WITH MORE THAN 51% ACID)
**Hazard Class:** 8
**UN/NA:** UN1830
Packing Group: II
**Information reported for product/size:** 440LB

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sulfuric Acid (7664-93-9) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\--------

| | | --Canada-- | | |
|---|---|---|---|---|
| Ingredient | Korea | DSL | NDSL | Phil. |
| Sulfuric Acid (7664-93-9) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\--------

| | -SARA 302- | | ------SARA 313------ | |
|---|---|---|---|---|
| Ingredient | RQ | TPQ | List | Chemical Catg. |
| Sulfuric Acid (7664-93-9) | 1000 | 1000 | Yes | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\--------

| | | -RCRA- | -TSCA- |
|---|---|---|---|
| Ingredient | CERCLA | 261.33 | 8(d) |

| | | | |
|---|---|---|---|
| Sulfuric Acid (7664-93-9) | 1000 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes

SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No

Reactivity: Yes (Pure / Liquid)

**Australian Hazchem Code:** 2P
**Poison Schedule:** No information found.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
**Label First Aid:**
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

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**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

# *Los Esteros Critical Energy Facility*

## *Appendix 8.5-B*
## *Material Safety Data Sheets –*
## *LECEF Phase 2*

***December 2003***

# MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO 356**

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 356**

APPLICATION : CORROSION INHIBITOR

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 3 / 3 FLAMMABILITY : 2 / 2 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Cyclohexylamine | 108-91-8 | 10.0 - 30.0 |
| Morpholine | 110-91-8 | 5.0 - 10.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**DANGER**
Corrosive. Combustible. May cause tissue damage. Harmful if absorbed through skin. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep away from sources of ignition - No smoking. Keep away from heat. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.
Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.
Combustible Liquid; may form combustible mixtures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin, Inhalation

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Corrosive. Will cause eye burns and permanent tissue damage. Exposure to low vapor concentrations can result in foggy or blurred vision, objects appearing bluish and appearance of a halo around lights. These symptoms are temporary.

SKIN CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered. Harmful if absorbed through skin.

INGESTION :
Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach.

INHALATION :
Irritating, in high concentrations, to the eyes, nose, throat and lungs. Vapors may have a strong offensive odor which may cause sensory response including headache, nausea and vomiting.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

HUMAN HEALTH HAZARDS - CHRONIC :
No adverse effects expected other than those mentioned above.

## 4. FIRST AID MEASURES

EYE CONTACT :
Get immediate medical attention. PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open.

SKIN CONTACT :
Get immediate medical attention. Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use. Remove contaminated clothing. Wash off affected area immediately with plenty of water.

INGESTION :
Get immediate medical attention. DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : 135 °F / 57 °C ( PMCC )

This product does not sustain combustion; therefore, it does not meet the definition of hazard class 3 for transportation.

EXTINGUISHING MEDIA :
Dry powder, Carbon dioxide, Foam, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material.
Keep containers cool by spraying with water.

FIRE AND EXPLOSION HAZARD :
Combustible Liquid; may form combustible mixtures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Remove sources of ignition. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Do not breathe vapors/gases/dust. Use with adequate ventilation. Avoid generating aerosols and mists. Keep away from acids and oxidizing agents. Do not use, store, spill or pour near heat, sparks or open flame. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

STORAGE CONDITIONS :
Store the containers tightly closed. Store away from heat and sources of ignition. Use proper grounding procedures. Store separately from acids. Store separately from oxidizers. Amine and sulphite products should not be stored within close proximity or resulting vapors may form visible airborne particles.

SUITABLE CONSTRUCTION MATERIAL :
PVC, Stainless steel

UNSUITABLE CONSTRUCTION MATERIAL :
Copper, Brass, Bronze, and their alloys

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

| Substance(s) | |
|---|---|
| Cyclohexylamine | TWA: 10 ppm , 41 mg/m3 |
| Morpholine | TWA: 20 ppm , 71 mg/m3 (Skin) |

OSHA/PEL :

| Substance(s) | |
|---|---|
| Cyclohexylamine | TWA: 10 ppm , 40 mg/m3 |
| Morpholine | TWA: 20 ppm , 70 mg/m3 (Skin)<br>STEL: 30 ppm , 105 mg/m3 (Skin) |

ENGINEERING MEASURES :
General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :
Where concentrations in air may exceed the limits given in this section, the use of a half face filter mask or air supplied breathing apparatus is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Organic vapor cartridge (Black) with a Particulate pre-filter (Purple). In event of emergency or planned entry into unknown concentrations a positive pressure, full-

facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Butyl gloves, Most glove materials are of low chemical resistance. Replace gloves regularly.

SKIN PROTECTION :
Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Light yellow Light green |
| ODOR | Pungent, Amine |

| | |
|---|---|
| SPECIFIC GRAVITY | 0.98 - 1 @ 60 °F / 16 °C |
| DENSITY | 8.2 - 8.3 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (1 %) | 10.3 |
| pH (100 %) | 12 |
| VISCOSITY | 5.1 cps @ 77 °F / 25 °C |
| FREEZING POINT | 17 °F / 8 °C |
| VAPOR PRESSURE | 0.5 mm Hg @ 100 °F / |
| VOC CONTENT | 35.4 % |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Heat and sources of ignition including static discharges.

MATERIALS TO AVOID :
Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Certain amines in contact with nitrous acid, organic or inorganic nitrites or atmospheres with high nitrous oxide concentrations may produce N-nitrosamines, many of which are cancer-causing agents to laboratory animals. Avoid contact with SO2 or acidic bisulfite products, which may react to form visible airborne amine salt particles.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen

## 11. TOXICOLOGICAL INFORMATION

The following results are for the product along with results on the hazardous components.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | 779 mg/kg | Product |

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | 2,055 mg/kg | Product |

Rating : Non-Hazardous

ACUTE INHALATION TOXICITY :

| Species | LC50 | Test Descriptor |
|---|---|---|
| Rat | > 12,000 mg/l (8 hrs) | Morpholine |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 8.0 / 8.0 | Product |

Rating : Extremely irritating (Corrosive)

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 110 / 110.0 | Product |

Rating : Extremely irritating (Corrosive)

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

MUTAGENICITY :
Mutagenicity tests on morpholine provided the following results: A bacterial mutagenicity (Ames) bioassay was negative; sister chromatid exchange transformation was positive; mouse lymphoma was weakly positive and rat hepatocyte/DNA repair was negative. A mutagenicity test battery on cyclohexylamine was inconclusive. In a short-term test, cyclohexylamine caused mutation in human white blood cells.

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: High

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Rainbow Trout | 96 hrs | 130 mg/l | Product |
| Fathead Minnow | 96 hrs | 75 mg/l | Product |

Rating : Slightly toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 180 mg/l | | Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : 573,000 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| 5 d | 1,000 mg/l | |

The organic portion of this preparation is expected to be readily biodegradable.

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM , provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

| Air | Water | Soil/Sediment |
|---|---|---|
| <5% | 30 - 50% | 50 - 70% |

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Moderate
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D001

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

Do not reuse empty container.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. |
| Technical Name(s) : | CYCLOHEXYLAMINE, MORPHOLINE |
| UN/ID No : | UN 2734 |
| Hazard Class - Primary : | 8 |
| Hazard Class - Secondary : | 3 |
| Packing Group : | II |
| Flash Point : | 57 °C / 135 °F |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. |
| Technical Name(s) : | CYCLOHEXYLAMINE, MORPHOLINE |
| UN/ID No : | UN 2734 |
| Hazard Class - Primary : | 8 |
| Hazard Class - Secondary : | 3 |
| Packing Group : | II |
| IATA Cargo Packing Instructions : | 812 |
| IATA Cargo Aircraft Limit : | 30 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. |
| Technical Name(s) : | CYCLOHEXYLAMINE, MORPHOLINE |
| UN/ID No : | UN 2734 |
| Hazard Class - Primary : | 8 |
| Hazard Class - Secondary : | 3 |
| Packing Group : | II |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Cyclohexylamine : Corrosive, Flammable
Morpholine : Corrosive, Flammable

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product contains the following substance(s) which is listed in Appendix A and B as an Extremely Hazardous Substance. Listed below are the statutory Threshold Planning Quantity (TPQ) for the substance(s) and the Reportable Quantity (RQ) of the product. If a reportable quantity of product is released, it requires notification to your State Emergency Response Commission. You may also be required to notify the National Response Center - See CERCLA/SUPERFUND, above.

| Extremely Hazardous Substance | TPQ | RQ |
|---|---|---|
| Cyclohexylamine | 10,000 lbs | 40,201 lbs |

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| X | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives

The following limitations apply:

| Maximum dosage | Limitation |
|---|---|
| 40 PPM | in the steam. |

This product can not be used where the steam produced will contact milk or milk products.

U.S. DEPARTMENT OF AGRICULTURE (USDA) :
USDA Inspection and Grading Programs - Food Safety and Inspection Service:
This product is authorized by USDA for use in federally inspected meat and poultry plants. Authorized use is under category : G6

This product can not be used where the steam produced will contact milk or milk products.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
This product contains the following substances listed in the regulation:

| Substance(s) | Citations |
|---|---|
| • Cyclohexylamine | Sec. 111 |

| | |
|---|---|
| • Morpholine | Sec. 111 |

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Water | 7732-18-5 |
| Cyclohexylamine | 108-91-8 |
| Morpholine | 110-91-8 |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
B3 - Combustible Liquids, E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS) and are listed on the Australian Inventory of Chemical Substances (AICS).

CHINA
All substances in this product comply with the Chemical Control Law and are listed on the Chemical Inventory of Existing Substances (CIES).

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Ministry of International Trade & industry List (MITI).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)
This product's trade name is registered with the Korean Ministry of Environment (KMOE).

MALAYSIA
This product contains substance(s) which are not in compliance with the Draft Industrial Chemicals Act and may require additional review.

NEW ZEALAND
This product's trade name is registered with the Environmental Risk Management Authority (ERMA).

THE PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Moderate

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 05/09/2000
Replaces : 12/15/1999

# AMMONIUM HYDROXIDE (10 - 35% NH3)

**MSDS Number: A5916** --- ***Effective Date: 03/04/99***

## 1. Product Identification

**Synonyms:** Ammonium hydroxide solutions; ammonia aqueous; ammonia solutions
**CAS No.:** 1336-21-6
**Molecular Weight:** 35.05
**Chemical Formula:** NH4OH in H2O
**Product Codes:**
J.T. Baker: 4807, 5019, 5350, 5358, 5604, 5817, 5820, 5838, 5891, 7847, 9718, 9719, 9721, 9730, 9731, 9733, 9741, 9742
Mallinckrodt: 0124, 0127, 1177, 3248, 3256, 5318, 6665, H007, H010, H893, H894, V044, V066, V592, V649, V893

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Ammonium Hydroxide | 1336-21-6 | 21 - 72% | Yes |
| Water | 7732-18-5 | 28 - 79% | No |

Contains between 10 and 35% ammonia.

## 3. Hazards Identification

**Emergency Overview**

**POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

---

**Potential Health Effects**

---

**Inhalation:**
Vapors and mists cause irritation to the respiratory tract. Higher concentrations can cause burns, pulmonary edema and death. Brief exposure to 5000 ppm can be fatal.
**Ingestion:**
Toxic! May cause corrosion to the esophagus and stomach with perforation and peritonitis. Symptoms may include pain in the mouth, chest, and abdomen, with coughing, vomiting and collapse. Ingestion of as little as 3-4 mL may be fatal.
**Skin Contact:**
Causes irritation and burns to the skin.
**Eye Contact:**
Vapors cause irritation. Splashes cause severe pain, eye damage, and permanent blindness.
**Chronic Exposure:**
Repeated exposure may cause damage to the tissues of the mucous membranes, upper respiratory tract, eyes and skin.
**Aggravation of Pre-existing Conditions:**
Persons with pre-existing eye disorders or impaired respiratory function may be more susceptible to the effects of this material.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.
**Eye Contact:**
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately. Immediate action is critical to minimize possibility of blindness.

---

# 5. Fire Fighting Measures

**Fire:**

Autoignition temperature: 651C (1204F)
Flammable limits in air % by volume:
lel: 16; uel: 25
**Explosion:**
Flammable vapors may accumulate in confined spaces.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 42 they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
-OSHA Permissible Exposure Limit (PEL):
50 ppm (NH3)
-ACGIH Threshold Limit Value (TLV):
25 ppm (NH3) (TWA) 35 ppm (STEL)
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded, a full facepiece respirator with an ammonia/methylamine cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials. Polyvinyl alcohol is not recommended.

**Eye Protection:**

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear, colorless solution.
**Odor:**
Ammonia odor.
**Solubility:**
Infinitely soluble.
**Specific Gravity:**
0.9 (28% NH4OH)
**pH:**
11.6 (1.0N)
**% Volatiles by volume @ 21C (70F):**
No information found.
**Boiling Point:**
ca. 36C (ca. 97F)
**Melting Point:**
-72C (-98F)
**Vapor Density (Air=1):**
0.60 NH3
**Vapor Pressure (mm Hg):**
115 @ 20C (68F)
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Burning may produce ammonia, nitrogen oxides.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Acids, acrolein, dimethyl sulfate, halogens, silver nitrate, propylene oxide, nitromethane, silver oxide, silver permanganate, oleum, beta-propiolactone. Most common metals.
**Conditions to Avoid:**
Heat, sunlight, incompatibles, sources of ignition.

# 11. Toxicological Information

For ammonium hydroxide:
oral rat LD50: 350 mg/kg; eye, rabbit, standard Draize, 250 ug; severe, investigated as a mutagen.
For ammonia:
inhalation rat LC50: 2000 ppm/4-hr; investigated as a tumorigen, mutagen.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | No | No | None |
| Water (7732-18-5) | No | No | None |

# 12. Ecological Information

**Environmental Fate:**
This material is not expected to significantly bioaccumulate.
**Environmental Toxicity:**
This material is expected to be very toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l. The EC50/48-hour values for daphnia are less than 1 mg/l.

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** AMMONIA SOLUTIONS (WITH 10-35% AMMONIA)
**Hazard Class:** 8
**UN/NA:** UN2672

Packing Group: III
**Information reported for product/size:** 385LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** AMMONIA SOLUTIONS (WITH 10-35% AMMONIA)
**Hazard Class:** 8
**UN/NA:** UN2672
Packing Group: III
**Information reported for product/size:** 385LB

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia | |
|---|---|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | Yes | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes | |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | No | No | No | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Ammonium Hydroxide (1336-21-6) | 1000 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 2P
**Poison Schedule:** S6
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **1** Reactivity: **0**

**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. IMMEDIATE ACTION IS ESSENTIAL FOR EYE EXPOSURES. In all cases call a physician immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 8.
**Disclaimer:**
**********

**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**
**********

**Prepared by:** Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

ASTRO PRODUCT CODE # 2460

*Akzo Nobel Functional Chemicals LLC*

# MATERIAL SAFETY DATA SHEET



FYRQUEL 550

## SECTION 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

**PRODUCT NAME**
FYRQUEL 550

**CHEMICAL NAME**
Butylated triphenyl phosphate

**SYNONYM**
t-Butylphenyl diphenyl phosphate

**CHEMICAL FORMULA**
Mixture

**CAS #**
MIXTURE

**CHEMICAL FAMILY**
Aryl phosphate

**MANUFACTURERS NAME**
Akzo Nobel Functional Chemicals LLC

**PRODUCT/TECHNICAL INFORMATION**
1-800-666-1200

**ADDRESS**
5 Livingstone Avenue
Dobbs Ferry, NY 10522

**MEDICAL/HANDLING EMERGENCY**
1-914-693-6946

**COUNTRY**
USA

**TRANSPORTATION EMERGENCY**
CHEMTREC 1-800-424-9300

**PRODUCT USE**
Fire-resistant hydraulic fluid

**REVISION DATE**
12/08/1999

**ISSUE DATE**
3/10/1995

**REVISION NO.**
010

## SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE DESCRIPTION | PERCENT | CAS# |
|---|---|---|
| Triphenyl phosphate | 5.000- 10.000 | 115-86-6 |
| Butylated triphenyl phosphate mixture | ** 90.000- 95.000 | MIXTURE |

** SUBSTANCE IS A COMPOUND AND/OR MIXTURE

ASTRO PRODUCT CODE # 2460

*Akzo Nobel Functional Chemicals LLC*

MATERIAL SAFETY DATA SHEET



## SECTION 3. HAZARDS IDENTIFICATION

**Appearance & Odor**
Clear, yellow liquid; essentially odorless.

**STATEMENT OF HAZARDS**
May cause mild skin and eye irritation.
Inhalation of vapor or mist may cause respiratory tract irritation.
Triphenyl phosphate may cause cholinesterase inhibition at levels above the exposure limits.

**Fire & Explosion Hazards**
This product is not defined as flammable or combustible. It is self-extinguishing once the source of ignition is removed. The material is not sensitive to static discharge or physical impact. It may decompose under fire conditions.

**Primary Route of Exposure**
Skin contact and inhalation are the primary routes of exposure to this product.

**Inhalation Acute Exposure**
Inhalation of vapors or mists may cause respiratory tract irritation. Triphenyl phosphate, a component of this product, may cause cholinesterase inhibition (see Section 4, "Note to Physician," for signs and symptoms of these effects).

**Skin Contact - ACUTE**
Skin contact may cause mild irritation.

**Eye contact - ACUTE**
Eye contact may cause mild irritation.

**Ingestion - ACUTE**
Ingestion may cause irritation of the gastrointestinal system and diarrhea. Ingestion of triphenyl phosphate, a component of this product, may cause cholinesterase inhibition. See Section 4, "Note to Physician," for signs and symptoms of these effects.

**CARCINOGENICITY**

| | | | |
|---|---|---|---|
| IARC | ....NO | OSHA | ....NO |
| NTP | ....NO | ACGIH | ....NO |

ASTRO PRODUCT CODE # 2460



## SECTION 4. FIRST AID MEASURES

**Inhalation First Aid**
If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Skin Contact - First Aid**
Remove contaminated clothing and equipment. Thoroughly wash all affected areas with soap and plenty of water. Get medical attention if irritation persists. Wash contaminated clothing before reuse. Thoroughly clean or destroy contaminated shoes.

**Eye Contact - First Aid**
Immediately flush eyes with plenty of running water. If victim is wearing contact lenses, remove them. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Get medical attention if irritation persists.

**Ingestion - First Aid**
Get medical attention by calling a physician or a poison control center immediately. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, keep head below hips to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.

**Medical conditions aggravated**
Persons with pre-existing neuromuscular disorders may be at an increased risk from exposure to this material.

**Note to Physician**
This product is an organophosphorus mixture containing triphenyl phosphate. Triphenyl phosphate has been reported to be a weak cholinesterase inhibitor in humans. Symptoms of cholinesterase inhibition may include: headache, nausea, sweating, numbness and tingling of the hands and feet, salivation, muscle twitching, tremors, incoordination, blurred vision, tears, abdominal cramps, diarrhea, and chest discomfort. In cases of cholinesterase inhibition, atropine by injection is antidotal. Pralidoxime chloride (2-PAM; Protopam chloride) is also antidotal when administered early and in conjunction with atropine.

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## SECTION 5. FIRE FIGHTING MEASURES

**FLASH POINT**
475.00 F 246.11 C

**FLASH METHOD**
Pensky-Martens Closed Cup

**AUTO IGNITION TEMPERATURE**
1030.00 F 554.44 C

**UPPER EXPLOSION LIMIT**
N/D

**LOWER EXPLOSION LIMIT**
N/D

**Extinguishing Media**
Use water fog or spray, dry chemical, foam or carbon dioxide extinguishing agents.

**Fire Fighting Procedures**
As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate non-essential personnel from the fire area. Firefighters should wear full-face, self-contained breathing apparatus and impervious protective clothing. If possible, move containers from the fire area. If not leaking, keep fire exposed containers cool with a water fog or spray to prevent rupture due to excessive heat. High pressure water may spread product from broken containers increasing contamination or fire hazard.

Dike fire control water for later disposal. Do not allow contaminated water to enter waterways.

**Fire & Explosion Hazards**
This product is not defined as flammable or combustible. It is self-extinguishing once the source of ignition is removed. The material is not sensitive to static discharge or physical impact. It may decompose under fire conditions.

**Other Fire + Explosion Hazards**
No other fire or explosion hazards of this product are known.

**Hazardous Products/Combustion**
Decomposition of this product under fire conditions can produce carbon monoxide, phosphorus oxides, and organic decomposition products.

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## SECTION 5. FIRE FIGHTING MEASURES (CONTINUED)

**NFPA HEALTH RATING**
1

**NFPA FLAMMABILITY RATING**
1

**NFPA REACTIVITY RATING**
0

**NFPA OTHER**
ND

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Cleanup**
Isolate spill area and restrict nonessential personnel. All personnel involved in spill cleanup should follow appropriate industrial hygiene practices (see Section 8). Stop source of spill if possible without being injured. Dike area to prevent spill from spreading. Soak up liquid with a suitable absorbent such as clay, sawdust, or kitty litter. Sweep up absorbed material and place in a chemical waste container for disposal. CAUTION! Spill area may be slippery. Cover spill area with a slurry of powdered household detergent and water. Use stiff brush to work slurry into cracks and crevices. Allow to stand for 2-3 minutes, then flush with water. Dike wash water for later disposal. Do not allow contaminated water to enter waterways or sewers.

## SECTION 7. HANDLING AND STORAGE

**Handling**
Wear protective clothing including chemical goggles and rubber gloves when handling this product to avoid eye and skin contact. Handle in a well-ventilated area. Avoid inhalation of vapor or mist. Wash thoroughly after handling.

Containers should be located in an area where they can be rotated regularly (first in, first out) and visually inspected for dents and bulging on a weekly basis. If bulged drums are found, they should be vented in an open area by removing the two-inch bung very slowly. The two-inch bung should not be removed completely until there is no sound of pressure being released. The bung can then be removed, but this should be done slowly and with care.

Emptied container may retain product residues. Follow all warnings and precautions even after container is emptied.

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## SECTION 7. HANDLING AND STORAGE (CONTINUED)

**Storage**
Store away from foodstuffs and animal feed. Containers should be stored in a cool, dry, well ventilated area away from flammable or oxidizing materials and sources of heat or flame. Exercise due caution to prevent damage to or leakage from the container.

Prolonged storage at elevated temperatures under wet alkaline or acidic conditions should be avoided to assure product integrity. Care should be taken to prevent moisture condensation in the container. Carbon steel is the preferred material of construction for storage containers. The product is normally shipped in unlined tank cars, trucks and drums.

**MAXIMUM STORAGE TEMPERATURE**
149.00 F 65.00 C
Higher in absence air/moisture

**General Comments**
At temperatures below 4.4 C (40 F), the viscosity characteristics are such that improved pumping rates may be achieved by warming. Temperatures from 27-37.8 C (80-100 F) provide good rates of flow.

This product can be stored and transported in equipment constructed of mild steel.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Respiratory protection**
Use a NIOSH-approved organic vapor/acid gas respirator (OVAG) with dust, mist, and fume filters to reduce potential for inhalation exposure if use conditions generate vapor, mist, or aerosol and adequate ventilation (e.g., outdoor or well-ventilated area) is not available. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure, pressure demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

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## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

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**Skin Protection**
Skin contact with the liquid or its aerosol should be prevented through the use of suitable protective clothing, gloves, and footwear selected with regard for use condition exposure potential. Combination neoprene over natural latex gloves are recommended.

**Eye Protection**
Eye contact with the liquid or its aerosol should be prevented through the use of chemical safety goggles or a face shield selected with regard for use condition exposure potential.

**Ventilation protection**
At elevated processing temperatures or in the event that use conditions generate airborne vapor, aerosol, or mist, the material should be handled in a well-ventilated area. Where adequate ventilation is not available, respiratory protection should be used.

**Other Protection**
Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather. Long sleeved clothing may be used to minimize skin contact.

**APPLICABLE EXPOSURE LIMITS**
Other than any exposure limits which may be displayed in Section 8, there are no other known exposure limits applicable to this product or its components.

---

### EXPOSURE LIMITS/REGULATORY INFORMATION (IN MG/M3)

| SUBSTANCE DESCRIPTION | REG. AGCY | PEL | TLV | TWA | STEL | CEIL |
|---|---|---|---|---|---|---|

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## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

### EXPOSURE LIMITS/REGULATORY INFORMATION (IN MG/M3)

| SUBSTANCE DESCRIPTION | REG. AGCY | PEL | TLV | TWA | STEL | CEIL |
|---|---|---|---|---|---|---|
| Triphenyl phosphate | | | | | | |
| | OSHA | 3.0000 | N/D | N/D | N/D | N/D |
| | ACGIH | N/D | 3.0000 | N/D | N/D | N/D |
| | NIOSH | N/D | N/D | 3.0000 | N/D | N/D |
| | SUPPLIER | N/D | N/D | N/D | N/D | N/D |
| Butylated triphenyl phosphate mixture | | | | | | |
| | OSHA | N/D | N/D | N/D | N/D | N/D |
| | ACGIH | N/D | N/D | N/D | N/D | N/D |
| | NIOSH | N/D | N/D | N/D | N/D | N/D |
| | SUPPLIER | N/D | N/D | N/D | N/D | N/D |

LEGEND:

EXPOSURE LIMIT DESCRIPTIONS
CEIL Ceiling Exposure Limit
PEL Permissible Exposure Limit
STEL Short Term Exposure Limit
TLV Threshold Limit Value
TWA Time Weighted Average
N/D = Not Determined

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## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**VAPOR PRESSURE (mm Hg)**
LT 0.1 @ 37.8 C (100 F)

**VAPOR DENSITY (Air = 1.0)**
N/D

**EVAPORATION RATE**
N/D

**VOLATILE %**
N/D

**BOILING POINT**
N/D F N/D C

**ODOR THRESHOLD (ppm)**
N/D

**SPECIFIC GRAVITY**
EQ 1.15 @ 15.6 C (60 F)

**BULK DENSITY**
. Not Applicable

**SOLUBILITY IN WATER**
LT 0.1 g/100 ml miscibility

**SOLUBILITY IN OTHER SOLVENTS**
Not Determined

**COEFFICIENT OF OIL/WATER**
N/D

**POUR POINT**
20.00 F -6.66 C

**MELTING POINT**
N/D F N/D C

**pH FACTOR**
N/D

**CLOUD POINT**
N/D F N/D C

**FLASH POINT**
475.00 F 246.11 C

**FLASH METHOD**
Pensky-Martens Closed Cup

**UPPER EXPLOSION LIMIT**
N/D

**LOWER EXPLOSION LIMIT**
N/D

**AUTO IGNITION TEMPERATURE**
1030.00 F 554.44 C

**Other**
Viscosity @ 37.7 C (100 F) = 500-600 SUS.

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## SECTION 10. STABILITY AND REACTIVITY

**Stability**
This product is stable at ambient temperatures and atmospheric pressure. It is not self-reactive and is not sensitive to static discharge or physical impact.

**Incompatibilities**
This product is incompatible with strong oxidizers, strong acids and strong alkalis. It hydrolyzes slowly at ambient temperatures in acidic or alkaline aqueous solutions.

**Polymerization**
Hazardous polymerization is not expected to occur.

**Decomposition**
Under wet acidic or alkaline conditions this product hydrolyzes slowly and nonviolently to form phenol, substituted phenols, and aryl phosphoric acids.

Vapors may decompose at elevated temperatures to release harmful materials.

**Conditions to Avoid**
Prolonged storage at elevated temperatures (above 65.6 C; 150 F) should be avoided.
Avoid contact with strong acids, strong bases, and strong oxidizers.

## SECTION 11. TOXICOLOGICAL INFORMATION

**Toxicological - Inhalation**
The acute inhalation LC50 (rat) for this material following a 4-hour exposure was > 3.1 mg/l, the highest attainable concentration. No effects were observed at this level.

**Inhalation Chronic Exposure**
Chronic inhalation exposure effects for this product are not known.

**Toxicological - Dermal**
Practically non-toxic; the acute dermal LD50 (rabbit) for this material is greater than 2000 mg/kg.

This material was found to be a mild skin irritant in rabbits following a 24-hour exposure.

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SECTION 11. TOXICOLOGICAL INFORMATION
(CONTINUED)

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**Skin Contact - CHRONIC**
Chronic dermal exposure effects for this product are not known. However, prolonged and/or repeated contact may cause irritation.

**Toxicological - Eye**
This product is a mild irritant to rabbit eyes.

**Toxicological - Ingestion**
Practically non-toxic; the acute oral LD50 (rat) for this material is > 5000 mg/kg.

**Ingestion - CHRONIC**
Daily ingestion by rats of 100, 400, or 1600 ppm of this material in the diet for three months produced increases in the liver and adrenal gland weights in females and increases in the liver weights of males at the high-dose level. However, no histopathological changes were noted.

**CARCINOGENICITY/MUTAGENICITY**
This product was examined for mutagenic and clastogenic activity in a series of in vitro assays. The assays included: Ames tests, the mouse lymphoma and chromosome aberration tests. No evidence of genetic activity was noted in any of these assays.
This product was tested in an in vitro malignant transformation assay using BALB/3T3 cells. It did not induce morphological transformations and thus did not exhibit carcinogenic potential in this assay.

**REPRODUCTIVE EFFECTS**
Daily administration of this material at 100, 400, or 1000 mg/kg to rats on days 6 through 20 of gestation demonstrated maternal toxicity (increased liver weights and reduced food consumption at the high-dose) and feto-toxicity (reduction in fetal body weight at the high-dose) but no indications of teratogenicity were observed.

**NEUROTOXICITY**
When this material was administered orally to hens at a cumulative oral dose of 23 g/kg, no signs of acute delayed neurotoxicity were noted.

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## SECTION 11. TOXICOLOGICAL INFORMATION (CONTINUED)

**Other Toxicological Effects**
No other toxic effects for this product are known.

**Target Organs**
Overexposure to this product may affect the skin, eyes, respiratory system, and central and peripheral nervous system.

## SECTION 12. ECOLOGICAL INFORMATION

**ECOTOXICOLOGICAL INFORMATION**
96-hr. LC50 (Rainbow trout) = > 2 mg/l
96-hr. LC50 (Sheepshead minnow) = > 1 mg/l
96-hr. LC50 (Mysid shrimp) = 0.39 mg/l

**DISTRIBUTION**
Triaryl phosphate esters, including triphenyl phosphate, exhibit low aqueous solubility, have moderate potential for bioconcentration, and readily undergo biodegradation.

**CHEMICAL FATE**
This material is readily biodegradable.
Hydrolysis rates for triphenyl phosphate, a product component, are:
at pH 9.5: half-life: 0.23 days
at pH 8.2: half-life: 7.5 days

## SECTION 13. DISPOSAL CONSIDERATIONS

**Waste Disposal**
Material that cannot be used or chemically reprocessed should be disposed of in accordance with all applicable regulations.
Product containers designed for single use should be thoroughly emptied before disposal.
NOTE! State and local regulations may be more stringent than federal.

This product, if unused, does not meet the EPA's RCRA criteria as either a listed or a characteristic hazardous waste. Generators of wastes are required to evaluate their materials for compliance with RCRA and local disposal procedures and regulations.

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## SECTION 13. DISPOSAL CONSIDERATIONS (CONTINUED)

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**CONTAINER DISPOSAL**
Emptied containers may retain residues of this material. Follow all warnings and precautions even after the container is emptied.

Containers should be drained of residual material before disposal. Emptied containers should be disposed of in accordance with all applicable laws and regulations.

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## *SECTION 14. TRANSPORT INFORMATION*

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**SHIPPING DESCRIPTION**
FOLLOWING SHIPMENTS ARE NOT REGULATED FOR TRANSPORT:
Surface transport within North America (U.S.A., Canada, Mexico) in packages of 119 gallons or less (non-bulk).
Air transport within North America (U.S.A., Canada, Mexico).

*FOLLOWING SHIPMENTS ARE REGULATED FOR TRANSPORT (SHIPPING* DESCRIPTION FOLLOWS):
Bulk surface shipments within North America (> 119 gallons).
Water transport within North America (U.S.A., Canada, Mexico).
Export shipments (excluding non-bulk shipments to Canada and Mexico and shipments via air transport to Canada and Mexico).

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
(Triphenyl phosphate/tert-butylated triphenyl phosphates mixtures containing 5% to 10% triphenyl phosphates)
9, UN3082, PG III
NORTH AMERICAN EMERGENCY RESPONSE GUIDE NO. 171

**REQUIRED LABELS**
PRIMARY LABEL: Class 9
SUBSIDIARY RISK LABEL: Marine pollutant

***ENVIRON. HAZARDOUS SUBSTANCE***
This product contains triphenyl phosphate which is a Marine Pollutant per 49 CFR 172.101, Appendix B.

ASTRO PRODUCT CODE # 2460



## SECTION 15. REGULATORY INFORMATION

Component Triphenyl phosphate is subject to the following

Enviromental List

| | |
|---|---|
| DSL | Domestic Substance List-Canada |
| MA. LIST | Massachusetts Substance List |
| NJ R-T-K | New Jersey R-T-K Hazard. Sub. |
| PA. LIST | Penn. Hazardous Substance List |
| TSCA | Toxic Subst. Cont. Act -listed |

Component Butylated triphenyl phosphate mixture is subject to the following

Enviromental List

| | |
|---|---|
| DSL | Domestic Substance List-Canada |
| TSCA | Toxic Subst. Cont. Act -listed |

**OTHER REGULATORY INFORMATION**
No other regulatory information is available on this product.

**WHMIS HAZARD CLASS**
NOT CONTROLLED

**HAZARD RATING SOURCE**
HMIS

**HEALTH**
1

**REACTIVITY**
0

**FLAMMABILITY**
1

**OTHER**

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## SECTION 16. OTHER INFORMATION

**OTHER INFORMATION**
FYRQUEL is a registered trademark of Akzo Nobel Chemicals Inc.

Revisions made in Section(s) 1, 14, 16

**CREATED BY**
Product Safety 914/674-5000

**KEY TO ABBREVIATIONS:**

| | | |
|---|---|---|
| EQ=EQual | LT=Less Than | GT=Greater Than |
| AP=APproximately | TR=TRace | ND=No Data available |

The information in this material safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. However, no warranty is made as to the accuracy of and/or sufficiency of such information and/or suggestions as to the merchantability or fitness of the product for any particular purpose, or that any suggested use will not infringe any patent. Nothing in here shall be construed as granting or extending any license under any patent. Buyer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes, including mixing with other products. The information contained herein supersedes all previously issued bulletins on the subject matter covered. If the date of this document is more than three years old, call to make certain that this sheet is current.

Click on any of the following to find out more about our ISO Grade 32,46,68 products and Water Glycol 200.

VG 32

VG 46

VG 68

WG 200

# Material Safety Data Sheet

## Section I - Product Identification

**Product Name: Hydro Safe ISO VG-32 Hydraulic Fluid**
**Proper Shipping Name: Hydraulic Systems Fluids, other than Petroleum**

**Hazard Class: Non-Hazardous**
**Hazard ID NO: N/A**

**Completed By: Donn Rush**
**Phone Number: 1-800-500-5058**
**24-HR Emergency: 1-800-424-9300**

**Canola Oil**

## Section II - Hazardous Components

**Material Cas NO % by wt. Hazard**
**Ingredients are not considered hazardous under current OSHA regulations**

## Section III - Physical Data

**Boil Pt. (°F): >500**
**Vapor Pressure (MM HG): Nil**
**Vapor Density (Air=1): >1**
**Percent Volatile: Nil**
**PH Neat: N/A**
**Appearance and Odor:**

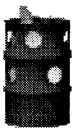
**Specific Gravity: 0.915**
**Evap. Rate: Nil**
**Sol. in Water: Insoluble**
**PH at %:**
**Clear light amber liquid; bland odor**

## Section IV - Fire and Explosion Hazard Data

**Flash Point, °F (Method Used): 485 (COC)**

**LEL: N/D**
**UEL: N/D**

Executive Summary



Fire Resistive Technical Article

| | |
|---|---|
| **HMIS and NFPA** | **Health: 1**<br>**Fire: 1**<br>**Reactivity: 0** |
| **Extinguishing Media:** | **Carbon dioxide, foam, dry chemical** |
| **Special fire fighting instructions:** | **None required** |
| **Unusual fire and explosion hazards:** | **None** |

## Section V - Health Hazard Information

| | |
|---|---|
| **Threshold Limit Value:** | **Not Applicable** |
| **Permissible Exosure Limit:** | **Not Applicable** |
| **Chronic (Recurrent Effects):** | **Unknown for this product.** |
| **Acute Effects:** | |
| **Inhalation:** | **No significant effects known.** |
| **Skin:** | **May be mild irritant on prolonged contact.** |
| **Eye:** | **Mild irritant.** |
| **Ingestion:** | **No significant effects known.** |

*******FIRST AID*******

| | |
|---|---|
| **Inhalation:** | **N/A** |
| **Skin:** | **Wash with soap and water.** |
| **Eye:** | **Flush with water for 15 minutes, consult physician.** |
| **Ingestion:** | **Give liquids, induce vomitting, consult physician.** |

*******Medical Conditions Generally Aggravated by Exposure*******

**None known.**

## Section VI - Reactivity Data

| | |
|---|---|
| **Stability:** | **Stable: (X)**<br>**Unstable: ( )** |
| **Incompatability (Materials to avoid):** | **Strong Oxidizers** |
| **Hazardous Decomposition Products:** | **Thermal; Oxides of Carbon** |
| **Hazardous Polymerization:** | **May Occur: ( )**<br>**Will Not Occur: (X)** |

## Section VII - Spill or Leak Procedures

| | |
|---|---|
| **Potential as a pollutant:** | **Not considered a pollutant. Effective waste disposal methods should be utilized.** |
| **Spill, Leak or Release:** | **Apply dry oil absorbent type material and sweep up.** |
| **Waste Disposal:** | **Can be incinerated under controlled conditions or treat as waste oil according to pertinent regulations.** |

## Section VIII - Special Protection Information

| | |
|---|---|
| **Respiratory Protection:** | **Not required.** |
| **Ventilation:** | **General good workplace ventilation is satisfactory.** |
| **Protective Gloves:** | **Rubber if skin is sensitive.** |
| **Eye Protection:** | **Safety goggles if splashing.** |
| **Other Protective Equipment:** | **Not required.** |

## Section IX - Special Precautions

**Storage and Handling Conditions: Avoid contact with strong oxidizers.**

## Section X

**Michigan Critical Materials Register - Act 293**
**Michigan Waste Management Act - Act 64**

**We hereby state that Hydro Safe ISO VG-32 does not contain any of the components listed in the above.**

## Additional Product Information

| | |
|---|---|
| **Carcinogens as defined by:** | **NTP: None**<br>**IARC: None**<br>**OSHA: None** |
| **CERCLA reportable quantity (LBS):** | **None** |
| **RCRA hazardous waste number:** | **N/A** |

# Material Safety Data Sheet



## SECTION I - Material Identity

Item Name..... CORROSION/SCALE INHIBITOR
Part Number/Trade Name..... NALCO 2833 CORR/SCALE INHIB.
National Stock Number..... 6850P2833
CAGE Code..... 89524
Part Number Indicator..... A
MSDS Number..... 14741
HAZ Code..... B

## SECTION II - Manufacturer's Information

Manufacturer Name..... NALCO CHEMICAL COMPANY.
Street..... ONE NALCO CENTER
City..... NAPERVILL, ILLINOIS
State..... IL
Country..... US
Zip Code..... 60563-1198
Emergency Phone..... 800-424-9300 (CHEMTREC)
Information Phone..... 800-462-5378

## MSDS Preparer's Information

Date MSDS Prepared/Revised..... 14APR00
Active Indicator..... N

## Alternate Vendors

## SECTION III - Physical/Chemical Characteristics

Hazard Storage Compatibility Code..... NR
NRC License Number..... NR
Net Propellant Weight (Ammo)..... NR
Appearance/Odor..... CLEAR TO HAZY, COLORLESS TO AMBER, LIQUID, NO ODOR.
Boiling Point..... 223 DEG F
Melting Point..... NR
Vapor Pressure..... NR
Vapor Density..... NR
Specific Gravity..... 1.32
Decomposition Temperature..... NR
Evaporation Rate..... NR

Solubility in Water..... COMPLETE
Percent Volatiles by Volume..... NR
Chemical pH..... 12.5-14
Corrosion Rate..... NR
Container Type..... N
Container Pressure Code..... 1
Temperature Code..... 4
Product State Code..... L

## SECTION IV - Fire and Explosion Hazard Data

Flash Point Method..... NA
Extinguishing Media..... USE FOR SURROUNDING AREA,
Special Fire Fighting Procedures..... USE FULL FIRE FIGHTERS PROTECTIVE GEAR.
Unusual Fire/Explosion Hazards..... NOT FLAMMABLE OR COMBUSTIBLE. IF PRODUCT IS ALLOWED TO DRY, THE SODIUM NITRITE IS AN OXIDIZING AGENT AND CAN INITIATE THE COMBUSTION OF OTHER MATERIALS. MAY EVOKE CARBON (COX) UNDER FIRE CONDITIONS. MAY EVOKE OXIDIZED OF NITROGEN UNDER FIRE CONDITIONS

## SECTION V - Reactivity Data

Stability..... YES
Stability Conditions to Avoid..... FREEZING TEMPERATURES
Materials to Avoid..... AVOID CONTACT WITH STRONG ACIDS, REDUCING AGENTS. DO NOT MIX W/AMINES.
Hazardous Decomposition Products..... CO, CO2,MAY BE FORMRD. DO NOT BREATH SMOKE OR FUMES.
Hazardous Polymerization..... NO
Polymerization Conditions to Avoid..... WILL NOT OCCUR,
LD50 - LD50 Mixture..... 630 MG/L SLIGHTLY TOXIC

## SECTION VI - Health Hazard Data

Route of Entry: Skin..... YES
Route of Entry: Ingestion..... YES
Route of Entry: Inhalation..... YES
Health Hazards - Acute and Chronic..... CAUSES FORMATION OF METHAEMOGLOBINAEMIA LEADING TO CYANOSIS AND POSSIBLE DEATH IF INGESTED. REPEATED INGESTION OF SMALL AMOUNTS CAUSE BLOOD PRESSURE TO DROP, RAPID PULSE, HEADACHE,AND VISUAL DISTURBANCE. CAUSES CENTRAL NERVOUS SYSTEM EFFECTS
Carcinogenity: NTP..... NO
Carcinogenity: IARC..... NO
Carcinogenity: OSHA..... NO
Explanation of Carcinogenity..... NONE
Symptoms of Overexposure..... CAUSES SKIN, EYES, AND RESPIRATORY

| | |
|---|---|
| | IRRITATION, CAN BE FATAL IF SWALLOWED. |
| Medical Cond. Aggrevated by Exposure.... | SIDIUM NITRITE, PREGNANT WOMEN ARE PARTICULARY SENSITIVE TO METHAEMOGLOBINAEMIA. |
| Emergency/First Aid Procedures..... | EYES.= IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MIN WHILE HOLDING EYE LIDS OPEN, GET MEDICAL ATTENTION SKIN: IMMEDIATELY FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MIN. GET IMMEDIATE MEDICAL ATTNETION INGESTION: INDUCE VOMITING IF CONSCOIUS. WASHOUT MOUTH AND GIVE WATER TO DRINK. GET IMMEDIATE MEDICAL ATTENTION INHALATION: REMOVE TO FRESH AIR. GET MEDICAL ATTENTION |

## SECTION VII - Precautions for Safe Handling and Use

| | |
|---|---|
| Steps if Material Released/Spilled..... | REMOVE IGNITION SOURCE,DIKE SPILL AREA, COVER SPILL WITH INERT MATERIAL. REMOVE AND PLACE INTO CONTAIER FOR DISPOSAL, |
| Neutralizing Agent..... | NR |
| Waste Disposal Method..... | DISPOSE OF IN ACCORDANCE TO ALL STATE AND FEDERAL LAWS. |
| Handling and Storage Precautions..... | AVOID EYE,SKIN CONTACT. DO NOT TAKE INTERNALLY. ENSURE ALL CONTAINERS ARE LABELED. KEEP CONTAINERS CLOSED WHEN NOT IN USE. USE WITH ADEQUATE VENTILATION |
| Other Precautions..... | KEEP IN DRY PLACE. STORE CONTINAERS TIGHTLY CLOSED. STORE SEPERATELY FROM ACIDS |

## SECTION VIII - Control Measures

| | |
|---|---|
| Respiratory Protection..... | USE NIOSH APPROVED RESPIRATOR WHEN TLV LEVELS ARE EXCEEDED. |
| Ventilation..... | LOCAL OR GENERAL |
| Protective Gloves..... | RUBBER OR IMPREVIOUS, |
| Eye Protection..... | CHEMICAL RESISTANT GOGGLES. |
| Other Protective Equipment..... | LAUNDER CLOTHING BEFORE REUSE, |
| Work Hygenic Practices..... | WASH WITH SOAP AND WATER AFTER HANDELING ANY CHEMICAL , |
| Supplemental Health/Safety Data..... | NR |

## SECTION IX - Label Data

| | |
|---|---|
| Protect Eye..... | YES |
| Protect Skin..... | YES |
| Protect Respiratory..... | YES |
| Chronic Indicator..... | NO |
| Contact Code..... | SLIGHT |
| Fire Code..... | UNKNOWN |
| Health Code..... | UNKNOWN |
| React Code..... | UNKNOWN |

Specific Hazard and Precaution..... NO TARGET ORGANS LISTED FOR CHRONIC EXPOSURES

## SECTION X - Transportation Data

Container Quantity..... 15
Unit of Measure..... GL

## SECTION XI - Site Specific/Reporting Information

Volatile Organic Compounds (P/G)..... 0
Volatile Organic Compounds (G/L)..... 0

## SECTION XII - Ingredients/Identity Information

Ingredient #..... 01
Ingredient Name..... SODIUM HYDROXIDE (0.1-1%)
CAS Number..... 1310732
Percent..... 1
Ingredient #..... 02
Ingredient Name..... SODIUM NITRITE (10-30%)
CAS Number..... 7632000
Percent..... 30
Ingredient #..... 03
Ingredient Name..... SODIUM MOLYBDATE (1-5%)
CAS Number..... 7631950
Percent..... 5

NOTICE: For additional information, contact BIOENVIRONMENTAL

*HMMS Intranet - 20 Dec 2003 19:22 - web_msds.display - Visit the Official HMMS Website at www.hmms.com*

MSDS Number: **S3170** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***11/17/99***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS | J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# SODIUM BROMIDE

## 1. Product Identification

**Synonyms:** Sedoneural
**CAS No.:** 7647-15-6
**Molecular Weight:** 102.89
**Chemical Formula:** NaBr
**Product Codes:**
J.T. Baker: 3588
Mallinckrodt: 0514, 0535

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sodium Bromide | 7647-15-6 | 100% | Yes |

## 3. Hazards Identification

**Emergency Overview**
---

**WARNING! HARMFUL IF SWALLOWED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

---

**Potential Health Effects**

---

**Inhalation:**
Dust may cause irritation to the respiratory tract; symptoms may include coughing and shortness of breath.

**Ingestion:**
May cause nausea, vomiting and abdominal pain. Ingestions are usually promptly rejected by vomiting, but sufficient absorption may occur to produce central nervous system, eye and brain effects. Symptoms may include skin rash, blurred vision and other eye effects, drowsiness, irritability, dizziness, mania, hallucinations, and coma.
**Skin Contact:**
Dry material may cause mild irritation. Solutions may cause irritation, redness, and pain.
**Eye Contact:**
May cause irritation, redness and pain.
**Chronic Exposure:**
Repeated or prolonged exposure by any route may cause skin rashes (bromaderma). Repeated ingestion of small amounts may cause central nervous system depression, including depression, ataxia, psychoses, memory loss, irritability, and headache.
**Aggravation of Pre-existing Conditions:**
Persons suffering from debilitation, depression, alcoholism, neurological or psychological disorders may be more susceptible to the effects of this compound.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
**Ingestion:**
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.
**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard.
**Explosion:**
Not considered to be an explosion hazard.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

---

# 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
None established.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work

area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**Personal Respirators (NIOSH Approved):**

For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**

Wear protective gloves and clean body-covering clothing.

**Eye Protection:**

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**

White crystals, granules, or powder

**Odor:**

Odorless.

**Solubility:**

116 g/l00 g water @ 50C (122F)

**Specific Gravity:**

3.21

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

0

**Boiling Point:**

1390C (2534F)

**Melting Point:**

755C (1391F)

**Vapor Density (Air=1):**

No information found.

**Vapor Pressure (mm Hg):**

No information found.

**Evaporation Rate (BuAc=1):**

No information found.

---

# 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage. Absorbs moisture from air.

**Hazardous Decomposition Products:**

Oxides of the contained metal and halogen, possibly also free, or ionic halogen.

**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Acids, alkaloidal and heavy metal salts, oxidizers, and bromine trifluoride.
**Conditions to Avoid:**
Moisture and incompatibles.

---

# 11. Toxicological Information

**Toxicological Data:**
Sodium Bromide: Oral rat LD50: 3500 mg/kg. Investigated as a reproductive effector.
**Reproductive Toxicity:**
Causes reproductive system effects in laboratory animals.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sodium Bromide (7647-15-6) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
No information found.
**Environmental Toxicity:**
No information found.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

# 14. Transport Information

Not regulated.

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sodium Bromide (7647-15-6) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\----------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Sodium Bromide (7647-15-6) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Sodium Bromide (7647-15-6) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Sodium Bromide (7647-15-6) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

**Australian Hazchem Code:** None allocated.
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **0** Reactivity: **0**
**Label Hazard Warning:**
WARNING! HARMFUL IF SWALLOWED. AFFECTS CENTRAL NERVOUS SYSTEM, BRAIN AND EYES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
**Label Precautions:**
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
**Label First Aid:**

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ONDEO Nalco

# MATERIAL SAFETY DATA SHEET

PRODUCT

**TRASAR® 23263**

**EMERGENCY TELEPHONE NUMBER**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **TRASAR® 23263**

APPLICATION : COOLING WATER TREATMENT

COMPANY IDENTIFICATION : ONDEO Nalco Company
ONDEO Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 REACTIVITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**CAUTION**
May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water. Protect product from freezing.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. May cause nausea and vomiting.

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 7346**

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 2 / 2 FLAMMABILITY : 1 / 1 INSTABILITY : 1 / 1 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| 1,3-Dichloro-5,5-Dimethylhydantoin | 118-52-5 | 10.0 - 30.0 |
| 1-Bromo-3-Chloro-5,5-Dimethyl-Hydantoin | 16079-88-2 | 30.0 - 60.0 |
| 1,3-Dichloro-5-Ethyl-5-Methylhydantoin | 89415-87-2 | 10.0 - 30.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**DANGER**
HARMFUL IF SWALLOWED. HIGHLY CORROSIVE. Causes eye and skin damage. Irritating to nose and throat. May cause sensitization by skin contact.
Avoid breathing dust. Use with adequate ventilation. Do not get in eyes, on skin or on clothing. Wear rubber gloves and chemical goggles and face shield when handling. Wash thoroughly after handling. Immediately remove contaminated clothing and wash before reuse.
Oxidizer; material is an oxidizer which may readily react with other materials, especially upon heating. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve hydrogen bromide and bromine under fire conditions. May evolve chlorine under fire conditions. May evolve HCl under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin, Inhalation

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

SKIN CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered. Repeated or prolonged contact may cause skin sensitization.

INGESTION :
Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach. May be harmful or fatal if swallowed.

INHALATION :
Not a likely route of exposure. Irritating, in high concentrations, to the eyes, nose, throat and lungs.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :
Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention.

INGESTION :
DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

Call a Poison Control Center or doctor for treatment advice. Have the product container or label with you when calling a Poison Control Center or doctor or going for treatment.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15 - 20 minutes. Remove contact lenses, if present, after the first 5 minutes, them continue rinsing eye.

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water, if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do

not give anything by mouth to an unconscious person., IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible., NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

NOTE TO PHYSICIAN :
Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : 287 °F / 142 °C ( COC )

EXTINGUISHING MEDIA :
Dry powder, Foam, Carbon dioxide, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material.

FIRE AND EXPLOSION HAZARD :
Oxidizer; material is an oxidizer which may readily react with other materials, especially upon heating. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve hydrogen bromide and bromine under fire conditions. May evolve chlorine under fire conditions. May evolve HCl under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ensure adequate ventilation. Do not touch spilled material. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
Sweep up and shovel. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
This product is toxic to fish. Do not discharge into lakes, streams, ponds or public waters.

## 7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep the containers closed when not in use. Avoid generating dusts. Classified as an ST-1 dust explosive hazard (ASTM E-1226-88). Airborne dusts of this product in an enclosed space and in the presence of an ignition source may constitute an explosion hazard.

STORAGE CONDITIONS :
Store the containers tightly closed. Store in suitable labelled containers. Keep in dry place.

SUITABLE CONSTRUCTION MATERIAL :
Butyl rubber, Buna-N, Hypalon, Teflon

UNSUITABLE CONSTRUCTION MATERIAL :
Do not use aluminum or mild steel., Brass, Carbon steel

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

| Substance(s) | |
|---|---|
| 1,3-Dichloro-5,5-Dimethylhydantoin | TWA: 0.2 mg/m3 0.2 mg/m3<br>STEL: 0.4 mg/m3 0.4 mg/m3 |

OSHA/PEL :

| Substance(s) | |
|---|---|
| 1,3-Dichloro-5,5-Dimethylhydantoin | TWA: 0.2 mg/m3<br>STEL: 0.4 mg/m3 |

Manufacturer's Recommendation :

| Substance(s) | |
|---|---|
| 1,3-Dichloro-5-Ethyl-5-Methylhydantoin | TWA: 0.2 mg/m3 |

ENGINEERING MEASURES :
General ventilation is recommended. Local exhaust ventilation may be necessary when dusts or mists are generated.

RESPIRATORY PROTECTION :
If dusts are generated, use an approved air-purifying respirator. An organic vapor/acid gas cartridge with dust/mist prefilter may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Neoprene gloves, PVC gloves, Butyl gloves

SKIN PROTECTION :
Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Briquettes |
| APPEARANCE | White |
| ODOR | Slight, Pungent |

| | |
|---|---|
| SOLUBILITY IN WATER | Partial |
| pH (1 %) | 3.6 |
| MELTING POINT | 248 - 298 °F / 120 - 148 °C |
| EVAPORATION RATE | < 1 |
| VOC CONTENT | 61.87 % |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Moisture
Avoid temperatures greater than 165 °C

MATERIALS TO AVOID :
Strong acids Strong Bases Contact with organic materials (e.g. rags, sawdust, hydrocarbon oils or solvents) and avoid reducing agents (e.g. hydrazine, sulfites, sulfide, aluminum or magnesium dust) which can generate heat, fires, explosions and the release of toxic fumes.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, HCl, Chlorine gas

## 11. TOXICOLOGICAL INFORMATION

The following results are for the product along with results on the active substances.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | 468 - 477 mg/kg | Product |

Rating : Toxic

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | > 2,000 mg/kg | Active Substance |

Rating : Non-Hazardous

SENSITIZATION :
Repeated or prolonged contact may cause sensitization in some individuals.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: High

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product along with results on the active substances.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Rainbow Trout | 96 hrs | 0.5 mg/l | Product |
| Bluegill Sunfish | 96 hrs | 1.2 mg/l | Product |
| Sheepshead Minnow | 96 hrs | 1.4 mg/l | Product |
| Fathead Minnow | 96 hrs | 0.71 mg/l | Product |

Rating : Very toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 0.4 mg/l | | Product |
| Mysid Shrimp (Mysidopsis bahia) | 96 hrs | 0.93 mg/l | | Product |
| American Oyster | 96 hrs | 0.84 mg/l | | Product |

Rating : Very toxic

AQUATIC PLANT RESULTS :

| Species | Exposure | EC50/LC50 | Test Descriptor |
|---|---|---|---|
| Green Algae (Selenastrum capricornutum) | 72 hrs | 0.12 mg/l | Active Substance ( 1,3-Dichloro-5-Ethyl-5-Methylhydantoin ) |

Rating :

AVIAN RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bobwhite Quail | | > 5,620 mg/kg | Similar active ingredients |
| Mallard Duck | | > 5,620 mg/kg | Similar active ingredients |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: High
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Do not contaminate water, food or feed by storage or disposal. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal law.

Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or other procedures approved by state and local authorities. If burned, stay out of smoke.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | OXIDIZING SOLID, N.O.S. |
| Technical Name(s) : | BROMOCHLORO-5,5-DIMETHYLHYDANTOIN, 1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN |
| UN/ID No : | UN 1479 |
| Hazard Class - Primary : | 5.1 |
| Packing Group : | II |
| Flash Point : | 142 °C / 287 °F |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | OXIDIZING SOLID, CORROSIVE, N.O.S. |
| Technical Name(s) : | BROMOCHLORO-5,5-DIMETHYLHYDANTOIN, 1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN |
| UN/ID No : | UN 3085 |
| Hazard Class - Primary : | 5.1 |
| Hazard Class - Secondary : | 8 |
| Packing Group : | II |
| IATA Cargo Packing Instructions : | |
| IATA Cargo Aircraft Limit : | (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | OXIDIZING SOLID, CORROSIVE, N.O.S. |
| Technical Name(s) : | BROMOCHLORO-5,5-DIMETHYLHYDANTOIN, 1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN |
| UN/ID No : | UN 3085 |
| Hazard Class - Primary : | 5.1 |
| Hazard Class - Secondary : | 8 |
| Packing Group : | II |
| *Marine Pollutant : | BROMOCHLORO-5,5-DIMETHYLHYDANTOIN |

*Note: This product is regulated as a Marine Pollutant when shipped by Rail, Highway, or Air in bulk quantities (greater than 119 gallons) and when shipped by water in all quantities.

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

1,3-Dichloro-5,5-Dimethylhydantoin : Corrosive, Dermal Sensitizer
1-Bromo-3-Chloro-5,5-Dimethyl-Hydantoin : Corrosive, Oxidizer
1,3-Dichloro-5-Ethyl-5-Methylhydantoin : Corrosive, Dermal Sensitizer

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| X | Delayed (Chronic) Health Hazard |
| X | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
This product is exempted under TSCA and regulated under FIFRA. The inerts are on the Inventory List.

FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT (FIFRA) :
EPA Reg. No. 6836-115-1706
In all cases follow instructions on the product label.

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
Substances known to the State of California to cause cancer are present as an impurity or residue.

| Substance(s) | Concentration | EFFECTS |
|---|---|---|
| • Bromoform | < .002 % | Causes Cancer |

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
This product is a registered biocide and is exempt from State Right to Know Labelling Laws.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
Pesticide controlled products are not regulated under WHMIS.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Moderate

* The environmental risk is: Moderate

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 2003/08/06
Replaces : 2003/04/06

ONDEO Nalco

# MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO 7396**

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 7396**

APPLICATION : WATER STABILIZATION

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 1 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous.

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Tetrapotassium Pyrophosphate | 7320-34-5 | 60.0 - 100.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**WARNING**
Irritating to eyes. May cause skin irritation.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.
May evolve oxides of phosphorus (POx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Slightly irritating, but will not injure eye tissue.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. No adverse effects expected.

INHALATION :
Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of phosphorus (POx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

UNSUITABLE CONSTRUCTION MATERIAL :
Aluminum, Do not use aluminum or mild steel.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed. Respiratory protection is not normally needed. Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Butyl gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Colorless |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.74 @ 59 °F / 15 °C |
| DENSITY | 14.5 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 10.0 - 11.5 |
| FREEZING POINT | -20 °F / -28.9 °C |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Extremes of temperature

MATERIALS TO AVOID :
None known

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of phosphorus

## 11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | 2,444 mg/kg | Product |

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | > 5,000 mg/kg | Product |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.8 / 8.0 | Product |

Rating : Slightly irritating

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 17.3 / 110.0 | Product |

Rating : Mildly irritating

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | 420 mg/l | Product |
| Rainbow Trout | 96 hrs | 450 mg/l | Product |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | > 100 mg/l | | Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Chemical Oxygen Demand (COD) : < 100 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| | 0 mg/l | |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| Flash Point : | None |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

| | |
|---|---|
| IATA Cargo Packing Instructions : | 820 |
| IATA Cargo Aircraft Limit : | 60 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| - | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

U.S. DEPARTMENT OF AGRICULTURE (USDA) :
USDA Inspection and Grading Programs - Food Safety and Inspection Service:
This product is authorized by USDA for use in federally inspected meat and poultry plants. Authorized use is under category : G2, G7

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

NSF INTERNATIONAL :
This product has received NSF/International certification under ANSI/NSF Standard 60 in the corrosion and scale control and sequestering categories. The official name is "Tetrapotassium Pyrophosphate." Maximum product application dosage is : 27 mg/l. Only product manufactured at Plant 101 USA and whose container label bears the ANSI/NSF Mark may be used in potable water treatment applications.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 04/04/2003
Replaces : 12/13/2001

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO 8305 PLUS**

APPLICATION : COOLING WATER TREATMENT

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 2 FLAMMABILITY : 1 / 1 REACTIVITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Sodium Tolyltriazole | 64665-57-2 | 1.0 - 5.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**WARNING**
Irritating to eyes and skin.
Do not get in eyes, on skin, on clothing. Do not take internally. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing.
Wear suitable protective clothing, gloves and eye/face protection.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve oxides of phosphorus (POx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Can cause moderate irritation.

SKIN CONTACT :
Can cause moderate irritation.

INGESTION :
Not a likely route of exposure. No adverse effects expected.

INHALATION :
Not a likely route of exposure. Aerosols or product mist may irritate the upper respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. If irritation persists, repeat flushing. Get immediate medical attention.

SKIN CONTACT :
Immediately flush with plenty of water for at least 15 minutes. If symptoms persist, call a physician.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Keep containers cool by spraying with water. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve oxides of phosphorus (POx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labelled. Keep the containers closed when not in use. Use with adequate ventilation.

STORAGE CONDITIONS :
Store the containers tightly closed. Store in suitable labelled containers.

UNSUITABLE CONSTRUCTION MATERIAL :
Product is corrosive to aluminum. Aluminum should not be used for feed, storage, or transportation systems.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available. Keep a safety shower available.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Light yellow |
| ODOR | Sweet, Organic |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.38 - 1.42 @ 77 °F / 25 °C |
| DENSITY | 11.5 - 11.8 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 11.5 - 13.0 |
| VISCOSITY | 7 cps @ 71 °F / 21.7 °C |
| FREEZING POINT | < -50 °F / < -45.6 °C |
| VAPOR PRESSURE | 0.5 mm Hg @ 100 °F / |

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of phosphorus

## 11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Moderate

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | 450 mg/l | Product |
| Rainbow Trout | 96 hrs | 610 mg/l | |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | > 1,000 mg/l | | Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Total Organic Carbon (TOC) : 23,000 mg/l

Chemical Oxygen Demand (COD) : 57,000 mg/l

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste. Special Waste Regulations 1996 apply.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM TOLYLTRIAZOLE, TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| Flash Point : | None |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM TOLYLTRIAZOLE, TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| IATA Cargo Packing Instructions : | 820 |
| IATA Cargo Aircraft Limit : | 60 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |

| | |
|---|---|
| Technical Name(s) : | SODIUM TOLYLTRIAZOLE, TETRAPOTASSIUM PYROPHOSPHATE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Tolyltriazole : Irritant

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| - | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

None

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Moderate

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 07/11/2000
Replaces : 06/24/1998

MATERIAL SAFETY DATA SHEET

PRODUCT

**NALCO BT-3000**

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO BT-3000**

APPLICATION : BOILER WATER TREATMENT

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 3 / 3 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Sodium Hydroxide | 1310-73-2 | 1.0 - 5.0 |
| Sodium Tripolyphosphate | 7758-29-4 | 1.0 - 5.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**DANGER**
Corrosive. May cause tissue damage.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Protect product from freezing. Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.
Not flammable or combustible. May evolve oxides of phosphorus (POx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Corrosive. Will cause eye burns and permanent tissue damage.

SKIN CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

INGESTION :
Not a likely route of exposure. Corrosive; causes chemical burns to the mouth, throat and stomach.

INHALATION :
Not a likely route of exposure. Irritating, in high concentrations, to the eyes, nose, throat and lungs.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :
Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use.

INGESTION :
DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Probable mucosal damage may contraindicate the use of gastric lavage. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : > 200 °F / > 93 °C ( PMCC )

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
Not flammable or combustible. May evolve oxides of phosphorus (POx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Avoid generating aerosols and mists. Do not mix with acids. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

STORAGE CONDITIONS :
Store the containers tightly closed. Store separately from acids. Store in suitable labelled containers.

UNSUITABLE CONSTRUCTION MATERIAL :
Do not use aluminum or mild steel.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

ACGIH/TLV :

| Substance(s) | |
|---|---|
| Sodium Hydroxide | CEILING: 2 mg/m3 |
| Tetrasodium | TWA: 5 mg/m3 |

Pyrophosphate
OSHA/PEL :
Substance(s)

| | |
|---|---|
| Sodium Hydroxide | CEILING: 2 mg/m3 |
| Tetrasodium Pyrophosphate | TWA: 5 mg/m3 |

ENGINEERING MEASURES :
General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :
If significant mists, vapors or aerosols are generated an approved respirator is recommended. A dust, mist, fume cartridge may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, PVC gloves, Butyl gloves, Rubber gloves

SKIN PROTECTION :
Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Light yellow |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.05 - 1.09 @ 77 °F / 25 °C |
| DENSITY | 8.7 - 9.1 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (1 %) | 11.8 |
| pH (100 %) | 13.3 |
| VISCOSITY | < 4 cps @ 72 °F / 22 °C |

FREEZING POINT < 33 °F / < 1 °C

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of phosphorus

## 11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: High

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Rainbow Trout | 96 hrs | > 5,000 mg/l | Product |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 3,125 mg/l | | Product |

Rating : Essentially non-toxic

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| Flash Point : | > 93 °C / > 200 °F |
| DOT Reportable Quantity (per package) : | 45,900 lbs |
| DOT RQ Component : | SODIUM HYDROXIDE |

AIR TRANSPORT (ICAO/IATA) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |

| | |
|---|---|
| Hazard Class - Primary : | 8 |
| Packing Group : | III |
| IATA Cargo Packing Instructions : | 820 |
| IATA Cargo Aircraft Limit : | 60 L (Max net quantity per package) |

MARINE TRANSPORT (IMDG/IMO) :

| | |
|---|---|
| Proper Shipping Name : | CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. |
| Technical Name(s) : | SODIUM HYDROXIDE |
| UN/ID No : | UN 3266 |
| Hazard Class - Primary : | 8 |
| Packing Group : | III |

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Hydroxide : Corrosive
Sodium Tripolyphosphate : Exposure Limit

CERCLA/SUPERFUND, 40 CFR 117, 302 :
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

| RQ Substance | RQ |
|---|---|
| Sodium Hydroxide | 45,900 lbs |

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

| | |
|---|---|
| X | Immediate (Acute) Health Hazard |
| - | Delayed (Chronic) Health Hazard |
| - | Fire Hazard |
| - | Sudden Release of Pressure Hazard |
| - | Reactive Hazard |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives

Limitations: no more than required to produce intended technical effect.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product contains the following substances listed in the regulation:

| Substance(s) | Citations |
|---|---|
| • Sodium Hydroxide<br>• Sodium Tripolyphosphate | Sec. 311 |

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Sodium Hydroxide | 1310-73-2 |
| Sodium Tripolyphosphate | 7758-29-4 |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

Nalco Internal No. F103915

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 09/27/1999
Replaces : 06/25/1997

MATERIAL SAFETY DATA SHEET

PRODUCT

# NALCO ELIMIN-OX®

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCO ELIMIN-OX®**

APPLICATION : OXYGEN SCAVENGER

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER : 0
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous.

| Hazardous Substance(s) | CAS NO | % (w/w) |
|---|---|---|
| Carbohydrazide | 497-18-7 | 5.0 - 10.0 |

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**WARNING**
May cause sensitization by skin contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.
Wear suitable protective clothing.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
Repeated or prolonged contact may cause skin sensitization.

INGESTION :
Not a likely route of exposure. No adverse effects expected.

INHALATION :
Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

UNSUITABLE CONSTRUCTION MATERIAL :
Natural rubber, Neoprene, Hypalon, Buna-N, HDPE (high density polyethylene)

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Where concentrations in air may exceed the limits given in this section, the use of a half face filter mask or air supplied breathing apparatus is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Particulate filter - HEPA (Purple) If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Colorless |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.02 @ 68 °F / 20 °C |
| DENSITY | 8.5 - 8.6 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 8.3 |
| pH (1 %) | 6.7 |
| VISCOSITY | 3.0 cps @ 60 °F / 15.6 °C |
| FREEZING POINT | 28 °F / -2 °C |
| VAPOR PRESSURE | 12 mm Hg @ 68 °F / 20 °C |
| VOC CONTENT | 0.17 % |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions. Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
At temperatures below 4 °C (40 °F), this product loses its stability and forms precipitates. Once formed, the precipitate cannot be resolubilized and loss of product activity will occur.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Contact with strong alkalies (e.g. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium

hydroxide, calcium hydroxide (lime), cyanide, sulfide, hypochlorites, chlorites) may generate heat, splattering or boiling and toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen

## 11. TOXICOLOGICAL INFORMATION

The following results are for the product.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | > 5,000 mg/kg | Product |

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rabbit | 2,000 mg/kg | Product |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.2 / 8.0 | Product |

Rating : Essentially non-irritating

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.3 / 110.0 | Product |

Rating : Essentially non-irritating

SENSITIZATION :
Repeated or prolonged contact may cause skin sensitization.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | 190 mg/l | Product |
| Rainbow Trout | 96 hrs | 360 mg/l | Product |
| Fathead Minnow | 96 hrs | 400 mg/l | Product |

Rating : Slightly toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | 96 mg/l | | Product |

Rating : Toxic

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM , provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

| Air | Water | Soil/Sediment |
|---|---|---|
| <5% | 30 - 50% | 50 - 70% |

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Carbohydrazide : Dermal Sensitizer

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

- Immediate (Acute) Health Hazard
X Delayed (Chronic) Health Hazard
- Fire Hazard
- Sudden Release of Pressure Hazard

- Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
Substances known to the State of California to cause cancer are present as an impurity or residue.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
D2B - Materials Causing Other Toxic Effects - Toxic Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS) and are listed on the Australian Inventory of Chemical Substances (AICS).

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Ministry of International Trade & industry List (MITI).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

THE PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 04/01/2003
Replaces : 09/23/2002

ONDEO Nalco

# MATERIAL SAFETY DATA SHEET

PRODUCT

**TRASAR® 23263**

**EMERGENCY TELEPHONE NUMBER(S)**
**(800) 424-9300 (24 Hours) CHEMTREC**

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **TRASAR® 23263**

APPLICATION : COOLING WATER TREATMENT

COMPANY IDENTIFICATION : Ondeo Nalco Company
Ondeo Nalco Center
Naperville, Illinois
60563-1198

**EMERGENCY TELEPHONE NUMBER(S)** : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

## 3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

**CAUTION**
May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water. Protect product from freezing.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. May cause nausea and vomiting.

INHALATION :
Not a likely route of exposure. Repeated or prolonged exposure may irritate the respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

EYE CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT :
Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

## 7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL STATE | Liquid |
| APPEARANCE | Clear Amber |
| ODOR | None |

| | |
|---|---|
| SPECIFIC GRAVITY | 1.1 @ 77 °F / 25 °C |
| DENSITY | 9.1 lb/gal |
| SOLUBILITY IN WATER | Complete |
| pH (100 %) | 5 |
| VISCOSITY | 10 cps @ 71 °F / 21.66 °C |
| FREEZING POINT | 26 °F / -3.33 °C |
| VAPOR PRESSURE | Same as water |
| VOC CONTENT | 0.00 % |

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

## 11. TOXICOLOGICAL INFORMATION

The following results are for the polymer.

ACUTE ORAL TOXICITY :

| Species | LD50 | Test Descriptor |
|---|---|---|
| Rat | > 5,000 mg/kg | Active Substance |

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 0.0 / 8.0 | Active Substance |

Rating : Practically non-irritating

PRIMARY EYE IRRITATION :

| Draize Score | Test Descriptor |
|---|---|
| 4.7 / 110.0 | Active Substance |

Rating : Minimally irritating

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

## 12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the polymer. The following results are for a similar product.

ACUTE FISH RESULTS :

| Species | Exposure | LC50 | Test Descriptor |
|---|---|---|---|
| Bluegill Sunfish | 96 hrs | > 1,000 mg/l | Active Substance |
| Rainbow Trout | 96 hrs | > 1,000 mg/l | Active Substance |

Rating : Essentially non-toxic

ACUTE INVERTEBRATE RESULTS :

| Species | Exposure | LC50 | EC50 | Test Descriptor |
|---|---|---|---|---|
| Daphnia magna | 48 hrs | > 1,000 mg/l | | Active Substance |
| Mysid Shrimp (M. litoralis) | 96 hrs | > 1,000 mg/l | | Similar Product |

Rating : Essentially non-toxic

PERSISTENCY AND DEGRADATION :

Total Organic Carbon (TOC) : 18,000 mg/l

Chemical Oxygen Demand (COD) : 43,000 mg/l

Biological Oxygen Demand (BOD) :

| Incubation Period | Value | Test Descriptor |
|---|---|---|
| | 17,300 mg/l | Similar Product |

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: High

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

| | |
|---|---|
| Sodium Bisulfate | 7681-38-1 |
| Water | 7732-18-5 |
| Acrylic Polymer | 20507700000-5034P |
| Substituted aliphatic aldehyde | 20507700000-5313P |

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

THE PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 07/28/2003
Replaces : 12/15/2000

# Sodium Hydroxide MSDS

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Sodium Hydroxide

Catalog Numbers:

MCC-031356, NC9532183, NC9731968, NC9830469, S392-12, S392-212, S392-50, S399-1, XX1.5SODHYD20L, XX55254F30LB, XXS320EPB50KG, XXSS2S4F30LB

Synonyms:

Caustic soda; Soda lye; Sodium hydrate; Lye.

Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

| CAS# | Chemical Name | % | EINECS# |
|---|---|---|---|
| 1310-73-2 | Sodium hydroxide | 50 | 215-185-5 |
| 7732-18-5 | Water | 50 | 231-791-2 |

Hazard Symbols: C

Risk Phrases: 35

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear.

Danger! Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns.

Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects

Eye:

Causes eye burns. May cause chemical conjunctivitis and corneal damage.

Skin:

Causes skin burns. May cause deep, penetrating ulcers of the skin. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion:

May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause systemic effects.

Inhalation:

Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Causes chemical burns to the respiratory tract. Aspiration may lead to pulmonary edema. May cause systemic effects.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Effects may be delayed.

## **** SECTION 4 - FIRST AID MEASURES ****

Eyes:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion:

If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

## **** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Use water with caution and in flooding amounts. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Non-combustible, substance itself does not burn but may decompose upon heating to produce irritating, corrosive and/or toxic fumes.

Extinguishing Media:

Do NOT get water inside containers. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.

Autoignition Temperature:Not applicable.

Flash Point: Not applicable.

Explosion Limits, lower:Not available.

Explosion Limits, upper:Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 0; Reactivity: 1

## **** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material (e.g. vermiculite, sand or earth),

then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use only in a well-ventilated area. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes.

Storage:

Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids. Keep away from metals. Keep away from flammable liquids. Keep away from organic halogens.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

| Chemical Name | ACGIH | NIOSH | OSHA - Final PELs |
|---|---|---|---|
| Sodium hydroxide | C 2 mg/m3 | 10 mg/m3 IDLH | 2 mg/m3 TWA |
| Water | none listed | none listed | none listed |

OSHA Vacated PELs:

Sodium hydroxide:

C 2 mg/m3

Water:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear chemical goggles and face shield.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR :1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

| | |
|---|---|
| Physical State: | Liquid |
| Appearance: | clear |
| Odor: | none reported |
| pH: | Alkaline |
| Vapor Pressure: | 14 mm Hg |
| Vapor Density: | >1.0 |
| Evaporation Rate: | Not available. |
| Viscosity: | >1 (ether=1) |
| Boiling Point: | 212 deg F |
| Freezing/Melting Point: | 32 deg F |
| Decomposition Temperature: | Not available. |
| Solubility in water: | Completely soluble in water. |
| Specific Gravity/Density: | 1.0 |
| Molecular Formula: | NaOH |
| Molecular Weight: | 0 |

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid:

Extreme temperatures.

Incompatibilities with Other Materials:

Metals, acids, nitro compounds, halogenated organics (e.g. dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), nitromethane, flammable liquids.

Hazardous Decomposition Products:

Toxic fumes of sodium oxide.

Hazardous Polymerization: Has not been reported.

## **** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 1310-73-2: WB4900000

CAS# 7732-18-5: ZC0110000

LD50/LC50:

CAS# 1310-73-2: Draize test, rabbit, eye: 400 ug Mild; Draize test, rabbit, eye: 1% Severe; Draize test, rabbit, eye: 50 ug/24H Severe; Draize test, rabbit, eye: 1 mg/24H Severe; Draize test, rabbit, skin: 500 mg/24H Severe.

CAS# 7732-18-5: Oral, rat: LD50 = >90 mL/kg.

Carcinogenicity:

Sodium hydroxide -

Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Water -

Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

No information found.

Teratogenicity:

No information found.

Reproductive Effects:

No information found.

Neurotoxicity:

No information found.

Mutagenicity:

No information found.

Other Studies:

See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: SODIUM HYDROXIDE,SOLID

Hazard Class: 8

UN Number: UN1823

Packing Group: II

Canadian TDG

No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 1310-73-2 is listed on the TSCA inventory.

CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 1310-73-2: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 1310-73-2: acute, reactive.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 1310-73-2 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Sodium hydroxide can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

Water is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 37/39 Wear suitable gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1310-73-2: 1

CAS# 7732-18-5: No information available.

United Kingdom Occupational Exposure Limits

CAS# 1310-73-2: OES-United Kingdom, STEL 2 mg/m3 STEL

CAS# 1310-73-2: OES-United Kingdom, STEL 2 mg/m3 STEL

Canada

CAS# 1310-73-2 is listed on Canada's DSL List.

CAS# 7732-18-5 is listed on Canada's DSL List.

This product has a WHMIS classification of E.

CAS# 1310-73-2 is listed on Canada's Ingredient Disclosure List.

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 1310-73-2: OEL-AUSTRALIA:TWA 2 mg/m3

OEL-BELGIUM:STEL 2 mg/m3

OEL-DENMARK:TWA 2 mg/m3

OEL-FINLAND:TWA 2 mg/m3

OEL-FRANCE:TWA 2 mg/m3

OEL-GERMANY:TWA 2 mg/m3

OEL-JAPAN:STEL 2 mg/m3

OEL-THE NETHERLANDS:TWA 2 mg/m3

OEL-THE PHILIPPINES:TWA 2 mg/m3

OEL-SWEDEN:TWA 2 mg/m3

OEL-SWITZERLAND:TWA 2 mg/m3;STEL 4 mg/m3

OEL-THAILAND:TWA 2 mg/m3

OEL-TURKEY:TWA 2 mg/m3
OEL-UNITED KINGDOM:TWA 2 mg/m3;STEL 2 mg/m3
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/24/1997 Revision #4 Date: 8/06/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

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MSDS Number: **S4106** * * * * * *Effective Date:* ***02/18/03*** * * * * * *Supercedes:* ***05/05/00***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**
**National Response in Canada**
**CANUTEC: 613-996-6666**
**Outside U.S. And Canada**
**Chemtrec: 703-527-3887**

**NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.**

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# SODIUM HYPOCHLORITE SOLUTION

## 1. Product Identification

**Synonyms:** Bleach; hypochlorous acid, sodium salt; soda bleach; sodium oxychloride
**CAS No.:** 7681-52-9
**Molecular Weight:** 74.44
**Chemical Formula:** NaOCl
**Product Codes:** 9416, P005

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) | 7681-52-9 | 5% | Yes |
| Water | 7732-18-5 | 95% | No |

## 3. Hazards Identification

**Emergency Overview**

**WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION**

**TO EYES AND RESPIRATORY TRACT. CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

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**Potential Health Effects**

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**Inhalation:**
May cause irritation to the respiratory tract, (nose and throat); symptoms may include coughing and sore throat.
**Ingestion:**
May cause nausea, vomiting.
**Skin Contact:**
May irritate skin.
**Eye Contact:**
Contact may cause severe irritation and damage, especially at higher concentration.
**Chronic Exposure:**
A constant irritant to the eyes and throat. Low potential for sensitization after exaggerated exposure to damaged skin.
**Aggravation of Pre-existing Conditions:**
Persons with impaired respiratory function, or heart disorders (or disease) may be more susceptible to the effects of the substance.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**
Consider oral administration of sodium thiosulfate solutions if sodium hypochlorite is ingested. Do not administer neutralizing substances since the resultant exothermic reaction could further damage tissue. Endotracheal intubation could be needed if glottic edema compromises the airway. For individuals with significant inhalation exposure, monitor arterial blood gases and chest x-ray.

---

# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard. Substance releases oxygen when heated, which may increase the severity of an existing fire. Containers may rupture from pressure build-up.
**Explosion:**
This solution is not considered to be an explosion hazard. Anhydrous sodium hypochlorite is very explosive.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire. Use water spray to cool fire-exposed containers, to dilute liquid, and control vapor.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

# 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
Sodium Hypochlorite:
AIHA (WEEL) - STEL - 2 mg/m3

-OSHA Permissible Exposure Limit (PEL):
0.5 ppm (TWA), 1 ppm (STEL) as Chlorine

-ACGIH Threshold Limit Value (TLV):
1 ppm (TWA), 3 ppm (STEL) as Chlorine
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Colorless to yellowish liquid.
**Odor:**
Chlorine-like odor.
**Solubility:**
100% in water.
**Density:**
1.07 - 1.14
**pH:**
9 - 10 (neutral solution-no excess sodium hydroxide)
**% Volatiles by volume @ 21C (70F):**
ca. 95
**Boiling Point:**
40C (104F) Decomposes slightly
**Melting Point:**

-6C (21F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
17.5 @ 20C (68F)
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Slowly decomposes on contact with air. Rate increases with the concentration and temperature. Exposure to sunlight accelerates decomposition. Sodium hypochlorite becomes less toxic with age.
**Hazardous Decomposition Products:**
Emits toxic fumes of chlorine when heated to decomposition. Sodium oxide at high temperatures.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Ammonia (chloramine gas may evolve),amines, ammonium salts, aziridine, methanol, phenyl acetonitrile, cellulose, ethyleneimine, oxidizable metals, acids, soaps, and bisulfates.

**Conditions to Avoid:**
Light, heat, incompatibles.

---

# 11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a tumorigen and mutagen. Irritation data: eye, rabbit, 10 mg - Moderate

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | No | No | 3 |
| Water (7732-18-5) | No | No | None |

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# 12. Ecological Information

**Environmental Fate:**
No information found.

**Environmental Toxicity:**
No information found.

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# 13. Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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# 14. Transport Information

Not regulated.

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# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\--------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\--------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | No | No | No | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\--------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Sodium Hypochlorite (as NaOCl) (7681-52-9) | 100 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No

SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** None allocated.
**Poison Schedule:** S5
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **0** Reactivity: **1**
**Label Hazard Warning:**
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY.
**Label Precautions:**
Avoid contact with eyes, skin and clothing.
Avoid breathing mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 8.
**Disclaimer:**
**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

# SULFURIC ACID, 52 - 100 %

**MSDS Number: S8234 --- *Effective Date: 09/14/00***

---

## 1. Product Identification

**Synonyms:** Oil of vitriol; Babcock acid; sulphuric acid
**CAS No.:** 7664-93-9
**Molecular Weight:** 98.08
**Chemical Formula:** H2SO4 in H2O
**Product Codes:**
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5889, 5960, 5961, 5971, 6902, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H976, H996, V344, V651

---

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sulfuric Acid | 7664-93-9 | 52 - 100% | Yes |
| Water | 7732-18-5 | 0 - 48% | No |

---

## 3. Hazards Identification

**Emergency Overview**
---
**POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

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**Potential Health Effects**

---

**Inhalation:**
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
**Ingestion:**
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
**Skin Contact:**
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
**Eye Contact:**
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
**Chronic Exposure:**
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
**Aggravation of Pre-existing Conditions:**
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
**Ingestion:**
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician

immediately.
**Eye Contact:**
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
**Explosion:**
Contact with most metals causes formation of flammable and explosive hydrogen gas.
**Fire Extinguishing Media:**
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

---

# 7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues

(vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
1 mg/m3(TWA), 3 mg/m3 (STEL), A2 - suspected human carcinogen for sulfuric acid contained in strong inorganic acid mists.

**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear oily liquid.

**Odor:**
Odorless.

**Solubility:**
Miscible with water, liberates much heat.

**Specific Gravity:**
1.84 (98%), 1.40 (50%), 1.07 (10%)

**pH:**
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
**% Volatiles by volume @ 21C (70F):**
No information found.
**Boiling Point:**
ca. 290C (ca. 554F) (decomposes at 340C)
**Melting Point:**
3C (100%), -32C (93%), -38C (78%), -64C (65%).
**Vapor Density (Air=1):**
3.4
**Vapor Pressure (mm Hg):**
1 @ 145.8C (295F)
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
**Hazardous Decomposition Products:**
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
**Conditions to Avoid:**
Heat, moisture, incompatibles.

---

# 11. Toxicological Information

**Toxicological Data:**
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
**Carcinogenicity:**
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sulfuric Acid (7664-93-9) | No | No | None |
| Water (7732-18-5) | No | No | None |

# 12. Ecological Information

**Environmental Fate:**
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
**Environmental Toxicity:**
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** SULFURIC ACID (WITH MORE THAN 51% ACID)
**Hazard Class:** 8
**UN/NA:** UN1830
Packing Group: II
**Information reported for product/size:** 440LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** SULPHURIC ACID (WITH MORE THAN 51% ACID)
**Hazard Class:** 8
**UN/NA:** UN1830
Packing Group: II
**Information reported for product/size:** 440LB

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sulfuric Acid (7664-93-9) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\--------

| | | --Canada-- | | |
|---|---|---|---|---|
| Ingredient | Korea | DSL | NDSL | Phil. |
| Sulfuric Acid (7664-93-9) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\--------

| | -SARA 302- | | ------SARA 313------ | |
|---|---|---|---|---|
| Ingredient | RQ | TPQ | List | Chemical Catg. |
| Sulfuric Acid (7664-93-9) | 1000 | 1000 | Yes | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\--------

| | | -RCRA- | -TSCA- |
|---|---|---|---|
| Ingredient | CERCLA | 261.33 | 8(d) |

| | | | |
|---|---|---|---|
| Sulfuric Acid (7664-93-9) | 1000 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes

SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No

Reactivity: Yes (Pure / Liquid)

**Australian Hazchem Code:** 2P
**Poison Schedule:** No information found.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
**Label First Aid:**
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **A5628** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***11/17/99***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# AMMONIUM BIFLUORIDE

## 1. Product Identification

**Synonyms:** Ammonium hydrogen fluoride; ammonium difluoride; acid ammonium fluoride

**CAS No.:** 1341-49-7
**Molecular Weight:** 57.04
**Chemical Formula:** NH4F HF
**Product Codes:**
J.T. Baker: 0619
Mallinckrodt: 3396

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Ammonium Bifluoride | 1341-49-7 | 100% | Yes |

## 3. Hazards Identification

**Emergency Overview**

---

**DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. AFFECTS RESPIRATORY SYSTEM, HEART, SKELETON, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS. CAUSES IRRITATION AND BURNS TO SKIN, EYES AND RESPIRATORY TRACT. IRRITATION AND BURN EFFECTS MAY BE DELAYED. HARMFUL IF ABSORBED THROUGH SKIN.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

---

**Potential Health Effects**

---

If inhaled or swallowed, this compound can cause fluoride poisoning. Early symptoms include nausea, vomiting, diarrhea, and weakness. Later effects include central nervous system effects, cardiovascular effects and death.

**Inhalation:**
May cause irritation and burns to the respiratory tract, symptoms may include coughing, sore throat, and labored breathing. May be absorbed through inhalation of dust; symptoms may parallel those from ingestion exposure. Irritation and burning effects may not appear immediately.

**Ingestion:**
May cause salivation, nausea, vomiting, diarrhea, and abdominal pain, followed by symptoms of weakness, tremors, shallow respiration, carpopedal spasm, convulsions, and coma. May cause brain and kidney damage. Affects heart and circulatory system. Death may be caused by respiratory paralysis. Lethal dose estimated at between 1 teaspoonful and 1 oz.

**Skin Contact:**
Causes irritation and burns to the skin. Effects may not appear immediately.

**Eye Contact:**
Causes irritation. May be extremely irritating with possible burns to eye tissue and permanent eye damage may result.

**Chronic Exposure:**
Chronic exposure may cause mottling of teeth and bone damage (osteosclerosis) and fluorosis. Symptoms of fluorisis include brittle bones,weight loss, anemia, calcified ligaments, general ill health and joint stiffness.

**Aggravation of Pre-existing Conditions:**
Populations that appear to be at increased risk from the effects of fluoride are individuals that suffer from diabetes insipidus or some forms of renal impairment.

---

# 4. First Aid Measures

First aid procedures should be pre-planned for fluoride compound emergencies.
**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
**Ingestion:**
Administer milk, chewable calcium carbonate tablets or milk of magnesia. Never give anything by mouth to an unconscious person. CALL A PHYSICIAN IMMEDIATELY.
**Skin Contact:**
Wipe off any excess material from skin and then immediately flush skin with large amounts of soapy water. Remove contaminated clothing and shoes. Wash clothing before re-use. Apply bandages soaked in magnesium sulfate. CALL A PHYSICIAN IMMEDIATELY.
**Eye Contact:**
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

**Note to Physician:**
For large exposures, systemic effects (hypocalcemia and hypomagnesia) may occur.

---

# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard.
**Explosion:**
Contact with water and metal at the same time may evolve flammable hydrogen gas.
**Fire Extinguishing Media:**
Dry chemical, foam or carbon dioxide. Do not use water.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

# 7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area. Protect against physical damage. Separate from acids and alkalis. Do not store in metal containers, as contact with moisture and metal at the same time may release flammable hydrogen gas. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
-OSHA Permissible Exposure Limit (PEL):
2.5 mg(F)/m3 (TWA)
-ACGIH Threshold Limit Value (TLV):
2.5 mg(F)/m3 (TWA)

**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
**Eye Protection:**
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
White crystals.
**Odor:**
Odorless.
**Solubility:**

41.5g/l00 g Water @ 25C (68F)
**Specific Gravity:**
1.51
**pH:**
3.5 (5% solution)
**% Volatiles by volume @ 21C (70F):**
0
**Boiling Point:**
240C (464F)
**Melting Point:**
124.6C (257F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Emits toxic fumes of hydrogen fluoride, nitric oxides, and ammonia when heated to decomposition. Upon contact with moisture and metal, this material may release hydrogen gas.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Reacts with acids to liberate hydrogen fluoride and base to liberate ammonia. When combined with moisture, will corrode glass, cement and most metals.
**Conditions to Avoid:**
No information found.

---

# 11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Ammonium Bifluoride (1341-49-7) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
This material is not expected to significantly bioaccumulate. When released into water, this material may biodegrade to a moderate extent.
**Environmental Toxicity:**
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** RQ, AMMONIUM HYDROGEN DIFLUORIDE, SOLID
**Hazard Class:** 8
**UN/NA:** UN1727
Packing Group: II
**Information reported for product/size:** 100LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** AMMONIUM HYDROGEN DIFLUORIDE, SOLID
**Hazard Class:** 8
**UN/NA:** UN1727
Packing Group: II
**Information reported for product/size:** 100LB

**International (Air, I.C.A.O.)**
---
**Proper Shipping Name:** AMMONIUM HYDROGEN DIFLUORIDE, SOLID
**Hazard Class:** 8
**UN/NA:** UN1727
Packing Group: II
**Information reported for product/size:** 100LB

# 15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                        TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Ammonium Bifluoride (1341-49-7)                   Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                         --Canada--
Ingredient                                        Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Ammonium Bifluoride (1341-49-7)                   Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Ammonium Bifluoride (1341-49-7)           No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                      -RCRA-    -TSCA-
Ingredient                                CERCLA      261.33     8(d)
----------------------------------------  ------      ------    ------
Ammonium Bifluoride (1341-49-7)           100         No         No


Chemical Weapons Convention:  Yes    TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

**Australian Hazchem Code:** 2X
**Poison Schedule:** S6
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **0** Reactivity: **0**
**Label Hazard Warning:**
DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. AFFECTS RESPIRATORY SYSTEM, HEART, SKELETON, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS. CAUSES IRRITATION AND BURNS TO SKIN, EYES AND RESPIRATORY TRACT. IRRITATION AND BURN EFFECTS MAY BE DELAYED. HARMFUL IF ABSORBED THROUGH SKIN.
**Label Precautions:**
Do not breathe dust.
Keep container closed.

Use only with adequate ventilation.
Wash thoroughly after handling.
Do not get in eyes, on skin, or on clothing.

**Label First Aid:**

In all cases call a physician immediately. First Aid procedures should be pre-planned for fluoride compound emergencies. If swallowed, administer milk, chewable calcium carbonate tablets or milk of magnesia. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing difficult, give artificial respiration. In case of skin contact wipe off any excess material then immediately flush skin with large amounts of soapy water. Remove contaminated clothing and shoes. Wash clothing before re-use. Apply bandages soaked in magnesium sulfate. In case of eye contact, immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting upper and lower eyelids occasionally.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

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**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**

**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **C4740** * * * * * *Effective Date:* ***05/14/03*** * * * * * *Supercedes:* ***04/17/03***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# Citric Acid Solution, 50% (w/w)

## 1. Product Identification

**Synonyms:** 2-Hydroxy-1,2,3-propanetricarboxylic acid
**CAS No.:** 77-92-9
**Molecular Weight:** 192.12
**Chemical Formula:** H3C6H5O7
**Product Codes:**
J.T. Baker: 0341
Mallinckrodt: 0524

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Citric Acid | 77-92-9 | 50% | Yes |
| Water | 7732-18-5 | 50% | No |

## 3. Hazards Identification

**Emergency Overview**

---

**WARNING! CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.**

**SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 1 - Slight
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Green (General Storage)

---

**Potential Health Effects**

---

**Inhalation:**
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.
**Ingestion:**
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. Extremely large oral dosages may produce gastrointestinal disturbances. Calcium deficiency in blood may result in severe cases of ingestion.
**Skin Contact:**
Causes irritation to skin. Symptoms include redness, itching, and pain.
**Eye Contact:**
Highly irritating; may also be abrasive.
**Chronic Exposure:**
Chronic or heavy acute ingestion may cause tooth enamel erosion.
**Aggravation of Pre-existing Conditions:**
No information found.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
**Ingestion:**
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

## 5. Fire Fighting Measures

**Fire:**
Autoignition temperature: 1011C (1852F)
Not considered to be a fire hazard.
**Explosion:**
Not considered to be an explosion hazard.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

## 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

## 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
None established.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**

For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Eye Protection:**
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear colorless liquid.

**Odor:**
Odorless.

**Solubility:**
No information found.

**Density:**
No information found.

**pH:**
2.2 (0.1 N sol)

**% Volatiles by volume @ 21C (70F):**
0

**Boiling Point:**
No information found.

**Melting Point:**
No information found.

**Vapor Density (Air=1):**
No information found.

**Vapor Pressure (mm Hg):**
No information found.

**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.

**Hazardous Decomposition Products:**
Carbon dioxide and carbon monoxide may form when heated to decomposition.

**Hazardous Polymerization:**
Will not occur.

**Incompatibilities:**
Metal nitrates (potentially explosive reaction), alkali carbonates and bicarbonates, potassium tartrate. Will corrode copper, zinc, aluminum and their alloys.
**Conditions to Avoid:**
No information found.

---

# 11. Toxicological Information

Oral rat LD50: 3 g/kg; irritation skin rabbit: 500 mg/24H mild; eye rabbit: 750 ug/24H severe.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Citric Acid (77-92-9) | No | No | None |
| Water (7732-18-5) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
No information found.
**Environmental Toxicity:**
No information found.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

# 14. Transport Information

Not regulated.

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Citric Acid (77-92-9) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\----------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Citric Acid (77-92-9) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Citric Acid (77-92-9) | No | No | No | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Citric Acid (77-92-9) | No | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** None allocated.
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **1** Reactivity: **0**
**Label Hazard Warning:**
WARNING! CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.
**Label Precautions:**
Avoid contact with eyes, skin and clothing.
Avoid breathing mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases, get medical attention.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **H3886** * * * * * *Effective Date:* ***05/07/03*** * * * * * *Supercedes:* ***11/12/01***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# HYDROCHLORIC ACID (10%-33%)

## 1. Product Identification

**Synonyms:** This MSDS applies to the concentrated standard used to make laboratory solutions and any solution that contains more than 10% but less than 33% Hydrochloric acid. For diluted product, see MSDS for Hydrochloric Acid (less than 10%). For saturated solution
**CAS No.:** 7647-01-0
**Molecular Weight:** 36.46
**Chemical Formula:** HCl in H2O
**Product Codes:**
J.T. Baker: 0323, 0327, 4654, 4657, 5618, 5619
Mallinckrodt: 2608, 2609, 2625, H151, H168, V035, V328

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Hydrogen Chloride | 7647-01-0 | 10 - 33% | Yes |
| Water | 7732-18-5 | 67 - 90% | No |

# 3. Hazards Identification

**Emergency Overview**
---
**POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED.**

**SAF-T-DATA(tm)** Ratings (Provided here for your convenience)
---
Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)
---

**Potential Health Effects**
---

**Inhalation:**
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
**Ingestion:**
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
**Skin Contact:**
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
**Eye Contact:**
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
**Chronic Exposure:**
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
**Aggravation of Pre-existing Conditions:**
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
**Ingestion:**

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard. May react with metals or heat to release flammable hydrogen gas.
**Explosion:**
Not considered to be an explosion hazard.
**Fire Extinguishing Media:**
Water or water spray. Neutralize with soda ash or slaked lime.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

---

# 7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
For Hydrochloric acid:
- OSHA Permissible Exposure Limit (PEL):
5 ppm (Ceiling)
- ACGIH Threshold Limit Value (TLV):
2 ppm (Ceiling), A4 Not classifiable as a human carcinogen

**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear, colorless liquid.
**Odor:**
Pungent odor.

**Solubility:**
Infinitely soluble.
**Density:**
1.05 @ 15C (59F)
**pH:**
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
**% Volatiles by volume @ 21C (70F):**
100
**Boiling Point:**
101 - 103C (214 - 217F)
**Melting Point:**
No information found.
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
A strong mineral acid, concentrated hydrochloric acid is highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
**Conditions to Avoid:**
Heat, direct sunlight.

---

# 11. Toxicological Information

Hydrochloric acid: Inhalation rat LC50: 3124 ppm/1H; Oral rabbit LD50: 900 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
-------------------------------------   -----    -----------    -------------
```

| | | | |
|---|---|---|---|
| Hydrogen Chloride (7647-01-0) | No | No | 3 |
| Water (7732-18-5) | No | No | None |

# 12. Ecological Information

**Environmental Fate:**
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
**Environmental Toxicity:**
This material is expected to be toxic to aquatic life.

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** HYDROCHLORIC ACID
**Hazard Class:** 8
**UN/NA:** UN1789
Packing Group: II
**Information reported for product/size:** 200L

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** HYDROCHLORIC ACID
**Hazard Class:** 8
**UN/NA:** UN1789
Packing Group: II
**Information reported for product/size:** 200L

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Hydrogen Chloride (7647-01-0) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\----------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Hydrogen Chloride (7647-01-0) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Hydrogen Chloride (7647-01-0) | 5000 | 500* | Yes | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Hydrogen Chloride (7647-01-0) | 5000 | No | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 2R
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **0** Reactivity: **0**
**Label Hazard Warning:**
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Avoid breathing vapor or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not

breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8.

**Disclaimer:**

**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

# SODIUM CARBONATE ANHYDROUS

**MSDS Number: S3242 --- *Effective Date: 06/30/98***

---

## 1. Product Identification

**Synonyms:** Carbonic acid, disodium salt; disodium carbonate; soda ash
**CAS No.:** 497-19-8
**Molecular Weight:** 105.99
**Chemical Formula:** $Na_2CO_3$
**Product Codes:**
J.T. Baker: 3602, 3604, 3605, 4502, 4923, 5198, 5834
Mallinckrodt: 1338, 7468, 7521, 7527, 7528, 7698

---

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sodium Carbonate | 497-19-8 | 99 - 100% | Yes |

---

## 3. Hazards Identification

**Emergency Overview**
---
**DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)
---
Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Orange (General Storage)
---

**Potential Health Effects**
---

**Inhalation:**
Inhalation of dust may cause irritation to the respiratory tract. Symptoms from excessive inhalation of dust may include coughing and difficult breathing. Excessive contact is known to cause damage to the nasal septum.
**Ingestion:**
Sodium carbonate is only slightly toxic, but large doses may be corrosive to the gastro-intestinal tract where symptoms may include severe abdominal pain, vomiting, diarrhea, collapse and death.
**Skin Contact:**
Excessive contact may cause irritation with blistering and redness. Solutions may cause severe irritation or burns.
**Eye Contact:**
Contact may be corrosive to eyes and cause conjuctival edema and corneal destruction. Risk of serious injury increases if eyes are kept tightly closed. Other symptoms may appear from absorption of sodium carbonate into the bloodstream via the eyes.
**Chronic Exposure:**
Prolonged or repeated skin exposure may cause sensitization.
**Aggravation of Pre-existing Conditions:**
No information found.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
**Skin Contact:**
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**
Consider endoscopy in all suspected cases of sodium carbonate poisoning. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances occurred.

---

# 5. Fire Fighting Measures

**Fire:**
Not considered to be a fire hazard.
**Explosion:**
Not considered an explosion hazard, but sodium carbonate may explode when applied to red-hot aluminum.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire.
**Special Information:**
Use protective clothing and breathing equipment appropriate for the surrounding fire.

---

# 6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

---

# 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
None established.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**
Wear protective gloves and clean body-covering clothing.
**Eye Protection:**
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
White powder or granules.
**Odor:**
Odorless.
**Solubility:**
45.5 g/100 ml water @ 100C (212F)
**Specific Gravity:**
2.53
**pH:**
11.6 Aqueous solution
**% Volatiles by volume @ 21C (70F):**
0
**Boiling Point:**
Decomposes.
**Melting Point:**
851C (1564F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage. Hygroscopic. Readily absorbs moisture from the air. Solutions are strong bases.
**Hazardous Decomposition Products:**
Oxides of carbon and sodium oxide.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Fluorine, aluminum, phosphorous pentoxide, sulfuric acid, zinc, lithium, moisture, calcium hydroxide and 2,4,6-trinitrotoluene. Reacts violently with acids to form carbon dioxide.
**Conditions to Avoid:**

Moisture, heat, dusting and incompatibles.

---

# 11. Toxicological Information

For Sodium Carbonate:
Oral rat LD50: 4090 mg/kg; inhalation rat LC50: 2300 mg/m3/2H; irritation eye rabbit: 50 mg severe; investigated as a mutagen, reproductive effector.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sodium Carbonate (497-19-8) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
No information found.
**Environmental Toxicity:**
No information found.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

# 14. Transport Information

Not regulated.

---

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|

```
-----------------------------------------------  ----  ---  -----  ---------
Sodium Carbonate (497-19-8)                       Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\--------------------------------
                                                        --Canada--
Ingredient                                        Korea  DSL   NDSL  Phil.
-----------------------------------------------  -----  ---   ----  -----
Sodium Carbonate (497-19-8)                       Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Sodium Carbonate (497-19-8)               No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                       -RCRA-    -TSCA-
Ingredient                                CERCLA      261.33     8(d)
----------------------------------------  ------      ------    ------
Sodium Carbonate (497-19-8)               No          No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

**Australian Hazchem Code:** No information found.
**Poison Schedule:** S5
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **0** Reactivity: **0**
**Label Hazard Warning:**
DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.
**Label Precautions:**
Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
**Label First Aid:**
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give

large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In all cases, get medical attention.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 3, 8, 16.

**Disclaimer:**

**********

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**********

**Prepared by:** Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Number: **S4442** * * * * * *Effective Date:* ***11/02/01*** * * * * * *Supercedes:* ***11/17/99***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# SODIUM NITRATE

## 1. Product Identification

**Synonyms:** Nitratine; nitric acid, sodium salt; sodium saltpeter; sodium nitrate, crystal
**CAS No.:** 7631-99-4
**Molecular Weight:** 84.99
**Chemical Formula:** NaNO3
**Product Codes:**
J.T. Baker: 3770, 3771, 4501
Mallinckrodt: 4484, 7709, 7793, 7796, 7804, 7808, 7811

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Sodium Nitrate | 7631-99-4 | 99 - 100% | Yes |

## 3. Hazards Identification

**Emergency Overview**
---

**DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)
---
Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Yellow (Reactive)
---

**Potential Health Effects**
---

**Inhalation:**
Inhalation of dust irritates the respiratory tract. Symptoms may include coughing, shortness of breath.
**Ingestion:**
May cause gastroenteritis and abdominal pains. Other symptoms may include dizziness, bloody diarrhea, convulsions, and collapse. Purging and diuresis can be expected. Small repeated doses may cause headache and mental impairment. Rare cases of nitrates being converted to the more toxic nitrites have been reported, mostly with infants.
**Skin Contact:**
May cause irritation, symptoms including redness, itching, and pain.
**Eye Contact:**
May cause irritation, symptoms including redness, itching, and pain.
**Chronic Exposure:**
Under some circumstances methemoglobinemia occurs in individuals when the nitrate is converted by bacteria in the stomach to nitrite. Nausea, vomiting, dizziness, rapid heart beat, irregular breathing, convulsions, coma, and death can occur should this conversion take place.
**Aggravation of Pre-existing Conditions:**
Workers with a history of kidney or lung disease may be more susceptible to the effects of this substance.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. Get medical attention for any breathing difficulty.
**Ingestion:**
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
**Skin Contact:**
Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
**Explosion:**
Explosive with shock, heat or friction. Sodium Nitrate decomposes explosively when heated > 538C (1000F). Sensitive to mechanical impact.
**Fire Extinguishing Media:**
Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.
**Special Information:**
Wear full protective clothing and breathing equipment for high-intensity fire or potential explosion conditions. This oxidizing material can increase the flammability of adjacent combustible materials.

---

# 6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. Small amounts of residue may be flushed to sewer with plenty of water.

---

# 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
None established.
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
**Personal Respirators (NIOSH Approved):**
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
**Skin Protection:**
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
**Eye Protection:**
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
White crystals.
**Odor:**
Odorless.
**Solubility:**
81.5 g/100 g water @ 15C (59F)
**Specific Gravity:**
2.26
**pH:**
Aqueous solution is neutral.
**% Volatiles by volume @ 21C (70F):**
0
**Boiling Point:**
380C (716F)
**Melting Point:**
308C (586F)
**Vapor Density (Air=1):**
No information found.
**Vapor Pressure (mm Hg):**
No information found.
**Evaporation Rate (BuAc=1):**
No information found.

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Emits nitrous oxides when heated to decomposition.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Reacts with acids to emit toxic fumes of nitrogen dioxide. Contact with the following may cause an explosion: barium rhodanide, boron phosphide, cyanides, sodium thiosulfate, sodium hypophosphite, sulfur plus charcoal, powdered aluminum and aluminum oxide. Fibrous organic material such as jute, wood, and similar cellulosic materials can become highly combustible by nitrate impregnation.
**Conditions to Avoid:**
Heat, flame, ignition sources, shock, friction, incompatibles.

---

# 11. Toxicological Information

Oral rat LD50: 1267 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Sodium Nitrate (7631-99-4) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
No information found.
**Environmental Toxicity:**
No information found.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** SODIUM NITRATE
**Hazard Class:** 5.1
**UN/NA:** UN1498
Packing Group: III
**Information reported for product/size:** 12X25LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** SODIUM NITRATE
**Hazard Class:** 5.1
**UN/NA:** UN1498
Packing Group: III
**Information reported for product/size:** 12X25LB

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Sodium Nitrate (7631-99-4) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\--------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Sodium Nitrate (7631-99-4) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\--------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Sodium Nitrate (7631-99-4) | No | No | No | Nitrate Cmpd |

--------\Federal, State & International Regulations - Part 2\--------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Sodium Nitrate (7631-99-4) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

**Australian Hazchem Code:** 1[T]
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

# 16. Other Information

**NFPA Ratings:** Health: **1** Flammability: **0** Reactivity: **1** Other: **Oxidizer**
**Label Hazard Warning:**
DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
**Label Precautions:**
Keep from contact with clothing and other combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
**Label First Aid:**
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases, get medical attention.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
MSDS Section(s) changed since last revision of document include: 8.
**Disclaimer:**
**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **F5956** * * * * * *Effective Date:* ***05/17/01*** * * * * * *Supercedes:* ***06/30/98***

**MSDS** **Material Safety Data Sheet**

*From:* **Mallinckrodt Baker, Inc.**
**222 Red School Lane**
**Phillipsburg, NJ 08865**

Mallinckrodt CHEMICALS J.T.Baker

**24 Hour Emergency Telephone: 908-859-2151**
**CHEMTREC: 1-800-424-9300**

**National Response in Canada**
**CANUTEC: 613-996-6666**

**Outside U.S. and Canada**
**Chemtrec: 703-527-3887**

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# FORMIC ACID

## 1. Product Identification

**Synonyms:** Methanoic acid; hydrogen carboxylic acid; formylic acid
**CAS No.:** 64-18-6
**Molecular Weight:** 46.03
**Chemical Formula:** HCOOH
**Product Codes:**
J.T. Baker: 0128, 0129
Mallinckrodt: 2592

## 2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|---|---|---|---|
| Formic Acid | 64-18-6 | 88 - 90% | Yes |
| Water | 7732-18-5 | 10 - 12% | No |

## 3. Hazards Identification

**Emergency Overview**

---

**DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE. VAPOR IS IRRITATING TO EYES AND RESPIRATORY TRACT. FLAMMABLE LIQUID AND VAPOR.**

**J.T. Baker SAF-T-DATA(tm)** Ratings (Provided here for your convenience)

---

Health Rating: 2 - Moderate
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red Stripe (Store Separately)

---

**Potential Health Effects**

---

**Inhalation:**
Inhalation of vapors can cause severe irritation of nose, throat, and upper respiratory tract. Inhalation of higher concentrations may cause central nervous system effects and lung damage.
**Ingestion:**
Causes serious burns and corrosion of the mouth, throat, and esophagus, with immediate pain and difficult swallowing. Other symptoms of abdominal pain, nausea, diarrhea and vomiting can occur, leading to shortness of breath and death. Severe poisonings may cause shock, kidney damage.
**Skin Contact:**
Corrosive. Symptoms of redness, pain, and severe burn can occur.
**Eye Contact:**
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
**Chronic Exposure:**
Prolonged or repeated exposure to low concentrations may cause skin irritation and burns. Prolonged or repeated exposure may cause liver and kidney damage.
**Aggravation of Pre-existing Conditions:**
Sensitization is rare, but may occur in persons previously sensitized to formaldehyde.

---

# 4. First Aid Measures

**Inhalation:**
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
**Ingestion:**
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

# 5. Fire Fighting Measures

**Fire:**
Autoignition temperature: 601C (1114F)
Flammable limits in air % by volume:
lel: 18; uel: 57
Flash point: 50C (CC).
Fire data listed is for formic acid. Flash Point and explosive limits are for 90% aqueous solutions of formic acid.
**Explosion:**
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sensitive to static discharge.
**Fire Extinguishing Media:**
Dry chemical, carbon dioxide, water spray, or alcohol resistant foam.
**Special Information:**
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

# 6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

---

# 7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. Strongly corrosive. Should be handled in 316 stainless steel, glass, ceramic, or similar corrosion resistant materials. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

# 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
-OSHA Permissible Exposure Limit (PEL):
5 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
5 ppm (TWA), 10 ppm (STEL)

-NIOSH IDLH Level: 30 ppm
**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.
**Personal Respirators (NIOSH Approved):**
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Formic acid has questionable warning properties and a low IDLH. Respirator recommended to 6 times the TLV value as a maximum.
**Skin Protection:**
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.
**Eye Protection:**
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

# 9. Physical and Chemical Properties

**Appearance:**
Clear, colorless liquid.
**Odor:**
Characteristic, pungent odor.
**Solubility:**

Infinitely soluble.
**Density:**
1.2
**pH:**
No information found.
**% Volatiles by volume @ 21C (70F):**
100
**Boiling Point:**
101C (214F)
**Melting Point:**
ca. 8C (ca. 46F)
**Vapor Density (Air=1):**
1.6 @ 19C (66F)
**Vapor Pressure (mm Hg):**
40 @ 24C (75F)
**Evaporation Rate (BuAc=1):**
2.1

---

# 10. Stability and Reactivity

**Stability:**
Stable under ordinary conditions of use and storage.
**Hazardous Decomposition Products:**
Carbon dioxide and carbon monoxide may form when heated to decomposition. Dehydrated by sulfuric acid to produce carbon monoxide.
**Hazardous Polymerization:**
Will not occur.
**Incompatibilities:**
Sulfuric acid, strong caustics, furfuryl alcohol, hydrogen peroxide, strong oxidizers and bases. Reacts explosively with oxidizing agents.
**Conditions to Avoid:**
Heat, flame, other sources of ignition.

---

# 11. Toxicological Information

Oral rat LD50: 1100 mg/kg; inhalation rat LC50: 15 gm/m3/15M; investigated as a tumorigen, mutagen.

--------\Cancer Lists\----------

| Ingredient | ---NTP Carcinogen--- Known | Anticipated | IARC Category |
|---|---|---|---|
| Formic Acid (64-18-6) | No | No | None |
| Water (7732-18-5) | No | No | None |

---

# 12. Ecological Information

**Environmental Fate:**
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals.
**Environmental Toxicity:**
This material is not expected to be toxic to aquatic life.

---

# 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

# 14. Transport Information

**Domestic (Land, D.O.T.)**
---
**Proper Shipping Name:** FORMIC ACID
**Hazard Class:** 8
**UN/NA:** UN1779
Packing Group: II
**Information reported for product/size:** 127LB

**International (Water, I.M.O.)**
---
**Proper Shipping Name:** FORMIC ACID
**Hazard Class:** 8
**UN/NA:** UN1779
Packing Group: II
**Information reported for product/size:** 127LB

**International (Air, I.C.A.O.)**
---
**Proper Shipping Name:** FORMIC ACID
**Hazard Class:** 8
**UN/NA:** UN1779
Packing Group: II
**Information reported for product/size:** 127LB

# 15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

| Ingredient | TSCA | EC | Japan | Australia |
|---|---|---|---|---|
| Formic Acid (64-18-6) | Yes | Yes | Yes | Yes |
| Water (7732-18-5) | Yes | Yes | Yes | Yes |

--------\Chemical Inventory Status - Part 2\----------

| Ingredient | Korea | --Canada-- DSL | NDSL | Phil. |
|---|---|---|---|---|
| Formic Acid (64-18-6) | Yes | Yes | No | Yes |
| Water (7732-18-5) | Yes | Yes | No | Yes |

--------\Federal, State & International Regulations - Part 1\----------

| Ingredient | -SARA 302- RQ | TPQ | ------SARA 313------ List | Chemical Catg. |
|---|---|---|---|---|
| Formic Acid (64-18-6) | No | No | Yes | No |
| Water (7732-18-5) | No | No | No | No |

--------\Federal, State & International Regulations - Part 2\----------

| Ingredient | CERCLA | -RCRA- 261.33 | -TSCA- 8(d) |
|---|---|---|---|
| Formic Acid (64-18-6) | 5000 | U123 | No |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 2R
**Poison Schedule:** None allocated.
**WHMIS:**
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

# 16. Other Information

**NFPA Ratings:** Health: **3** Flammability: **2** Reactivity: **0**
**Label Hazard Warning:**
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE. VAPOR IS IRRITATING TO EYES AND RESPIRATORY TRACT. FLAMMABLE LIQUID AND VAPOR.

**Label Precautions:**
Avoid contact with eyes, skin and clothing.
Do not breathe vapor or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.
**Label First Aid:**
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
**Product Use:**
Laboratory Reagent.
**Revision Information:**
No changes.
**Disclaimer:**
**********

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**********

**Prepared by:** Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

# MATERIAL SAFETY DATA SHEET

**PRO-LINK**
**510 Chapman Street**
**Canton, MA 02021**
**1-800-745-4657**

**HAZARD RATING**

| | |
|---|---|
| Health=1 | **4=Extreme** |
| Flammability=0 | **3=High** |
| Reactivity=0 | **2=Moderate** |
| Special=None | **1=Slight** |
| | **0=Insignificant** |

**N/A**=Not Applicable **N.D.**=No Data**N.E.**=Not Established

Product Name: **Concentrated Textile Rinse** **06/11/97 9:29 AM**
Document Code: TERI.DOC Chemical Family: **Organic acid aqueous solution**

EMERGENCY 24-HOUR TELEPHONE NUMBER
**1-800-424-9300 (CHEMTREC)**

## SECTION I: HAZARDOUS INGREDIENTS/HEALTH HAZARD DATA

This product has not been tested as a whole for health effects on animals or humans. Hazardous ingredients >0.99% and carcinogenic material >0.1% posed the following health hazards when tested individually at 100%.

| NAME | CAS NO. |
|---|---|
| **HYDROXYACETIC ACID** | **79-14-1** |

Eye contact may cause eye corrosion. Skin contact may cause skin irritation with discomfort or rash. Prolonged contact may cause burns. Ingestion may cause abdominal pain, nausea, vomiting, diarrhea, and abnormal kidney function. Inhalation may cause irritation of the respiratory passages. OSHA Pel and ACGIH TLV not available. Inhalation LC50 7.7 mg/L in rats. Oral rat LD50 is 4,240 mg/kg..

| NAME | CAS NO. |
|---|---|
| **NONYLPHENOXYPOLYETHOXYETHANOL** | **127087-87-0** |

May cause severe eye irritation and chemical burns. Prolonged or repeated skin contact may cause irritation and possibly dermatitis. Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts. Inhalation of mist may cause irritation. Aspiration may cause lung damage. Ingestion may cause abdominal discomfort, nausea, vomiting and diarrhea. OSHA PEL and ACGIH TLV not available.

## SECTION II: EMERGENCY AND FIRST AID PROCEDURES

**EYES:** Flush with water for at least 15 min. Consult physician.
**SKIN:** Remove contaminated clothing. Thoroughly wash exposed skin with soap and water.
**INHALED:** Remove to fresh air. Consult physician.

**INGESTION:** Do not induce vomiting. Drink 2 glasses of water. Consult physician
**PHYSICIAN:** Contains less than 1% by weight of Glycolic Acid (Hydroxyacetic Acid) CAS 000079-14-1 which is a corrosive, toxic material with an oral rat LD50 of 4240 mg/kg and rat LC50 (4 hour) of 7.7 mg/l. Treatment based on judgment of attending physician.

## SECTION III: PHYSICAL / CHEMICAL DATA

**APPEARANCE AND ODOR:** Clear almost colorless liquid with spiced apple odor
**WATER SOLUBILITY, % BY WT:** All proportions
**SPECIFIC GRAVITY:** 1.0
**% VOLATILE BY WT.:** Approximately 99
**pH :** 1.5 - 2.5
**pH @ use:** 2.0 - 3.0
**WT/GAL:** 8.3 lbs.
**Boiling point:** N/D

## SECTION IV: FIRE AND EXPLOSION DATA

**FLASH POINT:** 200 degrees F (TCC)
**AUTO-IGNITION TEMPERATURE:** N/D
**EXPLOSIVE LIMITS - LEL:** N/D **UEL:** N/D
**EXTINGUISHING MEDIA:** $C0_2$, foam, water fog or dry chemical.
**SPECIAL FIRE FIGHTING PROCEDURES:** Use NIOSH/MSHA approved self-contained positive-pressure breathing apparatus and protective clothing where this material is involved in a fire
**UNUSUAL FIRE AND EXPLOSION HAZARD:** None known.

## SECTION V: REACTIVITY DATA

**STABILITY:** Stable
HAZARDOUS **HAZARDOUS POLYMERIZATION:** Will not occur.
**INCOMPATIBILITY:** Metals, oxidizing agents, cyanides, and sulfides.
**HAZARDOUS DECOMPOSITION/COMBUSTION PRODUCTS:** Possibly hydrogen in the presence of metals, CO, $CO_2$, $H_2O$, ketones, aldehydes and unidentified organic compounds.

## SECTION VI: SPILLS, LEAKS AND DISPOSAL PROCEDURES

**WASTE DISPOSAL:** In accordance with Federal, State and Local regulations.
**NEUTRALIZING CHEMICALS:** Lime or soda ash

## SECTION VII: PROTECTION MEASURES

**VENTILATION:** Local exhaust or dilution ventilation may be necessary in poorly ventilated areas.
**EYE PROTECTION:** Chemical resistant safety glasses.
**RESPIRATORY PROTECTION:** When adequate ventilation cannot be achieved, use NIOSH/MSHA approved respirator equipped with organic/acid vapor cartridges.
**GLOVES:** Rubber gloves.
**OTHER PROTECTIVE EQUIPMENT:** Body covering clothing should be worn.

## SECTION VIII: SPECIAL PRECAUTIONS

One should always use chemicals with awareness of potential hazards, known and unknown, and their effect on the human system. We urge users to minimize employee exposure to all chemicals, including this product and to keep the level of exposure commensurate with good industrial hygiene practices.

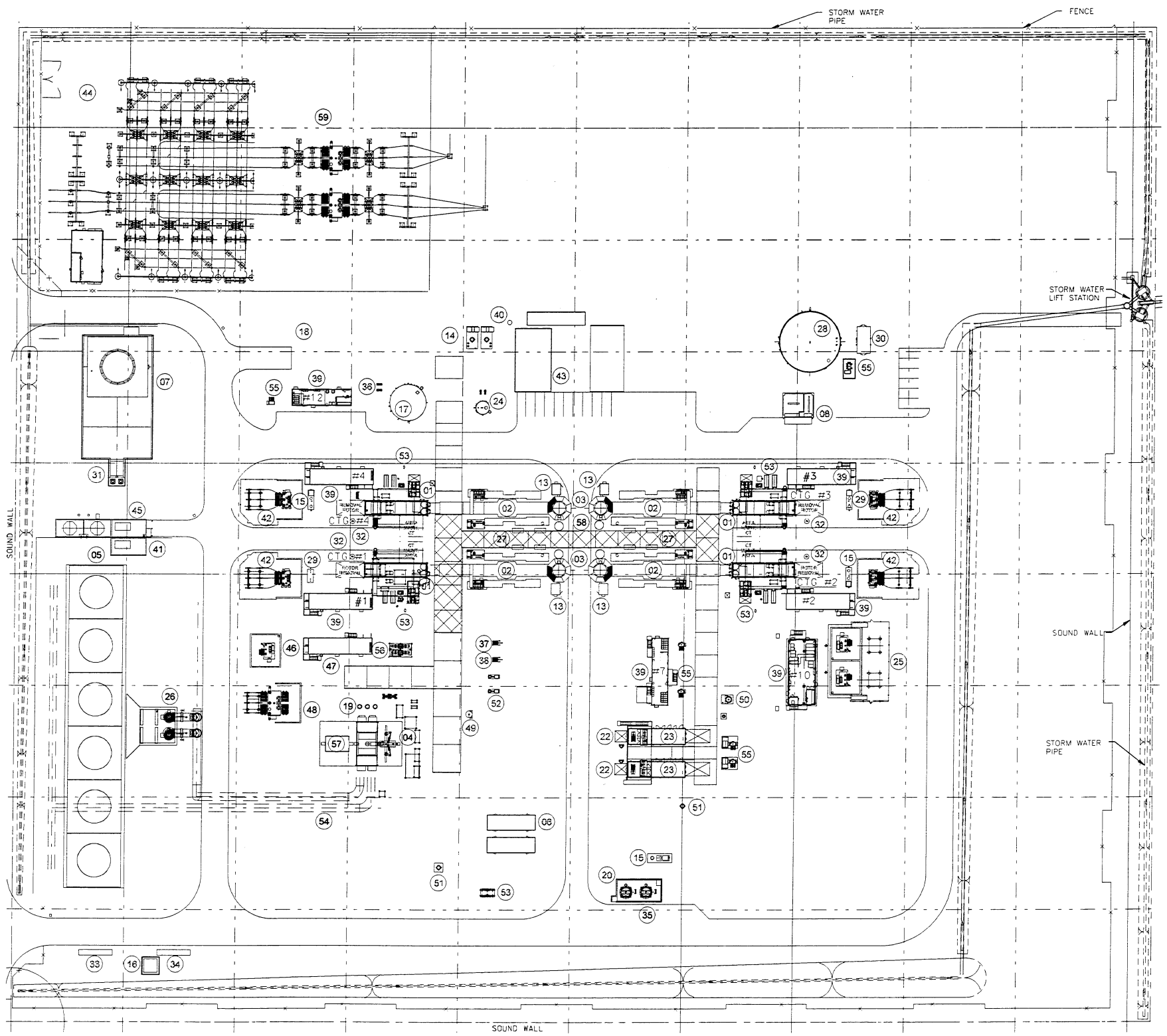
## DISCLAIMER OF LIABILITY

**The manufacturer and seller warrants that this product conforms to its standard specifications when used according to directions. As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for use of this product. Information contained herein is believed to be true and accurate but all statements or suggestions are made without any warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material and the results to be obtained from the use thereof.**

# *Los Esteros Critical Energy Facility*

# *Appendix 8.5-C*
# *Plot Plan Showing Hazardous Materials Storage Locations*

***December 2003***




## LEGEND

1. COMBUSTION TURBINE (CT)
2. HRSG CASING WITH SCR/CO SYSTEMS
3. HRSG STACK
4. STEAM TURBINE
5. COOLING TOWER (6 CELL) (NEW)
6. FUEL GAS COMPRESSORS
7. COOLING TOWER (1 CELL)
8. 
9. AUXILIARY SKIDS
10. SPRINT SKIDS
11. GENERATOR CIRCUIT BREAKER
12. WATER INJECTION SKIDS
13. CEMS ENCLOSURES
14. AIR COMPRESSOR/AIR DRYER SKIDS/AIR RECEIVER
15. OIL WATER SEPARATORS
16. PROCESS SUMP & PUMPS
17. DEMINERALIZED WATER STORAGE TANK
18. WATER TREATMENT AREA
19. CONDENSER
20. AQUEOUS AMMONIA STORAGE TANK & PUMPS
21. AMMONIA FEED SKIDS
22. CTG INLET AIR CHILLER SYSTEM
23. CTG CHILLED WATER PUMPS
24. POTABLE WATER TANK AND PUMPS
25. PRIMARY AUXILIARY TRANSFORMERS
26. CIRCULATING WATER PUMPS (NEW)
27. BOILER FEED WATER PUMPS (NEW)
28. RAW WATER STORAGE TANK
29. WATER WASH DRAIN TANKS
30. FIREWATER PUMPS
31. AUXILIARY COOLING WATER PUMPS
32. COIL CONDENSATE SUMP W/PUMP
33. PLANT WATER METER
34. PG&E FUEL GAS METER
35. AQUEOUS AMMONIA STORAGE TANK (NEW)
36. DEMINERALIZED WATER TRANSFER PUMPS
37. EQUIPMENT COOLING WATE HEAT EXCHANGER (NEW)
38. EQUIPMENT COOLING WATER HEAT EXCHANGER
39. POWER DISTRIBUTION CENTERS (PDC)
40. SANITARY WASTE LIFT STATION
41. CIRCULATING WATER CHEMICAL FEED SYSTEM (NEW)
42. GENERATOR STEP-UP TRANSFORMER
43. CONTROL, OFFICE AND SERVICE AREA
44. 115 kV SWITCHYARD
45. CIRCULATING WATER CHEMICAL FEED SYSTEM
46. STG UNIT AUXILIARY TRANSFORMER (NEW)
47. STG POWER DISTRIBUTION CENTER (NEW)
48. STG GENERATOR STEP-UP TRANSFORMER (NEW)
49. EQUIP COOLING WATER EXPANS. TK & AIR SEPAR
50. CHILLED WATER EXPANSION TK & AIR SEPARATOR
51. INSTRUMENT AIR RECEIVER
52. EQUIPMENT COOLING PUMPS
53. FUEL GAS FILTER/SEPARATORS
54. U/G CIRCULATING WATER PIPING (NEW)
55. SECONDARY AUXILIARY TRANSFORMERS
56. CHILLER CIRCULATING WATER STRAINER
57. ST GENERATOR (NEW)
58. BLOWDOWN TANK (TYP. 4) (NEW)
59. 115:230 KV SVP SWITCHYARD

BOLD ITEMS INDICATE NEW SCOPE

ADD NEW LEVEL OF PIPE RACK TO EXISTING PIPE RACK

80 0 80 160 240

SCALE IN FEET

| REV | DATE | DESCRIPTION | DRAWN | CHECKED | ENGINEER | PROJECT ENGINEER | PROJECT MANAGER |
|---|---|---|---|---|---|---|---|
| | - - | | | | | | |
| | - - | | | | | | |
| | - - | | | | | | |
| | - - | | | | | | |
| B | 12-11-03 | ADD SVP SWITCHYARD/BBS TANKS | | | | | |
| A | 10-31-03 | ISSUED FOR PERMITTING | | | | | |

| | | DATE |
|---|---|---|
| DRAWN BY | K BLAIR | 10-31-03 |
| CHECKED BY | G BAXTER | 10-31-03 |
| ENGINEER | G BAXTER | 10-31-03 |
| PROJECT ENGINEERING MANAGER | | - - |
| PROJECT MANAGER | | - - |

CALPINE

PROJECT NO.

**LOS ESTEROS CRITICAL ENERGY FACILITY**
**GENERAL ARRANGEMENT**
**COMBINED CYCLE CONVERSION (PHASE 2)**

SCALE 1" = 50'-0"

DWG. NO. LECEF2-G-1001

REVISION B

23-DEC-2003

24x36

# *Los Esteros Critical Energy Facility*

## *Appendix 8.6-A*
## *Project Parcel Maps*

***December 2003***

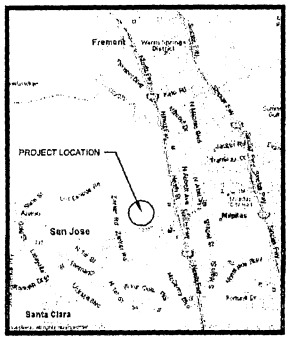
| LAND USE TYPE | | ACREAGE | | |
|---|---|---|---|---|
| | DATA CENTER BUILDINGS (DATA CENTERS, ISP, TELCO, CO-LOCATION, ONLINE PROVIDERS, STORAGE, WAREHOUSING & DISTRIBUTION ESTABLISHMENTS). CROSS-CONNECT, OFFICES LANDSCAPING[1] INFRASTRUCTURE PARKING VEHICULAR CIRCULATION | 60.23 ACRES | | |
| | LOS ESTEROS CRITICAL ENERGY FACILITY | 20.0 ACRES | | |
| | PG&E SUBSTATION (not included in Open Space requirement) | 24.0 ACRES | | |
| | ACCESS ROAD ON WPCP BUFFER LAND | 5.23 ACRES | | |
| | OPEN SPACE HABITAT | 13.37 ACRES | Percentage of Site (not including PG&E Substation area)[2] 8.89 % | 30 % |
| | OPEN SPACE SETBACKS | 2.27 ACRES | 1.51 % | |
| | TRAIL | 0.86 ACRES | 0.57 % | |
| | LANDSCAPED BUFFER LAND[3] | 28.62 ACRES | 19.03 % | |
| TOTALS: | | 174.4 ACRES | | |

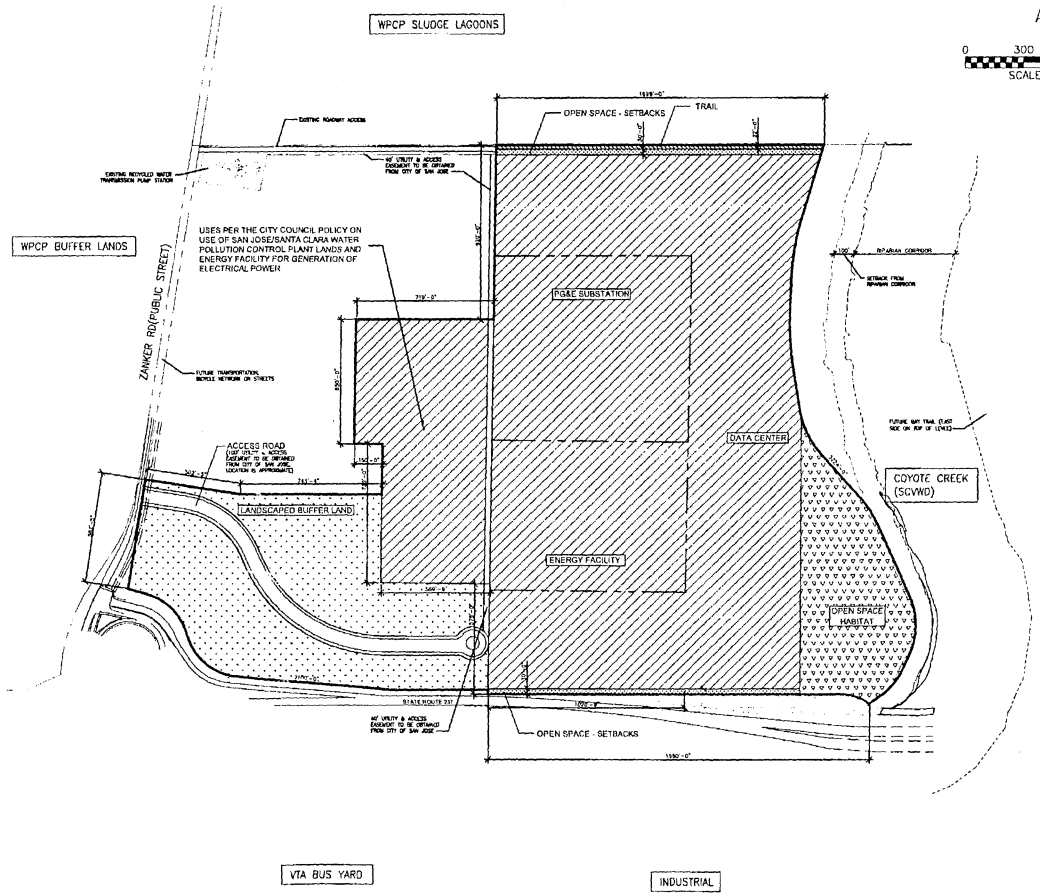
1 PERMITTED USE INCLUDES ANTENNAE AND WIRELESS TOWERS.

2 THE PROPERTY IDENTIFIED AS PG&E SUBSTATION WILL NOT BE INCLUDED IN THE CALCULATION OF THE 30% OPEN SPACE REQUIREMENT UNTIL SUCH TIME THAT A DEVELOPMENT APPROVAL IS ISSUED FOR NON PUBLIC USE OF THE PROPERTY.

3 PERMITTED USE INCLUDES SECURITY GUARD STATION AND SECURITY GATE.

LOCATION MAP




APPROVED BY THE CITY COUNCIL ON FEBRUARY 19, 2002. ORDINANCE NO. 26579.


1737 N. FIRST STREET, SUITE #300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909
CH2M HILL


| | | | | | |
|---|---|---|---|---|---|
| DSGN | | | | | |
| DR | | | | | |
| CHK | 2 | 2/4/02 | REVISED PER COMMENTS | MTR | VY |
| APVD | 1 | 10/31/01 | REVISED PER COMMENTS | MTR | VY |
| | NO. | DATE | REVISION | BY | APVD |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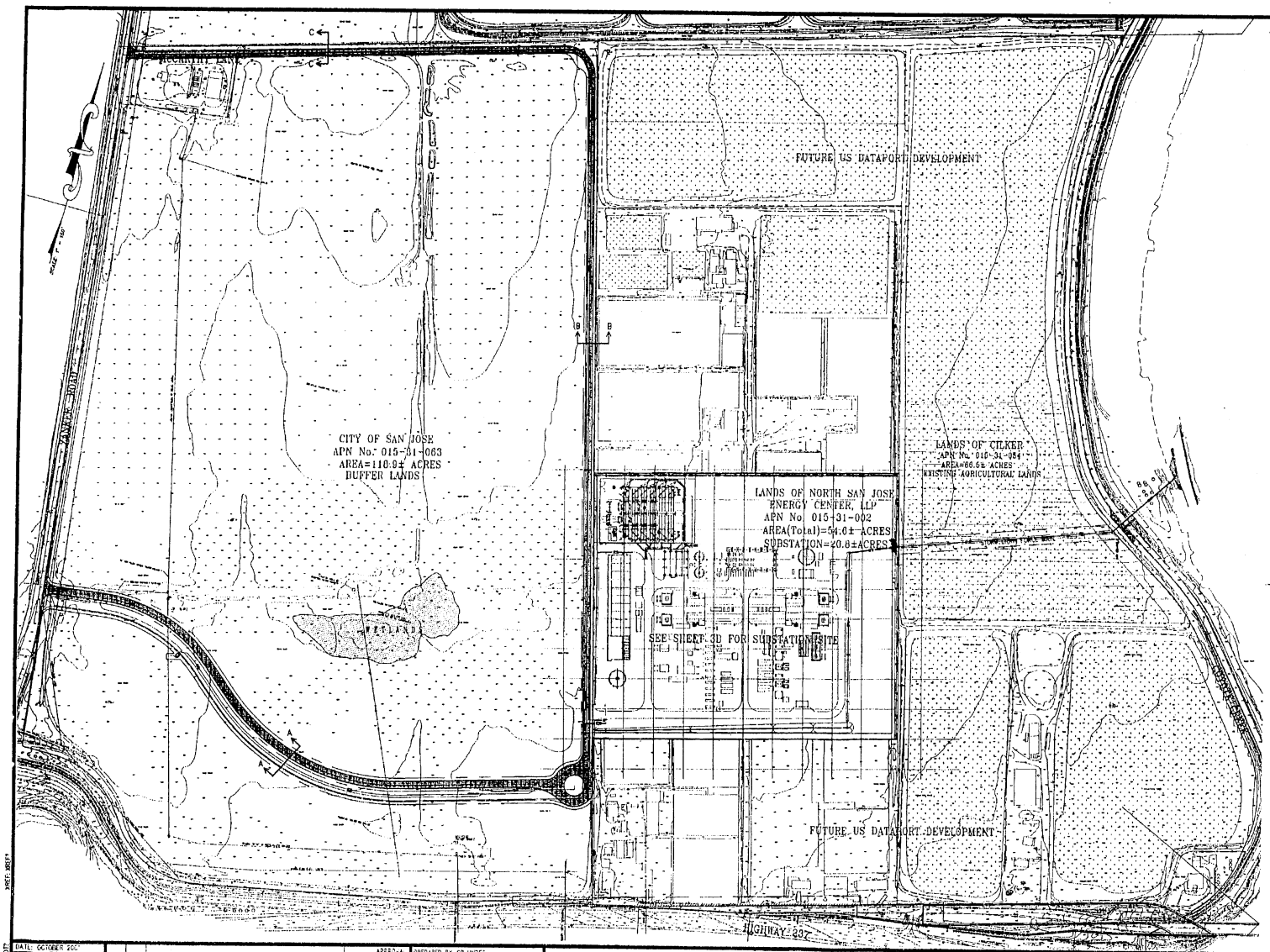
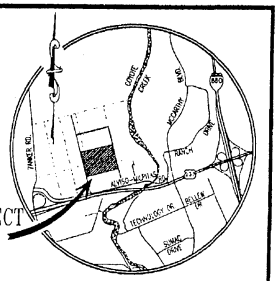
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

US DATAPORT/LECEF
SAN JOSE, CALIFORNIA

GENERAL DEVELOPMENT PLAN - EXHIBIT C
LAND USE PLAN

SHEET 2
DWG NO.
DATE 2/4/02
PROJ NO.




## VICINITY MAP

NOT TO SCALE

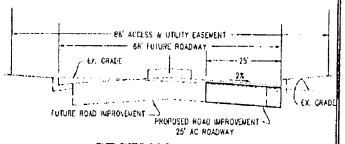
EXISTING EASEMENTS: (8) EASEMENT DESIGNATION

1.) 18.00' PG&E EASEMENT PER BOOK E529 PAGE 545 SANTA CLARA RECORDS
2.) STATE OF CALIFORNIA POLE LINE EASEMENT PER DOCUMENT #13593382 ON 1/29/1997 SANTA CLARA COUNTY RECORDS
3.) 16.00' PG&E EASEMENT 16.00' PG&E AND THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY EASEMENT PER BOOK D984 PAGE 646 SANTA CLARA COUNTY RECORDS
4.) "CONSENT TO REMOVAL OF PERSONAL PROPERTY" PER BOOK 951 PAGE 111 SANTA CLARA COUNTY RECORDS
5.) STATE OF CALIFORNIA SLOPE/RETAINING WALL EASEMENT PER DOCUMENT #13593382 ON 1/29/1997 SANTA CLARA COUNTY RECORDS.
6.) STATE OF CALIFORNIA BIKE PATH/UTILITY EASEMENT PER DOCUMENT #13593382 ON 1/29/1997 SANTA CLARA COUNTY RECORDS.
7.) 30.00' PG&E EASEMENT PER BOOK 7056 PAGE 139 SANTA CLARA COUNTY RECORDS

PROPOSED EASEMENTS: (5) EASEMENT DESIGNATION

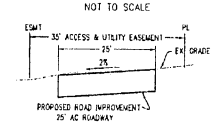
1.) 50' TEMPORARY CONSTRUCTION EASEMENT
2.) 10' PRIVATE STORM DRAIN EASEMENT
3.) 25' ACCESS EASEMENT
4.) 88' PRIVATE ACCESS AND UTILITY EASEMENT
5.) 25' UTILITY EASEMENT
6.) 10' RAW WATER EASEMENT
7.) 35' PRIVATE ACCESS AND UTILITY EASEMENT
8.) PRIVATE ACCESS AND UTILITY EASEMENT

NOTE: USDATAPORT DRAINAGE TO COLLECTED AND DIRECTED TO STORM DRAIN FORCEMAIN, AND DISCHARGED TO COYOTE CREEK. USDATAPORT IS SUBJECT TO A SEPARATE PD PERMIT.



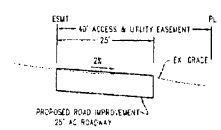

## SECTION A-A

NOT TO SCALE




## SECTION B-B

NOT TO SCALE




## SECTION C-C

NOT TO SCALE

PD PERMIT

| | | | | | | |
|---|---|---|---|---|---|---|
| DATE: OCTOBER 2001 | | | | | | APPROVAL |
| SCALE: 1" = 150' | | | | | | |
| DESIGNED: | | | | | | |
| DRAWN: | | | | | | |
| CHECKED: | | | | | | |
| PROJ. ENGR.: | | | | | | |
| PROJ. MGR.: | NO. | BY | DATE | REVISIONS | BY | DATE |

PREPARED BY, OR UNDER THE DIRECTION OF

BY _____
R.C.E. No. _____
DATE: _____

Planning
Surveying & Mapping
Land Development Engineering
Municipal Engineering
Construction Staking
Construction Management

& Associates
MILANI

3480 Buskirk Avenue, Suite 225
Pleasant Hill, CA 94523
Phone: (925) 941-1490
Fax: (925)941-1496

P.D. ZONING FILE NO. PDCSH 01-09-088 P.D. PERMIT FILE NO. P.D.S.H. 01-10-111

# PLANNED DEVELOPMENT PERMIT

OVERALL SITE PLAN

CITY OF SAN JOSE SANTA CLARA COUNTY CALIFORNIA

DWG PDPERMIT/P03A.DWG

SHEET 3A OF SHEETS

JOB NO. 210043-10

PLOT DATE:

SMAP SHOT: SMAP SHOT?

XREF: XREF?

# *Los Esteros Critical Energy Facility*

# *Appendix 8.6-B*
# *City of San Jose Pole Line Easement*

***December 2003***

April 17, 2003
JOB NO. 210043-10
LEGAL.18

EXHIBIT "A"
LEGAL DESCRIPTION
POLE LINE EASEMENT

ALL THAT REAL PROPERTY SITUATE IN THE CITY OF SAN JOSE, COUNTY OF SANTA CLARA, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THAT CERTAIN PARCEL OF LAND SHOWN AND SO DESIGNATED AS "LANDS OF THE CITY OF SAN JOSE, 123.717 ACRES +/- GROSS (GRID)" ON THE RECORD OF SURVEY ENTITLED "RECORD OF SURVEY, CONSISTING OF THREE (3) SHEETS, BEING THE LANDS OF THE CITY OF SAN JOSE, BEING A PORTION OF THE RANCHO RINCON LOS ESTEROS" DATED MAY 1994 AND FILED FOR RECORD IN THE OFFICE OF THE COUNTY RECORDER OF SANTA CLARA COUNTY IN BOOK 658 OF MAPS AT PAGE 4, DESCRIBED AS FOLLOWS:

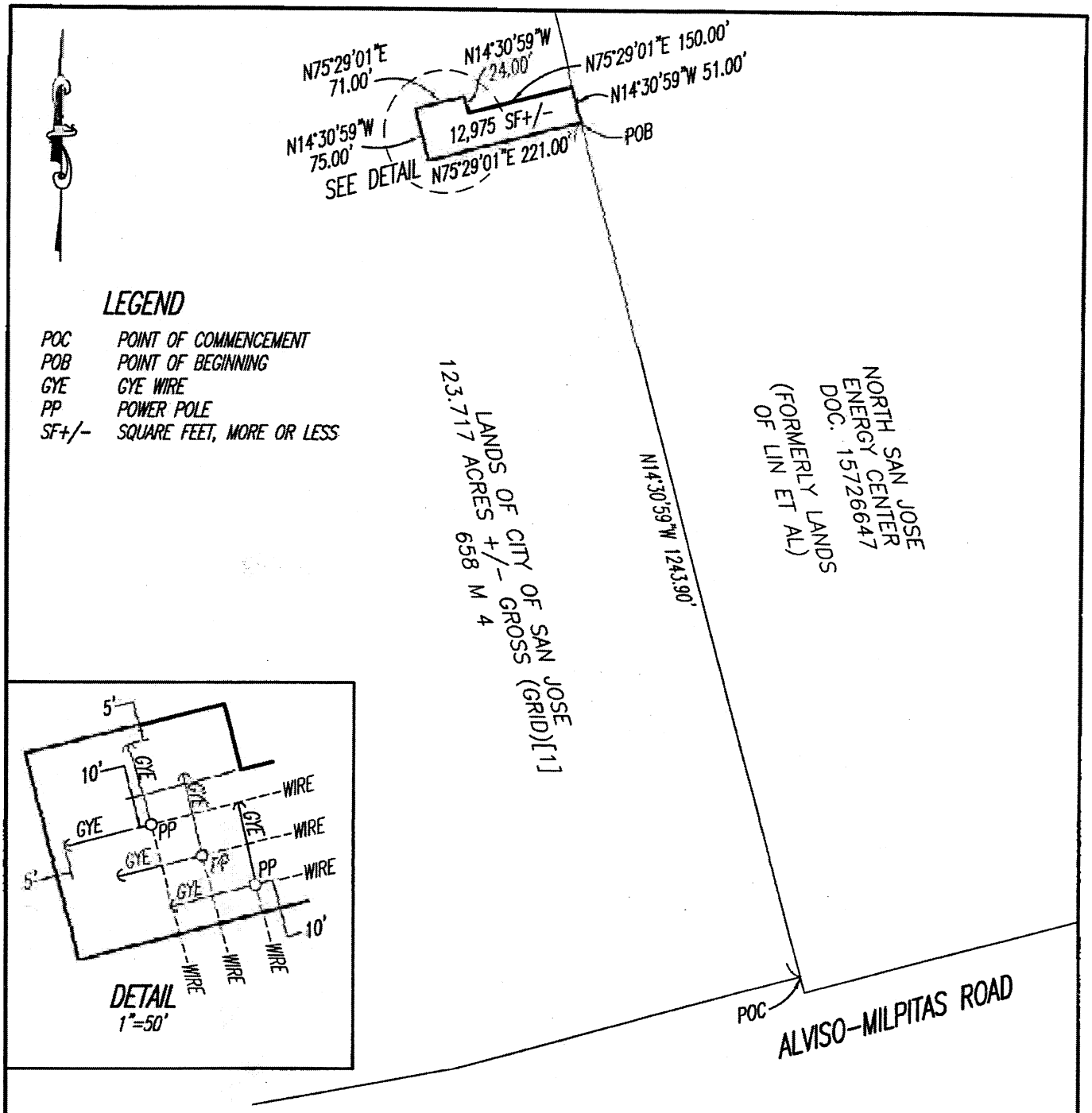
COMMENCING FOR REFERENCE AT THE SOUTHEASTERN CORNER OF SAID CITY OF SAN JOSE PARCEL AND RUNNING THENCE NORTHERLY ALONG THE EASTERN LINE THEREOF NORTH 14°30'59" WEST 1243.90 FEET TO THE TRUE POINT OF BEGINNING OF THE HEREIN DESCRIBED PARCEL OF LAND; THENCE, FROM SAID POINT OF BEGINNING, CONTINUING NORTHERLY ALONG SAID EASTERN LINE NORTH 14°30'59" WEST 51.00 FEET; THENCE, LEAVING SAID EASTERN LINE SOUTH 75°29'01" WEST 150.00 FEET; THENCE, NORTH 14°30'59" WEST 24.00 FEET; THENCE, SOUTH 75°29'01" WEST 71.00 FEET; THENCE, SOUTH 14°30'59" EAST 75.00 FEET; THENCE, NORTH 75°29'01" EAST 221.00 FEET TO THE POINT OF BEGINNING AND CONTAINING 12,975 SQUARE FEET OF LAND, MORE OR LESS.

THE DISTANCES GIVEN IN THIS DESCRIPTION ARE GROUND DISTANCES. TO CONVERT TO GRID DISTANCES, MULTIPLY DISTANCES GIVEN BY 0.999945623.

ALL AS SHOWN ON EXHIBIT "B" ATTACHED HERETO AND MADE A PART HEREOF.

END OF DESCRIPTION

FOR MILANI & ASSOCIATES
MICHAEL E. MILAN
L.S. 5311
EXPIRES: 12/31/03




# EXHIBIT "B"
# POLE LINE EASEMENT
## PORTION OF LANDS OF CITY OF SAN JOSE (658 M 4)
## CITY OF SAN JOSE - SANTA CLARA COUNTY - CALIFORNIA


MILANI & Associates
Planners - Engineers - Surveyors
4071 Port Chicago Hwy., Suite 100
Concord CA 94520-1122
Phone: (925) 674-9082
Fax: (925) 674-9279

FOR MILANI & ASSOCIATES
MICHAEL E. MILANI
LS 5311, EXP. 12/31/03


APRIL 17, 2003 SCALE: 1"=400' SHEET 1 OF 1 SHEET

10043-10\LGL10 (FOR LEGAL.18)

Project 10043-10
Parcel Map Check

Parcel name: POLE LINE ESMT

North: 1980505.1471 East : 6145058.8282
Line Course: N 14-30-59 W Length: 75.000
North: 1980577.7528 East : 6145040.0290
Line Course: N 75-29-01 E Length: 71.000
North: 1980595.5494 East : 6145108.7624
Line Course: S 14-30-59 E Length: 24.000
North: 1980572.3156 East : 6145114.7781
Line Course: N 75-29-01 E Length: 150.000
North: 1980609.9141 East : 6145259.9895
Line Course: S 14-30-59 E Length: 51.000
North: 1980560.5422 East : 6145272.7730
Line Course: S 75-29-01 W Length: 221.000
North: 1980505.1471 East : 6145058.8282

Perimeter: 592.000 Area 12,975 SF+/- 0.298 AC+/-

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: N 75-57-50 W
Error North: 0.00000 East : -0.00000
Precision 1: 592,000,000.000

# *Los Esteros Critical Energy Facility*

## *Appendix 8.6-C*
## *City of San Jose Ordinance Number 26343*

***December 2003***

File No. PDCSH 00-06-048

ORDINANCE NO. 26343

ORDINANCE OF THE CITY OF SAN JOSÉ PREZONING AND REZONING CERTAIN REAL PROPERTY SITUATED ON THE NORTH SIDE OF STATE ROUTE 237, BETWEEN ZANKER ROAD AND COYOTE CREEK.

WHEREAS, all rezoning proceedings required under the provisions of Chapter 20.40 of Title 20 of the San José Municipal Code have been duly had and taken with respect to the real property hereinafter described;

WHEREAS, the area encompassed by the subject proposed rezoning was the subject of an Environmental Impact Report (EIR) prepared in conformance with the California Environmental Quality Act of 1970 (CEQA), as amended, and found complete by the Planning Commission on March 14, 2001; and which Commission determination was appealed to the City Council and the City Council held a duly noticed hearing and upheld the finding of the Planning Commission on April 3, 2001; and

WHEREAS, this Council of the City of San José, acting as lead agency under CEQA, proposes to approve a project which was the subject of said EIR, to wit: the adoption of an ordinance prezoning and rezoning certain real property hereinafter described to A(PD) Planned Development; and

WHEREAS, this Council has, on April 3, 2001, adopted a certain resolution making certain findings concerning mitigation measures, adopting a mitigation monitoring and reporting program, making findings concerning alternatives, and adopting a statement of overriding considerations, all in accordance with CEQA, for the project; and

WHEREAS, this Council has, on April 3, 2001, adopted Resolution No. 70259; and

WHEREAS, the Council is the decision-making body for subject prezoning and rezoning to A(PD) Planned Development; and

WHEREAS, this Council does hereby certify that, as a decision-making body, it has considered and approves the information contained in such EIR prior to acting upon or approving such project;

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF SAN JOSÉ as follows:

SECTION 1. All that real property hereinafter described in this section, hereinafter referred to as "subject property," is hereby prezoned or rezoned as A(PD).

The base district zoning of the subject property shall be A-Agricultural. The PD zoning of the subject property shall be that development plan for the subject property entitled, "Planned Development Zoning, USDataport" dated June 6, 2000, **last revised March 19, 2001** with the following added conditions:

1. Energy and environment. Prior to issuance of PD permits for any campus building which will draw power from the electrical grid, the applicant has agreed to and shall limit the use of diesel generators to 25 hours per year and provide to the Director of Planning a plan which achieves the following goals:
   a. Elimination of the use of diesel generators as the source of backup power for the US Dataport campus buildings.
   b. Implementation of environmentally superior technology for power generation and supply alternatives that will reduce impacts to local and regional air quality to the extent such alternatives are available, reliable, and commercially feasible.
   c. Use of best commercially feasible available technology for plume visibility reduction.
   d. Implementation of a-c above in a manner that is compatible with the City's General Plan; the Mayor's Smart Energy Strategy recently approved by the Council that calls for energy generation facilities located in appropriate industrial zones; California laws and regulations; and the Final Environmental Impact Report (FEIR).
2. Backup power. In the event that the applicant cannot secure a satisfactory location and permits for power generation, identify methods for ensuring a reliable source of power, or environmentally superior technology as described above, the Director of Planning shall issue all permits necessary for applicant to use emergency backup diesel generators for its campus buildings only under the following additional condition:
   a. The applicant shall limit the use of emergency diesel generators to not exceed 50 hours per year as described in the FEIR and shall be further subject to Bay Area Air Quality Management District regulatory requirements including any enforcement.
3. Open space and Burrowing Owl Habitat. The applicant has represented and agreed to provide 52.5 acres of open space, which is equal to 30.11 percent of the total gross project area. This open space would be included as part of the project's zoning, as outlined in the attached Exhibit A. It shall consist of the following:
   a. 1.80 acres of open space setbacks.
   b. 23.16 acres of private open space in the area shown on Exhibit A,

including a 22-foot Bay Trail easement as recommended by the Planning Commission and the Director of Planning, on the applicant's private property. This private open space shall be landscaped in a manner consistent with the Alviso Master Plan and conducive to burrowing owl foraging and habitat pursuant to a burrowing owl habitat plan, subject to Applicant's reasonable need for a secure campus including fencing. This private open space shall be subject to a conservation easement, which shall be recorded subsequent to the completion of the Development Agreement referenced below. The grading and landscaping in the private open space area shall be done in a manner to take advantage of opportunities to naturally filter, detain and slow storm water running off the site while still preserving its qualities for burrowing owl habitat.

c. 27.53 acres of open space on the Water Pollution Control Plant's "buffer lands" to be landscaped consistent with the Alviso Master Plan and WPCP guidelines. To the extent possible, indigenous species should be planted as grasslands or marshlands with low shrubs and few trees. Trees should be kept close to the buildings. If necessary to control excess growth, the property shall be mowed, not disked. Ponds or wetlands can be incorporated into the design but a manicured "golf course" appearance is not desirable.

4. Recycled water. The applicant has agreed to use recycled water in the maintenance and operation of their cooling tower. This will be a beneficial element of City's ongoing efforts to divert effluent from the bay. The project will not add any salt to the water it uses. The Administration is directed to not require desalination of effluent water from the project as a condition of any permits nor to require any extraordinary payment of fees.
5. Noise. The applicant shall comply with the San José 2020 General Plan noise guidelines by implementing appropriate measures to prevent exceeding the guidelines. This requirement will ensure that noise from the cooling towers and other sources will not exceed applicable limits.
6. Lights. External and internal lights shall be designed so as not to create glare or other negative impacts to the Coyote Creek riparian corridor.
7. Community contributions. The applicant has offered a $1 million contribution over a ten-year time frame in community technology programs and scholarships. This contribution is subject to receiving approval of all permits and obtaining financing for the development of project. These programs and contributions should follow appropriate guidelines to be established by the City Council in concert with the Mayor's Office, the Office of Council District 4, and residents of the Alviso community.

8. Coyote Creek enhancements. The applicant has offered a $1 million contribution, over a ten-year time frame, toward improvement of the habitat and water quality of Coyote Creek. This contribution is subject to receiving approval of all permits and obtaining financing for the development of project. These programs and contributions should follow appropriate guidelines to be established by the City Council in concert with the Mayor's Office, the Office of Council District 4, and residents of the Alviso community. The applicant anticipates collaborating with the Santa Clara Valley Water District's Adopt-a-Creek program, the San Francisco Bay Bird Observatory and other local organizations with expertise in how to enhance the habitat and water quality of Coyote Creek.
9. Employment Limitation on "Buffer Lands". The number of employees on the Central Reliability Energy Center (CREC) or landscaped buffer land properties shall be limited to 50.
10. Entrance Road. The entrance road across the Water Pollution Control Plant's "buffer lands," as agreed to by the applicant, shall be placed in a recorded easement or otherwise established through appropriate documentation.
11. Development Agreement. Conditions above are subject to the applicant and City executing a mutually acceptable Development Agreement, or other appropriate document, including all business terms, PD Zoning entitlements and conditions including but not limited to 2.227 million square feet of data center buildings with a reliable source of power and location of PG & E substation on City "buffer lands."

Said General Development Plan is on file in the office of the Director of Planning and is available for inspection by anyone interested therein, and said General Development Plan is by this reference adopted and incorporated herein the same as if it were fully set forth herein.

The subject property referred to in this section is all that real property situate in the County of Santa Clara, State of California, described in attached Exhibit A.

SECTION 2. The district map of the City is hereby amended accordingly.

SECTION 3. The land development approval which is the subject of City File NoPDCSH00-06-048 is subject to the operation of Part 2.75 of Chapter 15.12 of Title 15 of the San José Municipal Code. The applicant for or recipient of such land use approval hereby acknowledges receipt of notice that the issuance of a building permit to implement such land development approval may be suspended, conditioned or denied where the City Manager has determined that such action is necessary to remain within the aggregate operational capacity of the sanitary sewer system available to the City of San José or to meet the discharge standards of the

sanitary sewer system imposed by the California Regional Water Quality Control Board for the San Francisco Bay Region.

PASSED FOR PUBLICATION OF TITLE this 3rd day of April, 2001.

| | |
|---|---|
| AYES: | CAMPOS, CHAVEZ, CORTESE, DANDO, DIQUISTO, REED, SHIRAKAWA, WILLIAMS, YEAGER; GONZALES |
| NOES: | LeZOTTE |
| ABSENT: | NONE |
| VACANT: | NONE |
| DISQUALIFIED: | NONE |

Ron Gonzales

Ron Gonzales, Mayor

ATTEST:

Patricia L. O'Hearn

Patricia L. O'Hearn, City Clerk

PDCSH00-06-048



## LEGAL DESCRIPTION

REAL PROPERTY in the City of San Jose, County of Santa Clara, State of California, described as follows:

PARCEL ONE:

Beginning at a 1/2 inch iron pipe set at the point of intersection of the centerline of the Milpitas-Alviso Road (66.00 feet in width) with the centerline of Zanker Road (40.00 feet in width) thence North 7° 15' West along said centerline of Zanker Road 33.40 feet to a one inch iron bolt set at the point of intersection of the Northwesterly line of said Milpitas-Alviso Road with the said centerline of Zanker Road thence North 73° 53' East 20.25 feet to the point of intersection of the Easterly line of Zanker Road with the Northwesterly line of the Milpitas-Alviso Road, thence North 7° 15' West along the said Easterly line of Zanker Road 2356.69 feet to a point; thence South 82° 45' West 20.00 feet to a point on the centerline of Zanker Road; thence North 7° 15' West along the centerline of Zanker Road 345.06 feet to a point; thence North 73° 43' East 1608.01 feet to a point on the Easterly line of that certain parcel shown upon the Record of Survey Map entitled, "Map of the property of Lawrence Lombardo and Angelina Lombardo", which said Map was recorded on July 22, 1955 in Book 60 of Maps, page 42, Santa Clara County Records, thence South 15° 30' 20" East 2707.33 feet to a 1/2 inch iron pipe set where this course intersects the centerline of the said Milpitas-Alviso Road; thence South 73° 53' West along said centerline of Milpitas-Alviso Road 1998.05 feet to the point of beginning and the terminus of the herein described parcel of land.

EXCEPTING THEREFROM a portion of each of those parcels of land described in the Deeds to Harold E. Casteel, et al, recorded April 12, 1966 in Book 7344, page 395 and recorded January 18, 1968 in Book 7998, page 362, both of Official Records of Santa Clara County, said portions being more particularly described as a whole as follows:

Commencing at the Southeasterly corner of said parcel of land is described in said Deed (7344 OR 395); thence along the Southerly line of last said parcel South 74° 49' 08" West 1998.05 feet to the centerline of Zanker Road (40.00 feet in width) as said road is described in last said Deed (7344 OR 395); thence along last said line North 06° 25' 52" West, 30.35 feet to the Northerly line of the existing state highway, road 04-SC1-237; thence along last said line North 74° 49' 08" East, 20.24 feet to the Easterly line of said Zanker Road; thence along last said line North 06° 25' 52" West 300.81 feet to a point of cusp; thence from a tangent that bears South 07° 43' 17" East along a curve to the left, with a radius of 675.00 feet, through an angle of 14° 27' 35", an arc length of 170.35 feet; thence South 22° 10' 52" East 81.16 feet; thence along a tangent curve to the left, with a radius of 50.00 feet, through an angle of 77° 51' 26", an arc length of 67.94 feet; thence North 79° 57' 42" East, 35.22 feet to a point on said Northerly line of the existing state highway, distant thereon North 74° 49' 08" East, 135.20 feet from said Easterly line of Zanker Road; thence along last said Northerly line North 74° 49' 08" East 1838.35 feet to the Easterly line of last said parcel; thence along last said line South 14° 31' 10" East 30.00 feet to the point of commencement, being that portion of land conveyed to the State of California by instrument recorded January 29, 1969 in Book 8417 of Official Records at page 618.

00-048

EXHIBIT A

PARCEL TWO:

Beginning at a 1/2 inch iron pipe set at the point of intersection of the centerline of the Milpitas-Alviso Road (66.00 feet in width) with the centerline of Zanker Road (40.00 feet in width) thence North 7° 25' West along said centerline of Zanker Road 33.40 feet to a one-inch iron bolt set at the point of intersection of the Northwesterly line of said Milpitas-Alviso Road with said centerline of Zanker Road, thence North 73° 53' East 20.25 feet to the point of intersection of the Easterly line of Zanker Road with the Northwesterly line of the Milpitas-Alviso Road, thence North 7° 15' West along the said Easterly line of Zanker Road 2356.69 feet to a point, thence South 82° 45' West 20.00 feet to a point on the centerline of Zanker Road, thence North 7° 15' West along the centerline of Zanker Road 345.06 feet to the true point of beginning of the herein described parcel, thence from said true point of beginning North 7° 15' West continuing along the centerline of Zanker Road 193.94 feet to a 1/2 inch iron pipe, then North 73° 43' East 1577.56 feet to a one inch iron pipe, said one inch iron pipe being at the Northeasterly corner of that certain parcel shown upon the Record of Survey map entitled "Map of the property of Lawrence Lombardo and Angelina Lombardo" which said map was recorded on July 22, 1955 in Book 60 of Maps, page 42, Santa Clara County Records, thence South 15° 30' 20" East 191.53 feet to a point thence South 73° 43' West 1608.01 feet to a point on the centerline of said Zanker Road, said point also being the true point of beginning of the herein described parcel and the terminus of this description.

PARCEL THREE:

A portion of Lot 1, as shown on that certain Map entitled, "Map of the subdivision of the land of William Zanker in the Berryessa portion of the Rancho Rincon de los Esteros", filed for record on December 31, 1894 in book "F" of Maps page 35, Santa Clara County Records; and more particularly described as follows:

Beginning at a point in the center of Zanker Road which is South 89° 50' East 20.17 feet from a 6" x 6" fence post marked BZ standing at the point of intersection of the Westerly line of Zanker Road (formerly Berryessa Lane) with the Northerly line of the said Zanker Tract, said post also being the Southeast corner of the T.F. Barnes 100-acre tract; thence along the Northern line of said Zanker Tract South 89° 50' East 910.43 feet to a point in the centerline of a slough, formerly the boundary between said Zanker Tract and lands of M. Bellew and from which point a 2" x 3" white witness post in said Northern fence line and marked W.P. bears North 89° 50' West 72.60 feet; thence along the centerline of said slough, South 11° East 206.58 feet and South 15° 45' East 264.00 feet to the common corner of lands of Zanker and Cropley in said centerline of said slough, and western line of lands of M. Bellew, as shown on said map, and from which corner a 2" x 3" white witness post on West said of slough bears South 73° 47' West 46.86 feet; thence along the fence now defining the line between said lands of Zanker and Cropley, and the Westerly extensions thereof, South 73° 47' West 967.11 feet to a point in the center of Zanker Road which lies North 73° 47' East 20.25 feet from a 4" x 4" white post at the most Southerly corner of said Lot 1; thence along the center of said Zanker Road North 7° 15' West 734.19 feet to the point of beginning.

EXCEPTING THEREFROM the following described parcel of land:

A portion of Lot 1, as said Lot is shown upon that certain map entitled "Map of the Subdivision of the Lands of William Zanker in the Berryessa Portion of the Rancho Rincon de los Esteros" which Map was filed for record in the Office of the Recorder of the County of Santa Clara, State of California on December 31, 1894 in Book "F" of Maps, page 35, and more particularly described as follows:

(LEGAL DESCRIPTION CONTINUED NEXT PAGE)

LEGAL DESCRIPTION: (Continued)

Parcel Three (continued)

Beginning at a point in the centerline of Zanker Road at the Northwesterly corner of that certain 12.83 acre parcel of land conveyed by Deed from John Medina, et ux, to Joe S. Garcia, et ux, dated July 18, 1958 and recorded August 20, 1958 in Book 4154 of Official Records, at page 405, Santa Clara County Records; thence leaving said centerline of Zanker Road along the Northeasterly line of said 12.83 acre parcel of land South 89° 50' East 30.25 feet to a point in a line that is parallel to and distant 30.00 feet, measured at right angles Easterly from said centerline of Zanker Road; thence along said parallel line South 7° 15' East 216.09 feet; thence at right angle to and leaving said parallel line South 82° 45' West 30.00 feet to a point in said centerline of Zanker Road; thence along said centerline and the Westerly line of said 12.83 acre parcel of land North 7° 15' West 220.00 feet to the point of beginning.

APN: 015-31-063
ARB: 15-31-5 & 35

****

# EXHIBIT "A"
LICK NO. 27

**Situate** in the in the County of Santa Clara, State of California.

**Beginning** at a point on the northern sideline of the Milpitas-Alviso Road at the intersection of the southern boundary of the City of Milpitas as established by the Annexation to the City entitled "Milpitas 1986-2" , said point being the centerline of the Coyote River as defined in said annexation;

Thence from said point of beginning, northerly along the western boundary of said annexation of Milpitas 1986-2 and the centerline of the Coyote River 3165 feet, more or less, to the southern boundary of the City of San Jose established by Lick No. 17; thence leaving said western boundary of Milpitas and the centerline of the Coyote River, along the southern boundary of said Lick No. 17, South 74°54'37" West 2025 feet, more or less, to the intersection of the eastern boundary of the City of San Jose as established by Lick No. 6; thence leaving the southern boundary of said Lick No. 17, along the eastern boundary of said Lick No. 6 South 14°30'59" East 2955.5 feet, more or less to the intersection with the northern boundary of the City of San Jose as established by Lick No. 2 on the southern sideline of the Milpitas-Alviso Road; thence leaving said eastern boundary of Lick No. 6, along the northern boundary of said Lick No. 2 to an angle point therein at the northeastern corner thereof; thence leaving said northern boundary and the southern sideline of the Milpitas-Alviso Road, along the eastern boundary of said Lick No. 2, southerly to the intersection of the northwestern boundary of the City of Milpitas as established by the Annexation to the City entitled "Milpitas 1981-1"; thence along said boundary of the City of Milpitas North 60°00'00"East 1923 feet, more or less, to the southern sideline of said first mentioned lands of the City of Milpitas by annexation "Milpitas 1986-2" on the northern sideline of the Milpitas-Alviso Road; thence along said boundary northwesterly to the point of beginning.

Containing approximately 148.8 acres

Revised in November 2000 by Dunbar and Craig Land Surveys, Inc.

LICENSED LAND SURVEYOR
CURT G. DUNBAR
5615
STATE OF CALIFORNIA

Curt G Dunbar, LS 5615
License renewal date 9-30-2002

Job No. 00125
Date: 9/30/2000
Drawn: CGD

# PERMITTED USES

## I. DATA CENTER/ENERGY FACILITY

**DATA CENTERS, ISP (INTERNET SERVICE PROVIDER), TELCO (TELECOMMUNICATION), COLLOCATION, ON-LINE PROVIDERS AND SIMILAR TELECOMMUNICATION / INTERNET EQUIPMENT HOUSING.** THESE TYPES OF FACILITIES ALL HAVE THE FOLLOWING COMMON CHARACTERISTICS:

-LOW STAFF OCCUPANCY
-HIGH DENSITY OF FLOOR MOUNTED ELECTRONIC COMPUTER EQUIPMENT
-SMALL AMOUNTS OF TRADITIONAL OFFICE AND PUBLIC FUNCTIONS
-HIGH ELECTRICAL POWER CONSUMPTION
-HIGH COOLING REQUIREMENTS
-SIGNIFICANT AMOUNT OF UTILITY INFRASTRUCTURE WITHIN THE BUILDINGS
-MINIMAL GLAZING REQUIREMENTS

**UNINTERRUPTABLE POWER SUPPLY SYSTEMS**
**STORAGE, WAREHOUSING AND DISTRIBUTION ESTABLISHMENTS**
**PG & E SUBSTATION**
**LECEF (LOS ESTEROS CRITICAL ENERGY FACILITY)**

- ENERGY FACILITY FOR GENERATION OF ELECTRICAL POWER
- CHILLED WATER GENERATING EQUIPMENT
- FUEL CELL DEMONSTRATION PLANT OF UP TO 10MW OF ELECTRICAL POWER

**CROSS-CONNECT, OFFICES:**

THERE ARE TWO LOCATIONS ON THE DATA CENTER SITE THAT WILL HOUSE CROSS-CONNECT OPERATIONS AND OFFICES.

THE CROSS-CONNECT FACILITY NEAR THE SITE ENTRY HAS THE MAIN FUNCTION OF LINKING INCOMING FIBER-OPTIC CABLE WITH DISTRIBUTION TO ALL OTHER FACILITIES ON SITE, AND LINKING CARRIER NETWORKS WITH EACH OTHER. THIS BUILDING WILL ALSO INCLUDE DATA CENTER SPACE WITH THE SAME CHARACTERISTICS DESCRIBED ABOVE. THE OFFICES IN THIS FACILITY WILL HOUSE DATA CENTER ON-SITE PERSONNEL AND ALSO ACCOMMODATE SITE RECEPTION, NETWORK MONITORING, AND SECURITY FUNCTIONS.

THE SECOND CROSS-CONNECT FACILITY WILL SERVE AS A REDUNDANT BACK-UP TO THE FIRST. IT IS ALSO ANTICIPATED THAT THIS FACILITY WILL HOUSE SITE MAINTENANCE EQUIPMENT AND BUILDING SHELL SPARE PARTS.

## II. LANDSCAPE AREA

**LANDSCAPE, HARDSCAPE, WATER FEATURES, FENCING, SECURITY GUARD STATION, AND SECURITY GATE**

## .. OPEN SPACE

**LANDSCAPE, FENCING, TRAIL, AND HABITAT**

# DEVELOPMENTSTANDARDS

## I. BUILDING HEIGHT

THE MAXIMUM BUILDING HEIGHT SHALL CONFORM TO THE GENERAL PLAN. AUXILIARY STRUCTURES, INCLUDING BUT NOT LIMITED TO, TOWERS AND COMMUNICATIONS DEVICES SHALL NOT EXCEED 100' IN HEIGHT, OR AS ALLOWED BY THE GENERAL PLAN.

## II. BUILDING SETBACKS

THE MINIMUM SETBACKS FROM ANY PROPERTY LINE TO BUILDINGS SHALL BE 25' FOR DATA CENTER AND 10' FOR LECEF. THERE IS AN EXISTING 100' RIPARIAN CORRIDOR SETBACK ON THE EAST SIDE OF THE PROPERTY. NO IMPROVEMENTS SHALL OCCUR WITHIN THE RIPARIAN CORRIDOR SETBACK, REGARDLESS OF BUILDING SETBACK LOCATION.

## III. INFRASTRUCTURE

PRIVATE:
ALL PRIVATE INFRASTRUCTURE SHALL BE CONSTRUCTED TO MEET OR EXCEED CITY OF SAN JOSE PUBLIC IMPROVEMENT STANDARDS.

## IV. OFF-STREET PARKING

A. THE NUMBER OF PARKING SPACES PROVIDED SHALL BE AS FOLLOWS:

| PROPOSED USE | PARKING PROPOSED |
|---|---|
| DATA CENTERS | 1100 SPACES |
| LECEF | 12 SPACES |
| TOTAL | 1112 SPACES |

THE TOTAL NUMBER OF OFF-STREET PARKING SPACES PROVIDED IS BASED ON THE PREMISE THAT THE NUMBER OF SPACES PROVIDED ADEQUATELY MEETS THE PARKING REQUIREMENTS OF THE INDIVIDUAL BUILDINGS AND USES.

B. THE MINIMUM DIMENSIONS OF PARKING SPACES AND AISLES SHALL CONFORM TO SECTION 20.12.180 OF THE CITY OF SAN JOSE ZONING ORDINANCE.

## V. PERFORMANCE STANDARDS

AS PER IP-INDUSTRIAL PARK ZONING DISTRICT AS DEFINED IN THE CITY OF SAN JOSE ZONING ORDINANCE.

## VI. PHASING

PLANNED DEVELOPMENT PERMITS SHALL BE SEPARATELY ISSUED FOR THE ENERGY FACILITY AND THE DATA CENTER. THE FOLLOWING OFF-SITE IMPROVEMENTS AND ENVIRONMENTAL MITIGATIONS (LISTED BELOW) SHALL BECOME APPLICABLE ONLY WHEN THE FIRST DATA CENTER PD PERMIT IS ISSUED: VII. OFF-SITE IMPROVEMENTS (ALL); VIII. ENVIRONMENTAL MITIGATIONS (B.2a-c; C.1a; E.1a-c; E.3a-b; I.1a-c; J.1).

## VII. OFF-SITE IMPROVEMENTS

**TRANSPORTATION:**

1) EXTEND WESTBOUND LEFT-TURN LANE AT INTERSECTION OF ZANKER ROAD AND TRIMBLE ROAD BY 50 FEET.
2) CONSTRUCT A MINIMUM OF 175 FEET OF STORAGE CAPACITY FOR THE WESTBOUND LEFT-TURN LANE AT THE INTERSECTION OF THE PROJECT ENTRANCE AND ZANKER ROAD.
3) CONSTRUCT A TRAFFIC SIGNAL AT THE INTERSECTION OF ZANKER ROAD AND THE PROJECT'S ACCESS.
4) CONSTRUCT A TRAFFIC SIGNAL AT THE INTERSECTION OF ZANKER ROAD AND BAYPOINTE DRIVE.

**STREET IMPROVEMENTS:**

1) IMPROVE BOTH SIDES OF ZANKER ROAD (BETWEEN HIGHWAY 237 TO THE PROJECT'S PROPOSED ACCESS ROAD) TO ITS ULTIMATE RIGHT-OF-WAY WIDTH OF 60 FEET TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.

**ELECTRICAL:**

1) INSTALL ELECTROLIER(S) ON BOTH SIDES OF ZANKER ROAD (BETWEEN HIGHWAY 237 TO THE PROJECT'S PROPOSED ACCESS ROAD).

## VIII. ENVIRONMENTAL MITIGATIONS

### A. LAND USE:

NOTE: CONDITION FROM CITY ON ODOR EASEMENTS IN CONJUNCTION WITH GRANT OF ACCESS EASEMENTS.

### B. TRANSPORTATION:

1. CITY OF MILPITAS INTERSECTIONS
   a. THE PROJECT WILL CONTRIBUTE UP TO $25,000 TO THE CITY OF MILPITAS CAPITAL IMPROVEMENT PROGRAM AS A FAIR SHARE CONTRIBUTION FOR IMPROVEMENTS AT THE ABBOTT AVENUE AND CALAVERAS BOULEVARD INTERSECTION. ACCORDING TO THE CITY OF SAN JOSE, $25,000 WOULD BE A FAIR SHARE CONTRIBUTION TO THE ESTIMATED COST OF IMPROVING THE INTERSECTION (FEBRUARY 21, 2001). THE $25,000 CONTRIBUTION TO THE CITY OF MILPITAS CIP IS BASED UPON AN ASSESSMENT MADE BY THE CITY OF MILPITAS OF THE COST OF STREET IMPROVEMENTS DIRECTLY REQUIRED AS A RESULT OF THIS PROJECT. THE CITY OF SAN JOSE CONSIDERS THIS A "FAIR SHARE" CONTRIBUTION.
2. THE PROJECT PROPOSES TO INCLUDE SITE DESIGN AND OPERATIONAL FEATURES IDENTIFIED AS PRIORITIES IN THE SANTA CLARA COUNTY CONGESTION MANAGEMENT PLAN (CMP) AND THE NORTH SAN JOSE DEFICIENCY PLAN, INCLUDING:
   a. DESIGN ELEMENTS SUCH AS A BICYCLE/PEDESTRIAN PATH
   b. OUTSIDE THE PERIMETER FENCE, AND BICYCLE PARKING NEAR EMPLOYEE ENTRANCES.
   c. SHOWERS WILL BE PROVIDED FOR USE BY EMPLOYEES THAT COMMUTE BY BICYCLE.
   A TRIP REDUCTION STRATEGY CONSISTING OF PARTICIPATION IN VTA'S ECO PASS PROGRAM, PARTICIPATING IN A SHUTTLE PROGRAM WITH SERVICE TO AND FROM THE TASMAN LRT STATION AND ACE/AMTRAK STATION, AND USE OF FLEXIBLE WORK HOURS TO REDUCE COMMUTING DURING PEAK HOURS.

### C. AIR QUALITY

1. STATIONARY SOURCES - THE PROJECT INCLUDES THE FOLLOWING MEASURES TO REDUCE EMISSIONS FROM STATIONARY SOURCES:
   a. DATA CENTER CAMPUS
   i. TURBOCHARGING AND AFTERCOOLING OF EMERGENCY BACKUP GENERATORS TO REDUCE NOX EMISSIONS.

ii. INSTALLATION OF PARTICULATE COLLECTORS ON THE STACKS OF EMERGENCY POWER BACKUP GENERATORS ON THE DATA CENTER CAMPUS TO REDUCE DIESEL PARTICULATE EMISSIONS.

b. LECEF
   i. WATER-INJECTED COMBUSTORS AND SELECTIVE CATALYTIC REDUCTION SYSTEMS ON GAS TURBINES AND STEAM GENERATORS WITH DUCT BURNERS.
   ii. CATALYTIC OXIDATION SYSTEMS ON GAS TURBINES AND STEAM GENERATORS.
   iii. PRIMARY USE OF NATURAL GAS TO RUN EQUIPMENT AT THE LECEF.
   iv. TURBOCHARGING AND AFTERCOOLING OF THE DIESEL FIRE PUMP ENGINE.
   v. AND/OR SELECTIVE CATALYTIC REDUCTION WITH THE AUXILIARY BOILERS.
   vi. NATURAL GAS FUELED CARB-CERTIFIED EMERGENCY START ENGINE-DRIVEN GENERATOR.

BAAQMD NEW SOURCE REVIEW RULES REQUIRE THAT OFFSETS BE PROVIDED FOR A CUMULATIVE INCREASE IN EMISSIONS OF MORE THAN 15 TONS PER YEAR OF NITROGEN OXIDES OR REACTIVE ORGANIC GASES (ALSO KNOWN AS PRECURSOR ORGANIC COMPOUNDS) OR 100 TONS PER YEAR OR MORE OF PM10 OR SULFUR OXIDES. OFFSETS ARE NOT REQUIRED FOR CARBON MONOXIDE EMISSIONS FROM THE STATIONARY SOURCES ON THE SITE UNDER THE NEW SOURCE REVIEW RULES.

AT BUILDOUT, THE PROJECT'S STATIONARY SOURCES WOULD EMIT MORE THAN 15 TONS PER YEAR OF NITROGEN OXIDES. PER BAAQMD'S NO NET INCREASE PERMIT PROGRAM, THE PROJECT WILL BE REQUIRED TO PROVIDE OFFSETS (EMISSION REDUCTION CREDITS) FOR NITROGEN OXIDE. OFFSETS FOR IMPACTS FROM BOTH THE DATA CENTER CAMPUS AND THE LECEF PORTIONS OF THE PROJECT WOULD BE PROVIDED EITHER THROUGH PURCHASE OR A COMBINATION OF PURCHASE AND SET ASIDES THROUGH THE DISTRICT'S OFF-SET BANK. EMISSION CREDITS ARE GRANTED FOR PERMANENT, VOLUNTARY DECREASES IN EMISSIONS AS COMPANIES SHUT DOWN OLD EMISSION SOURCES OR VOLUNTARILY REDUCE EMISSIONS BY ADDING NEW CONTROL EQUIPMENT. LOCAL OFFSETS FROM COMPANIES IN THE SOUTH BAY AREA (SOUTHERN ALAMEDA COUNTY, SOUTHERN SAN MATEO COUNTY AND/OR SANTA CLARA COUNTY) WILL BE PURCHASED, IF AVAILABLE. BASED UPON THE ESTIMATED EMISSIONS, OFFSETS WILL NOT BE REQUIRED FOR REACTIVE ORGANIC GASES, PM10 OR SULFUR OXIDES. THE APPLICANT WILL BE REQUIRED TO SECURE WRITTEN AUTHORIZATION FROM THE AIR POLLUTION CONTROL OFFICER (APCO) OF THE BAAQMD FOR AN AUTHORITY TO CONSTRUCT AND PERMIT TO OPERATE. APPLICANT WILL COMPLY WITH PERMIT REQUIREMENTS.

2. MOBILE SOURCES - THE FOLLOWING MITIGATION STRATEGIES WOULD BE UTILIZED TO REDUCE REGIONAL AIR QUALITY IMPACTS FROM DATA CENTER PROJECT TRAFFIC:
   a. IMPLEMENT FEASIBLE TRAVEL DEMAND MANAGEMENT (TDM) MEASURES FOR A PROJECT OF THIS TYPE. THIS WOULD INCLUDE A RIDE-MATCHING PROGRAM, PARTICIPATION IN THE ECOPASS PROGRAM, PROVISION OF BICYCLE STORAGE RACKS AND SHOWERS FOR EMPLOYEES, COORDINATION WITH REGIONAL RIDESHARING ORGANIZATIONS AND PREFERENTIAL PARKING FOR CARPOOL/VANPOOL VEHICLES.

3. CONSTRUCTION IMPACTS
   a. DUST IMPACTS
   THE BAAQMD HAS PREPARED A LIST OF FEASIBLE CONSTRUCTION DUST CONTROL MEASURES THAT CAN REDUCE CONSTRUCTION IMPACTS TO A LEVEL THAT IS LESS-THAN-SIGNIFICANT. THE FOLLOWING CONSTRUCTION PRACTICES REQUIRED BY THE CITY OF SAN JOSE MEET OR EXCEED THE BAAQMD FEASIBLE CONSTRUCTION DUST CONTROL MEASURES AND WILL BE IMPLEMENTED DURING ALL PHASES OF CONSTRUCTION ON THE PROJECT SITE:

   i. WATER ALL ACTIVE CONSTRUCTION AREAS HOURLY DURING DAYLIGHT HOURS.
   ii. COVER STOCKPILES OF DEBRIS, SOIL, SAND OR OTHER MATERIALS THAT CAN BE BLOWN BY THE WIND.
   iii. COVER ALL TRUCKS HAULING SOIL, SAND, AND OTHER LOOSE MATERIALS OR REQUIRE ALL TRUCKS TO MAINTAIN AT LEAST TWO FEET OF FREEBOARD.
   iv. PAVE, APPLY WATER HOURLY DURING DAYLIGHT HOURS, OR APPLY (NON-TOXIC) SOIL STABILIZERS ON ALL UNPAVED ACCESS ROADS, PARKING AREAS AND STAGING AREAS AT CONSTRUCTION SITES.
   v. SWEEP AT LEAST FOUR TIMES DAILY WITH WATER SWEEPERS ALL PAVED ACCESS ROAD, PARKING AREAS AND STAGING AREAS AT CONSTRUCTION SITES.
   vi. SWEEP STREETS DAILY AT LEAST TWICE DURING CONSTRUCTION WITH WATER SWEEPERS AND WITHIN ONE HOUR OF VISIBLE SOIL MATERIAL CARRIED ONTO ADJACENT PUBLIC STREETS.
   vii. HYDROSEED OR APPLY NON-TOXIC SOIL STABILIZERS TO INACTIVE CONSTRUCTION AREAS.
   viii. ENCLOSE, COVER, OR APPLY NON-TOXIC SOIL BINDERS TO EXPOSED STOCKPILES (DIRT, SAND, ETC.).
   ix. LIMIT TRAFFIC SPEEDS ON UNPAVED ROADS TO 15 MPH.
   x. INSTALL SANDBAGS OR OTHER EROSION CONTROL MEASURES TO PREVENT SILT RUNOFF TO PUBLIC ROADWAYS.
   xi. REPLANT VEGETATION IN DISTURBED AREAS AS QUICKLY AS POSSIBLE.

WATERING OF ACTIVE CONSTRUCTION SITES, STOCKPILES OF DEBRIS, SOIL, SAND OR OTHER MATERIALS WILL BE WITH RECYCLED WATER.

## D. NOISE

1. OFF-SITE IMPACTS FROM THE PROJECT
   a. OPERATIONAL NOISE
   i. PRIOR TO ISSUANCE OF A PLANNED DEVELOPMENT PERMIT FOR DATA CENTER. A DETAILED ACOUSTICAL ANALYSIS WILL BE CONDUCTED AS PART OF FINAL DESIGN. THIS ANALYSIS MUST CONFIRM THAT THE PROPOSED DESIGN OF ENCLOSURES FOR EMERGENCY BACKUP GENERATORS AND/OR OTHER EQUIPMENT WILL ACHIEVE EXTERIOR NOISE LEVELS AT THE EASTERN PROPERTY LINE AND NEARBY EDGE OF THE RIPARIAN CORRIDOR OF COYOTE CREEK IN CONFORMANCE WITH APPLICABLE NOISE GUIDELINES IN THE SAN JOSE 2020 GENERAL PLAN, INCLUDING THE RIPARIAN CORRIDOR POLICY. THESE GUIDELINES INCLUDE MAINTAINING NOISE LEVELS AT 60 DAY-NIGHT LEVEL (DNL) AT THE PROPERTY LINE ADJACENT TO PARK USES OF THE COYOTE CREEK PARK CHAIN AND MAINTAINING AMBIENT NOISE LEVELS IN THE RIPARIAN CORRIDOR. FOR THE PURPOSES OF THIS ANALYSIS, A SUBSTANTIAL INCREASE IN AMBIENT NOISE LEVELS WOULD BE CONSIDERED 3 DBA OR MORE.

THE PROJECT INCLUDES MEASURES SUCH AS ENCLOSURE OF NOISE-GENERATING EQUIPMENT, INCLUDING COMBUSTION TURBINE GENERATORS, UPS UNITS, AND GAS COMPRESSORS, IN ACOUSTICALLY-TREATED BUILDINGS TO REDUCE NOISE LEVELS FROM THE LECEF AND DATA CENTER.

   b. CONSTRUCTION IMPACTS
   ALTHOUGH NOT A SIGNIFICANT IMPACT, THE PROJECT INCLUDES THE FOLLOWING MEASURES TO REDUCE NOISE LEVELS DURING CONSTRUCTION.
   i. ALL CONSTRUCTION EQUIPMENT WILL BE ADEQUATELY MAINTAINED AND MUFFLED.
   IN THE EVENT PILE DRIVING OR SIMILAR IMPACT CONSTRUCTION TECHNIQUE IS USED FOR CONSTRUCTION OF THE LECEF, THE FOLLOWING MEASURES TO REDUCE SHORT-TERM CONSTRUCTION IMPACTS FROM PILE DRIVING ARE INCLUDED AS PART OF THE PROJECT:
   ii. PILE DRIVING AND/OR BLOW DOWN ACTIVITIES SHALL BE LIMITED TO DAYTIME HOURS.
   iii. ONLY SILENCED OR LOW PRESSURE STEAM BLOW TECHNIQUES WILL BE EMPLOYED.
   iv. A NOISE COMPLAINT RESOLUTION PROCESS WILL BE IN PLACE THROUGHOUT THE CONSTRUCTION AND OPERATION OF THE LECEF. A NOISE COMPLAINT CONTACT WILL BE IDENTIFIED BY THE PLANT OPERATOR TO RESPOND TO ANY LOCAL COMPLAINTS ABOUT CONSTRUCTION NOISE. THE TELEPHONE NUMBER OF A NOISE COMPLAINT CONTACT WILL BE POSTED AT THE CONSTRUCTION SITE AND INCLUDED IN NOTICES SENT TO RESIDENTS OF THE WEST WINDS MOBILE HOME PARK REGARDING THE CONSTRUCTION SCHEDULE. THE RESOLUTION PROCESS WILL INCLUDE: AN ATTEMPT TO CONTACT THE PERSON MAKING A COMPLAINT WITHIN 24 HOURS; AN INVESTIGATION OF THE SOURCE OF NOISE RELATED TO THE COMPLAINT; AND IDENTIFICATION OF ANY REASONABLE MEASURES THAT CAN BE TAKEN TO REDUCE THE NOISE AT ITS SOURCE. THE PROJECT APPLICANT WILL BE RESPONSIBLE FOR POSTING AND PROVIDING NOTICES OF CONSTRUCTION SCHEDULES TO RESIDENTS, AND WILL INFORM THE DIRECTION OF PLANNING, BUILDING AND CODE ENFORCEMENT OF THE NAME AND TELEPHONE NUMBER OF THE NOISE COMPLAINT CONTACT.

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## E. BIOLOGICAL RESOURCES

1. NEW OFF-SITE POTABLE WATER LINE FOR DATA CENTER

a. MITIGATION MEASURES FOR IMPACTS TO POSSIBLE CONGDON'S TARPLANT POPULATIONS

SURVEYS FOR CONGDON'S TARPLANT WILL BE CONDUCTED ALONG THE FINAL WATER LINE ALIGNMENT DURING THE FLOWERING PERIOD OF JUNE THROUGH AUGUST AS PART OF FINAL DESIGN. IN THE EVENT CONGDON'S TARPLANT POPULATIONS ARE FOUND WITHIN OR DIRECTLY ADJACENT TO THE PROPOSED POTABLE WATER LINE, THE FOLLOWING MITIGATION MEASURES WILL BE IMPLEMENTED TO REDUCE PROJECT-RELATED IMPACTS TO A LESS-THAN-SIGNIFICANT LEVEL. THIS MITIGATION WILL INCLUDE IMPLEMENTATION OF AVOIDANCE, MINIMIZATION, AND/OR EITHER HABITAT RESTORATION MEASURES OR OFF-SITE ACQUISITION AND PRESERVATION, AS DESCRIBED BELOW.

i. *AVOIDANCE OF DIRECT AND INDIRECT IMPACTS THROUGH PROJECT RE-DESIGN.* IN CONSULTATION WITH A PLANT ECOLOGIST, THE PROPOSED WATER LINE ALIGNMENT MAY BE REDESIGNED, CONSTRUCTED, AND OPERATED IN SUCH A WAY AS TO AVOID DIRECT AND INDIRECT IMPACTS TO CONGDON'S TARPLANT POPULATIONS.

ii. *MINIMIZATION OF INDIRECT EFFECTS.* INDIRECT EFFECTS TO THE SPECIES WOULD BE AVOIDED BY THE CREATION OF A BUFFER ZONE DURING AND AFTER CONSTRUCTION. PRIOR TO EXCAVATION, ANY POPULATIONS WOULD BE IDENTIFIED BY A QUALIFIED PLANT ECOLOGIST. A BUFFER ZONE WOULD BE ESTABLISHED AROUND THESE AREAS AND THEY WOULD BE OF SUFFICIENT SIZE TO ELIMINATE POTENTIAL DISTURBANCE TO THE PLANTS FROM HUMAN ACTIVITY AND ANY OTHER POTENTIAL SOURCES OF DISTURBANCE. TEMPORARY FENCES WOULD BE CONSTRUCTED BETWEEN THE DEVELOPMENT AND ANY POPULATIONS.

iii. *REPLACEMENT OF IMPACTED SPECIES THROUGH DEVELOPMENT OF A SPECIAL-STATUS PLANT HABITAT RESTORATION PLAN.* IF THE WATER LINE CANNOT BE DESIGNED TO AVOID SUBSTANTIAL IMPACTS TO A POPULATION OF CONGDON'S TARPLANT, THEN A SITE RESTORATION PLAN WOULD BE DEVELOPED BY A QUALIFIED PLANT ECOLOGIST. THE OBJECTIVE OF THIS MITIGATION MEASURE WOULD BE TO REPLACE THE SPECIAL-STATUS PLANTS AND HABITAT LOST DURING PROJECT IMPLEMENTATION. THE PROPOSED RESTORATION PROGRAM WOULD BE MONITORED FOR A PERIOD OF FIVE YEARS FROM THE DATE OF WATER LINE INSTALLATION. THE RESTORATION PLAN WOULD CONTAIN AT A MINIMUM THE FOLLOWING:

a) LOCATION OF AREAS ON SITE TO RESTORE LOST PLANT POPULATIONS. APPROPRIATE HABITAT WOULD BE CREATED ON SUITABLE SOILS.

b) DESCRIPTION OF THE PROPAGATION AND PLANTING TECHNIQUES TO BE EMPLOYED IN THE RESTORATION EFFORT. PERENNIAL PLANTS TO BE IMPACTED BY SITE GRADING WOULD BE SALVAGED AND RAISED IN A GREENHOUSE FOR EVENTUAL TRANSPLANTING WITHIN THE RESTORATION AREAS. ANNUAL PLANTS CAN BE ESTABLISHED THROUGH DIRECT SEEDING PRACTICES AND/OR TRANSPLANTING CONTAINER-GROWN PLANTS INTO EXISTING SUITABLE HABITAT.

c) DEVELOPMENT OF A TIMETABLE FOR IMPLEMENTATION OF THE RESTORATION PLAN, INCLUDING PILOT-PHASE STUDIES.

d) DEVELOPMENT OF A MONITORING PLAN AND PERFORMANCE CRITERIA. OVERALL, THE GOAL IS TO REPLACE PLANTS IMPACTED BY THE PROPOSED IMPROVEMENTS TO MAINTAIN A VIABLE POPULATION. THE SPECIAL-STATUS PLANT RESTORATION AREA WOULD BE LOCATED WITHIN A PARCEL OF SUFFICIENT SIZE, TO BE DETERMINED, TO PRECLUDE DISTURBANCE. THE SIZE OF THE AREA DEPENDS UPON THE NUMBER OF PLANTS IMPACTED, THEIR DENSITY IN UNDISTURBED ENVIRONMENTS AND ADJACENT LAND USES.

e) DESCRIBE REMEDIAL MEASURES TO BE PERFORMED IN THE EVENT THAT INITIAL RESTORATION MEASURES ARE UNSUCCESSFUL IN MEETING THE PERFORMANCE CRITERIA.

f) DESCRIBE SITE MAINTENANCE ACTIVITIES TO FOLLOW RESTORATION ACTIVITIES. THESE MAY INCLUDE WEED CONTROL, IRRIGATION, AND/OR CONTROL OF HERBIVORY BY WILDLIFE.

iv. *ACQUISITION AND PRESERVATION OF OFF-SITE POPULATIONS* . IN CONJUNCTION WITH THE MEASURES LISTED ABOVE, AN OFF-SITE AREA OR AREAS, WHICH ALREADY SUPPORT NATIVE POPULATIONS OF THE SPECIES TO BE IMPACTED, MAY BE PURCHASED AND SET ASIDE IN PERPETUITY. THIS PRESERVATION CAN BE IN THE FORM OF ACQUISITION, DEED RESTRICTION, OR CONSERVATION EASEMENT ETC. THAT EFFECTIVELY PREVENTS FUTURE DISTURBANCE TO THE OFF-SITE POPULATION.

RESULTS OF FLOWERING SEASON SURVEYS OF THE FINAL WATER LINE ALIGNMENT FOR CONGDON'S TARPLANT, AND A SITE RESTORATION OR MITIGATION PLAN (IF NECESSARY), WILL BE PROVIDED TO THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT PRIOR TO ISSUANCE OF A PLANNED DEVELOPMENT PERMIT FOR THE DATA CENTER PROJECT, OR PROVISION, WILL BE MADE IN THE PLANNED DEVELOPMENT PERMIT FOR COMPLETION OF THE SURVEYS PRIOR TO TRENCHING.

b. WETLANDS AND DRAINAGE CHANNELS

i. A DETAILED DETERMINATION OF WETLANDS WILL BE COMPLETED AS PART OF DESIGN FOR THE NEW OFF-SITE POTABLE WATER LINE. TO THE EXTENT FEASIBLE, JURISDICTIONAL WETLANDS WILL BE AVOIDED. IN THE EVENT IMPACTS TO JURISDICTIONAL WETLANDS CANNOT BE COMPLETELY AVOIDED, A MITIGATION AND MONITORING PLAN WILL BE PREPARED AND SUBMITTED TO THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT AND THE U.S. ARMY CORPS OF ENGINEERS. IMPACTS TO ANY JURISDICTIONAL WETLANDS WOULD BE MITIGATED ACCORDING TO A MITIGATION AND MONITORING PLAN AT A RATIO THAT WILL ENSURE REPLACEMENT OF LOST FUNCTIONS AND VALUES ASSOCIATED WITH HABITAT THAT WAS IMPACTED. ANY WORK DONE WITHIN THE DRAINAGE CHANNEL THAT CONVEYS WATER TO THE WETLAND MITIGATION POND ON THE VTA CERONE BUS MAINTENANCE FACILITY WILL BE CONDUCTED IN A MANNER TO AVOID IMPACTS TO THE POND. FLOWS TO THE POND WILL BE MAINTAINED BY CONDUCTING WORK WHEN THERE IS NO WATEI IN THE CHANNEL AND RECONTOURING THE CHANNEL TO ITS ORIGINAL CONFIGURATION AND ELEVATION. BEST MANAGEMENT PRACTICES FOR SEDIMENT CONTROL, SUCH AS USE OF SILT FENCING TO RETAIN SEDIMENT AND PROVIDING TEMPORARY COVER OF DISTURBED SURFACES, WILL BE FOLLOWED TO AVOID ADDITIONAL INPUTS OF SEDIMENT TO THE POND FOLLOWING CONSTRUCTION.

c. BURROWING OWL POPULATION

i. PROTOCOL LEVEL SURVEYS FOR RESIDENT OR NESTING BURROWING OWLS WILL BE COMPLETED AS PART OF THE DESIGN PROCESS FOR THE NEW POTABLE WATER LINE. THE SURVEYS WILL IDENTIFY EXISTING BURROWS AND AREAS USED BY BURROWING OWLS DURING THE NESTING SEASON OF FEBRUARY-AUGUST. PRECONSTRUCTION SURVEYS WILL ALSO BE CONDUCTED NO MORE THAN 30 DAYS PRIOR TO THE EXCAVATION FOR THE PROPOSED POTABLE WATER LINE. IF BREEDING OWLS ARE LOCATED ON OR IMMEDIATELY ADJACENT TO THE WATER LINE ALIGNMENT, A CONSTRUCTION-FREE BUFFER ZONE (TYPICALLY 250 FEET) AROUND THE ACTIVE BURROW WILL BE ESTABLISHED FOR THE DURATION OF BREEDING BY OWLS UNTIL YOUNG BIRDS HAVE FLEDGED. IF OWLS ARE RESIDENT DURING THE NONBREEDING SEASON (SEPTEMBER-JANUARY), A QUALIFIED ORNITHOLOGIST, IN CONSULTATION WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME, WOULD PASSIVELY RELOCATE (EVICT) THE OWLS TO AVOID THE LOSS OF ANY INDIVIDUALS DURING CONSTRUCTION.

ii. TO AVOID IMPACTS TO THE OWLS WITHIN THE RELOCATION AREA IN THE NORTHWESTERN PORTION OF THE VTA CERONE BUS MAINTENANCE FACILITY EITHER: 1) NO OWLS WILL BE RELOCATED OR DISTURBED DURING EITHER THE NESTING OR NON-NESTING SEASONS; OR 2) A REPLACEMENT MITIGATION SITE WILL BE ESTABLISHED WITHIN ONE MILE OF THE VTA SITE IN CONSULTATION WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME. IMPACTS TO THE BURROWING OWL RELOCATION AREA COULD BE MITIGATED BY ACQUIRING, EITHER BY DIRECT PURCHASE OR CONSERVATION EASEMENT, SUITABLE BURROWING OWL FORAGING HABITAT AT A MINIMUM RATIO OF 6.5 ACRES PER PAIR OF OWLS RELOCATED.

IMPACTS TO ANY JURISDICTIONAL WETLANDS WOULD BE MITIGATED AS DESCRIBED UNDER REGULATED HABITATS AND PRECONSTRUCTION SURVEYS FOR BURROWING OWLS WILL BE COMPLETED AS DESCRIBED UNDER BURROWING OWLS AND NESTING RAPTORS, BELOW.

2. SPECIAL STATUS WILDLIFE SPECIES
   a. BURROWING OWLS, NESTING RAPTORS, AND SALT MARSH COMMON YELLOW THROAT
      i. IN CONFORMANCE WITH FEDERAL AND STATE REGULATIONS REGARDING PROTECTION OF RAPTORS, APPROPRIATE PRECONSTRUCTION SURVEYS FOR BURROWING OWLS FOLLOWING CALIFORNIA DEPARTMENT OF FISH AND GAME PROTOCOLS WILL BE COMPLETED PRIOR TO ANY DEVELOPMENT TO ENSURE THAT OWLS HAVE NOT MOVED ONTO THE SITE.
         a) PRECONSTRUCTION SURVEYS WILL BE CONDUCTED NO MORE THAN 30 DAYS PRIOR TO THE START OF EACH PHASE OF SITE GRADING. IF BREEDING OWLS ARE LOCATED ON OR IMMEDIATELY ADJACENT TO THE SITE, A CONSTRUCTION-FREE BUFFER ZONE (TYPICALLY 250 FEET) AROUND THE ACTIVE BURROW WILL BE ESTABLISHED FOR THE DURATION OF BREEDING BY OWLS UNTIL YOUNG BIRDS HAVE FLEDGED. IF OWLS ARE RESIDENT DURING THE NONBREEDING SEASON (SEPTEMBER-JANUARY), A QUALIFIED ORNITHOLOGIST, IN CONSULTATION WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME, WOULD PASSIVELY RELOCATE (EVICT) THE OWLS TO AVOID THE LOSS OF ANY INDIVIDUALS DURING CONSTRUCTION.

      ii. PRECONSTRUCTION SURVEYS FOR NESTING RAPTORS (SUCH AS WHITE TAILED KITE AND NORTHERN HARRIER) AND SALT MARSH COMMON YELLOW THROAT WILL BE CONDUCTED TO ENSURE THAT NO RAPTOR NESTS WILL BE DISTURBED DURING CONSTRUCTION. SURVEYS WILL BE CONDUCTED NO MORE THAN 14 DAYS PRIOR TO THE INITIATION OF CONSTRUCTION ACTIVITIES DURING JANUARY THROUGH APRIL (THE EARLY PART OF THE BREEDING SEASON) AND NO MORE THAN 30 DAYS PRIOR TO THE INITIATION OF CONSTRUCTION ACTIVITIES DURING MAY THROUGH SEPTEMBER (THE LATTER PART OF THE BREEDING SEASON). DURING PRECONSTRUCTION SURVEYS, ALL TREES IN AND IMMEDIATELY ADJACENT TO CONSTRUCTION AREAS WILL BE INSPECTED FOR RAPTOR NESTS. IF AN ACTIVE RAPTOR OR SALTMARSH COMMON YELLOWTHROAT NEST IS FOUND, A CONSTRUCTION-FREE BUFFER ZONE (TYPICALLY 250 FEET) WILL BE ESTABLISHED AROUND THE NEST FOR THE DURATION OF BREEDING ACTIVITY UNTIL YOUNG BIRDS HAVE FLEDGED.

   b. POTENTIAL IMPACTS TO ROOSTING PALLID BATS DURING CONSTRUCTION
      i. CONSTRUCTION ACTIVITIES INVOLVING POTENTIAL ROOST SITES WILL BE CONDUCTED OUTSIDE THE MATERNITY ROOST SEASON. THE MATERNITY ROOST SEASON BEGINS AS EARLY AS MARCH 1 AND THE YOUNG ARE VOLANT (FLY OFF ON THEIR OWN) BY JULY 31.
      ii. A PRE-DEMOLITION SURVEY FOR ROOSTING BATS WILL BE CONDUCTED BY A QUALIFIED BAT BIOLOGIST 14 DAYS PRIOR TO ANY REMOVAL OF BUILDINGS, PARTICULARLY THOSE WITH CLOSED AREAS SUCH AS AN ATTIC SPACE, OR REMOVAL OF TREES GREATER THAN 12 INCHES IN DIAMETER. NO ACTIVITIES THAT WOULD RESULT IN DISTURBANCE TO ACTIVE ROOSTS WOULD PROCEED PRIOR TO THE COMPLETED SURVEYS. IF NO ACTIVE ROOSTS ARE FOUND, THEN NO FURTHER ACTION WOULD BE WARRANTED. IF A MATERNITY ROOST IS PRESENT, A QUALIFIED BAT BIOLOGIST WOULD DETERMINE THE EXTENT OF CONSTRUCTION-FREE ZONES AROUND ACTIVE NURSERIES LOCATED DURING SURVEYS. CDFG WOULD ALSO BE NOTIFIED OF ANY ACTIVE NURSERIES WITHIN THE CONSTRUCTION ZONE.
         a) INITIAL SURVEYS CAN BE CONDUCTED ANY TIME PRIOR TO THE PRE-DEMOLITION SURVEYS TO ESTABLISH IF A PARTICULAR LOCATION HAS SUPPORTED, OR SUPPORTS, ROOSTING BATS. A SURVEY FOR INDICATIONS OF NURSERY ROOSTS WOULD BE CONDUCTED PRIOR TO MARCH 1. IF INDICATIONS OF A MATERNITY ROOST ARE PRESENT, THE STRUCTURE CAN REMOVED OR MODIFIED BEFORE A MATERNITY ROOST BECOMES REESTABLISHED.

      iii. IF INDICATIONS OF A MATERNITY ROOST ARE PRESENT, BATS CAN BE EXCLUDED FROM THE BUILDING OR TREE AFTER JULY 31 AND BEFORE MARCH 1 TO PREVENT THE FORMATION OF MATERNITY COLONIES. SUCH NON-BREEDING BATS CAN BE SAFELY EVICTED, UNDER THE DIRECTION OF A QUALIFIED BAT BIOLOGIST, BY SEALING CREVICES AND PROVIDING THEM ONE-WAY EXCLUSION DOORS. SUCH A DEVICE WOULD BE EMPLOYED IN ALL EXPANSION JOINTS DURING DARK HOURS AS A TEMPORARY DEVICE TO PREVENT THE FORMATION OF A MATERNITY COLONY. IN ORDER NOT TO EXCLUDE ALL POTENTIAL MATERNITY ROOST HABITAT AT ONCE, ONLY ONE HALF OF THE EXPANSION JOINTS WOULD BE SEALED AT ANY ONE GIVEN TIME DURING THE MATERNITY COLONY-NESTING SEASON. THIS ACTION WOULD ALLOW BATS TO LEAVE DURING DARK HOURS, THUS INCREASING THEIR CHANCE OF FINDING NEW ROOSTS WITH A MINIMUM OF POTENTIAL PREDATION DURING DAYLIGHT.

3. REGULATED HABITATS (JURISDICTIONAL WETLANDS)
   a. WITHIN THE PROJECT AREA
      ALTHOUGH NOT A SIGNIFICANT IMPACT, THE IMPACT OF REMOVAL OF UP TO 0.2 ACRES OF JURISDICTIONAL WETLANDS WITHIN THE LANDSCAPED ACCESS DRIVEWAY AREA WOULD BE REDUCED BY A COMBINATION OF THE FOLLOWING MEASURES:
      i. *AVOIDANCE.* THE PROJECT WILL AVOID IMPACTS TO EXISTING WETLANDS AT THE NORTHEASTERN BOUNDARY OF THE LANDSCAPED ACCESS DRIVEWAY AREA. DURING CONSTRUCTION GRADING, THE WETLAND AREA WILL BE FENCED AND PROTECTED FROM DIRECT IMPACTS BY CONSTRUCTION EQUIPMENT.
         a) IF FEASIBLE, THE ALIGNMENT OF THE PERIMETER FENCING AT THE WESTERN BOUNDARY OF THE PROJECT SITE (IN THE BUFFER LAND AREA) WILL BE MODIFIED TO ALLOW RETENTION OF THE EXISTING SMALL JURISTICTIONAL WETLAND. IN THE EVENT IMPACTS TO JURISDICTIONAL WETLANDS ON THE SITE CANNOT BE COMPLETELY AVOIDED, HABITAT VALUES OF THE WETLANDS WILL BE REPLACED AS OUTLINED BELOW.
      ii. HABITAT REPLACEMENT. A MITIGATION AND MONITORING PLAN WILL BE DEVELOPED THAT MINIMIZES IMPACTS TO IDENTIFIED JURISDICTIONAL WETLANDS, IDENTIFIES THE LOCATION AND TYPE OF MITIGATION SITES AND THE SPECIES TO BE PLANTED IN THEM, AND SPECIFIES A DETAILED MONITORING PLAN. THE MITIGATION AND MONITORING PLAN WILL ENCOMPASS THE FOLLOWING:
         a) LOCATION OF APPROPRIATE MITIGATION SITES WITHIN THE LANDSCAPED ACCESS DRIVEWAY AREA. A QUALIFIED BIOLOGIST WILL IDENTIFY APPROPRIATE LOCATIONS FOR MITIGATION ON-SITE. IT MAY BE POSSIBLE TO INCORPORATE WETLAND MITIGATION IN THE PROJECT AREA ON EITHER SIDE OF THE ACCESS DRIVEWAY.
         b) REPLACEMENT RATIOS FOR IMPACTED HABITAT. ALL JURISDICTIONAL HABITATS WILL BE MITIGATED AT A RATIO THAT WILL ENSURE REPLACEMENT OF LOST FUNCTIONS AND VALUES ASSOCIATED WITH HABITAT THAT WAS IMPACTED. THE WETLAND DELINEATION OF THE SITE, IN CONJUNCTION WITH THE PROJECT PLANS, WILL BE USED TO DETERMINE THE SPECIFIC AREA, TYPE OF IMPACTS AND THE EXACT ACREAGE AND TYPE OF JURISDICTIONAL HABITAT TO BE CREATED.

      MITIGATION FOR IMPACTS TO JURISDICTIONAL WETLANDS WOULD INCLUDE THE CREATION OF WETLAND HABITAT IN ON-SITE LOCATION AT A RATIO DETERMINED BY REPLACEMENT OF LOST FUNCTIONS AND VALUES.

      iii. PRIOR TO GRADING IN THE VICINITY OF THE IDENTIFIED JURISDICTIONAL WETLANDS, THE PROJECT APPLICANT WILL OBTAIN SECTION 404 AND CLEAN WATER CERTIFICATION PERMITS, IF NEEDED, FROM THE U.S. ARMY CORPS OF ENGINEERS AND THE REGIONAL WATER QUALITY CONTROL BOARD. THE PROJECT WILL COMPLY WITH ALL CONDITIONS OF THE PERMIT DURING AND AFTER CONSTRUCTION.

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b. NEW OFF-SITE POTABLE WATER LINE ALIGNMENT FOR DATA CENTER A DETAILED DETERMINATION INCLUDES THE FOLLOWING MEASURES TO CHARACTERIZE THE EXTENT OF JURISDICTIONAL HABITAT AND MITIGATION MEASURES TO OFFSET IMPACTS TO OFF-SITE JURISDICTIONAL WETLANDS:

i. A DETAILED DETERMINATION OF WETLANDS WILL BE COMPLETED AS PART OF DESIGN FOR THE NEW OFF-SITE POTABLE WATER LINE. THE DETERMINATION WILL INCLUDE FIELD SURVEYS AS WELL AS COMPLETE DOCUMENTATION OF HISTORICAL CONDITIONS.

a) THE FINAL WATER LINE ALIGNMENT WILL BE DETERMINED BASED UPON THE RESULTS OF THE WETLAND DELINEATION. TO THE EXTENT FEASIBLE, JURISDICTIONAL WETLANDS WILL BE AVOIDED. IN THE EVENT IMPACTS TO JURISDICTIONAL WETLANDS CANNOT BE COMPLETELY AVOIDED, A MITIGATION AND MONITORING PLAN WILL BE PREPARED AND SUBMITTED TO THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT AND U.S. ARMY CORPS OF ENGINEERS FOR APPROVAL, AS DESCRIBED BELOW.

i) *HABITAT REPLACEMENT.* A MITIGATION AND MONITORING PLAN WILL BE DEVELOPED THAT MINIMIZES IMPACTS TO IDENTIFIED JURISDICTIONAL WETLANDS, IDENTIFIES THE LOCATION AND TYPE OF MITIGATION SITES AND THE SPECIES TO BE PLANTED IN THEM, AND SPECIFIES A DETAILED MONITORING PLAN. THE MITIGATION AND MONITORING PLAN WILL ENCOMPASS THE FOLLOWING:

- LOCATION OF APPROPRIATE MITIGATION SITES. A QUALIFIED BIOLOGIST WILL IDENTIFY APPROPRIATE LOCATIONS FOR MITIGATION WITHIN THE LANDSCAPED ACCESS DRIVEWAY AREA. IF ADEQUATE MITIGATION AREAS ARE NOT AVAILABLE WITHIN THIS AREA, MITIGATION WOULD BE CONDUCTED OFF-SITE AS CLOSE AS POSSIBLE TO THE IMPACTED AREA.
- REPLACEMENT RATIOS FOR IMPACTED HABITAT. ALL JURISDICTIONAL HABITATS WILL BE MITIGATED AT A RATIO THAT WILL ENSURE REPLACEMENT OF LOST FUNCTIONS AND VALUES ASSOCIATED WITH HABITAT THAT WAS IMPACTED. AS DISCUSSED ABOVE, A FORMAL WETLAND DELINEATION WILL BE CONDUCTED TO IDENTIFY AND MAP ALL JURISDICTIONAL HABITATS. THIS SURVEY, IN CONJUNCTION WITH THE WATER LINE PLANS, WILL DETERMINE THE SPECIFIC AREA, TYPE OF IMPACTS AND THE EXACT ACREAGE AND TYPE OF JURISDICTIONAL HABITAT TO BE CREATED.

ii. PRIOR TO GRADING IN THE VICINITY OF ANY IDENTIFIED JURISDICTIONAL WETLANDS ALONG THE NEW WATER LINE ALIGNMENT, THE PROJECT APPLICANT WILL OBTAIN SECTION 404 AND CLEAN WATER CERTIFICATION PERMITS, IF NEEDED, FROM THE U.S. ARMY CORPS OF ENGINEERS AND THE REGIONAL WATER QUALITY CONTROL BOARD. THE PROJECT WILL COMPLY WITH ALL CONDITIONS OF THE PERMIT DURING AND AFTER CONSTRUCTION.

4. DEGRADATION OF AQUATIC HABITAT

a. THE PROJECT WILL COMPLY WITH THE NPDES GENERAL CONSTRUCTION ACTIVITY STORM WATER PERMIT ADMINISTERED BY THE REGIONAL WATER QUALITY CONTROL BOARD. PRIOR TO CONSTRUCTION GRADING FOR THE PROPOSED LAND USES, THE APPLICANT WILL FILE A "NOTICE OF INTENT" (NOI) TO COMPLY WITH THE GENERAL PERMIT AND PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) WHICH ADDRESSES MEASURES THAT WOULD BE INCLUDED IN THE PROJECT TO MINIMIZE AND CONTROL CONSTRUCTION AND POST-CONSTRUCTION RUNOFF. THE SWPPP WILL BE SUBMITTED TO THE CITY OF SAN JOSE DEPARTMENT OF ENVIRONMENTAL SERVICES. THE FOLLOWING MEASURES WOULD BE INCLUDED IN THE SWPPP:

i. PRECLUDE NON-STORM WATER DISCHARGES TO THE STORM WATER SYSTEM.

ii. PERFORM MONITORING OF DISCHARGES TO THE STORM WATER SYSTEM.

b. SUBMIT A COPY OF THE DRAFT SWPPP TO THE CITY OF SAN JOSE DEPARTMENT OF ENVIRONMENTAL SERVICES FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION OF THE PROJECT.

c. THE PROJECT WILL COMPLY WITH THE CITY OF SAN JOSE GRADING ORDINANCE, INCLUDING EROSION- AND DUST-CONTROL DURING SITE PREPARATION, AND WITH THE CITY OF SAN JOSE ZONING ORDINANCE REQUIREMENT FOR KEEPING ADJACENT STREETS FREE OF DIRT AND MUD DURING CONSTRUCTION. THE FOLLOWING SPECIFIC MEASURES WOULD BE IMPLEMENTED TO PREVENT STORM WATER POLLUTION AND MINIMIZE POTENTIAL SEDIMENTATION DURING CONSTRUCTION.

i. RESTRICTING GRADING TO THE DRY SEASON OR MEET OTHER CITY REQUIREMENTS;

ii. USE SILT FENCING TO RETAIN SEDIMENT ON THE PROJECT SITE;

iii. PROVIDING TEMPORARY COVER OF DISTURBED SURFACES TO HELP CONTROL EROSION DURING CONSTRUCTION;

iv. PROVIDE TEMPORARY COVER OF ALL DISTURBED SURFACES TO HELP CONTROL EROSION DURING CONSTRUCTION.

v. PROVIDE PERMANENT COVER TO STABILIZE THE DISTURBED SURFACES AFTER CONSTRUCTION HAS BEEN COMPLETED.

d. THE PROJECT DESIGN WOULD INCLUDE FEATURES TO MINIMIZE NONPOINT SOURCE POLLUTANTS FROM ENTERING THE COYOTE CREEK BY-PASS CHANNEL. SUCH FEATURES COULD INCLUDE THE PLACEMENT OF VEGETATED SWALES WHERE POSSIBLE, AND THE INSTALLATION OF OIL ABSORBING MATERIALS (I.E., "FOSSIL FILTERS") IN THE INLETS OF ON-SITE CATCH BASINS.

e. IN ORDER TO COMPLY WITH THE CITY OF SAN JOSE GRADING ORDINANCE, RECYCLED WATER MUST BE USED FOR ALL NONPOTABLE USES DURING CONSTRUCTION. RECYCLED WATER IS AVAILABLE FROM THE RECYCLED WATER FILL STATION LOCATED ON LOS ESTEROS ROAD ACROSS FROM THE SAN JOSE-SANTA CLARA WATER POLLUTION CONTROL PLANT. PRIOR TO USE OF THIS WATER, A PERMIT WILL BE OBTAINED FROM SAN JOSE MUNICIPAL WATER.

f. AS PART OF THE MITIGATION FOR POST-CONSTRUCTION RUNOFF IMPACTS ADDRESSED IN THE SWPPP, THE PROJECT WILL IMPLEMENT REGULAR MAINTENANCE ACTIVITIES (I.E., SWEEPING, CLEANING STORM WATER INLETS, LITTER CONTROL) AT THE SITE TO PREVENT SOIL, GREASE, AND LITTER FROM ACCUMULATING ON THE PROJECT SITE AND CONTAMINATING SURFACE RUNOFF. STORM WATER CATCH BASINS WILL BE STENCILED TO DISCOURAGE ILLEGAL DUMPING.

5. ORDINANCE TREES

THE PROJECT WILL AVOID REMOVAL OF ORDINANCE SIZE TREES WHERE FEASIBLE. PARTICULAR CONSIDERATION WILL BE GIVEN TO AVOIDING HEALTHY SPECIMENS OF NATIVE TREES. A QUALIFIED ARBORIST OR BIOLOGIST WILL IDENTIFY MEASURES REQUIRED TO PROTECT THE HEALTH OF TREES TO BE RETAINED ON THE SITE AFTER CONSTRUCTION, AND THE ARBORIST'S REPORT WILL BE INCLUDED IN THE PD PERMIT FOR THE PROJECT.

IN ORDER TO REDUCE THE IMPACT FROM THE LOSS OF ORDINANCE-SIZED TREES, THE PROJECT INCLUDES THE REPLACEMENT OF ALL MATURE TREES THAT CANNOT BE INCORPORATED INTO FUTURE SITE PLANS AS FOLLOWS:

a. REPLACEMENT OF ALL ORDINANCE SIZE TREES REMOVED BY THE PROJECT WITH 24" BOX SPECIMENS AT A 4:1 REPLACEMENT RATIO.

b. REPLACEMENT OF TREES WITH DIAMETERS OF 12-18 INCHES WITH 24 INCH BOX SPECIMENS AT A 2:1 REPLACEMENT RATIO.

c. REPLACEMENT OF TREES WITH DIAMETERS LESS THAN 12 INCHES WITH 15 GALLON SPECIMENS AT A 1:1 REPLACEMENT RATIO.

d. A QUALIFIED ARBORIST WILL ACCURATELY IDENTIFY THE LOCATION OF RETAINED TREES THAT WILL REQUIRE PROTECTION FROM IMPACTS DUE TO GRADE CHANGES, COMPACTION, TRENCHING OR CHANGES IN WATER REGIME. SPECIFIC MEASURES TO PROTECT INDIVIDUAL NATIVE TREES, SUCH AS PROTECTIVE FENCING, WILL BE EMPLOYED BY THE PROJECT. IN ADDITION, AN ARBORIST WILL MONITOR GRADING, TRENCHING, AND PAVEMENT REMOVAL ACTIVITIES NEAR LARGE, NATIVE TREES IDENTIFIED FOR PROTECTION.

e. ANY REPLACEMENT TREES PLANTED OFF-SITE ALONG ROADWAY RIGHTS-OF-WAY OR ON SURROUNDING PROPERTIES WILL BE MAINTAINED (INCLUDING WATERING) FOR A MINIMUM OF FIVE YEARS.

## FLOODING, DRAINAGE AND WATER QUALITY

1. WATER QUALITY
   a. THE PROJECT WILL COMPLY WITH THE NPDES GENERAL CONSTRUCTION ACTIVITY STORM WATER PERMIT ADMINISTERED BY THE REGIONAL WATER QUALITY CONTROL BOARD. PRIOR TO CONSTRUCTION GRADING FOR THE PROPOSED LAND USES, THE APPLICANT WILL FILE A "NOTICE OF INTENT" (NOI) TO COMPLY WITH THE GENERAL PERMIT AND PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) WHICH ADDRESSES MEASURES THAT WOULD BE INCLUDED IN THE PROJECT TO MINIMIZE AND CONTROL CONSTRUCTION AND POST-CONSTRUCTION RUNOFF. THE SWPPP WILL BE SUBMITTED TO THE CITY OF SAN JOSE DEPARTMENT OF ENVIRONMENTAL SERVICES. THE FOLLOWING MEASURES WOULD BE INCLUDED IN THE SWPPP:
      i. PRECLUDE NON-STORM WATER DISCHARGES TO THE STORM WATER SYSTEM.
      ii. PERFORM MONITORING OF DISCHARGES TO THE STORM WATER SYSTEM.
   b. SUBMIT A COPY OF THE DRAFT SWPPP TO THE CITY OF SAN JOSE DEPARTMENT OF ENVIRONMENTAL SERVICES FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION OF THE PROJECT.
   c. THE PROJECT WILL COMPLY WITH THE CITY OF SAN JOSE GRADING ORDINANCE, INCLUDING EROSION- AND DUST-CONTROL DURING SITE PREPARATION, AND WITH THE CITY OF SAN JOSE ZONING ORDINANCE REQUIREMENT FOR KEEPING ADJACENT STREETS FREE OF DIRT AND MUD DURING CONSTRUCTION. THE FOLLOWING SPECIFIC MEASURES WOULD BE IMPLEMENTED TO PREVENT STORM WATER POLLUTION AND MINIMIZE POTENTIAL SEDIMENTATION DURING CONSTRUCTION.
      i. RESTRICTING GRADING TO THE DRY SEASON OR MEET OTHER CITY REQUIREMENTS;
      ii. USE SILT FENCING TO RETAIN SEDIMENT ON THE PROJECT SITE;
      iii. PROVIDING TEMPORARY COVER OF DISTURBED SURFACES TO HELP CONTROL EROSION DURING CONSTRUCTION;
      iv. PROVIDE TEMPORARY COVER OF ALL DISTURBED SURFACES TO HELP CONTROL EROSION DURING CONSTRUCTION.
      v. PROVIDE PERMANENT COVER TO STABILIZE THE DISTURBED SURFACES AFTER CONSTRUCTION HAS BEEN COMPLETED.
   d. THE PROJECT DESIGN WOULD INCLUDE FEATURES TO MINIMIZE NONPOINT SOURCE POLLUTANTS FROM ENTERING THE COYOTE CREEK BY-PASS CHANNEL. SUCH FEATURES COULD INCLUDE THE PLACEMENT OF VEGETATED SWALES WHERE POSSIBLE, AND THE INSTALLATION OF OIL ABSORBING MATERIALS (I.E., "FOSSIL FILTERS") IN THE INLETS OF ON-SITE CATCH BASINS.
   e. IN ORDER TO COMPLY WITH THE CITY OF SAN JOSE GRADING ORDINANCE, RECYCLED WATER MUST BE USED FOR ALL NONPOTABLE USES DURING CONSTRUCTION. RECYCLED WATER IS AVAILABLE FROM THE RECYCLED WATER FILL STATION LOCATED ON LOS ESTEROS ROAD ACROSS FROM THE SAN JOSE-SANTA CLARA WATER POLLUTION CONTROL PLANT. PRIOR TO USE OF THIS WATER, A PERMIT WILL BE OBTAINED FROM SAN JOSE MUNICIPAL WATER.
   f. AS PART OF THE MITIGATION FOR POST-CONSTRUCTION RUNOFF IMPACTS ADDRESSED IN THE SWPPP, THE PROJECT WILL IMPLEMENT REGULAR MAINTENANCE ACTIVITIES (I.E., SWEEPING, CLEANING STORM WATER INLETS, LITTER CONTROL) AT THE SITE TO PREVENT SOIL, GREASE, AND LITTER FROM ACCUMULATING ON THE PROJECT SITE AND CONTAMINATING SURFACE RUNOFF. STORM WATER CATCH BASINS WILL BE STENCILED TO DISCOURAGE ILLEGAL DUMPING.

## HAZARDOUS MATERIALS

1. POTENTIAL SOURCES OF ON-SITE CONTAMINATION
   a. FINAL PHASE II ENVIRONMENTAL ASSESSMENT WILL BE COMPLETED FOR THE DATA CENTER AND LECEF PROJECTS PRIOR TO ISSUANCE OF A PLANNED DEVELOPMENT PERMIT FOR EACH PROJECT. AT MINIMUM, ADDITIONAL SOIL SAMPLES WILL BE ANALYZED FOR ORGANOCHLORINE PESTICIDES, ARSENIC AND LEAD. SAMPLES WILL BE TAKEN AT SEVERAL DEPTHS TO DETERMINE THE VERTICAL DISTRIBUTION OF POTENTIAL CONTAMINANTS AND TO IDENTIFY ANY IMPACTS TO GROUNDWATER. AS PART OF THE FINAL PHASE II ENVIRONMENTAL ASSESSMENT, HEALTH RISK ASSESSMENTS WILL BE PREPARED IN THE EVENT PESTICIDE RESIDUES AND ASSOCIATED METALS CONCENTRATIONS EXCEED SCREENING LEVELS FOR THE PROPOSED USES. HEALTH RISK ASSESSMENTS WOULD IDENTIFY THE CONCENTRATIONS OF CHEMICALS THAT COULD REMAIN IN THE SOIL OR GROUND WATER AND STILL BE SAFE FOR FUTURE LAND USES. THE SAFE CONCENTRATIONS ARE DETERMINED BASED ON MODELING WHICH CONSIDERS THE USER POPULATION, CHEMICAL EXPOSURE PATHWAYS, AND TOXICITY (INCLUDING CARCINOGENIC AND NONCARCINOGENIC EFFECTS).
      i. THE RESULTS OF THE FINAL PHASE II REPORT, ANY HEALTH RISK ASSESSMENTS AND RISK-BASED CLEANUP GOALS FOR ON-SITE CONSTRUCTION WORKERS AND/OR FUTURE EMPLOYEES (IF NECESSARY), AND ANY REMEDIATION MEASURES WILL BE PROVIDED TO THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC) AND REGIONAL WATER QUALITY CONTROL BOARD FOR REVIEW. IF APPROPRIATE, REMEDIATION MEASURES COULD BE INCLUDED IN A VOLUNTARY CLEANUP AGREEMENT BETWEEN THE PROJECT PROPONENTS AND DTSC. A CLEARANCE LETTER FROM DTSC OR THE REGIONAL WATER QUALITY CONTROL BOARD FOR THE SITE, AS APPROPRIATE, WILL BE PROVIDED TO THE CITY OF SAN JOSE DEPARTMENT OF BUILDING, PLANNING, AND CODE ENFORCEMENT PRIOR TO THE ISSUANCE OF ANY PLANNED DEVELOPMENT PERMITS FOR THE PROJECT.
   b. PRIOR TO DEMOLITION OF EXISTING BUILDINGS, AN ASBESTOS SURVEY WILL BE CONDUCTED UNDER NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP) GUIDELINES. ALL POTENTIALLY FRIABLE ASBESTOS CONTAINING MATERIAL WILL BE REMOVED ACCORDING TO NESHAP GUIDELINES PRIOR TO BUILDING DEMOLITION.
      i. A LEAD SURVEY OF PAINTED SURFACES AND ADJACENT SOIL WILL ALSO BE PERFORMED PRIOR TO DEMOLITION. CAL/OSHA REQUIREMENTS WILL BE FOLLOWED DURING DEMOLITION ACTIVITIES, INCLUDING EMPLOYEE TRAINING, EMPLOYEE AIR MONITORING AND DUST CONTROL. ANY DEBRIS OR SOIL CONTAINING LEAD-BASED PAINT OR COATINGS WILL BE DISPOSED OF AT LANDFILLS THAT HAVE ACCEPTANCE CRITERIA FOR THE WASTE BEING DISPOSED.
   c. A SOIL MANAGEMENT PLAN (SMP) AND HEALTH AND SAFETY PLANS (HSP) [HEALTH AND SAFETY PLAN IS A PROJECT-SPECIFIC PLAN, GENERALLY PREPARED BY EACH CONTRACTOR WORKING ON A SITE, THAT DESCRIBES SAFETY MEASURES TO BE FOLLOWED DURING ALL PHASES OF CONSTRUCTION. IT IS DESIGNED TO PROTECT THE HEALTH AND SAFETY OF CONSTRUCTION WORKERS AND THE PUBLIC DURING THE CONSTRUCTION PERIOD] SHALL BE SUBMITTED TO THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL, THE CITY OF SAN JOSE ENVIRONMENTAL SERVICES DEPARTMENT, AND SAN JOSE FIRE DEPARTMENT HAZARDOUS MATERIALS DIVISION PRIOR TO START OF CONSTRUCTION.
      i. THE SOIL MANAGEMENT PLAN WILL ADDRESS HOW DDT CONTAMINATED SOIL WILL BE HANDLED DURING CONSTRUCTION AND DEVELOPMENT OF THE SITE. SOIL HANDLING DURING SITE GRADING, EXCAVATION FOR FOUNDATIONS AND UTILITIES, AND LANDSCAPING WILL BE SPECIFICALLY DISCUSSED. THE SOIL MANAGEMENT PLAN WILL ALSO DETAIL HOW EXCAVATED SOIL THAT MAY NEED OFFSITE DISPOSAL WILL BE STOCKPILED AND TESTED FOR DISPOSAL AND SOIL HANDLING ACTIVITIES DURING ON-GOING OPERATION OF THE DEVELOPMENT.

2. USE AND STORAGE OF HAZARDOUS MATERIALS BY THE PROJECT
   THE PROJECT WOULD COMPLY WITH THE FOLLOWING IN ORDER TO AVOID POSSIBLE IMPACTS ASSOCIATED WITH HAZARDOUS MATERIALS USE AND STORAGE:
   a. A NUMBER OF LOCAL, STATE AND FEDERAL REGULATIONS ADDRESS THE PREVENTION OF ACCIDENTAL RELEASES OF CHEMICALS THAT CAN AFFECT HUMAN HEALTH. THE CALIFORNIA ACCIDENTAL RELEASE PREVENTION (CALARP) PROGRAM REQUIRES BUSINESSES THAT HANDLE THRESHOLD QUANTITIES OF REGULATED SUBSTANCES TO SUBMIT A RISK MANAGEMENT PLAN TO OVERSEEING AGENCIES. NEW BUSINESSES OR USERS OF REGULATED SUBSTANCES ABOVE THRESHOLD QUANTITIES ARE REQUIRED TO SUBMIT A RISK MANAGEMENT PLAN THAT ADDRESSES POSSIBLE IMPACTS TO SENSITIVE POPULATIONS PRIOR TO USING THESE SUBSTANCES. THE COUNTY OF SANTA CLARA DEPARTMENT OF ENVIRONMENTAL HEALTH REVIEWS THE RISK MANAGEMENT PLANS AS THE CERTIFIED UNIFIED PROGRAM AGENCY (CUPA) AND THE CITY OF SAN JOSE IS THE LOCAL GOVERNMENT IMPLEMENTING AGENCY FOR BUSINESSES WITHIN THE CITY OF SAN JOSE.

3. SAN JOSE-SANTA CLARA WATER POLLUTION TREATMENT PLANT
   ALTHOUGH NOT CONSIDERED A SIGNIFICANT IMPACT, THE FOLLOWING MEASURE IS INCLUDED IN THE PROJECT TO REDUCE POTENTIAL IMPACTS TO USERS OF THE SITE IN THE EVENT OF AN ACCIDENTAL RELEASE OF AMMONIA AT THE WPCP.
   a. THE LECEF WILL BE CONNECTED TO THE WPCP'S ALARM SYSTEM, WHICH WOULD NOTIFY THE LECEF AND DATA CENTER CAMPUS OF ANY HAZARDOUS MATERIAL RELEASES FROM THE WPCP.

USE OF DOCUMENTS
ENT, AND THE IDEAS AND DESIGNS INCOR-
REIN, AS AN INSTRUMENT OF PROFESSIONAL
THE PROPERTY OF CH2M HILL AND IS NOT TO
WHOLE OR IN PART, FOR ANY OTHER PROJECT
WRITTEN AUTHORIZATION OF CH2M HILL.

BAR IS ONE INCH ON ORIGINAL DRAWING.
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

US DATAPORT/LECEF
SAN JOSE, CALIFORNIA

GENERAL DEVELOPMENT PLAN - EXHIBIT C
LAND USE PLAN - NOTES
(PAGE 3 OF 5)

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| PROJ NO. | |

## H. VISUAL RESOURCES

1. THE CONCEPTUAL PLANS SUBMITTED TO THE CITY OF SAN JOSE FOR THE PLANNED DEVELOPMENT (PD) REZONING OF THE PROJECT SITE INCLUDE BUILDING ELEVATIONS FOR THE DATA CENTER AND AN OVERALL LANDSCAPING PLAN WHICH ARE INTENDED TO ASSURE A MINIMUM LEVEL OF AESTHETIC QUALITY. SPECIFIC STRUCTURES PROPOSED IN THE FUTURE WILL BE REVIEWED BY CITY STAFF FOR CONFORMANCE WITH THE STANDARD ESTABLISHED BY THE PD ZONING . THESE MEASURES WOULD REDUCE THE ADVERSE VISUAL EFFECT OF DEVELOPING THE SITE.
2. ALL NEW INDUSTRIAL DEVELOPMENT WILL COMPLY WITH THE CITY'S INDUSTRIAL DESIGN GUIDELINES, WHICH STATE THAT STRUCTURES AND ACTIVITIES SHOULD BE LOCATED AND DESIGNED TO AVOID CREATING NUISANCES AND HAZARDS FOR ADJOINING PROPERTIES. THE INDUSTRIAL GUIDELINES ALSO PROVIDE THAT LIGHTING LEVELS SHOULD NOT SPILL ONTO ADJACENT PROPERTIES.
3. THE DEVELOPMENT WILL COMPLY WITH DESIGN AND LANDSCAPING POLICIES IN THE ALVISO MASTER PLAN FOR LANDS OUTSIDE THE ALVISO VILLAGE. THE PROJECT CONFORMS TO THE GENERAL DIRECTION IN THE ALVISO MASTER PLAN THAT TALLER BUILDINGS BE LOCATED FARTHER FROM THE RESIDENTIAL NEIGHBORHOOD AND CLOSER TO SR 237. TO THE EXTENT FEASIBLE, LANDSCAPE PLANT MATERIALS WILL BE NATIVE, WIND TOLERANT, RELATIVELY FAST GROWING AND REQUIRE LITTLE CARE. LANDSCAPING WILL BE USED TO SOFTEN THE EFFECT OF TALLER BUILDINGS.
4. SMALL EQUIPMENT WITHIN THE ENERGY FACILITY WILL BE PLACED WITHIN ENCLOSURES AS APPROPRIATE.
5. LANDSCAPE BERMS SURROUNDING THE SITE WILL BE PUT IN PLACE TO PARTIALLY SHIELD VIEWS OF THE PROJECT FROM SR 237 AND THE PROPOSED BAY TRAIL ALIGNMENT. THE COYOTE CREEK TRAIL MAY BE LOCATED AT THE TOP OF THE EXISTING COYOTE CREEK BY-PASS LEVEE AND SHIELDING WOULD BE LESS EFFECTIVE.

## I. UTILITIES AND SERVICE SYSTEMS

1. NEW OFF-SITE POTABLE WATER LINE FOR DATA CENTER
   AS PREVIOUSLY DESCRIBED IN SECTION E.(3) BIOLOGICAL RESOURCES, MITIGATION MEASURES, THE FOLLOWING MEASURES ARE INCLUDED IN THE PROJECT TO REDUCE POTENTIAL IMPACTS TO WETLANDS AND BURROWING OWLS FROM CONSTRUCTION OF A NEW OFF-SITE POTABLE WATER LINE:

   a. MITIGATION MEASURES FOR IMPACTS TO POSSIBLE CONGDON'S TARPLANT POPULATIONS

      SURVEYS FOR CONGDON'S TARPLANT WILL BE CONDUCTED ALONG THE FINAL WATER LINE ALIGNMENT DURING THE FLOWERING PERIOD OF JUNE THROUGH AUGUST AS PART OF FINAL DESIGN. IN THE EVENT CONGDON'S TARPLANT POPULATIONS ARE FOUND WITHIN OR DIRECTLY ADJACENT TO THE PROPOSED POTABLE WATER LINE, THE FOLLOWING MITIGATION MEASURES WILL BE IMPLEMENTED TO REDUCE PROJECT-RELATED IMPACTS TO A LESS-THAN-SIGNIFICANT LEVEL. THIS MITIGATION WILL INCLUDE IMPLEMENTATION OF AVOIDANCE, MINIMIZATION, AND/OR EITHER HABITAT RESTORATION MEASURES OR OFF-SITE ACQUISITION AND PRESERVATION, AS DESCRIBED BELOW.

      i. *AVOIDANCE OF DIRECT AND INDIRECT IMPACTS THROUGH PROJECT RE-DESIGN.* IN CONSULTATION WITH A PLANT ECOLOGIST, THE PROPOSED WATER LINE ALIGNMENT MAY BE REDESIGNED, CONSTRUCTED, AND OPERATED IN SUCH A WAY AS TO AVOID DIRECT AND INDIRECT IMPACTS TO CONGDON'S TARPLANT POPULATIONS.

      ii. *MINIMIZATION OF INDIRECT EFFECTS.* INDIRECT EFFECTS TO THE SPECIES WOULD BE AVOIDED BY THE CREATION OF A BUFFER ZONE DURING AND AFTER CONSTRUCTION. PRIOR TO EXCAVATION, ANY POPULATIONS WOULD BE IDENTIFIED BY A QUALIFIED PLANT ECOLOGIST. A BUFFER ZONE WOULD BE ESTABLISHED AROUND THESE AREAS AND THEY WOULD BE OF SUFFICIENT SIZE TO ELIMINATE POTENTIAL DISTURBANCE TO THE PLANTS FROM HUMAN ACTIVITY AND ANY OTHER POTENTIAL SOURCES OF DISTURBANCE. TEMPORARY FENCES WOULD BE CONSTRUCTED BETWEEN THE DEVELOPMENT AND ANY POPULATIONS.

      iii. *REPLACEMENT OF IMPACTED SPECIES THROUGH DEVELOPMENT OF A SPECIAL-STATUS PLANT HABITAT RESTORATION PLAN.* IF THE WATER LINE CANNOT BE DESIGNED TO AVOID SUBSTANTIAL IMPACTS TO A POPULATION OF CONGDON'S TARPLANT, THEN A SITE RESTORATION PLAN WOULD BE DEVELOPED BY A QUALIFIED PLANT ECOLOGIST. THE OBJECTIVE OF THIS MITIGATION MEASURE WOULD BE TO REPLACE THE SPECIAL-STATUS PLANTS AND HABITAT LOST DURING PROJECT IMPLEMENTATION. THE PROPOSED RESTORATION PROGRAM WOULD BE MONITORED FOR A PERIOD OF FIVE YEARS FROM THE DATE OF WATER LINE INSTALLATION. THE RESTORATION PLAN WOULD CONTAIN AT A MINIMUM THE FOLLOWING:

      a) LOCATION OF AREAS ON SITE TO RESTORE LOST PLANT POPULATIONS. APPROPRIATE HABITAT WOULD BE CREATED ON SUITABLE SOILS.
      b) DESCRIPTION OF THE PROPAGATION AND PLANTING TECHNIQUES TO BE EMPLOYED IN THE RESTORATION EFFORT. PERENNIAL PLANTS TO BE IMPACTED BY SITE GRADING WOULD BE SALVAGED AND RAISED IN A GREENHOUSE FOR EVENTUAL TRANSPLANTING WITHIN THE RESTORATION AREAS. ANNUAL PLANTS CAN BE ESTABLISHED THROUGH DIRECT SEEDING PRACTICES AND/OR TRANSPLANTING CONTAINER-GROWN PLANTS INTO EXISTING SUITABLE HABITAT.
      c) DEVELOPMENT OF A TIMETABLE FOR IMPLEMENTATION OF THE RESTORATION PLAN, INCLUDING PILOT-PHASE STUDIES.
      d) DEVELOPMENT OF A MONITORING PLAN AND PERFORMANCE CRITERIA. OVERALL, THE GOAL IS TO REPLACE PLANTS IMPACTED BY THE PROPOSED IMPROVEMENTS TO MAINTAIN A VIABLE POPULATION. THE SPECIAL-STATUS PLANT RESTORATION AREA WOULD BE LOCATED WITHIN A PARCEL OF SUFFICIENT SIZE, TO BE DETERMINED, TO PRECLUDE DISTURBANCE. THE SIZE OF THE AREA DEPENDS UPON THE NUMBER OF PLANTS IMPACTED, THEIR DENSITY IN UNDISTURBED ENVIRONMENTS AND ADJACENT LAND USES.
      e) DESCRIBE REMEDIAL MEASURES TO BE PERFORMED IN THE EVENT THAT INITIAL RESTORATION MEASURES ARE UNSUCCESSFUL IN MEETING THE PERFORMANCE CRITERIA.
      f) DESCRIBE SITE MAINTENANCE ACTIVITIES TO FOLLOW RESTORATION ACTIVITIES. THESE MAY INCLUDE WEED CONTROL, IRRIGATION, AND/OR CONTROL OF HERBIVORY BY WILDLIFE.

      RESULTS OF FLOWERING SEASON SURVEYS OF THE FINAL WATER LINE ALIGNMENT FOR CONGDON'S TARPLANT, AND A SITE RESTORATION OR MITIGATION PLAN (IF NECESSARY), WILL BE PROVIDED TO THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT PRIOR TO ISSUANCE OF A PLANNED DEVELOPMENT PERMIT FOR THE DATA CENTER PROJECT, OR PROVISION WILL BE MADE IN THE PLANNED DEVELOPMENT PERMIT FOR COMPLETION OF THE SURVEYS PRIOR TO TRENCHING.

   b. WETLANDS AND DRAINAGE CHANNELS

      i. A DETAILED DETERMINATION OF WETLANDS WILL BE COMPLETED AS PART OF DESIGN FOR THE NEW OFF-SITE POTABLE WATER LINE. TO THE EXTENT FEASIBLE, JURISDICTIONAL WETLANDS WILL BE AVOIDED. IN THE EVENT IMPACTS TO JURISDICTIONAL WETLANDS CANNOT BE COMPLETELY AVOIDED, A MITIGATION AND MONITORING PLAN WILL BE PREPARED AND SUBMITTED TO THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT AND THE U.S. ARMY CORPS OF ENGINEERS. IMPACTS TO ANY JURISDICTIONAL WETLANDS WOULD BE MITIGATED ACCORDING TO A MITIGATION AND MONITORING PLAN AT A RATIO THAT WILL ENSURE REPLACEMENT OF LOST FUNCTIONS AND VALUES ASSOCIATED WITH HABITAT THAT WAS IMPACTED.

      a) ANY WORK DONE WITHIN THE DRAINAGE CHANNEL THAT CONVEYS WATER TO THE WETLAND MITIGATION POND ON THE VTA CERONE BUS MAINTENANCE FACILITY WILL BE CONDUCTED IN A MANNER TO AVOID IMPACTS TO THE POND. FLOWS TO THE POND WILL BE MAINTAINED BY CONDUCTING WORK WHEN THERE IS NO WATER IN THE CHANNEL AND RECONTOURING THE CHANNEL TO ITS ORIGINAL CONFIGURATION AND ELEVATION. BEST MANAGEMENT PRACTICES FOR SEDIMENT CONTROL, SUCH AS USE OF SILT FENCING TO RETAIN SEDIMENT AND PROVIDING TEMPORARY COVER OF DISTURBED SURFACES, WILL BE FOLLOWED TO AVOID ADDITIONAL INPUTS OF SEDIMENT TO THE POND FOLLOWING CONSTRUCTION.

c. BURROWING OWL POPULATIONS

i. PROTOCOL LEVEL SURVEYS FOR RESIDENT OR NESTING BURROWING OWLS WILL BE COMPLETED AS PART OF THE DESIGN PROCESS FOR THE NEW POTABLE WATER LINE. THE SURVEYS WILL IDENTIFY EXISTING BURROWS AND AREAS USED BY BURROWING OWLS DURING THE NESTING SEASON OF FEBRUARY-AUGUST. PRECONSTRUCTION SURVEYS WILL ALSO BE CONDUCTED NO MORE THAN 30 DAYS PRIOR TO THE EXCAVATION FOR THE PROPOSED POTABLE WATER LINE. IF BREEDING OWLS ARE LOCATED ON OR IMMEDIATELY ADJACENT TO THE WATER LINE ALIGNMENT, A CONSTRUCTION-FREE BUFFER ZONE (TYPICALLY 250 FEET) AROUND THE ACTIVE BURROW WILL BE ESTABLISHED FOR THE DURATION OF BREEDING BY OWLS UNTIL YOUNG BIRDS HAVE FLEDGED. IF OWLS ARE RESIDENT DURING THE NONBREEDING SEASON (SEPTEMBER-JANUARY), A QUALIFIED ORNITHOLOGIST, IN CONSULTATION WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME, WOULD PASSIVELY RELOCATE (EVICT) THE OWLS TO AVOID THE LOSS OF ANY INDIVIDUALS DURING CONSTRUCTION.

ii. TO AVOID IMPACTS TO THE OWLS WITHIN THE RELOCATION AREA IN THE NORTHWESTERN PORTION OF THE VTA CERONE BUS MAINTENANCE FACILITY EITHER: 1) NO OWLS WILL BE RELOCATED OR DISTURBED DURING EITHER THE NESTING OR NON-NESTING SEASONS; OR 2) A REPLACEMENT MITIGATION SITE WILL BE ESTABLISHED WITHIN ONE MILE OF THE VTA SITE IN CONSULTATION WITH THE CALIFORNIA DEPARTMENT OF FISH AND GAME. IMPACTS TO THE BURROWING OWL RELOCATION AREA COULD BE MITIGATED BY ACQUIRING, EITHER BY DIRECT PURCHASE OR CONSERVATION EASEMENT, SUITABLE BURROWING OWL FORAGING HABITAT AT A MINIMUM RATIO OF 6.5 ACRES PER PAIR OF OWLS RELOCATED.

2. POTENTIAL IMPACTS TO THE SOUTH BAY WATER RECYCLING PROGRAM

SUPERCEDED BY SECTION 4 OF THE "CONDITIONS OF APPROVAL." SHEET 2E.

## CULTURAL RESOURCES

THE PROJECT PROPOSES TO INCLUDE THE FOLLOWING MEASURES TO AVOID OR REDUCE POTENTIAL IMPACTS TO BURIED CULTURAL RESOURCES:

1. NEW OFF-SITE POTABLE WATER LINE FOR DATA CENTER

THE PROJECT INCLUDES A COMPREHENSIVE MONITORING AND PROTECTION PROGRAM TO ENSURE THAT ALL SUBSURFACE RESOURCES ARE APPROPRIATELY PROTECTED. PRIOR TO SITE GRADING, A SUBSURFACE MECHANICAL TESTING PROGRAM FOR ARCHAEOLOGICAL MATERIALS WILL BE CONDUCTED OVER THE ENTIRE SITE. SUBSURFACE TESTING WILL LOOK FOR BURIED OR OBSCURED PREHISTORIC DEPOSITS AND IN THE VICINITY OF THE HISTORIC BOOTS FARM, POSSIBLE HISTORIC REMAINS. BACKHOE TRENCHES WOULD BE EXCAVATED SYSTEMATICALLY AT APPROXIMATELY 30-METER INTERVALS AND SAMPLES OF EXCAVATED SOILS WILL BE REGULARLY SCREENED TO HELP IDENTIFY SMALL ARCHAEOLOGICAL INDICATORS. SOIL LOGS AND/OR STRATIGRAPHIC PROFILES FOR EACH TRENCH WILL BE MAINTAINED.

2. IN THE EVENT SIGNIFICANT PREHISTORIC OR HISTORIC ARCHAEOLOGICAL RESOURCES ARE DISCOVERED, EITHER DURING THE PRECONSTRUCTION TESTING PROGRAM OR DURING SITE GRADING OR EXCAVATIONS FOR UTILITY LINES, ALL CONSTRUCTION WITHIN A RADIUS OF 50 FEET OF THE FIND WOULD BE HALTED, THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT WOULD BE NOTIFIED, AND THE ARCHAEOLOGIST WILL EXAMINE THE FIND AND MAKE APPROPRIATE RECOMMENDATIONS REGARDING THE SIGNIFICANCE OF THE FIND AND THE APPROPRIATE MITIGATION. RECOMMENDATIONS COULD INCLUDE COLLECTION, RECORDATION, AND ANALYSIS OF ANY SIGNIFICANT CULTURAL MATERIALS. (SIGNIFICANT CULTURAL MATERIALS INCLUDE BUT ARE NOT LIMITED TO: ABORIGINAL HUMAN REMAINS; CHIPPED STONE; GROUND STONE; SHELL AND BONE ARTIFACTS; CONCENTRATIONS OF FIRE-CRACKED ROCK; ASH AND CHARCOAL; SHELL; BONE; AND HISTORIC FEATURES SUCH AS PRIVIES OR BUILDING FOUNDATIONS.)

a. IN THE EVENT THAT HUMAN SKELETAL REMAINS ARE ENCOUNTERED, THE APPLICANT IS REQUIRED BY COUNTY ORDINANCE NO. B6-18 TO IMMEDIATELY NOTIFY THE COUNTY CORONER. UPON DETERMINATION BY THE COUNTY CORONER THAT THE REMAINS ARE NATIVE AMERICAN, THE CORONER SHALL CONTACT THE CALIFORNIA NATIVE AMERICAN HERITAGE COMMISSION, PURSUANT TO SUBDIVISION (C) OF SECTION 7050.5 OF THE HEALTH AND SAFETY CODE AND THE COUNTY COORDINATOR OF INDIAN AFFAIRS. NO FURTHER DISTURBANCE OF THE SITE MAY BE MADE EXCEPT AS AUTHORIZED BY THE COUNTY COORDINATOR OF INDIAN AFFAIRS IN ACCORDANCE WITH THE PROVISIONS OF STATE LAW AND THE HEALTH AND SAFETY CODE. THE DIRECTOR OF PLANNING, BUILDING AND CODE ENFORCEMENT WILL ALSO BE NOTIFIED.

b. ARCHAEOLOGICAL MONITORING DURING GROUND DISTURBING ACTIVITIES SUCH AS GRADING AND TRENCHING FOR UTILITY LINES WILL BE CONDUCTED IF RECOMMENDED BY THE ARCHAEOLOGIST CONDUCTING THE PRECONSTRUCTION TESTING PROGRAM.

# IX. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES, THE PROJECT DESIGNER SHALL FILE A NOTICE OF INTENT (NOI) TO COMPLY WITH THE STATE WATER RESOURCES CONTROL BOARD "GENERAL PERMIT FOR STORM WATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITY" IN COMPLIANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES).

# X. WATER POLLUTION CONTROL PLANT NOTE

PURSUANT TO PART 2.75 OF CHAPTER 15.12 OF THE SAN JOSE MUNICIPAL CODE, NO VESTED RIGHT TO A BUILDING PERMIT SHALL ACCRUE AS THE RESULT OF GRANTING ANY LAND DEVELOPMENT APPROVALS AND APPLICATION WHEN AND IF THE CITY MANAGER MAKES A DETERMINATION THAT THE CUMULATIVE SEWAGE TREATMENT DEMAND ON THE SAN JOSE-SANTA CLARA WATER POLLUTION CONTROL PLANT, REPRESENTED BY APPROVED LAND USES IN THE AREA SERVED BY SAID PLANT, WILL CAUSE THE TOTAL SEWAGE TREATMENT DEMAND TO MEET OR EXCEED THE CAPACITY OF THE SAN JOSE-SANTA CLARA WATER POLLUTION CONTROL PLANT TO TREAT SUCH SEWAGE ADEQUATELY AND WITHIN THE DISCHARGE STANDARDS IMPOSED ON THE CITY BY THE STATE OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD FOR THE SAN FRANCISCO BAY REGION. SUBSTANTIAL CONDITIONS DESIGNED TO DECREASE SANITARY SEWAGE ASSOCIATED WITH ANY LAND USE APPROVAL MAY BE IMPOSED BY THE APPROVING AUTHORITY.

USE OF DOCUMENTS
IENT, AND THE IDEAS AND DESIGNS INCOR-
EREIN, AS AN INSTRUMENT OF PROFESSIONAL
THE PROPERTY OF CH2M HILL AND IS NOT TO
WHOLE OR IN PART, FOR ANY OTHER PROJECT
IE WRITTEN AUTHORIZATION OF CH2M HILL

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

US DATAPORT/LECEF
SAN JOSE, CALIFORNIA

GENERAL DEVELOPMENT PLAN - EXHIBIT C
LAND USE PLAN - NOTES
(PAGE 4 OF 5)

SHEET 2d
DWG NO.
DATE 2/4/02
PROJ NO.

# CONDITIONS OF APPROVAL

1. ENERGY AND ENVIRONMENT. PRIOR TO ISSUANCE OF PD PERMITS FOR ANY DATA CENTER BUILDING WHICH WILL DRAW POWER FROM THE ELECTRICAL GRID, THE APPLICANT HAS AGREED TO AND SHALL LIMIT THE USE OF DIESEL GENERATORS ON THE DATA CENTER SITE TO 25 HOURS PER YEAR.

2. BACKUP POWER. IN THE EVENT THAT THE APPLICANT CANNOT SECURE A SATISFACTORY LOCATION AND PERMITS FOR POWER GENERATION, IDENTIFY METHODS FOR ENSURING A RELIABLE SOURCE OF POWER, OR ENVIRONMENTALLY SUPERIOR TECHNOLOGY AS DESCRIBED ABOVE, THE DIRECTOR OF PLANNING SHALL ISSUE ALL PERMITS NECESSARY FOR APPLICANT TO USE EMERGENCY BACKUP DIESEL GENERATORS FOR ITS CAMPUS BUILDINGS ONLY UNDER THE FOLLOWING ADDITIONAL CONDITION:
   a) THE APPLICANT SHALL LIMIT THE USE OF EMERGENCY DIESEL GENERATORS TO NOT EXCEED 50 HOURS PER YEAR AS DESCRIBED IN THE FEIR AND SHALL BE FURTHER SUBJECT TO BAY AREA AIR QUALITY MANAGEMENT DISTRICT REGULATORY REQUIREMENTS INCLUDING ANY ENFORCEMENT.

3. OPEN SPACE AND BURROWING OWL HABITAT. THE APPLICANT HAS REPRESENTED AND AGREED TO PROVIDE 30 PERCENT OF THE TOTAL GROSS PROJECT AREA AS OPEN SPACE. THIS OPEN SPACE WOULD BE INCLUDED AS PART OF THE PROJECT'S ZONING. IT SHALL CONSIST OF THE FOLLOWING:
   a) OPEN SPACE SETBACKS.
   b) PRIVATE OPEN SPACE, INCLUDING A 22-FOOT BAY TRAIL EASEMENT AS RECOMMENDED BY THE PLANNING COMMISSION AND THE DIRECTOR OF PLANNING, ON THE APPLICANT'S PRIVATE PROPERTY. THIS PRIVATE OPEN SPACE SHALL BE LANDSCAPED IN A MANNER CONSISTENT WITH THE ALVISO MASTER PLAN AND CONDUCIVE TO BURROWING OWL FORAGING AND HABITAT PURSUANT TO A BURROWING OWL HABITAT PLAN, SUBJECT TO APPLICANT'S REASONABLE NEED FOR A SECURE CAMPUS INCLUDING FENCING. THIS PRIVATE OPEN SPACE SHALL BE SUBJECT TO A CONSERVATION EASEMENT, WHICH SHALL BE RECORDED SUBSEQUENT TO THE COMPLETION OF THE DEVELOPMENT AGREEMENT REFERENCED BELOW. THE GRADING AND LANDSCAPING IN THE PRIVATE OPEN SPACE AREA SHALL BE DONE IN A MANNER TO TAKE ADVANTAGE OF OPPORTUNITIES TO NATURALLY FILTER, DETAIN AND SLOW STORM WATER RUNNING OFF THE SITE WHILE STILL PRESERVING ITS QUALITIES FOR BURROWING OWL HABITAT.
   c) OPEN SPACE ON THE WATER POLLUTION CONTROL PLANT'S "BUFFER LANDS" TO BE LANDSCAPED CONSISTENT WITH THE ALVISO MASTER PLAN AND WPCP GUIDELINES. TO THE EXTENT POSSIBLE, INDIGENOUS SPECIES SHOULD BE PLANTED AS GRASSLANDS OR MARSHLANDS WITH LOW SHRUBS AND FEW TREES. TREES SHOULD BE KEPT CLOSE TO THE BUILDINGS. IF NECESSARY TO CONTROL EXCESS GROWTH, THE PROPERTY SHALL BE MOWED, NOT DISKED. PONDS OR WETLANDS CAN BE INCORPORATED INTO THE DESIGN BUT A MANICURED "GOLF COURSE" APPEARANCE IS NOT DESIRABLE.

   EACH PD PERMIT APPLICATION SHALL INCLUDE DESIGNATION OF OPEN SPACE IN AN AMOUNT EQUAL TO AT LEAST 30 % OF THE DEVELOPED AREA INCLUDED IN THE APPLICATION. THE OPEN SPACE MAY BE DESIGNATED ON THE PROJECT SITE OR THE PORTION OF THE CITY BUFFER LAND IDENTIFIED AS "LANDSCAPED OPEN SPACE" ON THE PD ZONING LAND USE PLAN.

4. RECYCLED WATER. THE APPLICANT HAS AGREED TO USE RECYCLED WATER IN THE MAINTENANCE AND OPERATION OF THE LECEF COOLING TOWER. THIS WILL BE A BENEFICIAL ELEMENT OF CITY'S ONGOING EFFORTS TO DIVERT EFFLUENT FROM THE BAY. THE PROJECT WILL NOT CONTRIBUTE SIGNIFICANTLY TO SALT LOADING OF THE WATER IT USES. THE ADMINISTRATION IS DIRECTED TO NOT REQUIRE DESALINATION OF EFFLUENT WATER FROM THE PROJECT AS A CONDITION OF ANY PERMITS NOR TO REQUIRE ANY EXTRAORDINARY PAYMENT OF FEES.

5. NOISE. THE APPLICANT SHALL COMPLY WITH THE SAN JOSÉ 2020 GENERAL PLAN NOISE GUIDELINES BY IMPLEMENTING APPROPRIATE MEASURES TO PREVENT EXCEEDING THE GUIDELINES. THIS REQUIREMENT WILL ENSURE THAT NOISE FROM THE COOLING TOWERS AND OTHER SOURCES WILL NOT EXCEED APPLICABLE LIMITS.

6. LIGHTS. EXTERNAL AND INTERNAL LIGHTS SHALL BE DESIGNED SO AS NOT TO CREATE GLARE OR OTHER NEGATIVE IMPACTS TO THE COYOTE CREEK RIPARIAN CORRIDOR.

7. COMMUNITY CONTRIBUTIONS. THE APPLICANT HAS OFFERED A $1 MILLION CONTRIBUTION OVER A TEN-YEAR TIME FRAME IN COMMUNITY TECHNOLOGY PROGRAMS AND SCHOLARSHIPS. THIS CONTRIBUTION IS SUBJECT TO RECEIVING APPROVAL OF ALL PERMITS AND OBTAINING FINANCING FOR THE DEVELOPMENT OF PROJECT. THESE PROGRAMS AND CONTRIBUTIONS SHOULD FOLLOW APPROPRIATE GUIDELINES TO BE ESTABLISHED BY THE CITY COUNCIL IN CONCERT WITH THE MAYOR'S OFFICE, THE OFFICE OF COUNCIL DISTRICT 4, AND RESIDENTS OF THE ALVISO COMMUNITY.

8. COYOTE CREEK ENHANCEMENTS. THE APPLICANT HAS OFFERED A $1 MILLION CONTRIBUTION, OVER A TEN-YEAR TIME FRAME, TOWARD IMPROVEMENT OF THE HABITAT AND WATER QUALITY OF COYOTE CREEK. THIS CONTRIBUTION IS SUBJECT TO RECEIVING APPROVAL OF ALL PERMITS AND OBTAINING FINANCING FOR THE DEVELOPMENT OF PROJECT. THESE PROGRAMS AND CONTRIBUTIONS SHOULD FOLLOW APPROPRIATE GUIDELINES TO BE ESTABLISHED BY THE CITY COUNCIL IN CONCERT WITH THE MAYOR'S OFFICE, THE OFFICE OF COUNCIL DISTRICT 4, AND RESIDENTS OF THE ALVISO COMMUNITY. THE APPLICANT ANTICIPATES COLLABORATING WITH THE SANTA CLARA VALLEY WATER DISTRICT'S ADOPT-A-CREEK PROGRAM, THE SAN FRANCISCO BAY BIRD OBSERVATORY AND OTHER LOCAL ORGANIZATIONS WITH EXPERTISE IN HOW TO ENHANCE THE HABITAT AND WATER QUALITY OF COYOTE CREEK.

9. ENTRANCE ROAD. THE ENTRANCE ROAD ACROSS THE WATER POLLUTION CONTROL PLANT'S "BUFFER LANDS" SHALL BE PLACED IN A RECORDED EASEMENT.

10. DEVELOPMENT AGREEMENT. APPLICANT AND CITY SHALL EXECUTE A MUTUALLY ACCEPTABLE DEVELOPMENT AGREEMENT, OR OTHER APPROPRIATE DOCUMENT, INCLUDING ALL BUSINESS TERMS, PD ZONING ENTITLEMENTS AND CONDITIONS INCLUDING BUT NOT LIMITED TO 2.227 MILLION SQUARE FEET OF DATA CENTER BUILDINGS WITH A RELIABLE SOURCE OF POWER.

1737 N. FIRST STREET, SUITE #300
SAN JOSE, CALIFORNIA 95112-4524
(408)436-4909
CH2M HILL

| | | | | | |
|---|---|---|---|---|---|
| DSGN | | | | | |
| DR | | | | | |
| CHK | 2 | 2/4/02 | REVISED PER COMMENTS | MTR | VY |
| | 1 | 10/31/01 | REVISED PER COMMENTS | MTR | VY |
| APVD | NO. | DATE | REVISION | BY | APVD |

# *Los Esteros Critical Energy Facility*

## *Appendix 8.6-D*
## *City of San Jose Ordinance Number 26579*

***December 2003***

# CITY OF SAN JOSÉ, CALIFORNIA

Office of the City Clerk
801 North First Street, Room 116
San José, California 95110
Telephone (408) 277-4424
FAX (408) 277-3285

CITY CLERK

STATE OF CALIFORNIA )
COUNTY OF SANTA CLARA )
CITY OF SAN JOSE )

I, Patricia L. O'Hearn, City Clerk and Ex-Officio Clerk of the Council of and for the City of San Jose, in said County of Santa Clara, and State of California, do hereby certify that ***"Ordinance No. 26579"*** the original copy of which is attached hereto, was passed for publication of title on the ***19th day of February, 2002,*** was published in accordance with the provisions of the Charter of the City of San Jose, and was given final reading and adopted on the ***5th day of March, 2002,*** by the following vote:

AYES: CAMPOS, CHAVEZ, CORTESE, DANDO, DIQUISTO, REED, SHIRAKAWA, WILLIAMS, YEAGER; GONZALES

NOES: LeZOTTE

ABSENT: NONE

DISQ: NONE

Said ordinance is effective as of ***April 05, 2002.***

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the corporate seal of the City of San Jose, this ***6th day of March, 2002.***

(SEAL) Patricia L. O'Hearn
PATRICIA L. O'HEARN
CITY CLERK AND EX-OFFICIO
CLERK OF THE CITY COUNCIL

03.06.02 bc

PDCSH 01-09-088

ORDINANCE NO. 26579

AN URGENCY ORDINANCE OF THE CITY OF SAN JOSÉ REZONING CERTAIN REAL PROPERTY SITUATED ON THE NORTH SIDE OF STATE ROUTE 237, BETWEEN ZANKER ROAD AND COYOTE CREEK AND SETTING FORTH THE FACTS CONSTITUTING THE URGENCY.

WHEREAS, all rezoning proceedings required under the provisions of Chapter 20.120 of Title 20 of the San José Municipal Code have been duly had and taken with respect to the real property hereinafter described; and

WHEREAS, the area encompassed by the subject proposed rezoning was the subject of an Environmental Impact Report (EIR) prepared in conformance with the California Environmental Quality Act of 1970 (CEQA), as amended, and found complete by the Planning Commission on March 14, 2001; and

WHEREAS, the area encompassed by the subject proposed rezoning was the subject of a California Energy Commission Staff Assessment (SA) prepared in conformance with the California Environmental Quality Act of 1970 (CEQA), as amended, and considered by the Planning Commission on February 13, 2002; and

WHEREAS, this Council of the City of San José, acting as lead agency under CEQA, and as an agency that must make a decision on a power plant facility pursuant to Section 25519 of the California Public Resources Code, proposes to approve a project which was the subject of said EIR and SA, to wit: the adoption of an ordinance rezoning certain real property hereinafter described to A(PD) Planned Development Zoning District; and

WHEREAS, this Council has, on April 3, 2001, adopted Resolution No. 70259; and

WHEREAS, the Council is the decision-making body for subject rezoning to A(PD) Planned Development Zoning District; and

WHEREAS, this Council does hereby certify that, as a decision-making body, it has considered and approves the information contained in such EIR and SA prior to acting upon or approving such project; and

WHEREAS, the proposed project will not individually or cumulatively have an adverse effect on wildlife resources, as defined in Section 711.2 of the California Department of Fish and Game Code; and

WHEREAS, prior to February 19, 2002, the applicant has agreed to and shall have executed a hold harmless, release and indemnity agreement in a form acceptable to the City Attorney; and

WHEREAS, there is a continuing energy shortage in the State of California and a possibility

the Stage 2 and Stage 3 power alerts and rolling blackouts can occur during the upcoming summer months.

NOW THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF SAN JOSÉ,

SECTION 1. All that real property hereinafter described in this section, hereinafter referred to as "subject property," is hereby rezoned as A(PD) Planned Development.

The base district zoning of the subject property shall be A-Agricultural. The PD zoning of the subject property shall be that development plan for the subject property entitled, "Planned Development Zoning For Dataport/Los Esteros Critical Energy Facility," dated October 31, 2001, **last revised** February 2, 2002.

Said General Development Plan is on file in the office of the Director of Planning and is available for inspection by anyone interested therein, and said General Development Plan is by this reference adopted and incorporated herein the same as if it were fully set forth herein.

The subject property referred to in this section is all that real property situate in the County of Santa Clara, State of California, described in attached Exhibit A.

SECTION 2. The district map of the City is hereby amended accordingly.

SECTION 3. The land development approval which is the subject of City File No. (same as above) is subject to the operation of Part 2.75 of Chapter 15.12 of Title 15 of the San José Municipal Code. The applicant for or recipient of such land use approval hereby acknowledges receipt of notice that the issuance of a building permit to implement such land development approval may be suspended, conditioned or denied where the City Manager has determined that such action is necessary to remain within the aggregate operational capacity of the sanitary sewer system available to the City of San José or to meet the discharge standards of the sanitary sewer system imposed by the California Regional Water Quality Control Board for the San Francisco Bay Region.

SECTION 4. This Ordinance is declared by the City Council to be an urgency measure necessary for the immediate preservation of the public peace, health or safety. The facts constituting such urgency are: On January 17, 2001, the Governor of the State of California proclaimed a State of Emergency to exist due to the energy shortage in the State of California, as the State of California had been experiencing Stage 2 and Stage 3 power alerts as well as rolling blackouts. There is a continuing energy shortage in the State of California and, in recognition of the situation, the Governor has instituted an expedited process for the certification of certain power plants. The power plant portion of this project is being processed under an expedited process and will assist in alleviating the continued energy shortage. The Council's urgency action is needed to

PDCSH 01-09-088

allow the CEC's expedited schedule to continue and to enable the power plant to become operational by this summer, as currently planned, and is in furtherance and preservation of the public health, safety and welfare.

PASSED FOR PUBLICATION OF TITLE this 19th day of February, 2002.

AYES: CAMPOS, CHAVEV, CORTESE, DANDO, DIQUISTO, REED, SHIRAKAWA, WILLIAMS, YEAGER; GONZALES

NOES: LeZOTTE

ABSENT: NONE

DISQUALIFIED: NONE

Ron Gonzales

Ron Gonzales, Mayor

ATTEST:

Patricia L. O'Hearn

Patricia L. O'Hearn, City Clerk

EL:ll/207-02

EXHIBIT "A" PDC SH01 -09-088

SCHEDULE C
LEGAL DESCRIPTION

All that certain real property situate in the Unincorporated Area, County of Santa Clara, State of California, described as follows:

Beginning at a stake marked S.B. and 3/4" pipe driven along side of it, standing in the Northerly line of the Alviso and Milpitas Road, and at the Southeast corner of the 54.60 acre tract deeded by William Roots, et ux, to V.A. Silveira, by Deed of January 3, 1913 and recorded in the office of the County Recorder of Santa Clara County, in Book 398 of Deeds, Page 124, and from which a Maple 14" in diameter marked B.T.S.B., bears North 30° East One and 30/100 (1.30) feet; and a Maple 5" in diameter, marked B.T.S.B., bears North 50° West Three and 80/100 (3.80) feet; and running thence along the Northerly line of said road, North 73° 42' East 13.67 chains to a stake marked H.B., from which a Willow stub Two (2) feet in diameter, marked B.T.M., bears South 64° East Ten and 75/100 (10.75) feet; and thence South 72° 23' East 2.09 1/2 chains to a stake marked H.B.2; thence leaving said road and running along a fence, North 50° 37' East 1.09 1/2 chains to a stake marked H.B. 3 and North 30° 17' East 1.28 1/2 chains to a stake marked H.B. 4 and iron pipe; thence leaving said fence and following the Westerly line of the Coyote River as condemned by the County Authorities, One Hundred Fifty (150) feet wide with the following courses and distances; to wit: North 25° East 1.63 chains to a stake and iron pipe; North 6° 10' East 1.76 chains to a stake and iron pipe; North 3° 40' West 1.40 chains to a stake and iron pipe; North 23° 32' West 3.10 chains to a stake and iron pipe; North 35° 55' West 4.09 chains to a stake and iron pipe; North 41° West 3.69 chains to a stake and iron pipe; North 39° 5' West 5.54 chains to a stake and iron pipe; North 31° 5' West 2.74 chains to a stake and iron pipe; North 27° 33' West 1.90 chains to a stake and iron pipe; North 19° 3' West 2.36 chains to a stake and iron pipe; North 18° 20' West 3.79 chains to a stake and iron pipe; North 7° 13' West 5.05 chains to a stake marked B.1 and iron pipe; North 13° 15' West 1.22 chains to a stake marked B.4 and iron pipe; North 2° West 4.0007 chains to a stake marked B.3 and iron-pipe; North 5° East 1.92 chains to a stake marked B.2 and iron pipe; and North 3 1/2° West 1.55 chains to a pipe standing in the line between the lands of Mary E. McCarthy and the lands formerly of William Boots and in the Westerly line of the Coyote Creek Channel, as condemned by the County Authorities of Santa Clara County and from which a Weeping Willow three (3) feet in diameter marked B.T.B.M. bears North 73 1/2° Thirteen (13) feet; thence along the fence line between lands formerly of said Boots and McCarthy, South 73° 42' West 31.234 chains to a 6" x 6" fence post marked C.B.1, standing at the common corner for lands of said William Boots and the Heirs of C.H. Cropley, deceased, in the Southerly line of the lands of Mary E. McCarthy; thence along the fence line between lands of said Boots and the Cropley Heirs, South 15° 41' East 8.40 chains to a 2" x 3" stake marked S.1 and M.C., standing at the Northwesterly corner of lands of V.A. Silveira; thence along the Northerly line of said Silveira's land, North 73° 42' East 15.46 chains to a 3/4" pipe standing at the Northeast corner of said Silveira's land; and thence along the Easterly line of said Silveira's land, South 15° 41' East 35.32 chains to the Place of Beginning, and being a part of the William Boots Tract in the Rancho Rincon de los Esteros patented to Francisco Berryessa and B. Alviso.

Courses true. Var. 17° 55' East Surveyed December 17, 1919 by Chas. Herrmann of Herrmann Bros., Surveyors and C.E., San Jose, California; and being the same tract of land conveyed by William Boots and wife to Healy Bros. Co., a corporation by Deed dated January 8, 1920, recorded in the office of the County Recorder of the County of Santa Clara, State of California in Book 504 of Deeds, at Page 384.

Excepting therefrom, that portion of land as described in that certain Final Order of Condemnation to the Santa Clara Valley Water District, Case #713364 and filed for record in the office of the recorder of Santa Clara County on December 23, 1992 in Book M 556 at page 986, and being more particularly described as follows:

Being all of the lands described in the deed recorded in Book 762 of Official Records at page 694 in the office of the Recorder, County of Santa Clara, which lies Easterly of the following described Westerly lines:

Beginning at the Westerly terminus of the course described as N. 81° 53' 17" E. 858.27 feet in Parcel 1 of the deed to the State of California recorded in Book 5546 of Official Records at page 515, Santa Clara County Records; thence along said line N. 80° 46' 09" E. 619.15 feet; thence leaving said line, N. 46° 45' 24" E. 291.27 feet to the general Northerly line of Old Alviso - Milpitas Road; thence along said line S. 72° 23' 00" E. 5.65 feet to the true point of beginning; thence leaving said line N. 41° 17' 46" E. 64.47 feet; thence along a curve to the left having a radius of 335.72 feet through a central angle of 32° 18' 50" for an arc distance of 159.34 feet; thence N. 08° 58' 56" E. 78.65 feet; thence along a curve to the left having a radius of 380.15 feet through a central angle of 48° 27' 07" for an arc distance of 321.46 feet; thence N. 39° 28' 10" W. 397.90 feet; thence along a curve to the left having a radius of 626.12 feet through a central angle of 17° 58' 19" for an arc distance of 196.39 feet; thence N. 57° 26' 29" W. 298.90 feet; thence along a curve to the right having a radius of 454.90 feet through a central angle of 32° 25' 48" for an arc distance of 274.46 feet; thence N. 25° 00' 41" W. 192.12 feet; thence along a curve to the right having a radius of 1644.47 feet through a central angle of 11° 28' 54" for an arc distance of 329.54 feet; thence N. 13° 31' 47" W. 171.27 feet; thence along a curve to the right having a radius of 1232.96 feet through a central angle of 14° 18' 14" for an arc distance of 307.81 feet; thence N. 00° 46' 26" E. 396.08 feet to the Northerly line of said lands, as described in first said deed, and the Northerly terminus of this description.

ALSO, we note, but will not insure the rights and easements granted by William Boots and Margaret S. Boots, his wife, to Newton S. Jackson, Jr., and Edgar A. Jackson, by Deed dated October 14, 1927 and recorded December 6, 1927 in the office of the County Recorder of the County of Santa Clara, State of California, in Book 365 of Official Records, Page 178, to wit:

1. The right to use the roadway on the Westerly bank of the Coyote River, also called Coyote Creek, said roadway being used for ingress and egress to and from the lands of said Jackson lying Westerly of such road.

ARB No: 15-31-1
APN No: 015-31-054

# *Los Esteros Critical Energy Facility*

# *Appendix 8.7-A*
# *Ambient Noise Data – LECEF Phase 1*

***December 2003***

**TABLE NO-1**
Hourly Data – Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 1:02 PM | 65 | 68 | 61 |
| 2:02 PM | 64 | 66 | 60 |
| 3:02 PM | 63 | 66 | 59 |
| 4:02 PM | 64 | 66 | 59 |
| 5:02 PM | 63 | 65 | 59 |
| 6:02 PM | 63 | 65 | 58 |
| 7:02 PM | 63 | 65 | 59 |
| 8:02 PM | 63 | 65 | 57 |
| 9:02 PM | 62 | 64 | 57 |
| 10:02 PM | 62 | 64 | 57 |
| 11:02 PM | 62 | 63 | 56 |
| 12:02 AM | 60 | 62 | 53 |
| 1:02 AM | 58 | 61 | 48 |
| 2:02 AM | 56 | 58 | 43 |
| 3:02 AM | 55 | 58 | 41 |
| 4:02 AM | 58 | 61 | 45 |
| 5:02 AM | 63 | 66 | 57 |
| 6:02 AM | 67 | 69 | 64 |
| 7:02 AM | 63 | 65 | 59 |
| 8:02 AM | 61 | 64 | 58 |
| 9:02 AM | 60 | 63 | 57 |
| 10:02 AM | 61 | 63 | 56 |
| 11:02 AM | 67 | 69 | 62 |
| 12:02 PM | 66 | 68 | 61 |

**TABLE NO-2**

10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 11:02 | 65.7 | 68.0 | 62.0 |
| 11:12 | 66.4 | 68.5 | 61.5 |
| 11:22 | 64.9 | 67.5 | 61.5 |
| 11:32 | 65.6 | 68.5 | 61.5 |
| 11:42 | 65.1 | 67.5 | 61.5 |
| 11:52 | 64.9 | 67.0 | 61.0 |
| 12:02 | 65.5 | 68.0 | 61.0 |
| 12:12 | 64.6 | 67.0 | 60.5 |
| 12:22 | 65.8 | 68.0 | 61.0 |
| 12:32 | 65.1 | 68.0 | 61.0 |
| 12:42 | 65.3 | 67.5 | 61.5 |
| 12:52 | 64.2 | 66.0 | 61.5 |
| 13:02 | 66.2 | 68.5 | 61.5 |
| 13:12 | 64.7 | 67.0 | 61.0 |
| 13:22 | 64.1 | 66.0 | 60.0 |
| 13:32 | 65.1 | 67.5 | 61.0 |
| 13:42 | 63.9 | 66.0 | 60.5 |
| 13:52 | 63.9 | 66.0 | 60.0 |
| 14:02 | 63.4 | 65.5 | 59.5 |
| 14:12 | 63.3 | 65.5 | 59.5 |
| 14:22 | 63.3 | 65.5 | 59.0 |
| 14:32 | 64.7 | 67.0 | 59.5 |
| 14:42 | 62.7 | 64.5 | 59.0 |
| 14:52 | 63.9 | 66.0 | 59.0 |
| 15:02 | 62.4 | 64.5 | 57.5 |
| 15:12 | 62.9 | 65.5 | 58.5 |
| 15:22 | 63.4 | 65.5 | 59.0 |
| 15:32 | 64.2 | 66.5 | 59.5 |
| 15:42 | 64.2 | 67.0 | 59.0 |
| 15:52 | 63.2 | 65.5 | 58.5 |
| 16:02 | 63.7 | 66.5 | 59.0 |
| 16:12 | 63.5 | 65.0 | 60.0 |

**TABLE NO-2**
10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 16:22 | 63.0 | 65.0 | 59.0 |
| 16:32 | 62.6 | 65.0 | 57.0 |
| 16:42 | 63.4 | 66.0 | 59.5 |
| 16:52 | 62.5 | 64.0 | 59.0 |
| 17:02 | 62.7 | 64.5 | 59.0 |
| 17:12 | 64.8 | 66.5 | 59.0 |
| 17:22 | 62.0 | 64.0 | 57.0 |
| 17:32 | 63.2 | 65.5 | 58.5 |
| 17:42 | 62.6 | 64.5 | 58.5 |
| 17:52 | 62.9 | 65.0 | 59.0 |
| 18:02 | 63.2 | 65.0 | 57.5 |
| 18:12 | 63.0 | 64.5 | 60.0 |
| 18:22 | 63.9 | 65.0 | 58.5 |
| 18:32 | 61.9 | 64.0 | 58.0 |
| 18:42 | 62.5 | 65.0 | 58.5 |
| 18:52 | 62.2 | 64.0 | 59.0 |
| 19:02 | 65.4 | 64.5 | 58.5 |
| 19:12 | 61.3 | 63.5 | 57.0 |
| 19:22 | 64.9 | 67.0 | 58.0 |
| 19:32 | 63.8 | 66.0 | 57.0 |
| 19:42 | 61.8 | 63.5 | 57.0 |
| 19:52 | 63.9 | 67.0 | 57.0 |
| 20:02 | 61.7 | 64.0 | 57.0 |
| 20:12 | 63.1 | 64.5 | 57.0 |
| 20:22 | 61.6 | 63.5 | 57.0 |
| 20:32 | 62.0 | 63.5 | 57.5 |
| 20:42 | 63.2 | 65.0 | 57.0 |
| 20:52 | 60.6 | 63.0 | 56.0 |
| 21:02 | 61.5 | 63.5 | 56.5 |
| 21:12 | 61.9 | 64.0 | 57.5 |
| 21:22 | 61.9 | 64.0 | 57.5 |

**TABLE NO-2**
10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 21:32 | 61.8 | 64.5 | 56.5 |
| 21:42 | 62.4 | 65.0 | 58.0 |
| 21:52 | 60.9 | 62.5 | 56.5 |
| 22:02 | 61.4 | 64.0 | 56.5 |
| 22:12 | 60.1 | 62.5 | 55.5 |
| 22:22 | 66.2 | 64.0 | 56.5 |
| 22:32 | 61.5 | 64.5 | 56.0 |
| 22:42 | 61.0 | 63.0 | 56.0 |
| 22:52 | 60.8 | 63.0 | 55.5 |
| 23:02 | 60.4 | 63.0 | 55.0 |
| 23:12 | 60.8 | 63.0 | 55.5 |
| 23:22 | 60.5 | 63.0 | 54.0 |
| 23:32 | 60.6 | 63.5 | 53.5 |
| 23:42 | 58.0 | 60.5 | 50.0 |
| 23:52 | 58.5 | 60.5 | 48.5 |
| 0:02 | 57.5 | 60.0 | 50.5 |
| 0:12 | 57.5 | 60.5 | 49.5 |
| 0:22 | 59.4 | 63.0 | 48.0 |
| 0:32 | 58.7 | 61.0 | 48.5 |
| 0:42 | 57.6 | 60.0 | 47.0 |
| 0:52 | 58.4 | 61.0 | 44.5 |
| 1:02 | 56.8 | 58.5 | 46.5 |
| 1:12 | 57.0 | 58.5 | 45.0 |
| 1:22 | 52.2 | 56.0 | 43.5 |
| 1:32 | 55.6 | 57.5 | 40.5 |
| 1:42 | 55.6 | 58.5 | 43.0 |
| 1:52 | 56.6 | 59.0 | 41.5 |
| 2:02 | 56.8 | 59.5 | 44.5 |
| 2:12 | 54.3 | 57.0 | 37.5 |
| 2:22 | 55.4 | 57.5 | 40.5 |
| 2:32 | 55.6 | 58.5 | 44.0 |

**TABLE NO-2**
10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 2:42 | 56.7 | 59.5 | 43.0 |
| 2:52 | 55.1 | 59.0 | 40.0 |
| 3:02 | 54.8 | 58.0 | 41.0 |
| 3:12 | 55.7 | 58.5 | 39.5 |
| 3:22 | 57.9 | 61.5 | 41.5 |
| 3:32 | 59.7 | 62.5 | 46.5 |
| 3:42 | 58.6 | 61.5 | 44.5 |
| 3:52 | 57.8 | 61.0 | 46.5 |
| 4:02 | 59.2 | 62.0 | 46.5 |
| 4:12 | 60.7 | 63.0 | 49.5 |
| 4:22 | 60.4 | 63.5 | 51.5 |
| 4:32 | 62.0 | 64.5 | 55.5 |
| 4:42 | 63.8 | 66.5 | 59.0 |
| 4:52 | 64.5 | 66.5 | 59.5 |
| 5:02 | 65.5 | 68.0 | 60.0 |
| 5:12 | 66.2 | 68.5 | 61.5 |
| 5:22 | 66.5 | 68.5 | 63.5 |
| 5:32 | 67.4 | 69.0 | 64.5 |
| 5:42 | 66.9 | 68.5 | 64.5 |
| 5:52 | 67.7 | 69.5 | 65.0 |
| 6:02 | 67.2 | 69.0 | 64.5 |
| 6:12 | 65.4 | 67.5 | 59.5 |
| 6:22 | 62.4 | 64.5 | 59.0 |
| 6:32 | 61.8 | 63.5 | 58.5 |
| 6:42 | 61.0 | 62.5 | 58.0 |
| 6:52 | 62.1 | 64.0 | 58.5 |
| 7:02 | 61.4 | 63.5 | 58.0 |
| 7:12 | 61.6 | 64.0 | 58.0 |
| 7:22 | 61.1 | 63.5 | 57.0 |
| 7:32 | 61.2 | 63.0 | 57.0 |
| 7:42 | 61.7 | 64.0 | 58.0 |

**TABLE NO-2**
10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 7:52 | 61.5 | 64.0 | 58.0 |
| 8:02 | 61.0 | 62.5 | 57.0 |
| 8:12 | 61.6 | 64.0 | 57.0 |
| 8:22 | 60.3 | 62.5 | 57.0 |
| 8:32 | 59.9 | 61.5 | 55.5 |
| 8:42 | 58.6 | 60.5 | 56.0 |
| 8:52 | 61.6 | 64.0 | 57.5 |
| 9:02 | 59.6 | 61.5 | 56.0 |
| 9:12 | 60.9 | 63.5 | 56.5 |
| 9:22 | 61.1 | 63.0 | 56.0 |
| 9:32 | 61.1 | 62.5 | 54.5 |
| 9:42 | 60.1 | 62.5 | 54.5 |
| 9:52 | 62.0 | 64.5 | 56.0 |
| 10:02 | 61.8 | 64.5 | 57.0 |
| 10:12 | 69.5 | 67.0 | 59.0 |
| 10:22 | 66.5 | 69.5 | 61.5 |
| 10:32 | 66.4 | 68.5 | 63.0 |
| 10:42 | 66.0 | 68.0 | 63.0 |
| 10:52 | 66.8 | 69.5 | 61.5 |
| 11:02 | 65.7 | 68.0 | 62.5 |
| 11:12 | 65.8 | 68.0 | 62.5 |
| 11:22 | 65.8 | 68.5 | 61.5 |
| 11:32 | 66.5 | 69.0 | 60.0 |
| 11:42 | 65.4 | 67.5 | 61.5 |
| 11:52 | 65.4 | 67.5 | 61.5 |
| 12:02 | 64.9 | 67.5 | 60.0 |
| 12:12 | 66.6 | 68.5 | 60.0 |
| 12:22 | 65.9 | 68.5 | 60.5 |
| 12:32 | 65.5 | 67.5 | 60.5 |
| 12:42 | 64.6 | 66.5 | 61.5 |

**TABLE NO-2**
10-minute Measurements - Position M1

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|

**TABLE NO-3**
Hourly Data – Position M2

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 1:02 PM | 54 | 59 | 40 |
| 2:02 PM | 54 | 56 | 43 |
| 3:02 PM | 55 | 53 | 45 |
| 4:02 PM | 59 | 59 | 48 |
| 5:02 PM | 57 | 59 | 47 |
| 6:02 PM | 59 | 60 | 47 |
| 7:02 PM | 58 | 58 | 46 |
| 8:02 PM | 60 | 62 | 47 |
| 9:02 PM | 56 | 55 | 45 |
| 10:02 PM | 52 | 53 | 44 |
| 11:02 PM | 59 | 50 | 40 |
| 12:02 AM | 49 | 47 | 39 |
| 1:02 AM | 40 | 42 | 38 |
| 2:02 AM | 39 | 41 | 36 |
| 3:02 AM | 39 | 41 | 36 |
| 4:02 AM | 40 | 41 | 37 |
| 5:02 AM | 44 | 45 | 42 |
| 6:02 AM | 47 | 48 | 45 |
| 7:02 AM | 47 | 49 | 45 |
| 8:02 AM | 47 | 48 | 44 |
| 9:02 AM | 45 | 47 | 42 |
| 10:02 AM | 55 | 57 | 42 |
| 11:02 AM | 63 | 61 | 43 |

**TABLE NO-3**
Hourly Data – Position M2

| Hour Ending | Leq | L10 | L90 |
|---|---|---|---|
| 12:02 PM | 59 | 55 | 40 |
| 1:02 PM | 58 | 61 | 41 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 11:32 | 43.6 | 45.5 | 41.5 |
| 11:42 | 43.0 | 44.5 | 40.5 |
| 11:52 | 45.3 | 47.5 | 41.5 |
| 12:02 | 43.9 | 45.0 | 41.0 |
| 12:12 | 42.2 | 44.0 | 40.0 |
| 12:22 | 42.2 | 43.5 | 40.0 |
| 12:32 | 42.5 | 45.0 | 39.5 |
| 12:42 | 40.8 | 42.5 | 38.5 |
| 12:52 | 44.3 | 47.0 | 39.0 |
| 13:02 | 61.8 | 67.0 | 43.0 |
| 13:12 | 57.4 | 57.5 | 40.0 |
| 13:22 | 53.9 | 56.5 | 40.5 |
| 13:32 | 56.4 | 60.5 | 41.0 |
| 13:42 | 52.8 | 53.5 | 44.0 |
| 13:52 | 49.2 | 50.0 | 44.5 |
| 14:02 | 47.2 | 48.0 | 45.5 |
| 14:12 | 46.6 | 48.0 | 44.5 |
| 14:22 | 52.7 | 53.5 | 46.0 |
| 14:32 | 60.5 | 54.0 | 45.5 |
| 14:42 | 52.6 | 55.0 | 44.5 |
| 14:52 | 48.8 | 51.5 | 44.5 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 15:02 | 49.9 | 52.5 | 44.0 |
| 15:12 | 54.8 | 57.5 | 46.5 |
| 15:22 | 54.0 | 56.0 | 47.5 |
| 15:32 | 60.2 | 60.0 | 48.0 |
| 15:42 | 63.5 | 60.0 | 47.5 |
| 15:52 | 56.2 | 60.0 | 48.0 |
| 16:02 | 57.4 | 58.0 | 47.5 |
| 16:12 | 57.0 | 60.0 | 47.0 |
| 16:22 | 58.8 | 61.5 | 47.0 |
| 16:32 | 56.2 | 57.5 | 47.5 |
| 16:42 | 59.6 | 62.0 | 47.5 |
| 16:52 | 50.4 | 52.0 | 46.5 |
| 17:02 | 55.8 | 57.5 | 46.5 |
| 17:12 | 60.6 | 64.0 | 47.5 |
| 17:22 | 49.0 | 50.5 | 45.5 |
| 17:32 | 58.3 | 58.5 | 45.5 |
| 17:42 | 55.5 | 57.5 | 46.0 |
| 17:52 | 58.3 | 63.5 | 48.5 |
| 18:02 | 63.3 | 56.0 | 45.0 |
| 18:12 | 51.7 | 54.5 | 46.5 |
| 18:22 | 59.8 | 61.5 | 45.0 |
| 18:32 | 49.9 | 51.0 | 45.0 |
| 18:42 | 49.3 | 48.0 | 45.0 |
| 18:52 | 50.5 | 54.0 | 45.0 |
| 19:02 | 63.6 | 62.5 | 47.0 |
| 19:12 | 50.8 | 50.0 | 46.0 |
| 19:22 | 66.0 | 67.5 | 48.0 |
| 19:32 | 58.7 | 62.0 | 47.5 |
| 19:42 | 52.8 | 55.5 | 46.5 |
| 19:52 | 56.8 | 57.5 | 47.0 |
| 20:02 | 57.2 | 54.5 | 46.0 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 20:12 | 57.9 | 55.5 | 45.0 |
| 20:22 | 52.0 | 50.5 | 44.5 |
| 20:32 | 55.6 | 53.5 | 44.5 |
| 20:42 | 59.5 | 60.5 | 45.5 |
| 20:52 | 50.9 | 52.5 | 45.5 |
| 21:02 | 49.0 | 50.0 | 45.0 |
| 21:12 | 56.3 | 54.0 | 45.0 |
| 21:22 | 48.3 | 52.0 | 44.0 |
| 21:32 | 53.5 | 55.0 | 44.0 |
| 21:42 | 53.0 | 55.0 | 44.0 |
| 21:52 | 50.6 | 54.0 | 42.5 |
| 22:02 | 45.0 | 46.0 | 41.5 |
| 22:12 | 51.1 | 50.0 | 41.0 |
| 22:22 | 66.9 | 52.0 | 41.0 |
| 22:32 | 46.6 | 45.5 | 41.0 |
| 22:42 | 52.9 | 54.0 | 39.5 |
| 22:52 | 41.4 | 41.5 | 39.5 |
| 23:02 | 44.4 | 47.5 | 39.0 |
| 23:12 | 53.7 | 48.0 | 41.0 |
| 23:22 | 52.8 | 53.0 | 40.5 |
| 23:32 | 41.0 | 41.0 | 38.5 |
| 23:42 | 39.5 | 40.5 | 38.0 |
| 23:52 | 41.6 | 40.0 | 38.0 |
| 0:02 | 40.2 | 41.5 | 38.0 |
| 0:12 | 39.7 | 41.0 | 38.0 |
| 0:22 | 40.7 | 42.0 | 38.5 |
| 0:32 | 41.1 | 43.0 | 39.0 |
| 0:42 | 40.8 | 42.5 | 38.5 |
| 0:52 | 40.9 | 41.5 | 37.5 |
| 1:02 | 38.2 | 39.5 | 36.5 |
| 1:12 | 38.5 | 40.5 | 36.0 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 1:22 | 37.8 | 39.0 | 36.0 |
| 1:32 | 38.4 | 39.5 | 36.5 |
| 1:42 | 38.6 | 40.0 | 36.5 |
| 1:52 | 39.1 | 41.0 | 36.0 |
| 2:02 | 42.4 | 43.0 | 37.0 |
| 2:12 | 39.9 | 41.5 | 36.0 |
| 2:22 | 39.1 | 41.5 | 36.0 |
| 2:32 | 37.9 | 39.5 | 35.5 |
| 2:42 | 38.3 | 39.5 | 35.0 |
| 2:52 | 38.2 | 39.5 | 36.5 |
| 3:02 | 40.3 | 42.0 | 36.0 |
| 3:12 | 36.8 | 38.5 | 34.5 |
| 3:22 | 40.0 | 42.5 | 34.0 |
| 3:32 | 37.8 | 38.5 | 36.0 |
| 3:42 | 39.5 | 40.5 | 38.0 |
| 3:52 | 41.1 | 42.5 | 39.0 |
| 4:02 | 41.3 | 42.5 | 39.5 |
| 4:12 | 42.5 | 44.0 | 40.5 |
| 4:22 | 42.3 | 43.5 | 40.5 |
| 4:32 | 44.5 | 46.0 | 41.5 |
| 4:42 | 43.3 | 44.0 | 42.0 |
| 4:52 | 43.8 | 45.0 | 42.0 |
| 5:02 | 44.6 | 46.0 | 42.5 |
| 5:12 | 45.9 | 46.5 | 44.5 |
| 5:22 | 46.2 | 47.5 | 44.5 |
| 5:32 | 45.9 | 46.5 | 44.5 |
| 5:42 | 46.8 | 48.0 | 45.5 |
| 5:52 | 47.4 | 48.0 | 45.5 |
| 6:02 | 47.6 | 48.5 | 46.0 |
| 6:12 | 47.7 | 49.5 | 45.0 |
| 6:22 | 48.9 | 50.0 | 45.0 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 6:32 | 46.5 | 47.5 | 44.5 |
| 6:42 | 47.0 | 48.5 | 45.0 |
| 6:52 | 47.2 | 48.5 | 44.5 |
| 7:02 | 45.3 | 46.0 | 44.0 |
| 7:12 | 47.6 | 48.5 | 44.5 |
| 7:22 | 46.4 | 47.5 | 45.0 |
| 7:32 | 46.9 | 48.0 | 44.5 |
| 7:42 | 47.6 | 50.5 | 44.0 |
| 7:52 | 46.1 | 47.0 | 43.5 |
| 8:02 | 44.9 | 46.0 | 43.0 |
| 8:12 | 44.2 | 45.0 | 41.5 |
| 8:22 | 44.6 | 47.0 | 41.5 |
| 8:32 | 45.6 | 47.5 | 42.5 |
| 8:42 | 44.0 | 45.5 | 41.5 |
| 8:52 | 44.7 | 47.5 | 42.0 |
| 9:02 | 45.4 | 47.0 | 42.5 |
| 9:12 | 50.4 | 53.5 | 42.5 |
| 9:22 | 55.9 | 58.5 | 42.0 |
| 9:32 | 52.7 | 54.5 | 42.5 |
| 9:42 | 59.1 | 59.5 | 43.0 |
| 9:52 | 56.3 | 59.5 | 43.0 |
| 10:02 | 48.8 | 46.5 | 41.5 |
| 10:12 | 69.4 | 66.0 | 43.0 |
| 10:22 | 59.9 | 61.0 | 44.0 |
| 10:32 | 46.6 | 49.0 | 42.0 |
| 10:42 | 50.4 | 52.0 | 42.5 |
| 10:52 | 58.5 | 61.0 | 43.5 |
| 11:02 | 51.7 | 46.0 | 41.5 |
| 11:12 | 44.8 | 47.5 | 40.5 |
| 11:22 | 44.1 | 45.5 | 39.5 |
| 11:32 | 66.7 | 59.0 | 39.5 |

**TABLE NO-4**
10-minute Measurements – Position M2

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 11:42 | 46.2 | 50.0 | 40.0 |
| 11:52 | 46.1 | 46.5 | 39.5 |
| 12:02 | 55.0 | 58.5 | 40.0 |
| 12:12 | 60.3 | 64.0 | 42.0 |
| 12:22 | 56.5 | 57.5 | 39.5 |
| 12:32 | 60.6 | 64.0 | 40.0 |
| 12:42 | 51.4 | 54.5 | 39.5 |
| 12:52 | 58.3 | 58.5 | 40.0 |
| 13:02 | 55.0 | 59.0 | 43.5 |

**TABLE NO-5**
Hourly Results – Position M3

| Time | Leq (hr) | L10 (hr) | L90 (hr) |
|---|---|---|---|
| 3:03 PM | 56 | 57 | 47 |
| 4:03 PM | 59 | 62 | 52 |
| 5:03 PM | 59 | 59 | 53 |
| 6:03 PM | 59 | 60 | 52 |
| 7:03 PM | 57 | 59 | 49 |
| 8:03 PM | 60 | 62 | 45 |
| 9:03 PM | 53 | 55 | 42 |
| 10:03 PM | 49 | 52 | 40 |
| 11:03 PM | 56 | 49 | 38 |
| 12:03 AM | 38 | 40 | 37 |
| 1:03 AM | 37 | 38 | 36 |
| 2:03 AM | 43 | 43 | 37 |
| 3:03 AM | 42 | 44 | 38 |
| 4:03 AM | 42 | 44 | 38 |

**TABLE NO-5**
Hourly Results – Position M3

| Time | Leq (hr) | L10 (hr) | L90 (hr) |
|---|---|---|---|
| 5:03 AM | 48 | 49 | 45 |
| 6:03 AM | 52 | 54 | 50 |
| 7:03 AM | 52 | 54 | 50 |
| 8:03 AM | 50 | 51 | 47 |
| 9:03 AM | 52 | 54 | 49 |
| 10:03 AM | 51 | 53 | 48 |
| 11:03 AM | 47 | 49 | 43 |
| 12:03 PM | 45 | 46 | 41 |
| 1:03 PM | 54 | 57 | 43 |
| 2:03 PM | 55 | 58 | 48 |
| 3:03 PM | 57 | 57 | 48 |
| 4:03 PM | 61 | 59 | 50 |
| 5:03 PM | 59 | 61 | 52 |
| 6:03 PM | 59 | 61 | 51 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 14:43 | 59.0 | 61.0 | 47.0 |
| 14:53 | 54.1 | 58.5 | 46.5 |
| 15:03 | 51.6 | 53.5 | 47.5 |
| 15:13 | 56.7 | 59.0 | 49.5 |
| 15:23 | 61.9 | 64.0 | 53.0 |
| 15:33 | 56.6 | 58.0 | 52.5 |
| 15:43 | 55.3 | 57.5 | 51.5 |
| 15:53 | 60.6 | 61.5 | 53.5 |
| 16:03 | 61.1 | 65.0 | 52.5 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 16:13 | 55.2 | 57.0 | 52.5 |
| 16:23 | 57.4 | 61.0 | 52.5 |
| 16:33 | 55.3 | 57.0 | 52.5 |
| 16:43 | 55.8 | 57.5 | 52.5 |
| 16:53 | 60.3 | 60.5 | 54.0 |
| 17:03 | 63.4 | 61.0 | 53.5 |
| 17:13 | 60.3 | 64.0 | 52.5 |
| 17:23 | 58.6 | 60.5 | 53.0 |
| 17:33 | 56.6 | 58.0 | 52.0 |
| 17:43 | 61.1 | 60.5 | 52.5 |
| 17:53 | 58.8 | 59.0 | 52.0 |
| 18:03 | 53.0 | 54.0 | 51.0 |
| 18:13 | 61.5 | 64.5 | 52.0 |
| 18:23 | 54.0 | 55.5 | 49.5 |
| 18:33 | 52.0 | 53.5 | 48.5 |
| 18:43 | 51.0 | 52.5 | 47.0 |
| 18:53 | 53.7 | 57.5 | 47.0 |
| 19:03 | 59.1 | 58.0 | 46.0 |
| 19:13 | 64.8 | 64.5 | 46.0 |
| 19:23 | 60.8 | 64.5 | 46.5 |
| 19:33 | 60.4 | 63.5 | 45.0 |
| 19:43 | 51.3 | 54.5 | 45.5 |
| 19:53 | 55.2 | 57.5 | 44.0 |
| 20:03 | 51.5 | 51.0 | 43.5 |
| 20:13 | 54.4 | 57.5 | 42.0 |
| 20:23 | 51.3 | 54.5 | 42.5 |
| 20:33 | 57.7 | 58.0 | 42.5 |
| 20:43 | 43.4 | 44.0 | 41.5 |
| 20:53 | 47.8 | 51.0 | 41.0 |
| 21:03 | 50.7 | 55.0 | 40.5 |
| 21:13 | 49.6 | 52.5 | 40.5 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 21:23 | 46.4 | 48.0 | 40.5 |
| 21:33 | 49.3 | 50.0 | 40.5 |
| 21:43 | 52.7 | 56.0 | 41.5 |
| 21:53 | 49.8 | 49.0 | 39.5 |
| 22:03 | 43.9 | 45.0 | 39.5 |
| 22:13 | 63.9 | 54.0 | 39.0 |
| 22:23 | 39.7 | 40.0 | 38.5 |
| 22:33 | 48.5 | 49.0 | 38.5 |
| 22:43 | 46.4 | 48.5 | 38.0 |
| 22:53 | 41.4 | 45.5 | 37.5 |
| 23:03 | 41.5 | 44.0 | 38.5 |
| 23:13 | 38.4 | 39.0 | 37.5 |
| 23:23 | 39.4 | 42.0 | 37.5 |
| 23:33 | 38.6 | 40.5 | 37.0 |
| 23:43 | 37.5 | 38.0 | 36.5 |
| 23:53 | 38.1 | 39.0 | 37.0 |
| 0:03 | 37.6 | 38.0 | 36.5 |
| 0:13 | 37.6 | 38.5 | 36.5 |
| 0:23 | 36.8 | 38.0 | 35.5 |
| 0:33 | 36.6 | 37.0 | 35.5 |
| 0:43 | 36.0 | 36.5 | 35.0 |
| 0:53 | 37.6 | 38.5 | 35.5 |
| 1:03 | 38.1 | 40.0 | 36.0 |
| 1:13 | 37.9 | 39.5 | 35.5 |
| 1:23 | 48.1 | 45.5 | 36.5 |
| 1:33 | 42.0 | 45.5 | 37.0 |
| 1:43 | 40.9 | 42.5 | 38.0 |
| 1:53 | 38.5 | 39.5 | 37.0 |
| 2:03 | 38.7 | 39.5 | 37.5 |
| 2:13 | 39.1 | 40.5 | 37.0 |
| 2:23 | 41.3 | 45.0 | 37.5 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 2:33 | 45.3 | 47.5 | 39.5 |
| 2:43 | 42.2 | 44.0 | 39.5 |
| 2:53 | 42.4 | 44.5 | 38.5 |
| 3:03 | 39.8 | 41.0 | 38.0 |
| 3:13 | 40.1 | 42.5 | 37.0 |
| 3:23 | 39.9 | 41.5 | 37.5 |
| 3:33 | 46.1 | 48.0 | 40.0 |
| 3:43 | 41.1 | 42.5 | 38.5 |
| 3:53 | 40.2 | 42.0 | 38.0 |
| 4:03 | 41.7 | 43.5 | 39.0 |
| 4:13 | 41.2 | 42.5 | 39.0 |
| 4:23 | 44.8 | 46.5 | 41.0 |
| 4:33 | 48.7 | 50.0 | 45.5 |
| 4:43 | 47.2 | 48.0 | 45.5 |
| 4:53 | 47.9 | 49.0 | 45.5 |
| 5:03 | 50.3 | 52.5 | 46.5 |
| 5:13 | 52.2 | 54.0 | 50.0 |
| 5:23 | 51.6 | 53.0 | 48.5 |
| 5:33 | 53.7 | 55.0 | 51.5 |
| 5:43 | 52.7 | 54.0 | 50.0 |
| 5:53 | 51.1 | 52.0 | 49.0 |
| 6:03 | 52.0 | 53.5 | 50.0 |
| 6:13 | 52.5 | 54.0 | 50.5 |
| 6:23 | 53.3 | 55.0 | 51.0 |
| 6:33 | 53.2 | 54.5 | 50.0 |
| 6:43 | 52.0 | 53.5 | 49.0 |
| 6:53 | 52.0 | 53.5 | 49.5 |
| 7:03 | 51.7 | 53.5 | 48.5 |
| 7:13 | 51.5 | 53.5 | 48.5 |
| 7:23 | 51.1 | 52.0 | 49.0 |
| 7:33 | 49.5 | 51.5 | 46.5 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 7:43 | 48.4 | 49.5 | 46.5 |
| 7:53 | 48.6 | 50.0 | 46.0 |
| 8:03 | 48.5 | 50.0 | 46.0 |
| 8:13 | 51.1 | 52.5 | 48.5 |
| 8:23 | 52.3 | 54.0 | 49.5 |
| 8:33 | 50.9 | 53.5 | 47.5 |
| 8:43 | 52.1 | 54.5 | 49.5 |
| 8:53 | 51.4 | 53.5 | 48.5 |
| 9:03 | 53.1 | 55.0 | 49.5 |
| 9:13 | 53.2 | 54.5 | 51.0 |
| 9:23 | 52.0 | 54.0 | 48.5 |
| 9:33 | 51.6 | 54.0 | 46.5 |
| 9:43 | 49.8 | 52.0 | 46.5 |
| 9:53 | 49.6 | 52.0 | 46.0 |
| 10:03 | 48.8 | 51.5 | 46.0 |
| 10:13 | 47.6 | 49.5 | 43.5 |
| 10:23 | 47.6 | 50.0 | 44.5 |
| 10:33 | 46.4 | 48.5 | 44.0 |
| 10:43 | 48.0 | 50.0 | 42.5 |
| 10:53 | 45.1 | 47.0 | 42.5 |
| 11:03 | 46.0 | 48.5 | 42.5 |
| 11:13 | 43.0 | 44.5 | 41.5 |
| 11:23 | 43.4 | 45.5 | 41.0 |
| 11:33 | 47.2 | 48.5 | 42.0 |
| 11:43 | 45.5 | 47.5 | 42.0 |
| 11:53 | 44.0 | 46.0 | 41.5 |
| 12:03 | 43.8 | 45.5 | 40.5 |
| 12:13 | 49.3 | 52.0 | 41.0 |
| 12:23 | 45.4 | 48.0 | 42.0 |
| 12:33 | 46.2 | 48.5 | 42.5 |
| 12:43 | 59.4 | 62.0 | 43.0 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 12:53 | 53.4 | 57.5 | 43.5 |
| 13:03 | 54.9 | 59.0 | 46.0 |
| 13:13 | 54.1 | 55.5 | 46.5 |
| 13:23 | 55.4 | 59.0 | 47.0 |
| 13:33 | 58.0 | 60.5 | 48.0 |
| 13:43 | 54.4 | 56.0 | 50.5 |
| 13:53 | 54.8 | 57.0 | 49.0 |
| 14:03 | 52.5 | 54.5 | 47.5 |
| 14:13 | 60.0 | 56.0 | 46.5 |
| 14:23 | 50.0 | 53.0 | 44.5 |
| 14:33 | 56.8 | 61.0 | 47.5 |
| 14:43 | 60.1 | 55.0 | 47.5 |
| 14:53 | 53.5 | 56.0 | 47.5 |
| 15:03 | 57.1 | 59.0 | 50.0 |
| 15:13 | 58.7 | 56.5 | 50.0 |
| 15:23 | 56.8 | 58.0 | 49.5 |
| 15:33 | 54.1 | 55.5 | 50.0 |
| 15:43 | 54.4 | 55.0 | 49.0 |
| 15:53 | 66.0 | 62.0 | 50.5 |
| 16:03 | 61.3 | 61.0 | 50.0 |
| 16:13 | 60.2 | 61.5 | 51.0 |
| 16:23 | 61.7 | 65.0 | 52.0 |
| 16:33 | 60.0 | 60.5 | 53.0 |
| 16:43 | 55.5 | 57.0 | 51.5 |
| 16:53 | 56.5 | 59.0 | 52.5 |
| 17:03 | 56.5 | 58.0 | 52.5 |
| 17:13 | 62.8 | 65.0 | 53.5 |
| 17:23 | 54.9 | 57.0 | 51.0 |
| 17:33 | 57.1 | 59.5 | 51.0 |
| 17:43 | 53.4 | 55.5 | 50.0 |
| 17:53 | 60.8 | 64.5 | 50.5 |

**TABLE NO-6**
10-minute Measurements – Position M3

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 18:03 | 54.6 | 56.5 | 51.5 |
| 18:13 | 60.5 | 62.0 | 52.5 |
| 18:23 | 59.3 | 60.0 | 51.5 |
| 18:33 | 59.2 | 62.0 | 52.0 |
| 18:43 | 62.2 | 61.0 | 51.0 |
| 18:53 | 56.3 | 59.0 | 50.0 |

**TABLE NO-7**
Hourly Results – Position M4

| Time | Leq (hr) | L10 (hr) | L90 (hr) |
|---|---|---|---|
| 7:00 PM | 60 | 64 | 52 |
| 8:00 PM | 64 | 66 | 52 |
| 9:00 PM | 59 | 61 | 54 |
| 10:00 PM | 59 | 60 | 55 |
| 11:00 PM | 62 | 59 | 55 |
| 12:00 AM | 59 | 60 | 57 |
| | | | |
| 8:00 PM | 63 | 65 | 53 |
| 9:00 PM | 60 | 63 | 54 |
| 10:00 PM | 59 | 61 | 55 |
| 11:00 PM | 60 | 61 | 56 |
| 12:00 AM | 61 | 62 | 59 |
| 1:00 AM | 62 | 63 | 60 |
| 2:00 AM | 63 | 63 | 61 |
| 3:00 AM | 62 | 63 | 60 |
| 4:00 AM | 60 | 61 | 58 |
| 5:00 AM | 61 | 63 | 58 |

**TABLE NO-7**
Hourly Results – Position M4

| Time | Leq (hr) | L10 (hr) | L90 (hr) |
|---|---|---|---|
| 6:00 AM | 64 | 66 | 61 |
| 7:00 AM | 64 | 68 | 56 |
| 8:00 AM | 65 | 69 | 53 |
| 9:00 AM | 64 | 68 | 52 |
| 10:00 AM | 64 | 68 | 52 |
| 11:00 AM | 65 | 68 | 51 |
| 12:00 PM | 64 | 67 | 51 |
| 1:00 PM | 64 | 67 | 51 |

**TABLE NO-8**
10-minute Results – Position M4

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 19:10 | 67.5 | 62.5 | 52.0 |
| 19:20 | 62.7 | 66.0 | 53.5 |
| 19:30 | 61.8 | 64.5 | 52.5 |
| 19:40 | 59.3 | 63.5 | 52.5 |
| 19:50 | 63.7 | 68.0 | 53.5 |
| 20:00 | 59.3 | 62.0 | 53.5 |
| 20:10 | 56.1 | 57.5 | 52.5 |
| 20:20 | 61.2 | 64.5 | 54.0 |
| 20:30 | 61.9 | 62.5 | 53.5 |
| 20:40 | 59.8 | 61.0 | 54.0 |
| 20:50 | 62.6 | 67.0 | 54.5 |
| 21:00 | 57.6 | 59.0 | 54.5 |
| 21:10 | 60.4 | 64.5 | 54.5 |
| 21:20 | 58.0 | 59.0 | 54.5 |
| 21:30 | 58.0 | 59.5 | 54.0 |

**TABLE NO-8**
10-minute Results – Position M4

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 21:40 | 58.1 | 59.0 | 54.5 |
| 21:50 | 58.7 | 61.0 | 55.0 |
| 22:00 | 58.7 | 60.5 | 55.0 |
| 22:10 | 61.4 | 61.0 | 55.0 |
| 22:20 | 58.3 | 60.0 | 55.0 |
| 22:30 | 58.2 | 59.5 | 55.0 |
| 22:40 | 59.5 | 62.0 | 55.0 |
| 22:50 | 60.4 | 62.0 | 56.0 |
| 23:00 | 60.8 | 62.0 | 58.5 |
| 23:10 | 62.2 | 63.5 | 59.0 |
| 23:20 | 61.2 | 62.5 | 59.0 |
| 23:30 | 60.7 | 61.5 | 58.0 |
| 23:40 | 60.0 | 61.0 | 58.0 |
| 23:50 | 61.4 | 62.5 | 59.0 |
| 0:00 | 61.3 | 62.0 | 59.5 |
| 0:10 | 61.0 | 62.0 | 59.0 |
| 0:20 | 61.8 | 63.0 | 60.0 |
| 0:30 | 62.0 | 63.0 | 60.5 |
| 0:40 | 61.7 | 62.5 | 60.0 |
| 0:50 | 62.7 | 63.5 | 61.0 |
| 1:00 | 62.9 | 63.5 | 61.5 |
| 1:10 | 63.4 | 64.0 | 62.0 |
| 1:20 | 63.0 | 64.0 | 61.5 |
| 1:30 | 63.1 | 64.0 | 62.0 |
| 1:40 | 61.7 | 62.5 | 59.5 |
| 1:50 | 60.4 | 61.5 | 58.0 |
| 2:00 | 63.2 | 64.0 | 62.0 |
| 2:10 | 62.2 | 63.0 | 60.5 |
| 2:20 | 62.1 | 63.0 | 60.5 |
| 2:30 | 62.2 | 63.0 | 60.5 |
| 2:40 | 61.1 | 62.5 | 59.0 |

**TABLE NO-8**
10-minute Results – Position M4

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 2:50 | 61.0 | 62.0 | 59.0 |
| 3:00 | 62.0 | 64.0 | 59.5 |
| 3:10 | 60.5 | 62.5 | 57.5 |
| 3:20 | 59.2 | 60.5 | 57.5 |
| 3:30 | 59.4 | 60.0 | 57.0 |
| 3:40 | 59.1 | 60.5 | 57.5 |
| 3:50 | 60.3 | 61.5 | 58.0 |
| 4:00 | 61.6 | 62.5 | 59.5 |
| 4:10 | 61.5 | 63.0 | 59.0 |
| 4:20 | 62.9 | 64.0 | 60.0 |
| 4:30 | 60.8 | 63.0 | 57.0 |
| 4:40 | 61.4 | 63.5 | 57.0 |
| 4:50 | 60.3 | 61.0 | 57.5 |
| 5:00 | 60.0 | 61.5 | 58.0 |
| 5:10 | 61.4 | 62.5 | 58.5 |
| 5:20 | 63.6 | 65.5 | 57.5 |
| 5:30 | 64.2 | 66.0 | 60.5 |
| 5:40 | 65.4 | 67.0 | 62.5 |
| 5:50 | 65.3 | 67.0 | 61.5 |
| 6:00 | 64.3 | 66.0 | 61.0 |
| 6:10 | 63.1 | 66.5 | 57.0 |
| 6:20 | 63.5 | 66.5 | 56.5 |
| 6:30 | 63.5 | 66.5 | 57.0 |
| 6:40 | 65.4 | 68.0 | 56.5 |
| 6:50 | 66.0 | 69.5 | 53.5 |
| 7:00 | 63.9 | 68.0 | 53.5 |
| 7:10 | 62.9 | 67.0 | 54.5 |
| 7:20 | 66.6 | 71.0 | 55.5 |
| 7:30 | 65.1 | 69.0 | 52.5 |
| 7:40 | 63.5 | 67.5 | 51.5 |
| 7:50 | 64.8 | 69.0 | 51.5 |

**TABLE NO-8**
10-minute Results – Position M4

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 8:00 | 63.3 | 67.0 | 52.5 |
| 8:10 | 63.8 | 68.0 | 51.5 |
| 8:20 | 63.9 | 68.0 | 52.0 |
| 8:30 | 63.9 | 67.5 | 52.0 |
| 8:40 | 62.5 | 66.5 | 52.0 |
| 8:50 | 65.4 | 69.0 | 51.0 |
| 9:00 | 64.6 | 69.5 | 53.0 |
| 9:10 | 64.0 | 68.0 | 52.5 |
| 9:20 | 63.6 | 67.5 | 52.0 |
| 9:30 | 65.0 | 68.5 | 51.5 |
| 9:40 | 66.5 | 69.5 | 52.0 |
| 9:50 | 62.4 | 66.5 | 51.0 |
| 10:00 | 64.2 | 68.0 | 51.0 |
| 10:10 | 65.1 | 70.0 | 52.0 |
| 10:20 | 63.5 | 67.5 | 51.0 |
| 10:30 | 64.1 | 67.5 | 50.5 |
| 10:40 | 68.7 | 69.5 | 51.0 |
| 10:50 | 61.7 | 65.5 | 52.0 |
| 11:00 | 65.3 | 68.5 | 50.5 |
| 11:10 | 62.0 | 66.5 | 51.0 |
| 11:20 | 61.1 | 64.5 | 50.0 |
| 11:30 | 60.7 | 64.0 | 50.0 |
| 11:40 | 68.8 | 70.5 | 51.0 |
| 11:50 | 62.8 | 66.0 | 51.0 |
| 12:00 | 63.9 | 68.0 | 52.0 |
| 12:10 | 64.9 | 68.5 | 52.5 |
| 12:20 | 61.7 | 63.5 | 50.5 |
| 12:30 | 66.6 | 70.5 | 51.5 |
| 12:40 | 60.6 | 64.5 | 50.0 |
| 12:50 | 64.6 | 67.5 | 52.5 |
| 13:00 | 63.3 | 66.0 | 50.5 |

**TABLE NO-8**
10-minute Results – Position M4

| Period Ending | Leq | L10 | L90 |
|---|---|---|---|
| 13:10 | 65.0 | 69.5 | 51.5 |
| 13:20 | 63.4 | 67.5 | 53.0 |
| 13:30 | 63.9 | 68.5 | 52.0 |
| 13:40 | 64.6 | 69.0 | 53.0 |

# *Los Esteros Critical Energy Facility*

# *Appendix 8.7-B*
# *LECEF Supplemental NOISE-4*
# *Monitoring Results*

***December 2003***

# LECEF – Noise Monitoring for COC NOISE-4

**PREPARED FOR:** California Energy Commission (CEC)
LECEF Project Team

**PREPARED BY:** Mark Bastasch, P.E./CH2M HILL

**DATE:** April 26, 2003

The purpose of this memorandum is to demonstrate that the Los Esteros Critical Energy Facility (LECEF) complies with the California Energy Commission (CEC) Conditions of Certification (COC) NOISE-4. NOISE-4 required LECEF to limit the increase in nighttime ambient noise levels at the main Cilker home to no more than 5 dBA. NOISE-4 also required that noise from the plant not exceed 60 $L_{DN}$ at Location 2. Additionally, no new pure tone components were to be introduced.

Based on the following analysis of the data collected, LECEF fully complies with the CEC COC NOISE-4.

All measurements were conducted using either Bruel & Kjaer Type 2236 or Larson Davis System 824 sound level meters. Microphones were elevated approximately 5 feet above the ground on tripods. To ensure accuracy of the measurements, the sound level meters were calibrated before and after every noise monitoring event. All equipment used in the survey complies with the requirements of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for Type 1 precision sound level measurement instrumentation.

## COC NOISE-4(A): Pre-Project Noise Survey

COC NOISE-4(A) required a 25-hour noise survey at the main Cilker home prior to the start of construction. To satisfy this requirement, noise level measurements were conducted on 1/31/02 through 2/1/02 at the Cilker residence (see Figure 1 for monitoring locations – all tables and figures are at the end of this document).

The weather during this survey was consistent throughout the recording period with overcast skies, mild temperature (40°F), and very little wind. There was no precipitation at any time and little formation of dew in the morning.

The microphone was positioned near the backyard fence so that the house blocked some of the traffic noise from Highway 237. The majority of noise at the site originated from Highway 237 and aircraft from San Jose International Airport. Continuous measurements began at 9:50 a.m. on 1/31/02 and ran continuously until 11:00 a.m. on 2/1/02. Table 1 and Figure 2 present the hourly average noise levels. Short-term measurements were taken at 4:55 p.m., 8:25 p.m., 12:05 a.m., 2:00 a.m., and 10:25 a.m. Figure 3 presents the statistical levels and one-third octave band data for each short-term measurement.

## COC NOISE-4(B): Operational Noise Survey

COC NOISE-4(B) required a 25-hour noise survey at the Cilker home and short-term noise measurements at the Coyote Creek riparian corridor and the location of the proposed San Francisco Bay Trail while the plant was operating at 80 percent or greater rated capacity. Measurements were to be collected during the daytime and nighttime hours and include one-third octave bands. To satisfy this requirement, measurements were collected while the plant was operating at 80 percent or greater capacity from 4/2/03 through 4/3/03.

The weather during this monitoring period was variable, with periods of precipitation and moderate winds. At 4:15 p.m. on 4/2/03 the skies were partly cloudy and the temperature was 59°F with 46 percent relative humidity and winds greater than 10 mph. While these meteorological conditions are not ideal for noise monitoring, it was obvious the major noise source at all monitoring locations was Highway 237 and not the LECEF. At 1:40 a.m. on 4/3/03 the skies were partly cloudy and the temperature was 49°F with 75 percent relative humidity. There was no wind or precipitation. These meteorological conditions were observed until 4 a.m. and are conducive to accurate noise measurements. Therefore, during the period of most concern to the CEC, the nighttime hours when traffic along Highway 237 is at a minimum, the meteorological conditions were acceptable.

Table 2 and Figure 4 present the hourly noise levels recorded at the Cilker residence (the same monitoring location used for the pre-project noise survey shown in Figure 1). Figure 5 presents the statistical levels and one-third octave band data measurement at the Cilker residence.

Figure 6 presents the noise measurements at the Coyote Creek riparian corridor (Location 2 in Figure 1). Table 3 and Figure 7 present the noise measurements at the location of the proposed San Francisco Bay Trail (refer to Figure 1).

## COC NOISE-4(C): Data Evaluation and Mitigation Assessment

COC NOISE-4(C) required additional plant mitigation if the LECEF increased the average nighttime background noise level by more than 5 dBA at the Cilker residence or noise levels exceeded the 60 $L_{DN}$ at the Coyote Creek riparian corridor or the proposed San Francisco Bay Trail. For a continuous noise source like LECEF, 60 $L_{DN}$ is equivalent to 54 dBA.

### Cilker Residence

Comparison of pre-project survey noise levels at the Cilker residence (Table 1 and Figure 2) to the operation noise survey (Table 2 and Figure 4) shows that the project did not increase the $L_{90}$ noise level by more than 5 dBA. The pre-project average nighttime $L_{90}$ was 50 dBA and the operational average $L_{90}$ was 50 dBA. The increase is less than 5 dBA. Therefore, no additional mitigation measures are required.

### Coyote Creek Riparian Corridor

Figure 6 shows that the $L_{eq}$ and $L_{90}$ noise levels during the night at the Coyote Creek riparian corridor (Location 2), the time period when the LECEF noise level would be the most noticeable, are below the 54 dBA level (equivalent to 60 $L_{DN}$). No exceedance occurred. Therefore, no additional mitigation measures are required.

### Proposed San Francisco Bay Trail

Figure 7 shows that the noise levels during the night at the proposed San Francisco Bay Trail (Location 2), the time period when the LECEF noise level would be the most noticeable, are below the 54 dBA level (equivalent to 60 $L_{DN}$). No exceedance occurred. Therefore, no additional mitigation measures are required.

## COC NOISE-4(D): Pure Tone Evaluation and Mitigation Assessment

No audible pure tones were observed at any of the monitoring locations. Figures 5, 6, and 7 present the one-third octave band measurements at the Cilkers residence, the Coyote Creek riparian corridor, and near the proposed San Francisco Bay Trail with LECEF at 80 percent or greater capacity. No pure tones are present and therefore no additional mitigation measures required.

**TABLE 1**
Summary of Pre-Project Hourly Values at Cilker Residence (dBA)

| Date & Time | $L_{eq}$ | $L_{10}$ | $L_{90}$ |
|---|---|---|---|
| 01/31/2002 11:00AM | 60 | 63 | 55 |
| 01/31/2002 Noon | 56 | 59 | 52 |
| 1/31/02 1:00 PM | 58 | 62 | 52 |
| 1/31/02 2:00 PM | 57 | 60 | 53 |
| 1/31/02 3:00 PM | 60 | 63 | 56 |
| 1/31/02 4:00 PM | 60 | 62 | 58 |
| 1/31/02 5:00 PM | 61 | 64 | 58 |
| 1/31/02 6:00 PM | 60 | 62 | 57 |
| 1/31/02 7:00 PM | 61 | 63 | 58 |
| 1/31/02 8:00 PM | 63 | 67 | 58 |
| 1/31/02 9:00 PM | 61 | 65 | 56 |
| 1/31/02 10:00 PM | 59 | 62 | 57 |
| 1/31/02 11:00 PM | 58 | 61 | 54 |
| 02/01/2002 Midnight | 55 | 57 | 52 |
| 2/1/02 1:00 AM | 53 | 55 | 48 |
| 2/1/02 2:00 AM | 51 | 54 | 46 |
| 2/1/02 3:00 AM | 53 | 57 | 46 |
| 2/1/02 4:00 AM | 52 | 55 | 46 |
| 2/1/02 5:00 AM | 55 | 58 | 51 |
| 2/1/02 6:00 AM | 61 | 62 | 58 |
| 2/1/02 7:00 AM | 63 | 66 | 59 |
| 2/1/02 8:00 AM | 60 | 63 | 57 |
| 2/1/02 9:00 AM | 61 | 64 | 56 |
| 2/1/02 10:00 AM | 59 | 62 | 57 |
| 2/1/02 11:00 AM | 59 | 61 | 55 |

**TABLE 2**
Summary of Operational Hourly Values at Cilker Residence (dBA)

| Date & Time | $L_{eq}$ | $L_{10}$ | $L_{90}$ | Percent Output[1] |
|---|---|---|---|---|
| 4/2/03 4:00 PM | 62 | 64 | 60 | 106% |
| 4/2/03 5:00 PM | 61 | 63 | 58 | 106% |
| 4/2/03 6:00 PM | 59 | 61 | 56 | 106% |
| 4/2/03 7:00 PM | 65 | 65 | 59 | 106% |
| 4/2/03 8:00 PM | 62 | 64 | 59 | 107% |
| 4/2/03 9:00 PM | 61 | 63 | 58 | 106% |
| 4/2/03 10:00 PM | 61 | 63 | 56 | 107% |
| 4/2/03 11:00 PM | 57 | 59 | 50 | 107% |
| 4/3/03 12:00 AM | 52 | 55 | 47 | 107% |
| 4/3/03 1:00 AM | 51 | 54 | 45 | 107% |
| 4/3/03 2:00 AM | 52 | 55 | 46 | 107% |
| 4/3/03 3:00 AM | 52 | 56 | 45 | 107% |
| 4/3/03 4:00 AM | 57 | 61 | 49 | 106% |
| 4/3/03 5:00 AM | 61 | 64 | 57 | 106% |
| 4/3/03 6:00 AM | 64 | 67 | 59 | 106% |
| 4/3/03 7:00 AM | 61 | 63 | 56 | 106% |
| 4/3/03 8:00 AM | 58 | 60 | 52 | 107% |
| 4/3/03 9:00 AM | 62 | 64 | 58 | 107% |
| 4/3/03 10:00 AM | 58 | 61 | 51 | 80% |
| 4/3/03 11:00 AM | Data Downloaded | | | 104% |
| 4/3/03 12:00 PM | 57 | 59 | 51 | 107% |
| 4/3/03 1:00 PM | 60 | 62 | 54 | 107% |
| 4/3/03 2:00 PM | 58 | 60 | 54 | 106% |
| 4/3/03 3:00 PM | 58 | 60 | 54 | 106% |
| 4/3/03 4:00 PM | 62 | 63 | 59 | 107% |
| 4/3/03 5:00 PM | 62 | 63 | 58 | 107% |
| 4/3/03 6:00 PM | 63 | 61 | 54 | 0% |
| 4/3/03 7:00 PM | 64 | 65 | 59 | 0% |
| 4/3/03 8:00 PM | 61 | 63 | 57 | 0% |
| 4/3/03 9:00 PM | 60 | 62 | 56 | 0% |

**TABLE 2 (continued)**
Summary of Operational Hourly Values at Cilker Residence (dBA)

| Date & Time | $L_{eq}$ | $L_{10}$ | $L_{90}$ | Percent Output[1] |
|---|---|---|---|---|
| 4/3/03 10:00 PM | 59 | 62 | 54 | 0% |
| 4/3/03 11:00 PM | 55 | 58 | 50 | 0% |
| 4/4/03 12:00 AM | 52 | 55 | 47 | 0% |
| 4/4/03 1:00 AM | 52 | 55 | 46 | 0% |
| 4/4/03 2:00 AM | 51 | 54 | 45 | 0% |
| 4/4/03 3:00 AM | 53 | 57 | 46 | 0% |
| 4/4/03 4:00 AM | 59 | 61 | 54 | 0% |
| 4/4/03 5:00 AM | 61 | 64 | 57 | 0% |

Note 1: Percent output based on gross output of all four turbines and nominal plant capacity of 180 MW.

**TABLE 3**
Summary of Operational Hourly Values at Proposed SF Bay Trail (dBA)

| Date & Time | $L_{eq}$ | $L_{10}$ | $L_{90}$ |
|---|---|---|---|
| 4/3/03 12:00 AM | 49 | 50 | 47 |
| 4/3/03 1:00 AM | 49 | 51 | 47 |
| 4/3/03 2:00 AM | 50 | 50 | 47 |
| 4/3/03 3:00 AM | 51 | 52 | 47 |
| 4/3/03 4:00 AM | 50 | 51 | 47 |
| 4/3/03 5:00 AM | 51 | 53 | 49 |

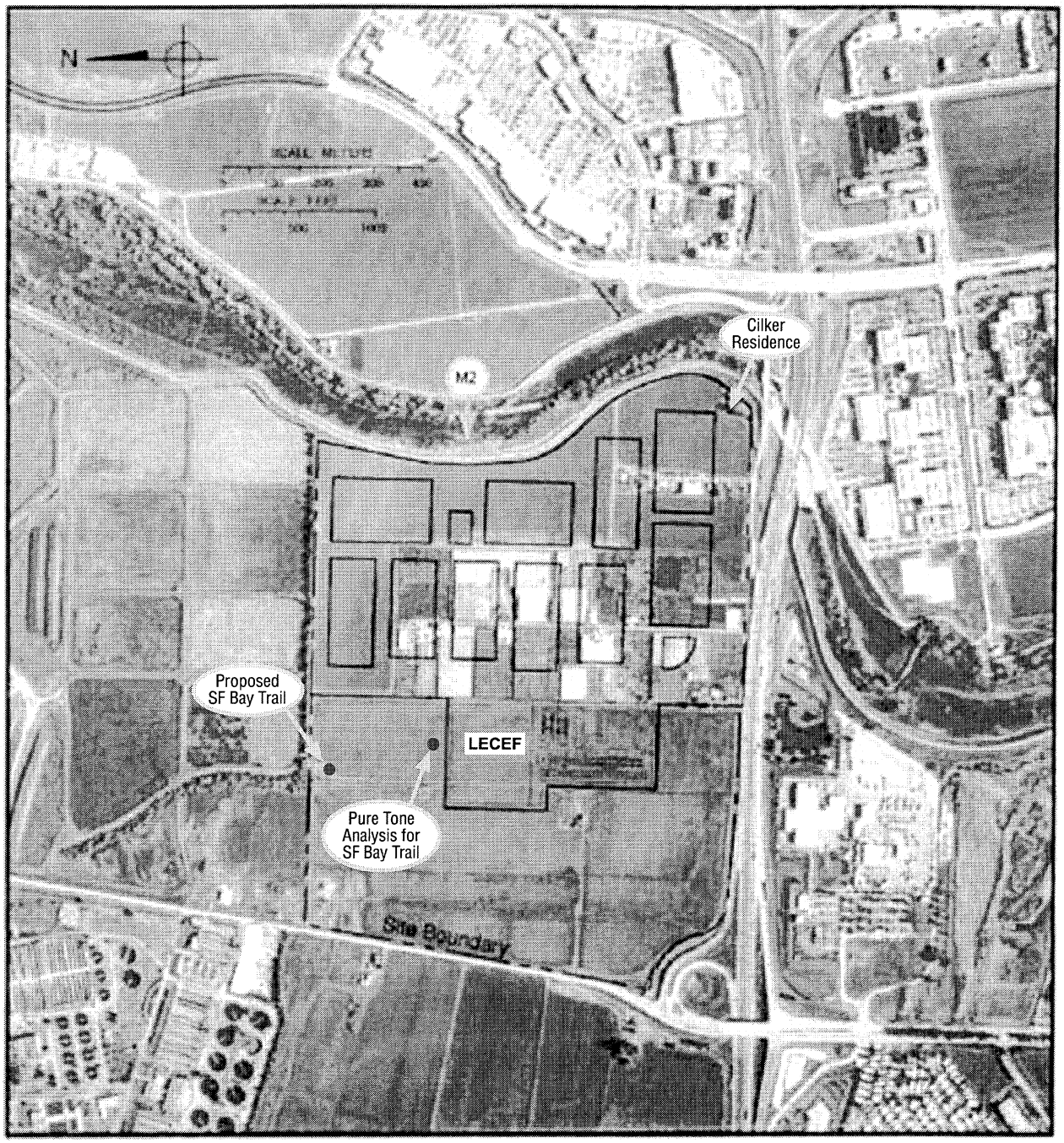



Figure 1
**Noise Monitoring Locations**
LOS ESTEROS CRITICAL ENERGY FACILITY

**Figure 2**
**Pre-Project Noise Monitoring at Cilker Residence**
**(1/31 through 2/1/2003)**

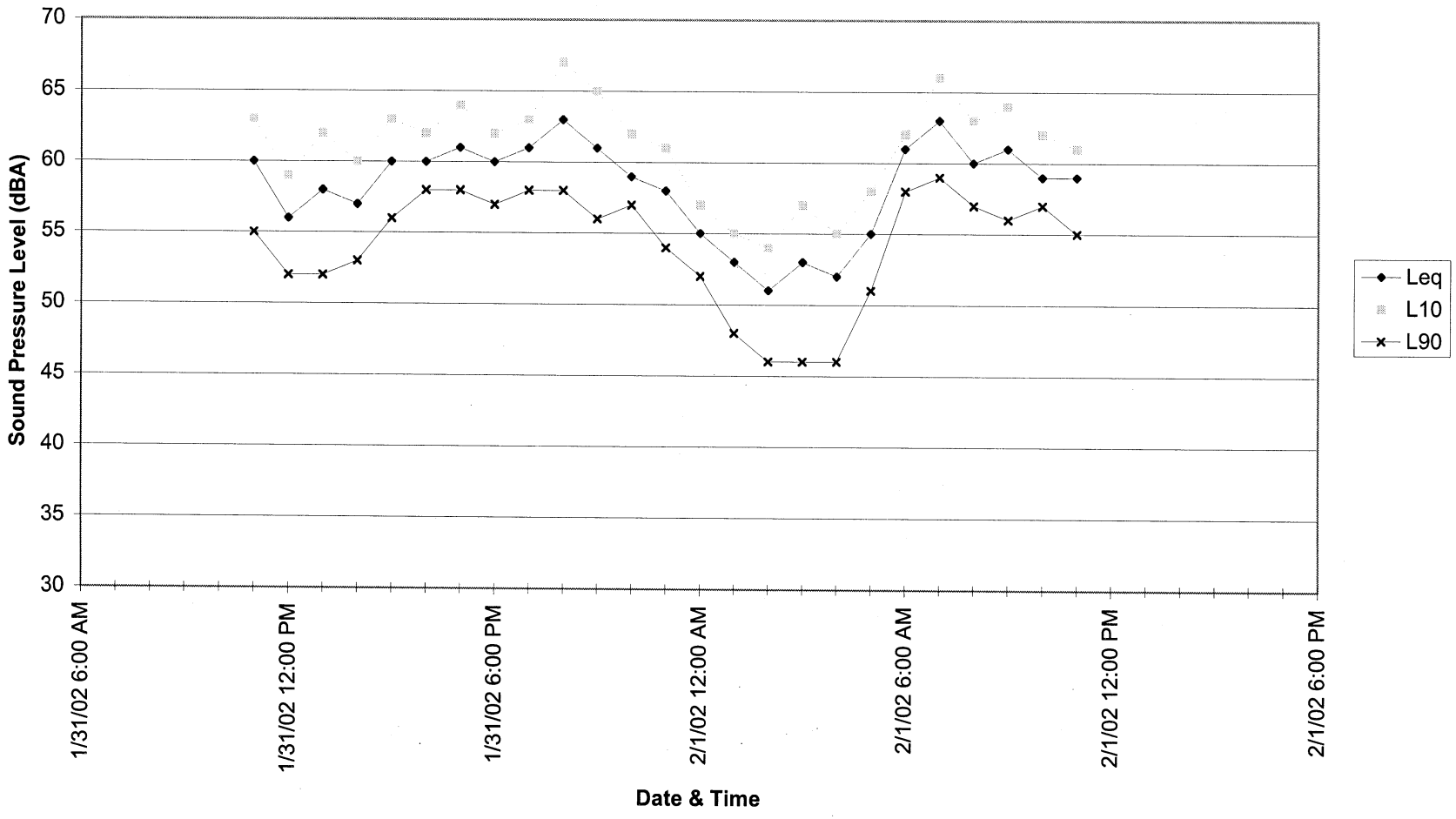


Figure 3

# Cilker Residence: Pre-Project

| Series | Date | Time | Duration | Leq | L1 | L5 | L10 | L50 | L90 | L95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31-Jan-02 | 4:57 PM | 10:00.0 | 63 | 72 | 67 | 66 | 62 | 59 | 59 |
| 2 | 31-Jan-02 | 8:29 PM | 10:00.0 | 65 | 80 | 69 | 63 | 57 | 55 | 54 |
| 3 | 01-Feb-02 | 12:06 AM | 10:00.0 | 54 | 58 | 57 | 56 | 53 | 49 | 48 |
| 4 | 01-Feb-02 | 2:02 AM | 10:00.0 | 51 | 56 | 55 | 54 | 49 | 46 | 45 |
| 5 | 01-Feb-02 | 10:27 AM | 10:00.0 | 57 | 62 | 59 | 58 | 56 | 54 | 53 |

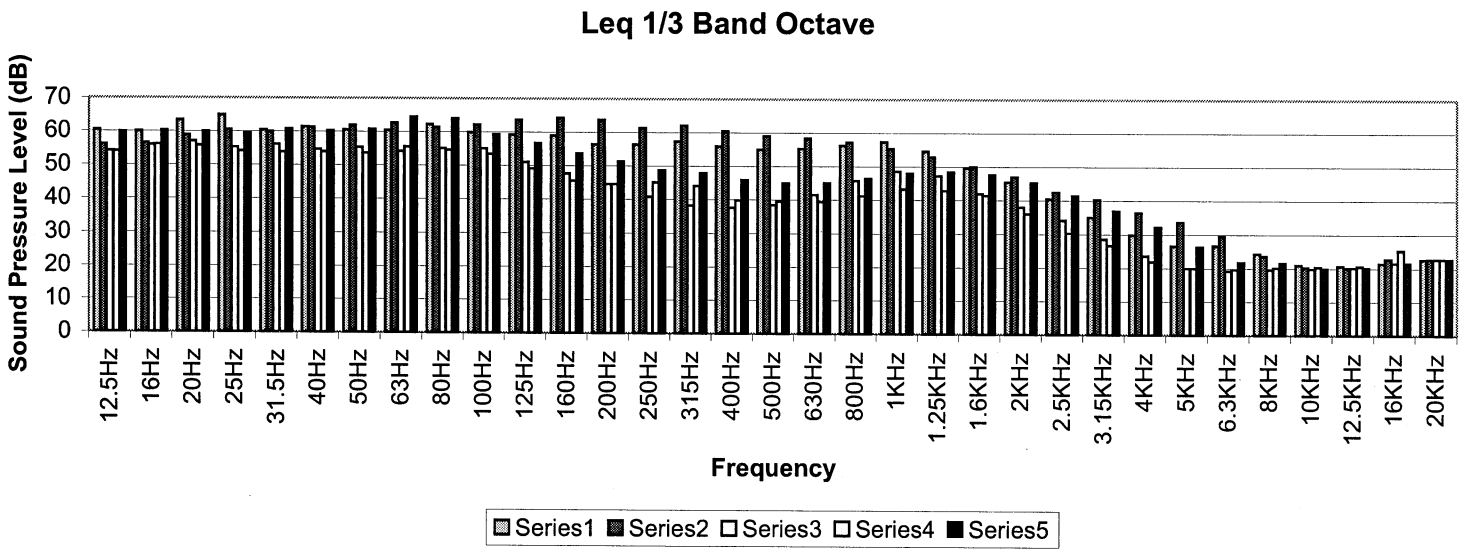


**Figure 4**
**Noise Monitoring at Cilker Residence**
**(4/2 through 4/4/2003)**

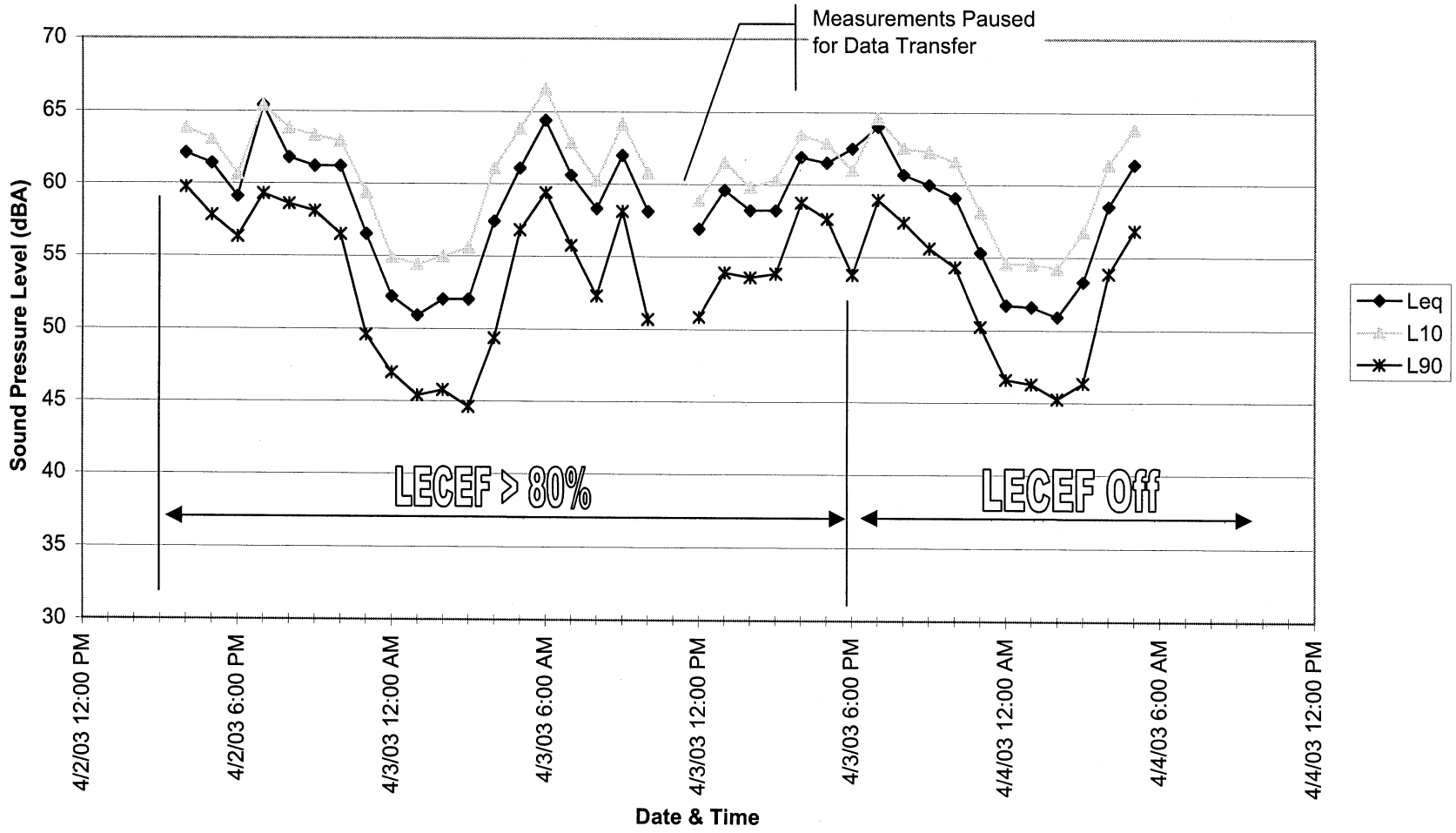
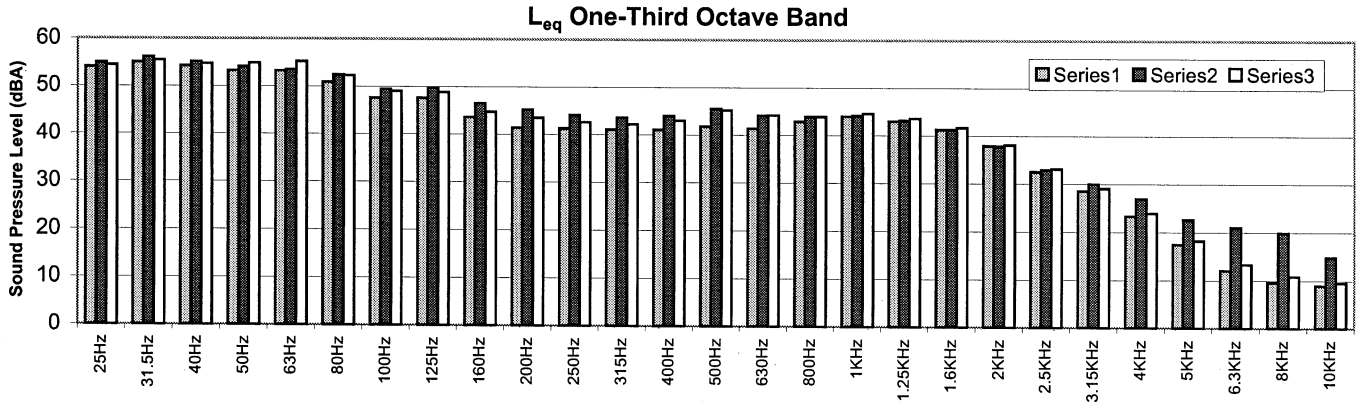


**Figure 5**
**Sound Pressure Level at the Cilker Residence (dBA)**
**Pure Tone Analysis**

| Series | Date | Time | Duration | Leq | L1 | L10 | L50 | L90 | L95 | L99 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-Apr-2003 | 1:00 AM | 1:00:00 | 51 | 58 | 54 | 49 | 45 | 45 | 44 |
| 2 | 03-Apr-2003 | 2:00 AM | 1:00:00 | 52 | 61 | 55 | 50 | 46 | 45 | 44 |
| 3 | 03-Apr-2003 | 3:00 AM | 1:00:00 | 52 | 60 | 56 | 49 | 45 | 44 | 43 |



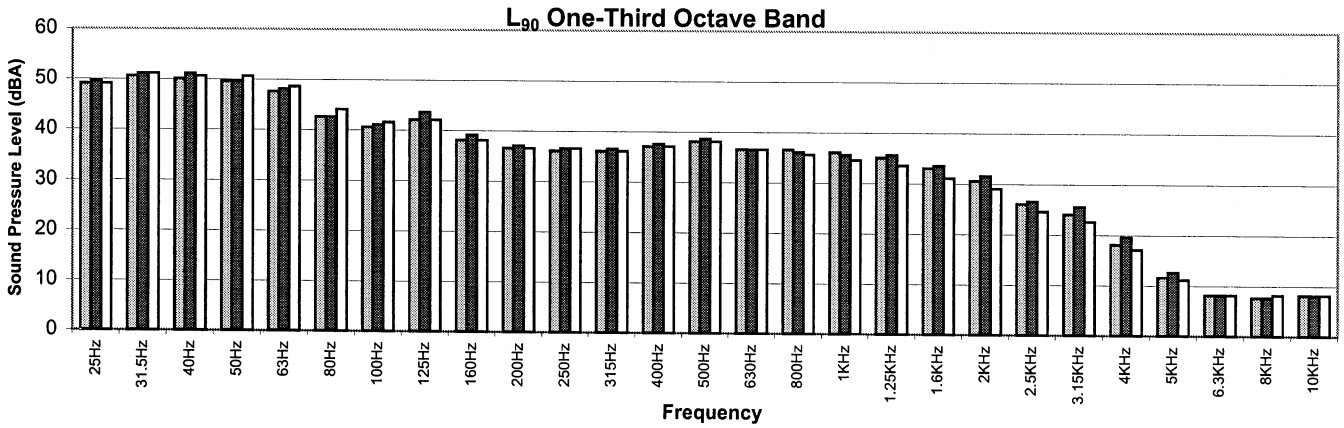
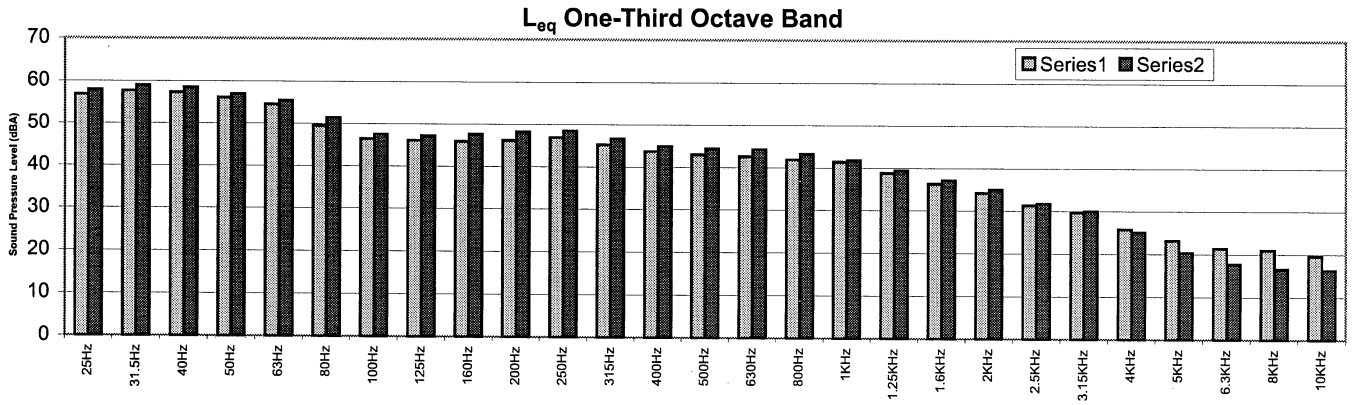



**Figure 6**
**Sound Pressure Level at the Coyote Creek Riparian Corridor (Location 2)**
**Pure Tone Analysis**

| Series | Date | Time | Duration | Leq | L1 | L10 | L50 | L90 | L95 | L99 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-Apr-2003 | 3:23:31 | 10:00.0 | 50 | 54 | 52 | 49 | 48 | 47 | 47 |
| 2 | 03-Apr-2003 | 3:33:31 | 10:00.0 | 51 | 55 | 53 | 51 | 49 | 48 | 48 |



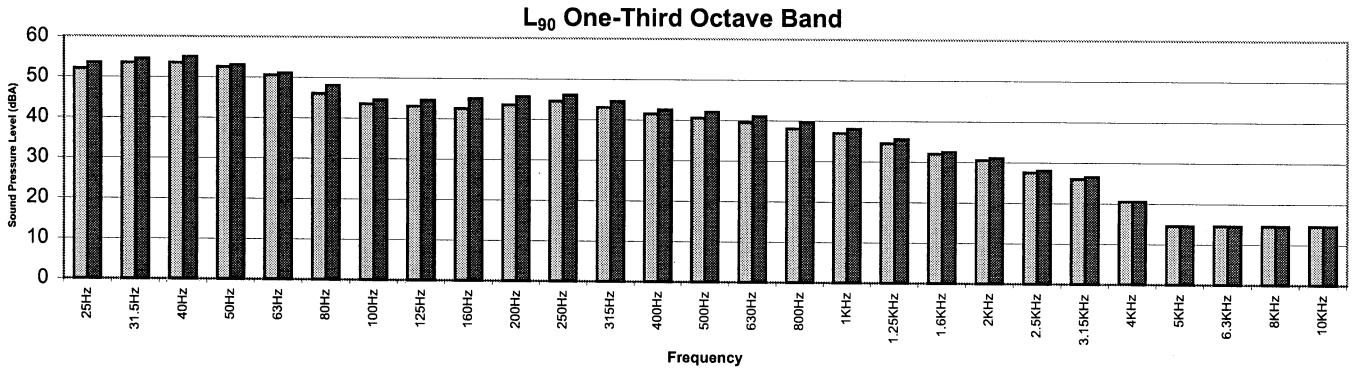
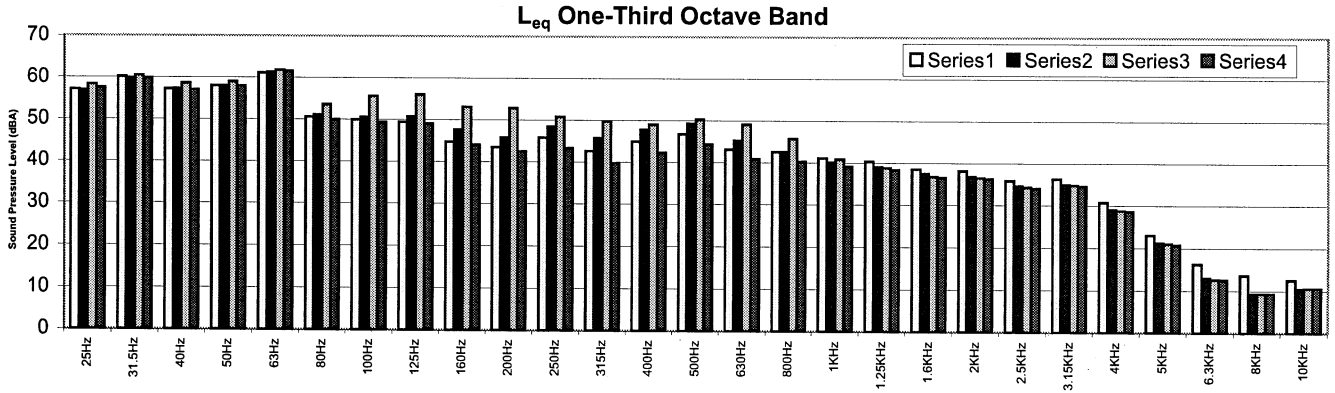
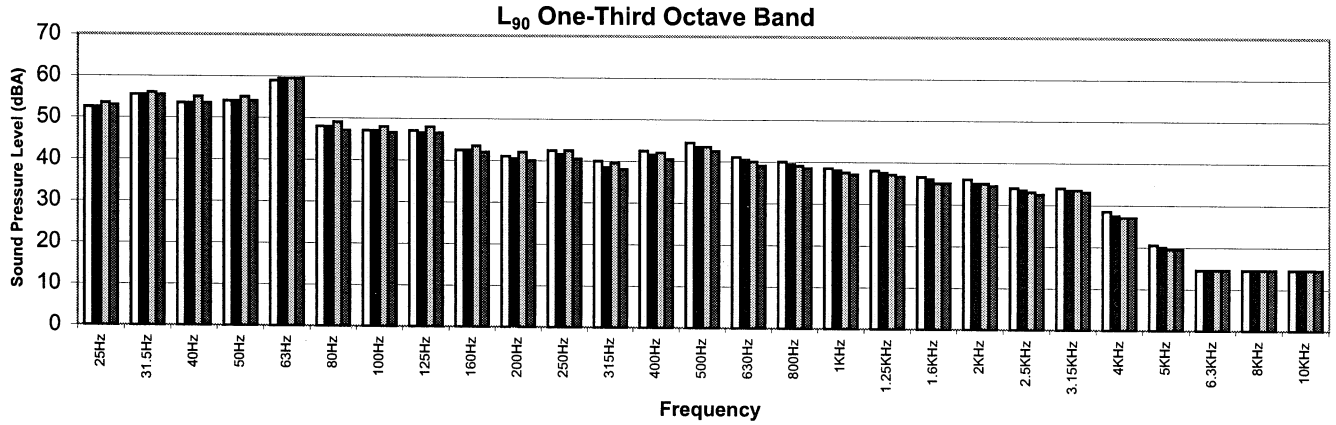



**Figure 7**
**Sound Pressure Level at the SF Bay Trail (dBA)**
**Pure Tone Analysis**

| Series | Date | Time | Duration | Leq | L1 | L10 | L50 | L90 | L95 | L99 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-Apr-03 | 1:50 AM | 10:00.0 | 51 | 53 | 53 | 51 | 50 | 49 | 49 |
| 2 | 03-Apr-03 | 2:00 AM | 10:00.0 | 52 | 62 | 53 | 50 | 49 | 49 | 49 |
| 3 | 03-Apr-03 | 2:10 AM | 10:00.0 | 54 | 66 | 55 | 50 | 49 | 49 | 49 |
| 4 | 03-Apr-03 | 2:20 AM | 10:00.0 | 49 | 51 | 50 | 49 | 48 | 48 | 48 |

NOTE: Measurements were taken closer to plant than those presented in Table 3. See Figure 1.



# LECEF – Supplemental Noise Monitoring

**PREPARED FOR:** California Energy Commission (CEC)
LECEF Project Team

**PREPARED BY:** Mark Bastasch/CH2M HILL
Jeremy Fleming/CH2M HILL-IDC

**DATE:** May 7, 2002

A short-term ambient noise survey in the vicinity of the Coyote Creek riparian corridor (Location M2) and a 25 hour noise survey at the main Cilker home were conducted in accordance with the California Energy Commissions (CEC) Condition of Certification (COC) NOISE-4(A).

Noise level measurements were conducted on 1/31/02 and 2/1/02 at the Cilker residence, along the Coyote Creek riparian corridor (M2) and halfway between the Cilker Residence and M2 along the riparian corridor (M7). Refer to Figure 1 for monitoring locations. Measurements were conducted using a Bruel & Kjaer (B&K) Type 2236 sound level meter or a Larson Davis System 824 sound level meter. Microphones were elevated approx. 5 feet above the ground on tripods. To ensure accuracy of the measurements, the sound level meters were calibrated before and after every noise monitoring event. All equipment used in the survey complies with the requirements of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for Type 1 precision sound level measurement instrumentation.

The weather was consistent throughout the recording period with overcast skies, mild temperature (40 F) and very little wind. There was no precipitation at any time and little formation of dew in the morning.

## Cilker Residence

### 25-hour Continuous Monitoring

25-hour continuous monitoring was performed with the B&K 2236 along the backside of the Cilker residence (Figure 1). The B&K meter was positioned approximately 6 feet from the chain link fence, just north of the Cilker property. The meter was set to record Leq, L10 and L90 on one-minute intervals. The microphone was positioned so that the house blocked some of the traffic noise from Highway 237. The majority of noise at the site originates from Highway 237. There was a fair amount of overhead airplane and helicopter noise. Measurements began at 9:50 a.m. and ran continuously until 11:00 a.m. the following day. Table 1 and Figure 2 present the calculated hourly average noise levels.

### Short-Term Monitoring

The Larson Davis meter was positioned approximately 10 feet from the B&K equipment for the short-term measurements. The majority of the noise originated from Highway 237.

Overhead airplane or helicopter noise was heard during each monitoring session. Measurements were taken at 4:55 p.m., 8:25 p.m., 12:05 am, 2:00 am and 10:25 am. Figure 3 presents the statistical levels and one-third octave band data for each measurement.

**TABLE 1**
Summary of Hourly Values at Cilker Residence (dBA)

| Time | Leq | L10 | L90 |
|---|---|---|---|
| 01/31/2002 11:00AM | 60 | 63 | 55 |
| 01/31/2002 Noon | 56 | 59 | 52 |
| 1/31/02 1:00 PM | 58 | 62 | 52 |
| 1/31/02 2:00 PM | 57 | 60 | 53 |
| 1/31/02 3:00 PM | 60 | 63 | 56 |
| 1/31/02 4:00 PM | 60 | 62 | 58 |
| 1/31/02 5:00 PM | 61 | 64 | 58 |
| 1/31/02 6:00 PM | 60 | 62 | 57 |
| 1/31/02 7:00 PM | 61 | 63 | 58 |
| 1/31/02 8:00 PM | 63 | 67 | 58 |
| 1/31/02 9:00 PM | 61 | 65 | 56 |
| 1/31/02 10:00 PM | 59 | 62 | 57 |
| 1/31/02 11:00 PM | 58 | 61 | 54 |
| 02/01/2002 Midnight | 55 | 57 | 52 |
| 2/1/02 1:00 AM | 53 | 55 | 48 |
| 2/1/02 2:00 AM | 51 | 54 | 46 |
| 2/1/02 3:00 AM | 53 | 57 | 46 |
| 2/1/02 4:00 AM | 52 | 55 | 46 |
| 2/1/02 5:00 AM | 55 | 58 | 51 |
| 2/1/02 6:00 AM | 61 | 62 | 58 |
| 2/1/02 7:00 AM | 63 | 66 | 59 |
| 2/1/02 8:00 AM | 60 | 63 | 57 |
| 2/1/02 9:00 AM | 61 | 64 | 56 |
| 2/1/02 10:00 AM | 59 | 62 | 57 |
| 2/1/02 11:00 AM | 59 | 61 | 55 |

## M2

Short duration (10 minute) spot measurements were collected with the Larson Davis 824 along Coyote Creek (M2). The majority of the noise originated from Highway 237. Overhead airplane and helicopter noise was heard during each monitoring session. Measurements were taken at this position at 5:15 p.m., 12:21 am, and 10:41 am. Figure 4 presents the statistical levels and one-third octave band data for each measurement.

## M7

Short duration (10 minute) spot measurements were collected with the Larson Davis 824 at the halfway between the Cilker Residence and Coyote Creek (M7). The majority of the noise originated from Highway 237. Overhead airplane and helicopter noise was heard during each monitoring session. Measurements were taken at this position at 8:45 p.m. and 1:45 am. Figure 5 presents the statistical levels and one-third octave band data for each measurement.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.7-C*
# *Sound Level Modeling Source Inputs - LECEF Phase 2*

***December 2003***

## LECEC - Phase II - Listing of Sound Power Levels used in Modeling

**Appendix A, HAI Report 1581E, 22 Dec 2003**

| No. | Name | ID | A-wt. | No. | Name | ID | A-wt. |
|---|---|---|---|---|---|---|---|
| 1 | Amonia Injection Skid | Unit 1 | **101.3** | 70 | Stack Body | Unit 2 | **82.7** |
| 2 | Amonia Injection Skid | Unit 4 | **101.3** | 71 | Transverse Pipe Rack | STG-1 | **103.7** |
| 3 | Amonia Injection Skid | Unit 3 | **101.3** | 72 | Transverse Pipe Rack | STG-1 | **103.7** |
| 4 | Amonia Injection Skid | Unit 2 | **101.3** | 73 | Filter House Roof | Unit 1 | **86.5** |
| 5 | Aux Transformer | | **94.2** | 74 | Filter House Roof | Unit 2 | **86.5** |
| 6 | Aux transformer | STG-1 | **94.2** | 75 | Filter House Roof | Unit 3 | **86.5** |
| 7 | Aux Water Pump | Cool | **88.5** | 76 | Filter House Roof | Unit 4 | **86.5** |
| 8 | Boiler Feed Pump | Unit 1 | **108.7** | 77 | ST Upper Structure Roof | STG | **91.8** |
| 9 | Boiler Feed Pump | Unit 2 | **108.7** | 78 | Air Inlet Plenum North | Unit 1 | **101.4** |
| 10 | Boiler Feed Pump | Unit 4 | **108.7** | 79 | Air Inlet Plenum North | Unit 4 | **101.4** |
| 11 | Boiler Feed Pump | Unit 3 | **108.7** | 80 | Air Inlet Plenum North | Unit 3 | **101.4** |
| 12 | Circ Water Pump | STG-1 | **102.5** | 81 | Air Inlet Plenum North | Unit 2 | **101.4** |
| 13 | Circ Water Pump | STG-1 | **102.5** | 82 | Air Inlet Plenum South | Unit 1 | **101.4** |
| 14 | Cooling Tower Exhaust | STG-1 | **100.6** | 83 | Air Inlet Plenum South | Unit 4 | **101.4** |
| 15 | Cooling Tower Exhaust | STG-1 | **100.6** | 84 | Air Inlet Plenum South | Unit 3 | **101.4** |
| 16 | Cooling Tower Exhaust | STG-1 | **100.6** | 85 | Air Inlet Plenum South | Unit 2 | **101.4** |
| 17 | Cooling Tower Exhaust | STG-1 | **100.6** | 86 | Cooling Tower Dry Inlet | East | **86.9** |
| 18 | Cooling Tower Exhaust | STG-1 | **100.6** | 87 | Cooling Tower Dry Inlet | West | **86.9** |
| 19 | Cooling Tower Exhaust | STG-1 | **100.6** | 88 | Cooling Tower Wet Inlet | East | **101.8** |
| 20 | Cooling Tower Exhaust | STG-1 | **100.6** | 89 | Cooling Tower Wet Inlet | West | **101.8** |
| 21 | CT Sprint Control Skid | Unit 1 | **83.8** | 90 | EJ-1 North | Unit 3 | **83.1** |
| 22 | CT Sprint Control Skid | Unit 4 | **83.8** | 91 | EJ-1 North | Unit 2 | **83.1** |
| 23 | CT Sprint Control Skid | Unit 3 | **83.8** | 92 | EJ-1 North | Unit 1 | **83.1** |
| 24 | CT Sprint Control Skid | Unit 2 | **83.8** | 93 | EJ-1 North | Unit 4 | **83.1** |
| 25 | CTG Chiller Skid | Unit 2 | **104.7** | 94 | EJ-1 South | Unit 3 | **83.1** |
| 26 | CTG Chiller Skid | Unit 3 | **104.7** | 95 | EJ-1 South | Unit 2 | **83.1** |
| 27 | Gas Filter Skid | Unit 1 | **68.8** | 96 | EJ-1 South | Unit 1 | **83.1** |
| 28 | Gas Filter Skid | Unit 4 | **68.8** | 97 | EJ-1 South | Unit 4 | **83.1** |
| 29 | Gas Filter Skid | Unit 3 | **68.8** | 98 | EJ-2 North | Unit 3 | **67.8** |
| 30 | Gas Filter Skid | Unit 2 | **68.8** | 99 | EJ-2 North | Unit 2 | **67.8** |
| 31 | Gas Metering | AUX | **105** | 100 | EJ-2 North | Unit 4 | **67.8** |
| 32 | Gt Comp Exhaust Vent | Unit 1 | **88.3** | 101 | EJ-2 North | Unit 1 | **67.8** |
| 33 | Gt Comp Exhaust Vent | Unit 4 | **88.3** | 102 | EJ-2 South | Unit 3 | **67.8** |
| 34 | Gt Comp Exhaust Vent | Unit 3 | **88.3** | 103 | EJ-2 South | Unit 2 | **67.8** |
| 35 | Gt Comp Exhaust Vent | Unit 2 | **88.3** | 104 | EJ-2 South | Unit 1 | **67.8** |
| 36 | HRSG Stack | Unit 1 | **110.5** | 105 | EJ-2 South | Unit 4 | **67.8** |
| 37 | HRSG Stack | Unit 4 | **110.5** | 106 | Generator Vent | Unit 1 | **92.6** |
| 38 | HRSG Stack | Unit 3 | **110.5** | 107 | Generator Vent | Unit 4 | **92.6** |
| 39 | HRSG Stack | Unit 2 | **110.5** | 108 | Generator Vent | Unit 3 | **92.6** |
| 40 | HRSG Steam Lines | Unit 1 | **102.2** | 109 | Generator Vent | Unit 2 | **92.6** |
| 41 | HRSG Steam Lines | Unit 2 | **102.2** | 110 | GT Air Inlet Filter North | Unit 3 | **100.7** |
| 42 | HRSG Steam Lines | Unit 3 | **102.2** | 111 | GT Air Inlet Filter North | Unit 2 | **100.7** |
| 43 | HRSG Steam Lines | Unit 4 | **102.2** | 112 | GT Air Inlet Filter North | Unit 1 | **100.7** |
| 44 | ST Lube Oil Skid | STG-1 | **100.6** | 113 | GT Air Inlet Filter North | Unit 4 | **100.7** |
| 45 | ST/STG Enclosure Louvre | STG-1 | **98.9** | 114 | GT Air Inlet Filter South | Unit 3 | **100.7** |
| 46 | ST/STG Enclosure Louvre | STG-1 | **98.9** | 115 | GT Air Inlet Filter South | Unit 2 | **100.7** |
| 47 | ST/STG Enclosure Louvre | STG-1 | **98.9** | 116 | GT Air Inlet Filter South | Unit 1 | **100.7** |
| 48 | ST/STG Enclosure Louvre | STG-1 | **98.9** | 117 | GT Air Inlet Filter South | Unit 4 | **100.7** |
| 49 | STG Transformer | STG-1 | **102** | 118 | GT/Generator Enclosure (North) | Unit 1 | **93.6** |
| 50 | Switchyard Transformer | AUX | **102** | 119 | GT/Generator Enclosure (North) | Unit 4 | **93.6** |
| 51 | Switchyard Transformer | AUX | **102** | 120 | GT/Generator Enclosure (South) | Unit 1 | **93.6** |
| 52 | Transformer | Unit 1 | **100.4** | 121 | GT/Generator Enclosure (South) | Unit 4 | **93.6** |
| 53 | Transformer | Unit 1 | **100.4** | 122 | GT/Generator Enclosure North | Unit 3 | **93.6** |
| 54 | Transformer | Unit 2 | **100.4** | 123 | GT/Generator Enclosure North | Unit 2 | **93.6** |
| 55 | Transformer | Unit 4 | **100.4** | 124 | GT/Generator Enclosure South | Unit 3 | **93.6** |
| 56 | Diffuser Duct North | Unit 1 | **92** | 125 | GT/Generator Enclosure South | Unit 2 | **93.6** |
| 57 | Diffuser Duct North | Unit 4 | **92** | 126 | HRSG Duct A North | Unit 1 | **91.5** |
| 58 | Diffuser Duct North | Unit 3 | **92** | 127 | HRSG Duct A North | Unit 4 | **91.5** |
| 59 | Diffuser Duct North | Unit 2 | **92** | 128 | HRSG Duct A North | Unit 3 | **91.5** |
| 60 | Diffuser Duct South | Unit 1 | **92** | 129 | HRSG Duct A North | Unit 2 | **91.5** |
| 61 | Diffuser Duct South | Unit 4 | **92** | 130 | HRSG Duct A South | Unit 1 | **91.5** |
| 62 | Diffuser Duct South | Unit 3 | **92** | 131 | HRSG Duct A South | Unit 4 | **91.5** |
| 63 | Diffuser Duct South | Unit 2 | **92** | 132 | HRSG Duct A South | Unit 3 | **91.5** |
| 64 | Gas Compressor | North Unit | **113.9** | 133 | HRSG Duct A South | Unit 2 | **91.5** |
| 65 | Gas Compressor | South Unit | **113.9** | 134 | HRSG Duct B North | Unit 1 | **86.5** |
| 66 | ST Pipe Rack Spur | STG-1 | **103.7** | 135 | HRSG Duct B North | Unit 4 | **86.5** |
| 67 | Stack Body | Unit 1 | **82.7** | 136 | HRSG Duct B North | Unit 3 | **86.5** |
| 68 | Stack Body | Unit 4 | **82.7** | 137 | HRSG Duct B North | Unit 2 | **86.5** |
| 69 | Stack Body | Unit 3 | **82.7** | 138 | HRSG Duct B South | Unit 1 | **86.5** |

## LECEC - Phase II - Listing of Sound Power Levels used in Modeling

**Appendix A, HAI Report 1581E, 22 Dec 2003**

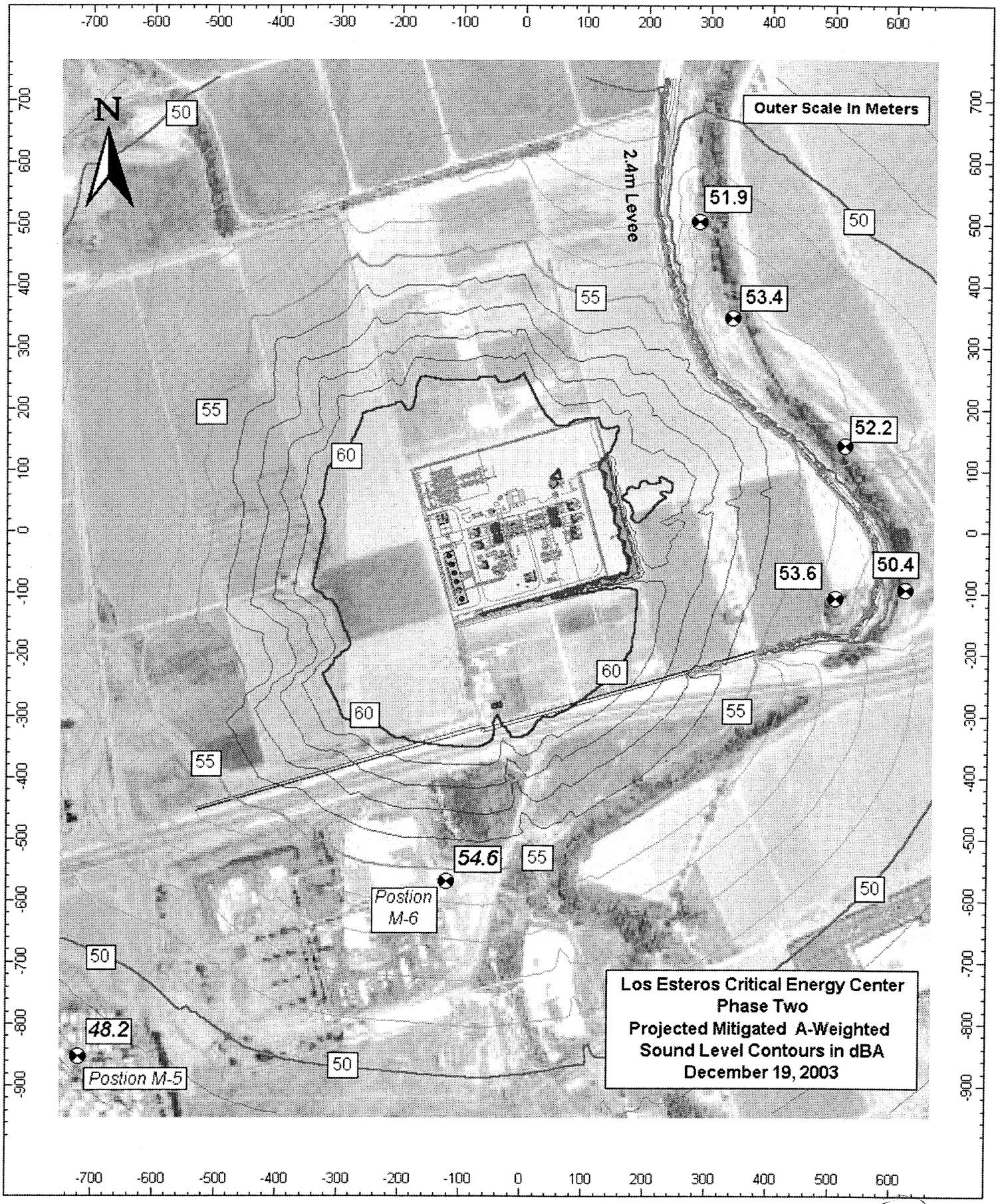
| No. | Name | ID | A-wt. |
|---|---|---|---|
| 139 | HRSG Duct B South | Unit 4 | **86.5** |
| 140 | HRSG Duct B South | Unit 3 | **86.5** |
| 141 | HRSG Duct B South | Unit 2 | **86.5** |
| 142 | HRSG Duct C North | Unit 1 | **84.5** |
| 143 | HRSG Duct C North | Unit 4 | **84.5** |
| 144 | HRSG Duct C South | Unit 3 | **84.5** |
| 145 | HRSG Duct C South | Unit 2 | **84.5** |
| 146 | HRSG Duct C North | Unit 3 | **84.5** |
| 147 | HRSG Duct C North | Unit 2 | **84.5** |
| 148 | HRSG Duct C South | Unit 1 | **84.5** |
| 149 | HRSG Duct C South | Unit 4 | **84.5** |
| 150 | HRSG Duct D North | Unit 1 | **80.5** |
| 151 | HRSG Duct D North | Unit 4 | **80.5** |
| 152 | HRSG Duct D North | Unit 3 | **80.5** |
| 153 | HRSG Duct D North | Unit 2 | **80.5** |
| 154 | HRSG Duct D South | Unit 1 | **80.5** |
| 155 | HRSG Duct D South | Unit 4 | **80.5** |
| 156 | HRSG Duct D South | Unit 3 | **80.5** |
| 157 | HRSG Duct D South | Unit 2 | **80.5** |
| 158 | HRSG Duct E North | Unit 1 | **80.5** |
| 159 | HRSG Duct E North | Unit 4 | **80.5** |
| 160 | HRSG Duct E North | Unit 3 | **80.5** |
| 161 | HRSG Duct E North | Unit 2 | **80.5** |
| 162 | HRSG Duct E South | Unit 1 | **80.5** |
| 163 | HRSG Duct E South | Unit 4 | **80.5** |
| 164 | HRSG Duct E South | Unit 3 | **80.5** |
| 165 | HRSG Duct E South | Unit 2 | **80.5** |
| 166 | HRSG Duct F North | Unit 1 | **79.5** |
| 167 | HRSG Duct F North | Unit 4 | **79.5** |
| 168 | HRSG Duct F North | Unit 3 | **79.5** |
| 169 | HRSG Duct F North | Unit 2 | **79.5** |
| 170 | HRSG Duct F South | Unit 1 | **79.5** |
| 171 | HRSG Duct F South | Unit 4 | **79.5** |
| 172 | HRSG Duct F South | Unit 3 | **79.5** |
| 173 | HRSG Duct F South | Unit 2 | **79.5** |
| 174 | HRSG M1 North | Unit 3 | **80.5** |
| 175 | HRSG M1 North | Unit 2 | **80.5** |
| 176 | HRSG M1 South | Unit 1 | **80.5** |
| 177 | HRSG M1 South | Unit 1 | **80.5** |
| 178 | HRSG M1 South | Unit 4 | **80.5** |
| 179 | HRSG M1 South | Unit 4 | **80.5** |
| 180 | HRSG M1 South | Unit 3 | **80.5** |
| 181 | HRSG M1 South | Unit 2 | **80.5** |
| 182 | HRSG M-2 North | Unit 3 | **81.5** |
| 183 | HRSG M-2 North | Unit 2 | **81.5** |
| 184 | HRSG M-2 South | Unit 1 | **81.5** |
| 185 | HRSG M-2 South | Unit 1 | **81.5** |
| 186 | HRSG M-2 South | Unit 4 | **81.5** |
| 187 | HRSG M-2 South | Unit 4 | **81.5** |
| 188 | HRSG M-2 South | Unit 3 | **81.5** |
| 189 | HRSG M-2 South | Unit 2 | **81.5** |
| 190 | HRSG Transition North | Unit 1 | **73.8** |
| 191 | HRSG Transition North | Unit 4 | **73.8** |
| 192 | HRSG Transition North | Unit 3 | **73.8** |
| 193 | HRSG Transition North | Unit 2 | **73.8** |
| 194 | HRSG Transition South | Unit 1 | **73.8** |
| 195 | HRSG Transition South | Unit 4 | **73.8** |
| 196 | HRSG Transition South | Unit 3 | **73.8** |
| 197 | HRSG Transition South | Unit 2 | **73.8** |
| 198 | M 3-4-5 North | Unit 1 | **82.8** |
| 199 | M 3-4-5 North | Unit 4 | **82.8** |
| 200 | M 3-4-5 North | Unit 3 | **82.8** |
| 201 | M 3-4-5 North | Unit 2 | **82.8** |
| 202 | M 3-4-5 South | Unit 1 | **82.8** |
| 203 | M 3-4-5 South | Unit 4 | **82.8** |
| 204 | M 3-4-5 South | Unit 3 | **82.8** |
| 205 | M 3-4-5 South | Unit 2 | **82.8** |
| 206 | SCR North | Unit 1 | **78.5** |
| 207 | SCR North | Unit 4 | **78.5** |
| 208 | SCR North | Unit 3 | **78.5** |
| 209 | SCR North | Unit 2 | **78.5** |
| 210 | SCR South | Unit 1 | **78.5** |
| 211 | SCR South | Unit 4 | **78.5** |
| 212 | SCR South | Unit 3 | **78.5** |
| 213 | SCR South | Unit 2 | **78.5** |
| 214 | Turbine Enclosure (North Face) | Unit 1 | **91.7** |
| 215 | Turbine Enclosure (North Face) | Unit 4 | **91.7** |
| 216 | Turbine Enclosure (South Face) | Unit 1 | **91.7** |
| 217 | Turbine Enclosure (South Face) | Unit 4 | **91.7** |
| 218 | Turbine Enclosure North | Unit 3 | **91.7** |
| 219 | Turbine Enclosure North | Unit 2 | **91.7** |
| 220 | Turbine Enclosure South | Unit 3 | **91.7** |
| 221 | Turbine Enclosure South | Unit 2 | **91.7** |
| 222 | Turbine Vent Fan Motor | Unit 1 | **73.8** |
| 223 | Turbine Vent Fan Motor | Unit 4 | **73.8** |
| 224 | Turbine Vent Fan Motor | Unit 3 | **73.8** |
| 225 | Turbine Vent Fan Motor | Unit 2 | **73.8** |
| 226 | Filterhouse End Wall | Unit 1 | **87.2** |
| 227 | Filterhouse End Wall | Unit 2 | **87.2** |
| 228 | Filterhouse End Wall | Unit 3 | **87.2** |
| 229 | Filterhouse End Wall | Unit 4 | **87.2** |
| 230 | Cooling Tower Wet Inlet East | STG-1 | **112.8** |
| 231 | Cooling Tower Wet Inlet West | STG-1 | **112.8** |
| 232 | Cooling Tower Dry Inlet East | STG-1 | **97.9** |
| 233 | Cooling Tower Dry Inlet West | STG-1 | **97.9** |
| 234 | ST Upper Structure End East | STG | **82.4** |
| 235 | ST Upper Structure South | STG | **87.9** |
| 236 | ST Upper Structure End West | STG | **90.9** |
| 237 | ST Upper Structure Side North | STG | **86.9** |
| 238 | STG Condensor End West | STG | **106** |
| 239 | ST Condensor End East | STG | **109.2** |
| 240 | ST Condensor ST-Side South | STG | **106.2** |
| 241 | ST Condensor-Side South | STG-1 | **109.5** |
| 242 | ST Condensor Generator-Side Sout | STG-1 | **103** |
| 243 | ST Condensor ST-Side North | STG-1 | **106.2** |
| 244 | STCondensor Generator-Side North | STG-1 | **103** |
| 245 | ST Condensor Side North | STG-1 | **109.5** |

Note: Only overall levels are listed. In the modeling octave band levels were used.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.7-D*
# *Projected A-Weighted Sound Level Modeling Contour Map*

***December 2003***


Outer Scale In Meters
N
2.4m Levee
51.9
53.4
52.2
50.4
53.6
54.6
48.2
Postion M-6
Postion M-5
50
55
60
Los Esteros Critical Energy Center
Phase Two
Projected Mitigated A-Weighted
Sound Level Contours in dBA
December 19, 2003

# *Los Esteros Critical Energy Facility*

# *Appendix 8.7-E*
# *Noise Complaint Resolution Form*

***December 2003***

**Appendix 8.7-C.** Noise Complaint Resolution Form.

| **NOISE COMPLAINT RESOLUTION FORM**<br>**LOS ESTEROS CRITICAL ENERGY FACILITY (LECEF) – PHASE 2**<br>**SAN JOSE, CALIFORNIA** |
|---|
| Complainant's name and address: |
| Date complaint received:<br>Time complaint received: |
| Nature of noise complaint: |
| Definition of problem after investigation by plant personnel: |
| Initial noise levels at 3 feet: _____ dBA<br>Initial noise levels at the complainant's property: _____ dBA<br>Final noise levels at 3 feet: _____ dBA<br>Final noise levels at the complainant's property: _____ dBA |
| Description of corrective measures taken: |
| This information is certified to be correct:<br>Plant Manager's Signature |
| Approximate installed cost of corrective measures:<br>Date installation completed:<br>Date first letter sent to complainant: (copy attached)<br>Date final letter sent to complainant: (copy attached)<br><br>*(Attach additional pages and supporting documentation, as required.)* |

# *Los Esteros Critical Energy Facility*

# *Appendix 8.14-A*
# *Phase I Environmental Site Assessment Update*

***December 2003***

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

# Phase I Environmental Site Assessment Update

Highway 237 and Coyote Creek

55-Acre Parcel

San Jose, California

This report has been prepared for:

**CALPINE**

620 Coolidge Drive, Suite 200

Folsom, California 95630

April 13, 2000

Project No. 587-12D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MV, 587-12D Calpine 55 acre.DOC

**PHASE I ENVIRONMENTAL SITE ASSESSMENT UPDATE**

**HIGHWAY 237 & COYOTE CREEK**

**55-ACRE PARCEL**

**SAN JOSE, CALIFORNIA**

# 1.0 INTRODUCTION

## 1.1 Purpose

This Phase I environmental site assessment update was performed for Calpine, who we understand is considering developing the site for commercial use.

The purpose of this study was to document environmental concerns at the site related to current and historic chemical use and to evaluate the potential for a release of hazardous materials from on- or off-site sources that could significantly impact the site's soil and/or ground water quality.

## 1.2 Scope of Work

As requested, the scope of work for this update report was performed to bring the original Phase I study for the site (Lowney Associates, February 15, 2000) into general accordance with the American Society for Testing and Materials (ASTM) Designation E 1527-97 as outlined in our proposal dated March 9, 2000. The scope of work included the following tasks.

- Site walk-through and observation of existing conditions.
- Distribute site history questionnaires.
- Interview owners/workers at the site

This scope of work was combined with the previously completed takes to bring the document into general compliance with ASTM requirements. The previously completed tasks are outline below:

- A drive-by reconnaissance of the site and adjacent properties for readily observable indications of current or historic activities that have or could significantly impact the site.
- Review of readily available topographic maps and reports to evaluate local hydrogeologic conditions, including anticipated ground water depth and flow direction.

- Review of readily available documents, maps, and aerial photographs, and interviews with knowledgeable persons to evaluate past land uses.
- Review of a regulatory agency database report to evaluate the potential impact to the site from reported contamination incidents at nearby facilities.
- Review of available regulatory agency files to obtain information about the use and storage of hazardous materials at the site.

Our scope of services did not include sampling or analysis of on-site building materials, air, soil, or ground water. The limitations of this Phase I environmental assessment are presented in Section 6.0; the terms and conditions of your agreement are presented in Appendix A.

## 2.0 SITE RECONNAISSANCE

### 2.1 Site Location and Ownership

The approximately 55-acre site, shown in Figures 1 and 2, is located near the northwest corner of the intersection of Highway 237 and Coyote Creek in San Jose, California and is denoted as assessor's parcel number (APN) 015-31-002. The site is located in an agricultural, residential, and commercial area and is bounded by agricultural land (owned by Cilker Orchards) to the north; Alviso-Milpitas Road to the south; agricultural, residential, and commercial property to the east; and vacant land to the west. There are currently eight property owners; an owner list is presented in Appendix B.

### 2.2 Topographic Features and Hydrogeology

Based on U.S. Geologic Survey (USGS) topographic maps, the site's elevation is approximately 10 to 15 feet above mean sea level. Topography in the vicinity of the site slopes gently to the north toward the San Francisco Bay. Based on our geotechnical investigation and our experience in the area, the shallow water-bearing zone is variable across the site, and likely encountered from near the ground surface to depths of approximately 19 feet. Ground water beneath the site likely flows northeast toward Coyote Creek and the San Francisco Bay.

### 2.3 Site Visit

Our representative, environmental geologist John McCain, visited the project site on March 23, 2000 and was accompanied on a part-time basis by Ms. Elizabeth Lin (co-owner of the Lin Nursery, Inc., 1515 & 1515-A Alviso-Milpitas Road), Mr. Wilson Doe (representing the 1515-C Alviso-Milpitas Road property), and Ms. Lily Kwong (co-owner of 1515-E Alviso-Milpitas Road property). A subsequent site visit was made on April 11, 2000 by our representatives, environmental geologist John McCain and Senior Project Geologist Douglas Young; our representatives were accompanied by Mr. Tuck Lin, Mr. Tom Huen, Ms. Lily Kwong, and current tenants at the 1515-B Alviso-Milpitas Road property.

The site was developed with several nursery complexes and residential structures. Several greenhouses were present throughout the site. Alviso-Milpitas Road permitted access along the southern property boundary of the site, while a gravel drive (the middle road) provided access through the center of the site. The middle road extended north from Alviso-Milpitas Road to the northern portion of the site (Figure 3). The current site tenants are listed in Table 1.

**Table 1. Curent Site Tenants**

| Address | Tenant | General Use |
|---|---|---|
| 1515 Alviso-Milpitas Road | Ms. Elizabeth Lin | Residence |
| 1515-A Alviso-Milpitas Road | Lin Garden | Nursery |
| 1515-B Alviso-Milpitas Road | Hoo Gee Hom | Living quarters and nursery |
| 1515-C Alviso-Milpitas Road | Hing Doe | Living quarters and nursery |
| 1515-D Alviso-Milpitas Road | Tim Wong | Living quarters and nursery |
| 1515-E Alviso-Milpitas Road | Harry Kwong, Lily Kwong | Three residences and flower nursery |
| 1515-G Alviso-Milpitas Road | Hoo Gee Hom, My Sui Hoo | Living quarters |
| 1515-H Alviso-Milpitas Road | Luk Loo Nursery, Inc. | Living quarters |
| 1515-K Alviso-Milpitas Road | Hoo Gee Hom, My Sui Hoo | Living quarters and nursery |
| 1515-L Alviso-Milpitas Road | Lau Brothers Nursery | Nursery |
| Unknown | United Flower Growers Association | Meeting hall and nursery |

Descriptions of the individual properties comprising the 55-acre project site are summarized below.

### 2.3.1 1515 & 1515-A Alviso-Milpitas Road (Lin Property)

The approximately 10-acre property was developed with an approximately 2,000-square-foot residence, approximately 525-square-foot mobile home, approximately 1,225-square-foot structure (including vegetable cooler and living quarters), approximately 1,400-square-foot boiler structure, approximately 50-square-foot pesticide storage shed, approximately 162,800-square-feet of greenhouse space, and other small storage sheds (Figure 3). The wood framed and finished residence was located on the southwest corner of the site and fronted Alviso-Milpitas Road; observations of the interior of the residence were not made. An approximately 36-foot by 8-foot diameter underground storage tank (UST), formerly used to store diesel, was resting on the ground surface approximately 50 feet east of the residence adjacent to the greenhouses. The UST was empty and had a tar coating. No holes were observed in the tank. No staining was observed on the ground surface beneath the UST.

Based on an April 11, 2000 conversation with Ms. Elizabeth Lin (co-owner of the property), the diesel UST was formerly located beneath the ground surface, to the east of the boiler structure on the property. The UST reportedly floated to the ground surface during a flood in approximately 1982. The UST was then emptied

of diesel fuel (an unknown volume) and moved to its present location. The diesel fuel was reportedly taken off-site.

The mobile home was located approximately 20 feet northwest of the residence and had a wood framed and finished garage structure located adjacent to the west (Figure 3); no observations of the interior of the mobile home were made since it was private. An approximately 4-foot by 4-foot barbeque pit was located adjacent to the north of the garage structure; Ms. Elizabeth Lin reported that the tenants reportedly use the pit to cook.

A vegetable cooler structure was located approximately 75 feet north of the residence (Figure 3). A small, one-room living quarters was located within the southeastern corner of the structure, and a small office was located adjacent to the west of the living quarters. The vegetable cooler (no longer in use) was located in the northern portion of the structure. The cooler and other small storage areas located in the northern portion of the structure contained household debris including furniture, paper, and clothing. Approximately twenty 50-pound bags of fertilizer were located on the northwest corner of the structure.

Domestic trash, irrigation plumbing, concrete, wood, and other debris were scattered on the east side of a fence along the western property boundary. An approximately 500-gallon gasoline UST was reportedly located approximately 40 feet northwest of the cooler/living quarter's structure (Figure 3). A vent pipe for the UST was observed to extend out of the ground on the west side of the fence running along the western property boundary. An asphalt pad was observed on the east side of the fence in the area over the UST location.

An agricultural chemical storage shed was present approximately 10 feet north of the location of the gasoline UST (Figure 3). The wood-framed and metal-sided storage shed contained several gallon containers of fertilizers and 50-pound bags of dry fertilizers. Several of the containers and bags had been damaged exposing virgin fertilizer to the shelves and dirt flooring within the shed. Although, no pesticides were observed within the shed, a sign posted on the front door of the shed read "Pesticide Storage Area."

The concrete floored boiler structure was located approximately 160 feet northeast of the residence. The boiler was used to provide steam heat for the greenhouses on-site and was serviced by natural gas. An approximately 10-foot by 6-foot above ground boiler tank, an approximately 10,000-gallon water tank, an approximately 100-gallon water return tank, hand tools, and an agricultural chemical mixer were located within the boiler structure. Though the boiler was no longer in use, the 10,000-gallon wooden water tank contained approximately 8,000-gallons of water which feeds the irrigation system throughout the greenhouses. The agricultural chemical mixer, located in the northwest corner of the structure, had a mixing/holding tank and pump to pump the agricultural chemicals through a series of 1-inch-diameter metal pipes running from the boiler structure throughout the greenhouses on the property; agricultural chemicals observed within the boiler structure included fertilizers and fungicides.

A PVC cased water supply well was observed approximately 15 feet west of the boiler structure. The well was capped at the ground surface and had a series of metal piping apparently running to the boiler structure.

A second pesticide storage shed was located approximately 25 feet east of the boiler structure (Figure 3). The shed contained pesticides and herbicides including Subdue fungicide, Botani Gard ES, Mycainsecticide, Mavrik Insecticide, Enstar, Daconil, 2787 WDG, Phyton 27, and Micro Lin. The agricultural chemicals were stored within the shed on shelving, in containers no larger than 1 gallon or 5 pounds. A pesticide mixer was observed in the shed and appeared empty. Metal piping ran from the pesticide mixer into the surrounding greenhouses. The dirt floor of the pesticide shed appeared to have been impacted with agricultural chemicals.

The greenhouses were wood framed and plastic/fiber sided and located on the north and east portions of the property (Figure 3). The greenhouses were covered with clear plastic to allow the sun to penetrate. Systems containing 1-inch diameter metal piping (pesticide/fertilizer system), 3-inch-diameter metal piping (steam system), and 1-inch PVC piping (irrigation system) ran along the ceiling of the greenhouses. The greenhouses located on the northern portion of the property were partially collapsed. The greenhouses to the east and northeast of the residence were operational, although they are reportedly being phased out of operation.

The property adjacent to the north of the greenhouses was vacant and overgrown with weeds and tall grasses. Two inoperative vans were observed near the middle road. A pile of household debris was located on the north side of the vans and contained metal, wood, clothing, furniture, and trash.

### 2.3.2 1515-B Alviso-Milpitas Road (Hom Property)

The approximately 5-acre property was developed with an approximately 1,500-square-foot living quarters, boiler structure, pesticide storage and mixing shed, and greenhouses, all located on the west side of the middle road (Figure 3). A concrete floored garage space was located in the north portion of the living quarters and served as a cleaning and boxing area for the vegetables grown in the greenhouses on-site. A metal boiler tank and metal water return tank were located in a concrete floored shed approximately 20 feet north of the living quarters; both tanks were mounted on stands. The boiler was fueled by natural gas; metal piping ran from the boiler into the greenhouses adjacent to the west which allowed the boiler to provide steam to the greenhouses. An approximately 10,000-gallon water AST and an approximately 100-gallon water AST were located adjacent to the east of the boiler and apparently supplied the boiler as well as the greenhouses. A second boiler tank (empty and inoperative) was located outside to the north of the boiler structure. According to the current tenants, the tank has been in this location and inoperative since approximately 1978.

The wood floored pesticide storage and mixing shed was located adjacent to the northwest of the boiler structure (Figure 3). Less than 5 pounds of pesticides (Dispel 2x) were observed to be stored on shelving within the shed. A pesticide mixer was located in the center of the shed. The mixer was empty and rested directly on the wood floor of the shed. Metal piping ran from the mixer to the greenhouses adjacent to the west.

The approximately 80,000 square feet of greenhouses were currently being used for cultivation of vegetables. Systems containing 1-inch-diameter metal piping (pesticide/fertilizer system), 3-inch-diameter metal piping (steam system), and 1-inch PVC piping (irrigation system) ran along the ceiling of the greenhouses.

### 2.3.3 1515-C Alviso-Milpitas Road (Doe Property)

The approximately 6-acre property was occupied by a living quarters, boiler and water tank structure, pesticide storage and mixing shed, and greenhouses (Figure 3). The approximately 12,000-square-foot, wood framed and metal sided living quarters was located on the west side of the middle road and reportedly contained 10 bedrooms. Observations of the interior of the living quarters were not made. The southeastern corner of the living quarters contained a concrete floored garage. A vehicle, tractor, and household items including clothing, furniture, and trash were observed in the garage area.

A boiler and water tank structure was located adjacent to the west of the living quarters (Figure 3). The wood framed and metal sided boiler and water tank structure was concrete floored and contained a metal boiler tank and wooden water AST (approximately 10,000-gallon tank). The boiler tank rested on a stand and the metal piping carried the steam from the boiler into the greenhouses on the west side of the property. The boiler was currently fueled by natural gas.

The pesticide storage and mixing shed was located adjacent to the west of the boiler and water tank structure (Figure 3). The shed contained less than 50 pounds (powder) and less than 5 gallons (liquid) of fertilizers and pesticides including Malthion, B-Nine-SP, and Acti-Dione-PM. The pesticides and fertilizers were stored on shelves in the shed in individual containers sold by garden shops/nursery supply stores. The pesticide mixer was located in the center of the shed. The machine was empty and the metal piping used to carry the pesticides to the greenhouses extended out the western side of the shed. The metal piping was above ground and ran to the greenhouses on the west side of the property.

The greenhouses were covered with clear plastic to allow the sun to penetrate. Systems containing 1-inch diameter metal piping (pesticide/fertilizer system), 3-inch diameter metal piping (steam system), and 1-inch PVC piping (irrigation system) ran along the ceiling of the greenhouses.

An approximately 10,000-gallon diesel UST was reportedly located on the east side of the living quarters structure (Figure 3). This tank apparently serviced the boiler

located on this property. The vent pipe for the tank was observed on the east wall of the living quarters.

### 2.3.4 1515-D Alviso-Milpitas Road (Wong Property)

The approximately 3-acre property contained a boiler structure, living quarters, and a pesticide storage shed. Greenhouse structures were present on the west portion of the property and appeared to be used for the cultivation of flowers. The greenhouses were covered with clear plastic to allow the sun to penetrate. Systems containing 1-inch diameter metal piping (pesticide/fertilizer system), 3-inch-diameter metal piping (steam system), and 1-inch PVC piping (irrigation system) ran along the ceiling of the greenhouses.

The concrete-floored, wood framed and fiberboard sided boiler structure contained a metal boiler tank and a metal water tank; both tanks were mounted on stands. The boiler was fueled by natural gas and reportedly has not been used in the past year. Mr. Thomas Huen (representative of Mr. Tim Wong, the current property owner) reported that the boiler was never fueled by a diesel UST.

The two wood framed and metal-sided living quarters structures were located adjacent to the north of the boiler structure; a total of five bedrooms were reported within the living quarters structures. No observations of the inside of the living quarters were made.

The concrete floored, wood framed and fiberboard sided pesticide storage shed was located to the north of the boiler structure. Approximately 5 gallons of Malathion 8 were observed to be stored on shelving within the shed. A pesticide mixer was located in the south side of the shed and appeared empty. Metal piping was observed to extend from the machine into the greenhouses on the property.

### 2.3.5 1515-E Alviso-Milpitas Road (Kwong Property)

The approximately 1.65-acre property contained three residential structures and three greenhouse areas. The residential structures (two 3-bedroom structures and one 2-bedroom structure) appeared to be modular type homes; observations of the interiors of the residences were not made.

The greenhouse areas were located west of the residences and had wooden frames covered with plastic sheeting. One of the greenhouses extended onto the United Growers Association (UFGA) property adjacent to the north.

An approximately 4-foot by 3-foot, metal pesticide storage shed was located on the north side of the northern most residence (Figure 3); the shed was empty. Though Ms. Kwong reportedly stored the bulk of the pesticides in the metal shed, a second, dirt floored pesticide storage and mixing area was observed within a shed located adjacent to the greenhouses on the western portion of the UFGA property (adjacent to the north). Ms. Kwong reported that nursery operations ceased approximately three years ago, and only limited flower growing has occurred since that time.

### 2.3.6 The United Flower Growers Association

The approximately 1.65-acre United Flower Growers Association (UFGA) property was located on the northwestern corner of the site. The property was developed with an approximately 4,400-square-foot single story building used as a meeting hall with some office and classroom space (Figure 3). A garage was located in the western portion of the building and appeared to be empty with the exception of an approximately 20-gallon pesticide spreader (empty) and a lawnmower. Approximately four propane canisters (approximately 5 feet tall) and an outdoor grill area were located on the east side of the building. A gravel parking area was located on the south and west sides of the building. A former propane tank concrete pad was located approximately 30 feet southeast of the building. Ms. Lily Kwong reported that the tank was removed approximately three years ago.

Two metal ASTs were located on the west side of the building. The ASTs were empty, and one (approximately 500-gallon) was on a stand while the second (approximately 100-gallon) rested on the ground surface. Ms. Kwong reported that the 500-gallon tank was used for storage of pesticides at an off-site location, and the 100-gallon tank was reportedly used to store water at an off-site location. Both tanks were brought on-site from the off-site location and were reportedly never used on-site. Plastic sheeting, metal irrigation piping, and metal fencing debris was present on the western portion of the UFGA property.

A former greenhouse area operated by Ms. Lily Kwong extended up onto the western portion of the UFGA property. A shed located adjacent to the east of the greenhouse contained a pesticide mixing and storage area (Figure 3). The mixer was empty and less than 5 pounds of pesticides were observed in plastic containers and bags on the dirt floor of the shed; the dirt floor of the shed appeared to have been impacted with the pesticides.

### 2.3.7 1515-G and 1515-K Alviso-Milpitas Road (Hom Property)

The approximately 10-acre property was located at the southeastern corner of the site (Figure 3). The property was developed with three living quarters structures (1515-K Alviso-Milpitas Road, 1515-G Alviso-Milpitas Road, and an unlabeled living quarters), a boiler structure, and greenhouses. The 1515-K and 1515-G Alviso-Milpitas Road living quarters were wood framed and metal-sided (Figure 3). The 1515-K Alviso-Milpitas Road structure contained approximately two bedrooms, a kitchen, and a vegetable cooler. The vegetable cooler had been converted into a dry storage space. An apparent agricultural chemical storage area was located in a shed adjacent to the west of the 1515-K Alviso-Milpitas Road structure. Though no pesticides were observed in the shed area, Ms. Elizabeth Lin reported that limited, historical pesticide storage and mixing occurred within the shed. Greenhouses were present to the north of the living quarters.

The interior of the 1515-G Alviso-Milpitas Road living quarters was not observed, but the structure appeared to have at least two bedrooms. The third living quarters structure (not labeled with a number address) was located adjacent to the west of

the 1515-K Alviso-Milpitas Road living quarters structure (Figure 3) and appeared to contain one bedroom. An associated shed and mobile home trailer were located adjacent to the southwest of the structure. Greenhouses were present to the south of the living quarters.

The concrete-floored, wood framed and metal-sided boiler structure was located near the northwestern corner of the property, near the middle road (Figure 3). The natural gas fueled, metal boiler tank was mounted on a metal stand; a metal water return tank was located adjacent to the east. The southern side of the boiler structure contained a single roomed living quarters. A 5-gallon bucket of apparent gear lube was observed on the south side of the boiler structure. The greenhouses were located adjacent to the east of the boiler structure. Mr. Tuck Lin reported that the greenhouses were currently used to grow mushrooms. No pesticides were reportedly used on the mushrooms within the greenhouses. The greenhouses appeared to be in poor condition and some areas had collapsed.

Two active water supply wells, one reportedly inactive water supply well, and an apparent water AST were observed on the southern portion of the property along Alviso-Milpitas Road (Figure 3). One of the water supply wells was located approximately 40 feet west of the 1515-K Alviso-Milpitas Road living quarters structure; metal and PVC piping ran from the well to the apparent water AST which was located approximately five feet to the north of the well. The second active water supply well was located approximately 50 feet west of the first. The well had metal and PVC piping extending to the apparent water tank. The inactive water supply well was observed approximately 25 feet south of the un-numbered living quarters located along Alviso-Milpitas Road. The apparent well was located adjacent to a 4-foot by 4-foot wooden shed that contained two empty 55-gallon drums. No cover was observed on the well; a tape measure was used to determine that the well was open to a depth greater than 25 feet.

The wood framed and fiber sided greenhouses were located adjacent to the north of the 1515-K Alviso-Milpitas Road living quarters and adjacent to the south of the 1515-G Alviso-Milpitas Road living quarters. The greenhouses were in poor condition and several sections of the roof of the greenhouses had collapsed. Systems containing 1-inch diameter metal piping (pesticide/fertilizer system), 3-inch-diameter metal piping (steam system), and 1-inch PVC piping (irrigation system) ran along the ceiling of the greenhouses.

### 2.3.8 1515-H Alviso-Milpitas Road (Loo Property)

The approximately 5-acre property was developed with a wood-framed and concrete-block structure containing three bedrooms which did not appear to have been occupied within the past year. A water tank and pesticide mixer were located to the east of the living quarters. The pesticide mixer and water tank were located within a structure frame (the walls and roof were not present on the framework) adjacent to the east of the living quarters. Ms. Elizabeth Lin reported that the building contained a natural gas fueled boiler at one time. An apparent water AST was located to the east of the pesticide mixer.

Greenhouses were located to the north and east of the 1515-H Alviso-Milpitas Road structure. The greenhouses were in poor condition and several portions of the roof had collapsed; the greenhouses did not appear to be in operation. A pole-mounted transformer was observed adjacent to the north of the greenhouses.

### 2.3.9 1515-L Alviso-Milpitas Road (Lau Property)

The approximately 12.3-acre property contained the Lau Brother's Nursery greenhouses located on the east side of the middle road (Figure 3). An approximately 8,000-square-foot, wood framed and metal-sided boiler structure contained a natural gas fed boiler, an above ground water tank, an agricultural chemical mixer, vegetable coolers, and living quarters. The boiler was located within the center of the structure, and the agricultural chemical mixer was located north of the boiler tank inside the structure. Approximately twenty 50-pound bags of fertilizer and two 55-gallon drums of liquid fertilizer (approximately half-full) were stored on the concrete flooring of the structure near the boiler tank. The vegetable coolers (still in use) occupied the western portion of the structure. Vegetables harvested from the greenhouses on the property were reportedly stored in the vegetable cooler prior to distribution. The eastern end of the structure contained living quarters consisting of approximately five bedrooms and three bathrooms.

Ms. Elizabeth Lin and Mr. Wilson Doe reported that a diesel UST was located on the southern side of the boiler structure (Figure 3). A vent pipe apparently associated with the UST was observed on the southern side of the boiler structure.

A wood framed and metal-sided cooler structure was located to the south of the boiler structure. The structure appeared to be used for storage of vegetables after harvesting.

A storage yard area was observed to the south and west of the boiler structure and contained a semi-trailer, a camping trailer, a vehicle, and domestic debris including wood crates, clothing, and trash. An inactive agricultural well reportedly exists near the existing greenhouse structures. The well was not observed during our site visit, however.

## 2.4 Site Vicinity Reconnaissance

To evaluate adjacent land use, we performed a drive-by survey. Our observations are presented in Table 2. Of the facilities listed in Table 2, Cilker Orchards and the road construction yard may use, handle, and/or store hazardous materials

**Table 2. Adjacent Properties**

| Land Use | Business Name and Address | Direction from Site |
|---|---|---|
| Agricultural | Cilker Orchards<br>1595 Alviso-Milpitas Road | North |
| Alviso-Milpitas Road, industrial | Road construction storage yard | South |
| Agricultural, residential, commercial | Cilker Orchards/Silva Produce/Pacheco Tractor Service/Williams Trucking<br>1595 Alviso-Milpitas Road<br>Raul Ivarra residence<br>1591 Alviso-Milpitas Road | East |
| Vacant | buffer zone for San Jose-Santa Clara Water Pollution Control Plant | West |

The treatment plant portion of the San Jose-Santa Clara Water Pollution Control Plant is located approximately 1,600 feet west of the site. The plant uses, handles, and stores large quantities of hazardous materials, including chlorine and sulfur dioxide gasses.

## 2.5 Interviews

During our March 23, 2000 site visit, we contacted Ms. Elizabeth Lin, Mr. Wilson Doe, and Ms. Lilly Kwong for general information regarding past and current site usage. Ms. Lin, Mr. Doe, and Ms. Kwong were asked to complete a questionnaire. Questionnaires were sent to Mr. Norman E. Matteoni, Esq. (representing Tuck & Elizabeth Lin, Hoo Gee Hom and My Sui Hoo, Hoo Gee Hom Nursery, Inc., Yuk Lun Loo Nursery, Inc., and the United Flower Growers, Inc.), Mr. Gordon Chan (representing Kam Cheong Lau & Pou Leng Ip Lau and Kam Wo Lau and Lily L. Lau), and Mr. Thomas Huen (representing Chung Tim Wong & Yin Yi Wong and Harry Kwong & Lily Kwong). Copies of the completed questionnaires received by Lowney Associates are included in Appendix B. A brief discussion of the questionnaires and conversations with selected individuals is provided below.

Ms. Elizabeth Lin has owned her approximately 10-acre portion of the subject site since October 1978. Ms. Lin informed us of the approximate location of the reported 500-gallon gasoline UST present on the western portion of her property. Ms. Lin reported that the gasoline UST was most likely used to fuel machinery used on the orchard, and the tank has not been used since 1978. The orchard reportedly contained orange, prisimon, apricot, and pear trees. Orchard trees were removed from the area currently occupied by greenhouses on Ms. Lin's property. Ms. Lin reported that the UST resting on the ground surface to the east of her 1515 Alviso-Milpitas Road residence was once used as a back-up fuel supply for the boiler located on her property. The UST was reportedly buried on the east side of the boiler structure currently on the Lin property. The UST surfaced during a flood event which occurred in 1982. Following the flood, the tank was emptied of diesel fuel and placed in its current location.

Ms. Lin reported that a boiler used to be located in the structure adjacent to the east of the 1515-H Alviso-Milpitas Road living quarters structure. Ms. Lin did not know the date that the boiler was removed. Ms. Lin reported that the boiler was fueled by natural gas.

Mr. Wilson Doe reported that minor maintenance of the tractor and nursery vehicles was performed within the garage portion of the 1515-C Alviso-Milpitas Road living quarters structure. The maintenance included oil changes for the vehicles and the waste oil was reportedly picked up for off-site disposal/recycling by the City of San Jose. Mr. Doe identified the location of a 10,000-gallon diesel UST on the Doe property. The tank is reportedly located on the east side of the living quarters on-site. Mr. Doe reported that the UST on the Doe property and the diesel UST present on the Lau Brother's property (1515-L Alviso-Milpitas Road) were installed in approximately 1978. Mr. Doe also reported that an approximately 32-foot by 10-foot concrete slab was present above the 10,000-gallon diesel UST on the Doe property. The slab was poured over the UST after a flood occurred in the site vicinity (approximately 1982) and caused the UST to rise to the surface. At that time, the UST was measured to contain approximately 4,000 gallons of diesel fuel. The Doe's pumped water into the tank to weigh the tank down and aid in anchoring it. The current volume of the diesel fuel in the UST present on the Doe property is unknown.

The boiler on the Doe property (1515-C Alviso-Milpitas Road) was last used in approximately 1992 and very limited nursery activities have existed since that time. Mr. Doe reported that pesticides were used approximately 10 to 20 years ago in the greenhouses to the west of the living quarters. The pesticides were reportedly stored and mixed in the pesticide storage/mixing shed located on the west side of the boiler shed on the Doe property (Figure 3). Mr. Doe reported that the property gets its water from the well located on the southern portion of the 55-acre project site near the 1515-K Alviso-Milpitas Road living quarters (Figure 3), Mr. Doe reported that the water line (along with the natural gas line) runs up the middle road; the water line is located along the west side of the middle road, while the natural gas line runs along the east side of the middle road.

According to the questionnaire completed by Mr. Tim Wong (co-owner of the 1515-D Alviso-Milpitas Road property), the greenhouses on the property are used to grow flowers. Agricultural chemicals such as Subdue, Neemazda, and Orthene historically have been applied to the site.

Ms. Lily Kwong reported that the pesticide use at the 1515-E Alviso-Milpitas Road property included Avid, Diazinon AG 500, Dylox, Fore, and Orthene. Pesticide use stopped in approximately 1998.

According to the questionnaire completed by Mr. Kam Wo Lau, Ms. Lily L. Lau, Mr. Kam Cheong Lau, and Mr. Pou Leng Ip Lau, the Lau Brother's Nursery (1515-L Alviso-Milpitas Road) has three structures totaling approximately 9,500 square feet. Chinese vegetables were reportedly grown in the greenhouses on the property. The co-owners reported that no agricultural chemicals were historically applied to

the site. The Lau's reported that the site contained the following: above ground storage tanks (for water), an agricultural well, a boiler, chemical storing and mixing areas, a sump, and an underground storage tank (UST).

## 3.0 HISTORICAL REVIEW

To evaluate the site history, we reviewed the following.

- Available stereo-paired aerial photographs (1963, 1966, and 1968) from the USGS Library in Menlo Park, California.
- Available USGS 15-minute and 7.5-minute topographic maps (1961, 1968, 1973, and 1980).
- Historic Sanborn fire insurance maps were requested from Sanborn Mapping and Geographic Information Service (Sanborn GIS) in Pelham, New York. Information obtained by us during the study indicated that no Sanborn maps were available.

Our observations are summarized below.

**1961 through 1973:** Based on the 1961 USGS topographic map, the site appeared to be developed with an orchard and residence. The site appeared to remain similar through at least 1973.

Based on the 1961 topographic map, the properties adjacent to the north and south of the site were developed with orchards. The property adjacent to the west of the site was vacant land. The property adjacent to the east was developed with a residence, an orchard, and associated barn structures. Based on the 1963 aerial photograph, the adjacent properties appeared similar, with the exception of the property adjacent to the south; this property had been cleared of the former orchard and a structure was present on the southeastern corner of the property. Highway 237 also was present to the south. The adjacent properties appeared to remain similar through at least 1973.

**1980:** Based on the 1980 topographic map, the site appeared to have been cleared of all former orchards and was developed with the existing nursery facility. A residence remained on the southwestern portion of the site. The adjacent properties appeared similar to the prior maps and photographs.

## 4.0 REGULATORY RECORDS

### 4.1 City and County Agencies File Review

To obtain information on hazardous materials usage and storage, we reviewed readily available information at the Santa Clara County Building Department (SCCBD), San Jose Fire Department (SJFD), and Santa Clara County Environmental Health Department (SCCEHD) pertaining to the 1515 Alviso-Milpitas Road address.

No files were available at the SJFD or the SCCEHD. A 1994 electrical permit for the 1515 Alviso-Milpitas Road address was the only document made available to us by the SCCBD.

We additionally reviewed a well location map from the Santa Clara Valley Water district (SCVWD). Several wells are shown on the map. A copy of the map is provided in Appendix B.

### 4.2 Regulatory Agency Database Report

During this study, a regulatory agency database report was obtained and reviewed to help establish whether contamination incidents have been reported within the site vicinity. A list of the database sources reviewed, a detailed description of the sources, and a radius map indicating the location of the reported facilities relative to the project site are presented in Appendix C. Nearby reported hazardous materials incidents and facilities are presented in Table 3.

**Table 3. Nearby Hazardous Materials Incidents and Facilities**

| Facility Name | Map ID No. | Address | Distance and Direction From Site | Potential Concern |
|---|---|---|---|---|
| Cilker Orchard #3 | 10 | 1595 Alviso-Milpitas Road San Jose, CA | Adjacent to the east | The site was reported to have a 3,000-gallon gasoline UST and ground water monitoring well. |
| AT&T Farms/ McCarthy Ranch | 2, 7 | Coyote Creek Reach 3/Highway 237 Milpitas, CA | Unknown* | Listed in SMS R_2 and SLIC databases of ground water pollution cases; no further information provided. RWQCB listed as lead agency. |

* Although mapped on the site, this facility was not identified/observed on-site or adjacent to the subject property during the site and vicinity reconnaissance.

During interviews with Mr. Cilker, the owner of the adjacent property to the east, he was unaware of the AT&T Farms/McCarthy Ranch facility being anywhere near his property. It is suspected that this site was mislocated on the database report.

## 5.0 CONCLUSIONS

### 5.1 Historical Summary

The site's first developed use appears to have been with orchards from at least the early 1960s through the mid- to late 1970s. By 1980, the site was developed with the existing nursery facility and residences. Site information dating back prior to 1961 was unavailable from the sources researched, but based on our experience in this area, site use prior to 1961 was likely agricultural and/or undeveloped land.

## 5.2 Agricultural Wells

Four water supply wells were observed on the site; three on the 1515-G & 1515-K Alviso-Milpitas Road property and one on the 1515 & 1515-A Alviso-Milpitas Road property. A fifth well was reported, but not observed, to be present at the Lau property (1515-L Alviso-Milpitas Road). The five on-site water supply wells should be properly abandoned in accordance with SCVWD requirements if continued use is no longer intended.

One potential additional well (M6) was identified on the SCVWD well location map (Appendix B). The SCVWD should be contacted to evaluate the status of all wells at the site. If any additional wells are found to exist and are no longer needed, they should be properly destroyed following SCVWD guidelines.

## 5.3 On-Site Soil Quality

Due to the agricultural history of the site, a potential environmental concern is the possible presence of residual pesticides and associated metals (arsenic, lead, and mercury) in the native soils. Based on the planned use of the site, we do not consider these pesticides, if present, a significant threat to the future occupants of the site. The site will be largely capped by the commercial development and associated asphalt-concrete drives and parking areas; thus, risk to human health and the environment will be significantly reduced if residual pesticides are present. Construction worker health and safety issues and off-site disposal of excess soil, however, can be concerns if high pesticide levels are present. Soil sampling should be performed to evaluate if elevated concentrations of pesticides and associated metals are present throughout the greenhouse areas, and in the pesticide storage and mixing sheds.

## 5.4 Storage Tanks

The California Code of Regulations requires that all underground storage tanks used for hazardous substances be closed if they are not in use. Temporary closure requirements apply if the tank will be used within 12 months. The application for temporary closure must be submitted within 90 days from the date of last use. Permanent closure (usually removal) is required if the tank will not be used within 12 months.

The gasoline UST located at the Lin property and the two diesel USTs present at the Doe and Lau properties should be removed. Additionally, the approximately 10,000-gallon UST resting on the ground surface to the east of the 1515 Alviso-Milpitas Road residence should be removed from the site for proper disposal or recycling.

A soil and ground water quality evaluation should be conducted at each of the current UST locations as well as at the former location of the tank that is currently resting at the ground surface.

## 5.5 Asbestos

Due to the construction of the on-site structures prior to 1980, asbestos-containing materials (ACMs) may be present. Since demolition of the buildings is under consideration, an asbestos survey must be conducted under National Emissions Standards for Hazardous Air Pollutants (NESHAP) guidelines. In addition, NESHAP guidelines require that all potentially friable ACM be removed prior to building demolition or renovation that may disturb the ACM.

## 5.6 Lead-Based Paint

The on-site structures also should be evaluated for the presence of lead based paint prior to demolition. If the lead based paint is still bonded to the building components, its removal is not required prior to demolition. However, the personnel conducting the demolition must comply with the training, worker protection, and monitoring requirements of the California Occupational Safety and Health Administration (Cal/OSHA) Lead in Construction Standard, Title 8, California Code of Regulations (CCR) 1532.1. If the lead based paint is peeling, flaking or blistered, it should be removed prior to demolition. It is assumed that such paint will become separated from the building components during demolition activities; thus, it must be managed and disposed as a separate waste steam.

## 5.7 Potential Environmental Concerns Within the Site Vicinity

The regulatory agency database report identified the AT&T/McCarthy Ranch facility as being on or near the site. The owner of the adjacent property, Mr. Cilker, has no knowledge of this facility or where it may be located. The location of this site on the database report appears to be mislabeled. The RWQCB should be contacted to help locate this site if additional information is desired.

The San Jose-Santa Clara Water Pollution Control Plant is located within approximately 1,600 feet west of the project site. Consideration should be given to reviewing the facility's risk management plan to evaluate whether the project site falls within the radius of influence for gas releases from the plant.

## 5.8 Urban Runoff Pollution Prevention Program

The Urban Runoff Pollution Prevention Program, also called the Non-Point Source Program, was developed in accordance with the requirements of the 1986 San Francisco Bay Basin Water Quality Control Plan to reduce water pollution associated with urban storm water runoff. This program was also designed to fulfill the requirements of the Federal Clean Water Act, which mandated that the EPA develop National Pollution Discharge Elimination System (NPDES) permit application requirements for various storm water discharges, including those from municipal storm drain systems and construction site. For properties of 5 acres or greater, a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) must be prepared prior to commencement of construction.

### 5.9 Septic Tanks

The on-site structures are reported to have septic systems. Prior to site grading activities, the systems should be properly abandoned in accordance with county health department requirements.

## 6.0 LIMITATIONS

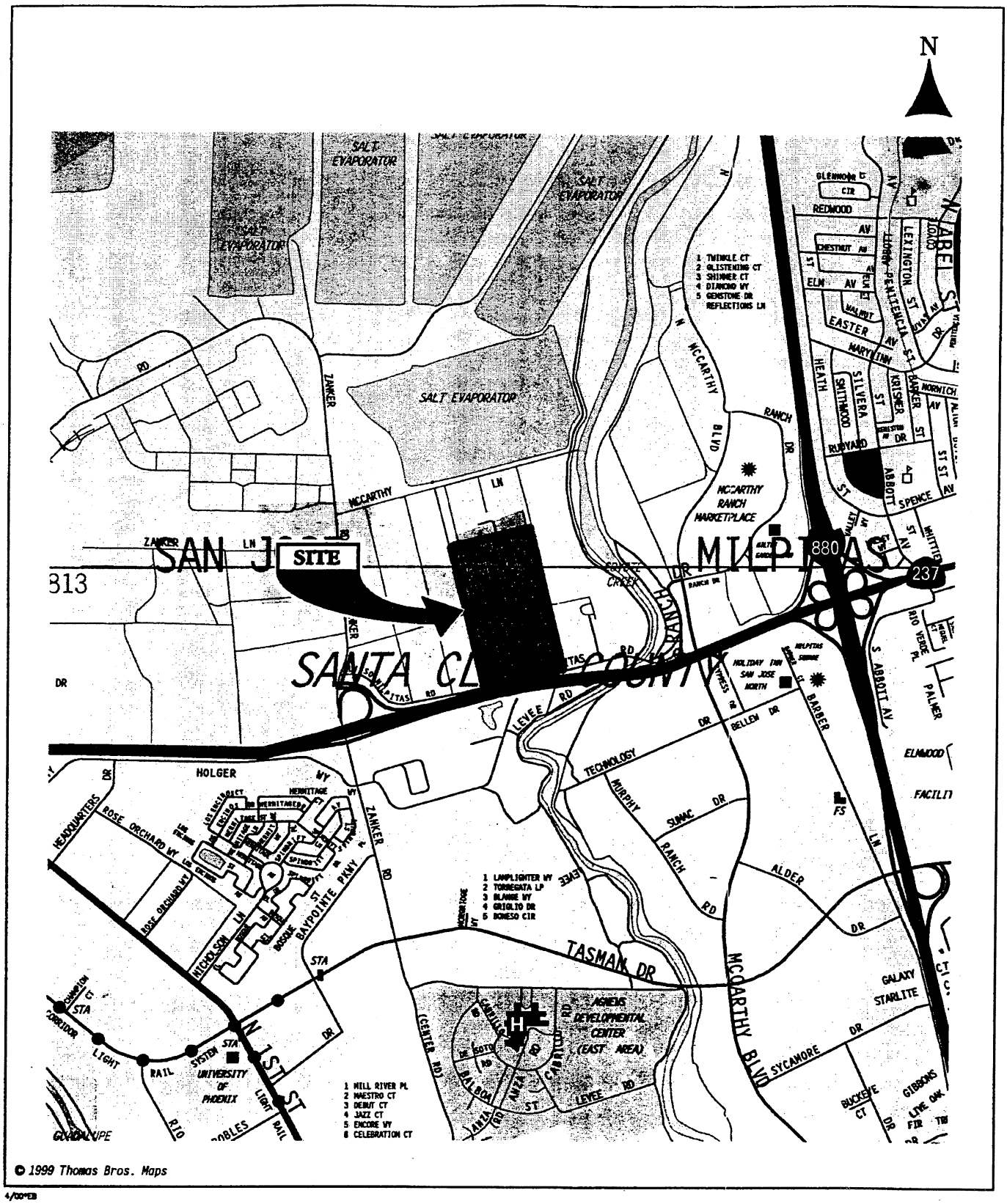
As with all site assessments, the extent of information obtained is a function of client demands, time limitations, and budgetary constraints. Our conclusions and recommendations regarding the site are based on readily observable site conditions, review of readily available documents, maps, aerial photographs, and data collected and/or reported by others. We are not responsible for the accuracy of information or data presented by others. Our conclusions and recommendations in this site assessment are qualified in that no soil, ground water, air, or building material analyses were performed. Sampling and analysis lead to a more reliable assessment of environmental conditions, conditions which often cannot be noted from typical Phase I activities. Should you desire a greater degree of confidence, these samples should be obtained and analyzed to further evaluate environmental conditions.

This report was prepared for the sole use of Calpine. We make no warranty, expressed or implied, except that our services have been performed in accordance with environmental principles generally accepted at this time and location.

## 7.0 REFERENCE

Lowney Associates. February 15, 2000. *Phase I Environmental Site Assessment.*

* * * * * * * * * * * * * *




4/00*EB

**VICINITY MAP**

HIGHWAY 237/COYOTE CREEK 55-ACRE PARCEL

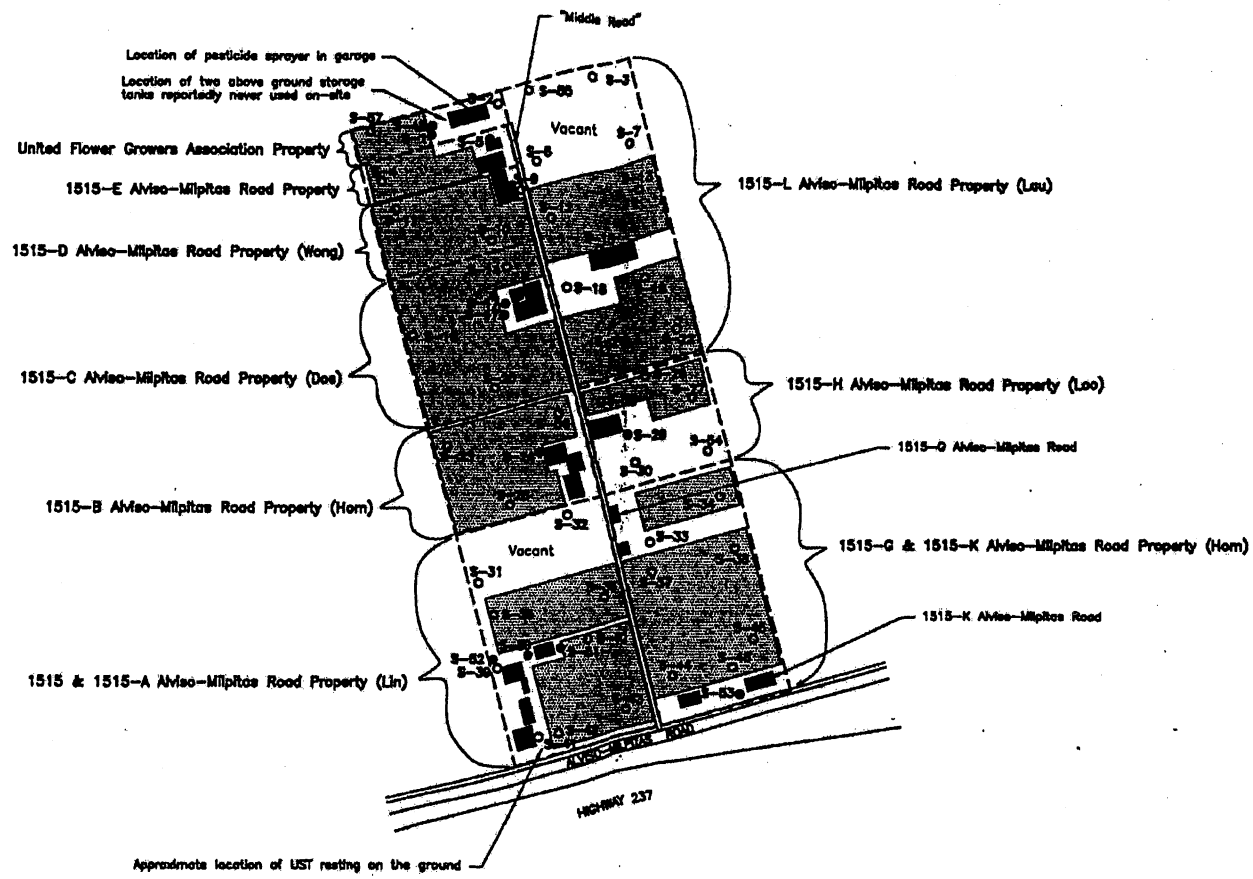
San Jose, California

**LOWNEY ASSOCIATES**

Environmental/Geotechnical/Engineering Services

**FIGURE 1**

**587-12D**




LEGEND

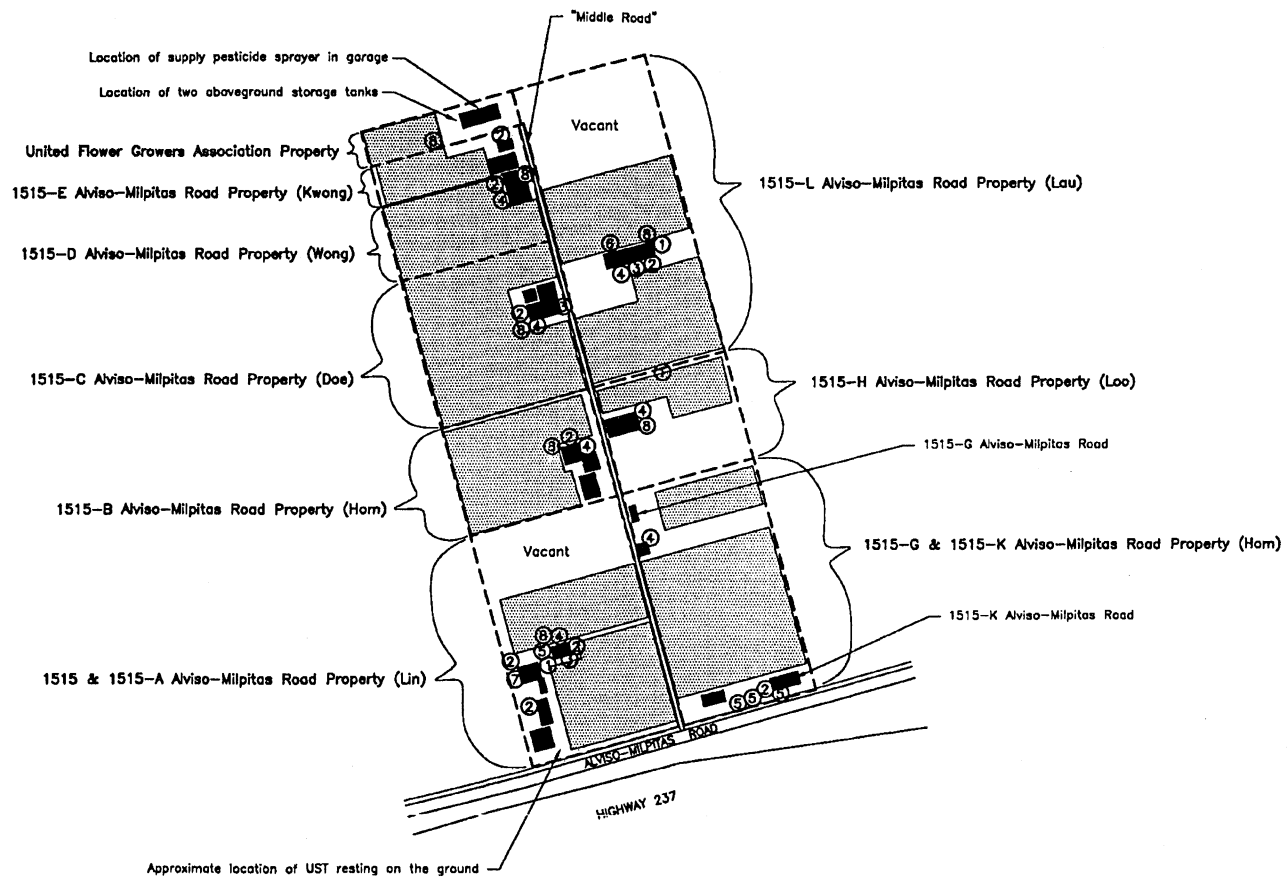
- O – Approximate location of greenhouse area/former agricultural area soil sample
- ● – Approximate location of pesticide mixing/storage area soil sample and/or ground water sample (if applicable)
- ▒ – Approximate location of on-site greenhouse/nursery
- ■ – Approximate location of on-site structures

Base by Unknown.

**SITE PLAN**
**55-ACRE LIN/HOM PROPERTY**
**San Jose, California**

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 2
687-127




LEGEND

① – Approximate location of pole–mounted transformer
② – Approximate location of pesticide storage shed
③ – Approximate location of diesel UST
④ – Approximate location of boiler
⑤ – Approximate location of water supply well observed by Lowney Associates
⑥ – Approximate location of water supply well reported by others but not observed by Lowney Associates
⑦ – Approximate location of gasoline UST
⑧ – Approximate location of agricultural chemical mixer

– Approximate location of on–site greenhouse/nursery
– Approximate location of on–site structures

Base by Unknown.

0 400
Scale feet

SITE PLAN
HIGWAY 237/COYOTE CREEK 55–ACRE PARCEL
San Jose, California

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 3
587–12D

4/00-13

# *Los Esteros Critical Energy Facility*

# *Appendix 8.14-B*
# *Phase II Soil and Groundwater Quality Evaluation*

***December 2003***

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

# Phase II Soil and Ground Water Quality Evaluation

55-acre Lin/Hom parcel

San Jose, California

This report has been prepared for:

**Calpine**

620 Coolidge Drive, Suite 200, Folsom, California 95630

July 14, 2000

Project No. 587-12F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**PHASE II SOIL AND GROUND WATER QUALITY EVALUATION**

**55-ACRE LIN/HOM PARCEL**

**SAN JOSE, CALIFORNIA**

# 1.0 INTRODUCTION

## 1.1 Purpose

In this report, we present the results of the soil and ground water quality evaluation performed at the 55-acre Lin/Hom parcel located in San Jose, California (Figure 1). This work was performed for Calpine who is considering purchasing the property for com-mercial development.

## 1.2 Site Background

The approximately 55-acre parcel is located near the northwest intersection of Highway 237 and Coyote Creek. The site is located in an agricultural, residential, and commercial area and is bounded by McCarthy Lane to the north; Alviso-Milpitas Road to the south; agricultural, residential, and commercial property to the east; and vacant land to the west (Figure 2). This parcel currently is being used for various agricultural farming purposes.

The site is developed with several nursery/greenhouse complexes and residential structures. As discussed in our Phase I Environmental Site Assessment reports dated February 13, 2000 and April 13, 2000 (draft), underground storage tanks (USTs) (three diesel fuel tanks and one gasoline tank), and several pesticide mixing/storage areas were identified on-site (Figure 2). These areas, coupled with former agricultural use of the property, prompted the performance of this phase of work to evaluate soil and ground water quality.

## 1.3 Scope of Work

The scope of work performed was outlined in our agreement with you, dated April 26, 2000, and included the following tasks.

- Drilling of exploratory borings near the USTs and pesticide mixing/storage areas, and from the greenhouse/agricultural areas.
- Collection of soil and ground water samples for laboratory analysis.

# 2.0 SOIL AND GROUND WATER QUALITY EVALUATION

To evaluate soil and ground water quality near the former USTs, the pesticide storage and mixing areas, and within the greenhouses located on the parcel, a subsurface investigation was performed on May 9, 10, 11, and 13, 2000. Under the

supervision of Principal Environmental Engineer Stason I. Foster, Environmental Geologist John W. McCain drilled 59 borings to approximate depths between 2½ and 10 feet.

## 2.1 UST Areas

As shown on Figures 3, 4, and 5, one boring was drilled near each of the existing UST locations. For the diesel UST that reportedly had floated to the ground surface during a flood in approximately 1982, a boring was drilled near the former in-place location to the east of the boiler structure on the Lin property.

Ground water was encountered in three of the four borings at approximate depths of 3 to 4 feet. Soil and ground water sampling protocols are presented in Appendix A.

Soil samples collected from just above the shallow water-bearing zone and ground water grab samples (where encountered) from each boring, were selected for submittal to a state-certified analytical laboratory.

The samples were analyzed for total petroleum hydrocarbons as gasoline and diesel (TPHg and TPHd) (EPA Test Method 8015); benzene, toluene, ethylbenzene, and total xylenes (BTEX) (EPA Test Method 8020); and fuel oxygenates (EPA Test Method 8260). The ground water samples additionally were analyzed for organochlorine pesticides (EPA Test Method 8081). These analyses were selected to help evaluate possible contamination due to the presence of the USTs. The results of these analyses are presented in Tables 1 and 2. Copies of the analytical reports and chain of custody documentation are presented in Appendix A.

**Table 1. Analytical Results of Selected Soil Samples – UST Area**
(concentrations in parts per million)

| Boring Number | Depth (feet) | TPHg | TPHd | BTEX | Fuel Oxygenates |
|---|---|---|---|---|---|
| T-1 | 2½ - 3 | <1.0 | <1.0 | <0.005 | <0.005 |
| T-2 | 2½ - 3 | <1.0 | <1.0 | <0.005 | <0.005 |
| T-3 | 9½ - 10 | <1.0 | <1.0 | <0.005 | <0.005 |
| T-4 | 2½ - 3 | <1.0 | <1.0 | <0.005 | <0.005 |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit

**Table 2. Analytical Results of Selected Ground Water Samples-UST Area**
(concentrations in parts per million)

| Well Number | Date | TPHg | TPHd | BTEX | Fuel Oxygenates | Organochlorine Pesticides |
|---|---|---|---|---|---|---|
| T-1 | 5/11/00 | <50 | <50 | <0.5 | <5 | ND |
| T-2 | 5/11/00 | <50 | <50 | <0.5 | <5 | ND |
| T-4 | 5/11/00 | <50 | <50 | <0.5 | <5 | ND |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
ND – Not Detected (detection limits vary)

## 2.2 Greenhouses and Pesticide Storage/Mixing Areas

### 2.2.1 Soil Quality

Fifty-five soil samples were collected at a depth of approximately ½ foot from the borings drilled near the greenhouses and the pesticide storage and mixing areas. These samples were analyzed for organochlorine pesticides (EPA Test Method 8081) and the metals mercury, arsenic, selenium, and lead. The pesticide and metals results are presented in Tables 3 and 4, respectively. Sampling locations are shown on Figure 6.

**Table 3. Analytical Results of Selected Soil Samples – Organochlorine Pesticides**
(concentrations in parts per million)

| Boring Number | Depth (feet) | DDT | DDE | DDD | Dieldrin | Heptachlor Epoxide | Endo-sulfan I | Endo-sulfan II | Endrin | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|
| S-1 | 0 - ½ | 0.328 | 1.52 | <0.100 | <0.100 | <0.050 | <0.050 | <0.100 | <0.100 | <4.25 |
| S-2 | 0 - ½ | 0.328 | 1.54 | <0.100 | <0.100 | <0.050 | <0.050 | <0.100 | <0.100 | <4.25 |
| S-3 | 0 - ½ | 0.363 | 1.83 | <0.200 | <0.200 | <0.100 | <0.100 | <0.200 | <0.200 | <8.50 |
| S-4 | 0 - ½ | 0.181 | 1.55 | <0.100 | <0.100 | <0.050 | <0.050 | <0.100 | <0.100 | <4.25 |
| S-5 | 0 - ½ | 0.049 | 0.236 | <0.020 | <0.020 | <0.010 | <0.010 | <0.020 | <0.020 | <0.850 |
| S-6 | 0 - ½ | 0.483 | 1.80 | <0.200 | <0.200 | <0.100 | <0.100 | <0.200 | <0.200 | <8.50 |
| S-7 | 0 - ½ | 0.142 | 1.10 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-9 | 0 - ½ | 0.127 | 0.699 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-10 | 0 - ½ | 0.083 | 0.806 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-11 | 0 - ½ | 0.047 | 0.551 | <0.040 | <0.040 | <0.020 | <0.020 | <0.040 | <0.040 | <1.70 |
| S-12 | 0 - ½ | 0.121 | 0.865 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-13 | 0 - ½ | 0.251 | 1.07 | <0.100 | <0.100 | <0.050 | <0.050 | <0.100 | <0.100 | <4.25 |
| S-14 | 0 - ½ | 0.207 | 1.27 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-15 | 0 - ½ | <0.2 | 0.379 | <0.200 | <0.200 | <0.100 | <0.100 | <0.200 | <0.200 | <8.50 |
| S-16 | 0 - ½ | 0.088 | 0.740 | <0.040 | <0.040 | <0.020 | <0.020 | <0.040 | <0.040 | <1.70 |
| S-17 | 0 - ½ | 0.083 | 0.347 | <0.040 | <0.040 | <0.020 | <0.020 | <0.040 | <0.040 | <1.70 |
| S-18 | 0 - ½ | 0.344 | 1.20 | <0.080 | <0.080 | <0.040 | <0.040 | <0.080 | <0.080 | <3.40 |
| S-19 | 0 - ½ | 0.163 | 0.914 | <0.100 | <0.100 | <0.050 | <0.050 | <0.100 | <0.100 | <4.25 |

continued

## Table 3. Analytical Results of Selected Soil Samples – Organochlorine Pesticides

(concentrations in parts per million)
(continued)

| Boring Number | Depth (feet) | DDT | DDE | DDD | Dieldrin | Heptachlor Epoxide | Endo-sulfan I | Endo-sulfan II | Endrin | Toxaphene |
|---|---|---|---|---|---|---|---|---|---|---|
| S-20 | 0 - ½ | <0.04 | 0.481 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-21 | 0 - ½ | 0.066 | <0.04 | <0.04 | <0.04 | 0.498 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-22 | 0 - ½ | 0.115 | 0.635 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-23 | 0 - ½ | 0.305 | 3.09 | <0.2 | <0.2 | <0.1 | <0.1 | <0.2 | <0.2 | <8.5 |
| S-24 | 0 - ½ | 8.66 | 1.1 | 1.27 | <0.4 | 0.389 | 1.75 | <0.4 | <0.4 | <17 |
| S-25 | 0 - ½ | <0.1 | 1.01 | <0.1 | <0.1 | <0.05 | <0.05 | <0.1 | <0.1 | <4.25 |
| S-26 | 0 - ½ | <0.2 | 1.73 | <0.2 | <0.2 | <0.1 | <0.1 | <0.2 | <0.2 | <8.5 |
| S-27 | 0 - ½ | <0.16 | 0.949 | <0.16 | <0.16 | <0.04 | <0.04 | <0.16 | <0.16 | <3.4 |
| S-28 | 0 - ½ | 0.323 | 1.62 | <0.08 | <0.08 | <0.04 | <0.04 | <0.08 | <0.08 | <3.4 |
| S-29 | 0 - ½ | 0.023 | 0.141 | 0.0094 | <0.008 | <0.004 | <0.004 | <0.008 | <0.008 | <0.34 |
| S-30 | 0 - ½ | 0.092 | 1.02 | 0.064 | <0.08 | <0.04 | <0.04 | <0.08 | <0.08 | <3.4 |
| S-31 | 0 - ½ | 1.78 | <0.2 | <0.2 | <0.2 | <0.1 | <0.1 | <0.2 | <0.2 | <8.5 |
| S-32 | 0 - ½ | 0.045 | 0.398 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-33 | 0 - ½ | 0.117 | 0.454 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-34 | 0 - ½ | 0.092 | 0.74 | 0.044 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-35 | 0 - ½ | 0.084 | 0.644 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-36 | 0 - ½ | <0.04 | 0.642 | <0.04 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-37 | 0 - ½ | 0.134 | 0.476 | 0.049 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-38 | 0 - ½ | 0.067 | 0.304 | 0.035 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-39 | 0 - ½ | 0.0049 | 0.018 | 0.013 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-40 | 0 - ½ | 0.11 | 1.63 | 0.052 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-41 | 0 - ½ | 0.393 | 1.87 | 0.038 | 0.019 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-42 | 0 - ½ | 0.175 | 1.73 | 0.076 | <0.04 | <0.02 | <0.02 | <0.04 | <0.04 | <1.7 |
| S-43 | 0 - ½ | 0.137 | 1.384 | 0.039 | 0.0083 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-44 | 0 - ½ | 0.035 | 0.205 | 0.02 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-45 | 0 - ½ | 0.308 | 1.05 | 0.036 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-46 | 0 - ½ | 0.085 | 0.39 | 0.0097 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-47 | 0 - ½ | 0.013 | 0.106 | <0.008 | <0.008 | <0.004 | <0.004 | <0.008 | <0.008 | <0.34 |
| S-48 | 0 - ½ | <0.5 | 1.10 | <0.1 | <0.1 | <0.1 | <0.5 | <0.5 | <0.1 | <5.0 |
| S-50 | 0 - ½ | 0.504 | 1.45 | 0.138 | <0.1 | <0.05 | <0.05 | <0.1 | <0.1 | <4.2 |
| S-51 | 0 - ½ | 0.271 | 1.02 | 0.03 | 0.017 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-52* | 0 - ½ | 0.098 | 0.023 | 0.014 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | 12.0 |
| S-53 | 0 - ½ | 0.504 | 1.27 | 0.085 | 0.011 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-54 | 0 - ½ | <0.004 | 1.51 | <0.004 | 0.01 | <0.002 | <0.002 | 0.128 | 0.062 | <0.17 |
| S-55 | 0 - ½ | 0.224 | 1.85 | 0.056 | 0.014 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-56 | 0 - ½ | 0.026 | 0.427 | 0.035 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| S-57 | 0 - ½ | 0.23 | 1.99 | 0.083 | 0.016 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| T-3 | 9½ -10 | <0.004 | <0.004 | <0.004 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| T-4 | 2½ - 3 | <0.004 | <0.004 | <0.004 | <0.004 | <0.002 | <0.002 | <0.004 | <0.004 | <0.17 |
| PRG | -- | 12.0 | 12.0 | 17.0 | 0.15 | 0.27 | 5,300 | 5,300 | 260 | 2.20 |
| TTLC | -- | 1.0 | 1.0 | 1.0 | 8.0 | 4.7 | NE | NE | 0.200 | 5.0 |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
PRG Preliminary Remediation Goal for industrial site use–EPA Region 9, 1999
TTLC Total Threshold Limit Concentration
NE Not Established
* Soil Sample S-52 also contained Alpha-BHC (0.13 ppm), Beta-BHC (0.23 ppm), and Delta-BHC (1.40 ppm)

## Table 4. Analytical Results of Selected Soil Samples – Metals
(concentrations in parts per million)

| Boring Number | Depth (feet) | Arsenic | Lead | Mercury | Selenium |
|---|---|---|---|---|---|
| S-1 | 0 - ½ | 32 | 85 | <0.05 | <25 |
| S-2 | 0 - ½ | 35 | 87 | 0.06 | <25 |
| S-3 | 0 - ½ | 28 | 85 | 0.06 | <25 |
| S-4 | 0 - ½ | 57 | 140 | 0.08 | <25 |
| S-5 | 0 - ½ | 39 | 110 | 0.06 | <25 |
| S-6 | 0 - ½ | 48 | 140 | 0.06 | <25 |
| S-7 | 0 - ½ | 36 | 110 | <0.05 | <25 |
| S-9 | 0 - ½ | 37 | 91 | 0.07 | <25 |
| S-10 | 0 - ½ | 42 | 110 | 0.07 | <25 |
| S-11 | 0 - ½ | 57 | 150 | 0.06 | <25 |
| S-12 | 0 - ½ | 55 | 160 | <0.05 | <25 |
| S-13 | 0 - ½ | 42 | 120 | 0.1 | <25 |
| S-14 | 0 - ½ | 56 | 140 | 0.11 | <25 |
| S-15 | 0 - ½ | 19 | 41 | 0.07 | <25 |
| S-16 | 0 - ½ | 58 | 150 | 0.08 | <25 |
| S-17 | 0 - ½ | 50 | 120 | <0.05 | <25 |
| S-18 | 0 - ½ | 34 | 79 | 0.08 | <25 |
| S-19 | 0 - ½ | 35 | 89 | <0.05 | <25 |
| S-20 | 0 - ½ | 48 | 120 | 0.12 | <25 |
| S-21 | 0 - ½ | 36 | 85 | 0.05 | <25 |
| S-22 | 0 - ½ | 34 | 85 | 0.05 | <25 |
| S-23 | 0 - ½ | 59 | 150 | 0.11 | <25 |
| S-24 | 0 - ½ | 32 | 90 | <0.05 | <25 |
| S-25 | 0 - ½ | 50 | 120 | 0.13 | <25 |
| S-26 | 0 - ½ | 49 | 110 | 0.12 | <25 |
| S-27 | 0 - ½ | 51 | 130 | 0.13 | <25 |
| S-28 | 0 - ½ | 49 | 140 | 0.1 | <25 |
| S-29 | 0 - ½ | 51 | 130 | <0.05 | <25 |
| S-30 | 0 - ½ | 55 | 120 | 0.08 | <25 |
| S-31 | 0 - ½ | 34 | 88 | 0.05 | <25 |
| S-32 | 0 - ½ | 36 | 76 | 0.06 | <25 |
| S-33 | 0 - ½ | 42 | 130 | <0.05 | <25 |
| S-34 | 0 - ½ | 48 | 140 | 0.1 | <25 |
| S-35 | 0 - ½ | 51 | 130 | 0.06 | <25 |
| S-36 | 0 - ½ | 47 | 140 | <0.05 | <25 |
| S-37 | 0 - ½ | 56 | 160 | 0.07 | <25 |
| S-38 | 0 - ½ | 42 | 100 | 0.05 | <25 |
| S-39 | 0 - ½ | 28 | 64 | 0.07 | <25 |
| S-40 | 0 - ½ | 43 | 160 | 0.12 | <25 |
| S-41 | 0 - ½ | 46 | 140 | <0.05 | <25 |
| S-42 | 0 - ½ | 52 | 170 | 0.09 | <25 |
| S-43 | 0 - ½ | 55 | 180 | 0.11 | <25 |
| S-44 | 0 - ½ | 43 | 130 | <0.05 | <25 |

continued

**Table 4. Analytical Results of Selected Soil Samples – Metals**
(concentrations in parts per million)
(continued)

| Boring Number | Depth (feet) | Arsenic | Lead | Mercury | Selenium |
|---|---|---|---|---|---|
| S-45 | 0 - ½ | 55 | 180 | 0.06 | <25 |
| S-46 | 0 - ½ | 65 | 170 | 0.07 | <25 |
| S-47 | 0 - ½ | 11 | <5.0 | <0.05 | <25 |
| S-48 | 0 - ½ | 50 | 130 | <0.05 | <25 |
| S-50 | 0 - ½ | 53 | 180 | 0.09 | <25 |
| S-51 | 0 - ½ | 46 | 120 | 0.06 | <25 |
| S-52 | 0 - ½ | 67 | 310 | 0.6 | <25 |
| S-53 | 0 - ½ | 45 | 140 | <0.05 | <25 |
| S-54 | 0 - ½ | 58 | 140 | 0.06 | <25 |
| S-55 | 0 - ½ | 39 | 94 | <0.05 | <25 |
| S-56 | 0 - ½ | 51 | 130 | 0.54 | <25 |
| S-57 | 0 - ½ | 42 | 94 | <0.05 | <25 |
| PRG | -- | 2.7 | 1,000 | 610 | 10,000 |
| TTLC | -- | 500 | 1,000 | 20 | 100 |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
TTLC Total Threshold Limit Concentration
PRG Preliminary Remediation Goal for industrial site use–EPA Region 9, 1999

In addition, 19 of the shallow soil samples were analyzed for organophosphorous pesticides (EPA Test Method 8141), N-methyl carbamates (EPA Test Method 8318) and chlorinated herbicides (EPA Test Method 8151). The results of these analyses are shown in Table 5. The only two organophosphorous pesticides detected in the samples were chlorpyrifos and parathion. The only chlorinated herbicide detected in the samples was pentachlorophenol. No N-methyl carbamates were detected in any of the samples and therefore not shown in Table 5.

**Table 5. Analytical Results of Selected Soil Samples - Organophosphorous Pesticides and Chlorinated Herbicides**
(concentrations in parts per million)

| Boring Number | Depth (feet) | Chlorpyrifos (Dursban) | Parathion | Pentachlorophenol (PCP) |
|---|---|---|---|---|
| S-1 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-2 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-4 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-5 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-6 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-10 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-11 | 0 - ½ | <0.03 | <0.04 | <0.01 |

continued

**Table 5. Analytical Results of Selected Soil Samples - Organophosphorous Pesticides and Chlorinated Herbicides**
(concentrations in parts per million)
(continued)

| Boring Number | Depth (feet) | Chlorpyrifos (Dursban) | Parathion | Pentachlorophenol (PCP) |
|---|---|---|---|---|
| S-13 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-14 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-20 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-21 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-23 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-24 | 0 - ½ | 0.100 | 0.06 | 0.42 |
| S-25 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-29 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-30 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-39 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| S-47 | 0 - ½ | <0.03 | 0.06 | <0.01 |
| S-51 | 0 - ½ | <0.03 | <0.04 | <0.01 |
| PRG | -- | 2,600 | 5,300 | 11.0 |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
PRG Preliminary Remediation Goal for industrial site use–EPA Region 9, 1999

### 2.2.2 Ground Water Quality

To evaluate ground water quality, ground water grab samples were collected from six borings drilled near the pesticide storage and mixing areas (S-24, S-29, S-47, S-50, S-51, and S-53) (Figure 6). The ground water samples were analyzed for organochlorine pesticides and the metals mercury, arsenic, selenium, and lead. The results of the metals analysis are presented in Table 6.

**Table 6. Analytical Results of Selected Ground Water Samples- Pesticide Storage and Mixing Areas**
(concentrations in parts per billion)

| Boring Number | Date | Arsenic | Lead | Mercury | Selenium | Organochlorine Pesticides |
|---|---|---|---|---|---|---|
| S-24 | 5/10/00 | <5.0 | <15 | <0.2 | <15 | ND* |
| S-29 | 5/11/00 | <5.0 | 30 | <0.2 | <15 | ND |
| S-47 | 5/11/00 | <5.0 | <15 | <0.2 | <15 | ND |
| S-50 | 5/11/00 | <5.0 | <15 | <0.2 | <15 | ND |
| S-51 | 5/13/00 | 14 | 26 | <0.2 | <15 | ND |
| S-53 | 5/13/00 | <5.0 | 30 | <0.2 | <15 | ND |
| MCL | -- | 50 | 15** | 2.0 | 50 | |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
MCL Drinking water Maximum Contaminant Levels–California DHS, March 12, 1999
ND Not Detected (detection limits vary)
* All non-detect except for Endosulfan I at 0.3 ppb.
** Lead Action Level for drinking water

# 3.0 CONCLUSIONS AND RECOMMENDATIONS

## 3.1 Soil Quality – Pesticides and Metals

The laboratory analyses of soil samples detected various pesticides. The main pesticide detected was DDT and the related compounds DDD and DDE. The sum of these three compounds is commonly referred to as total DDT. Total DDT levels up to 11.03 ppm were detected in one sample; however, in most samples, the total DDT levels ranged from about 0.5 to 2.5 ppm. In about half the samples, the total DDT concentrations were greater than the 1.0 ppm Total Threshold Limit Concentration (TTLC). The TTLC is the level above which a solid waste is considered hazardous per Title 22 of the California Code of Regulations.

None of the total DDT levels detected exceed the preliminary remediation goal (PRG) of 12.0 ppm for industrial site use. The PRGs are risk-based concentrations developed by EPA Region 9 for use as screening levels in determining if further evaluation is warranted, in prioritizing areas of concern, in establishing initial cleanup goals, and in estimation of potential health risks. The PRGs are chemical concentrations that correspond to fixed levels of risk (either a cancer risk of one in one million [$10^{-6}$] or a non-carcinogenic hazard quotient of one, whichever occurs at a lower concentration).

Since the DDT levels detected do not exceed the PRGs, the concentrations detected do not appear to pose a significant threat to human health in a commercial or industrial setting. If property use were to be changed to a residential setting, additional work likely would be required. Since the site is planned for commercial use and will be largely capped by buildings and associated concrete drives and parking areas, risk to human health and the environment will be significantly reduced.

Heptachlor epoxide was detected in two of the samples at 0.498 and 0.389 ppm. Although above the PRG (0.27 ppm), this compound does not appear to be a significant concern since it was only infrequently detected; thus, significant exposure is unlikely to occur. The levels detected also are well below the TTLC of 4.7 ppm.

Toxaphene was detected in only one sample (S-52). However, the concentration detected (12.0 ppm) is well above the PRG (2.2 ppm) and TTLC (5.0 ppm). Since this sample was collected from a pesticide storage/mixing area and exceeds both the PRG and TTLC, we recommend that additional sampling be performed in this vicinity to evaluate the vertical and horizontal extent of toxaphene-impacted soil.

Lead and arsenic concentrations detected in soil are higher than typical background levels which are commonly less than 50 ppm and less than 10 ppm, respectively. However, the levels detected are well below their respective TTLC values of 1,000 and 500 ppm. As with the residual pesticides, the metal concentrations detected do not appear to pose a significant threat to human health in a commercial/industrial setting.

Due to the presence of residual pesticides and elevated levels of metals, a construction worker health and safety plan should be developed for the earthwork portion of the proposed development.

We also recommend that further testing for arsenic, lead, and organochlorine pesticides be completed on selected deeper soil samples. This additional testing will help confirm that concentrations of target constituents do not increase with depth. Based on our experience, a reduction in concentrations would be expected in the upper few feet of soil.

If on-site soil is to be off-hauled, additional characterization should be performed prior to transport. Total DDT concentrations in the upper ½ foot of soil appear to exceed California's hazardous waste criteria (TTLC of 1.0 ppm). Since off-site disposal of this soil could be costly, we recommend that the planned development be designed to minimize the amount of soil to be exported.

Only two organophosphorous pesticides (chlorpyrifos and parathion) were detected in the soil samples collected. The only chlorinated herbicide detected was pentachlorophenol. The concentrations detected for each of these compounds were well below their respective PRGs for industrial site use. No N-methyl carbamates were detected in any of the soil samples.

### 3.2 Soil Quality – Petroleum Hydrocarbons

Petroleum hydrocarbons were not detected in the soil samples collected near the existing USTs. We recommend that the USTs be removed in accordance with applicable regulations prior to site development. Although additional soil and ground water sampling will be required as part of the UST removal process, the data collected to date does not indicate that the USTs have significantly impacted the site.

### 3.3 Ground Water Quality

During this investigation, ground water grab samples were collected from nine borings advanced near the USTs and pesticide storage/mixing areas at the site. No significant levels of petroleum hydrocarbons or pesticides were detected in the ground water samples analyzed.

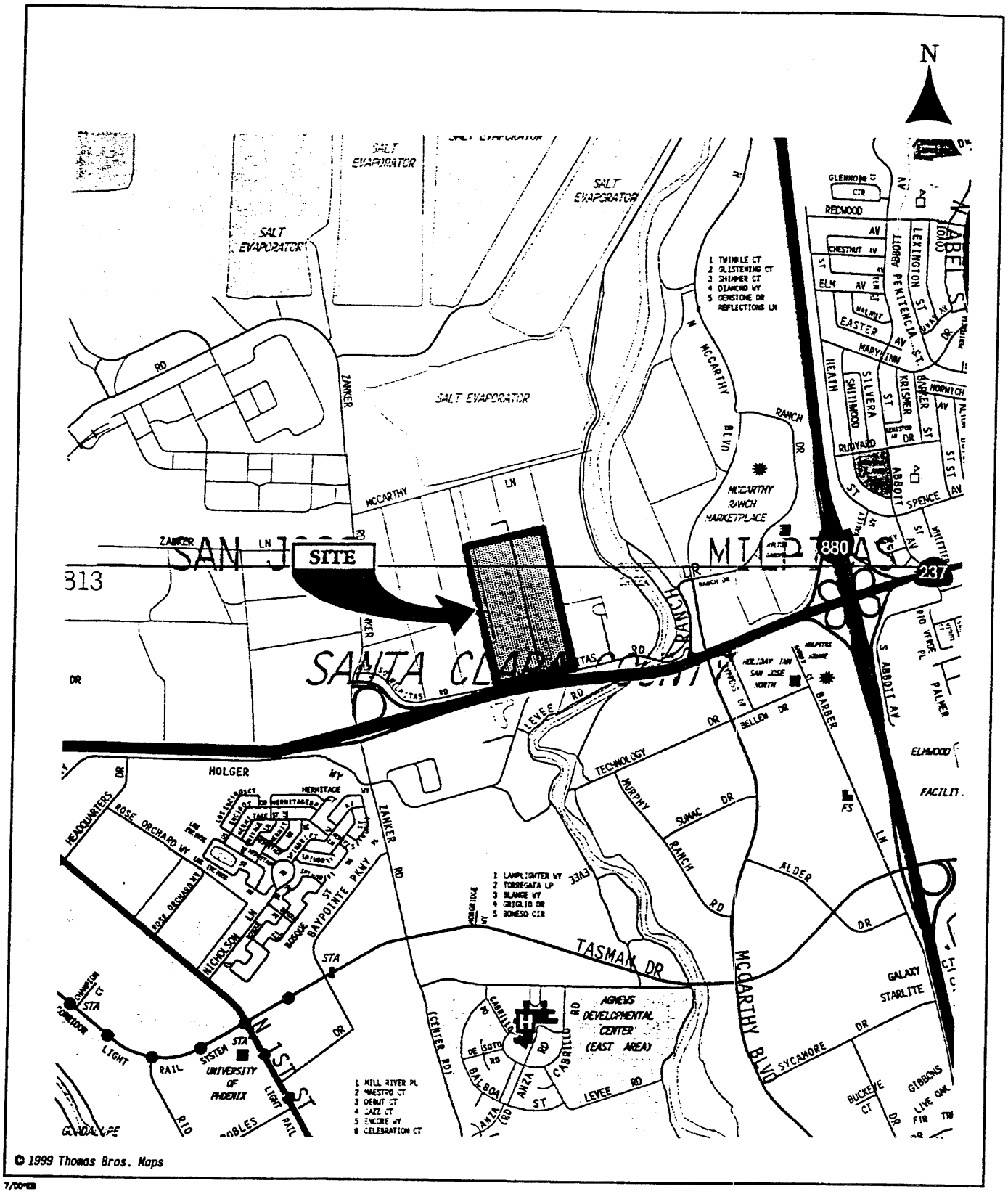
Metal concentrations detected in the ground water samples did not exceed the drinking water maximum contaminant levels (MCLs). Although no MCL has been established for lead, there is an action level of 15 ppb for drinking water at the consumer tap. Lead levels were found to exceed this level in three samples. Since shallow on-site ground water is not proposed as a drinking water source, the lead levels detected do not appear to be a significant concern and may be due to sediments contained in the ground water grab samples.

## 4.0 LIMITATIONS

This report was prepared for the use of Calpine in evaluating soil and ground water quality at the 55-acre Lin/Hom parcel at the time of this study. We make no warranty, expressed or implied, except that our services have been performed in accordance with environmental principles generally accepted at this time and location. The chemical and other data presented in this report can change over time and are applicable only to the time this study was performed. We are not responsible for the data presented by others.

The accuracy and reliability of geo- or hydrochemical studies are a reflection of the number and type of samples taken and extent of the analyses conducted, and are thus inherently limited and dependent upon the resources expended. Chemical analyses were performed for specific parameters during this investigation, as detailed in the scope of services. Please note that additional constituents not analyzed for during this evaluation may be present in soil and ground water at the site. Our sampling and analytical plan was designed using accepted environmental principles and our judgment for the performance of a soil and ground water quality evaluation and was based on the degree of investigation approved by you. It is possible to obtain a greater degree of certainty, if desired, by implementing a more rigorous soil and ground water sampling program or evaluating the risk posed by the contaminants detected, if any.

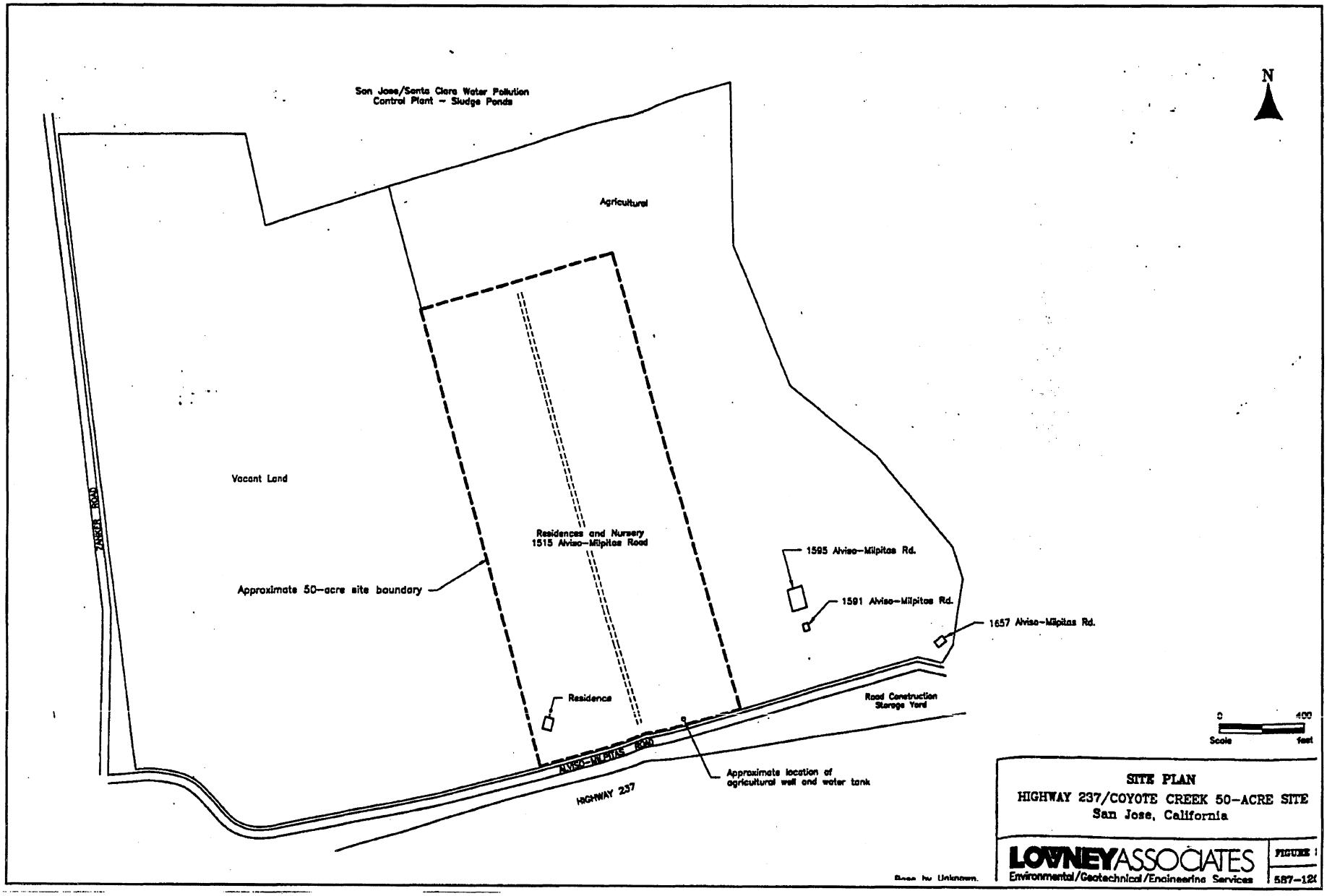
* * * * * * * * * * * * * *




VICINITY MAP
55-ACRE LIN/HOM PROPERTY
San Jose, California

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

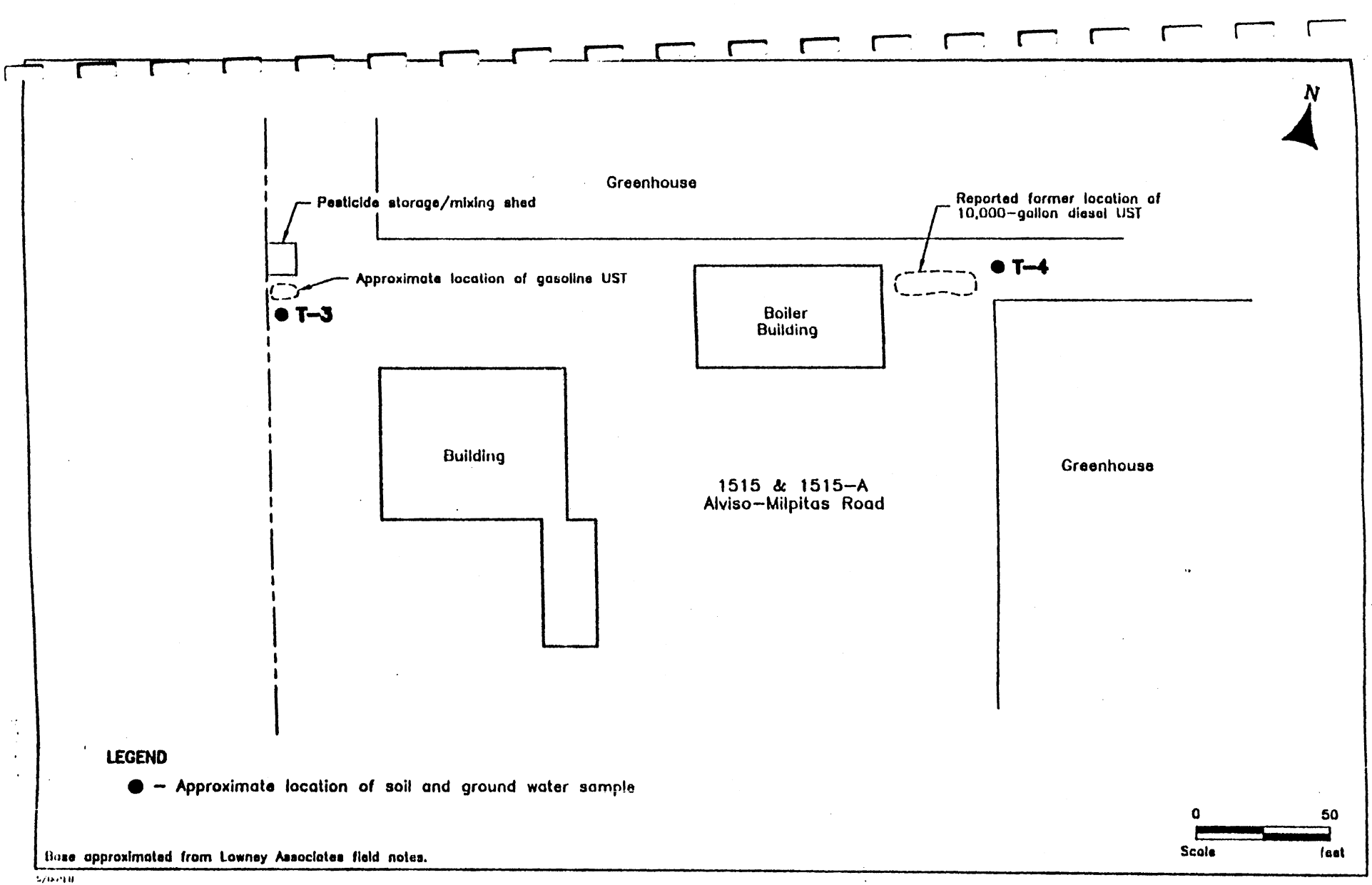
FIGURE 1
587-12F




**SITE PLAN**
HIGHWAY 237/COYOTE CREEK 50–ACRE SITE
San Jose, California

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

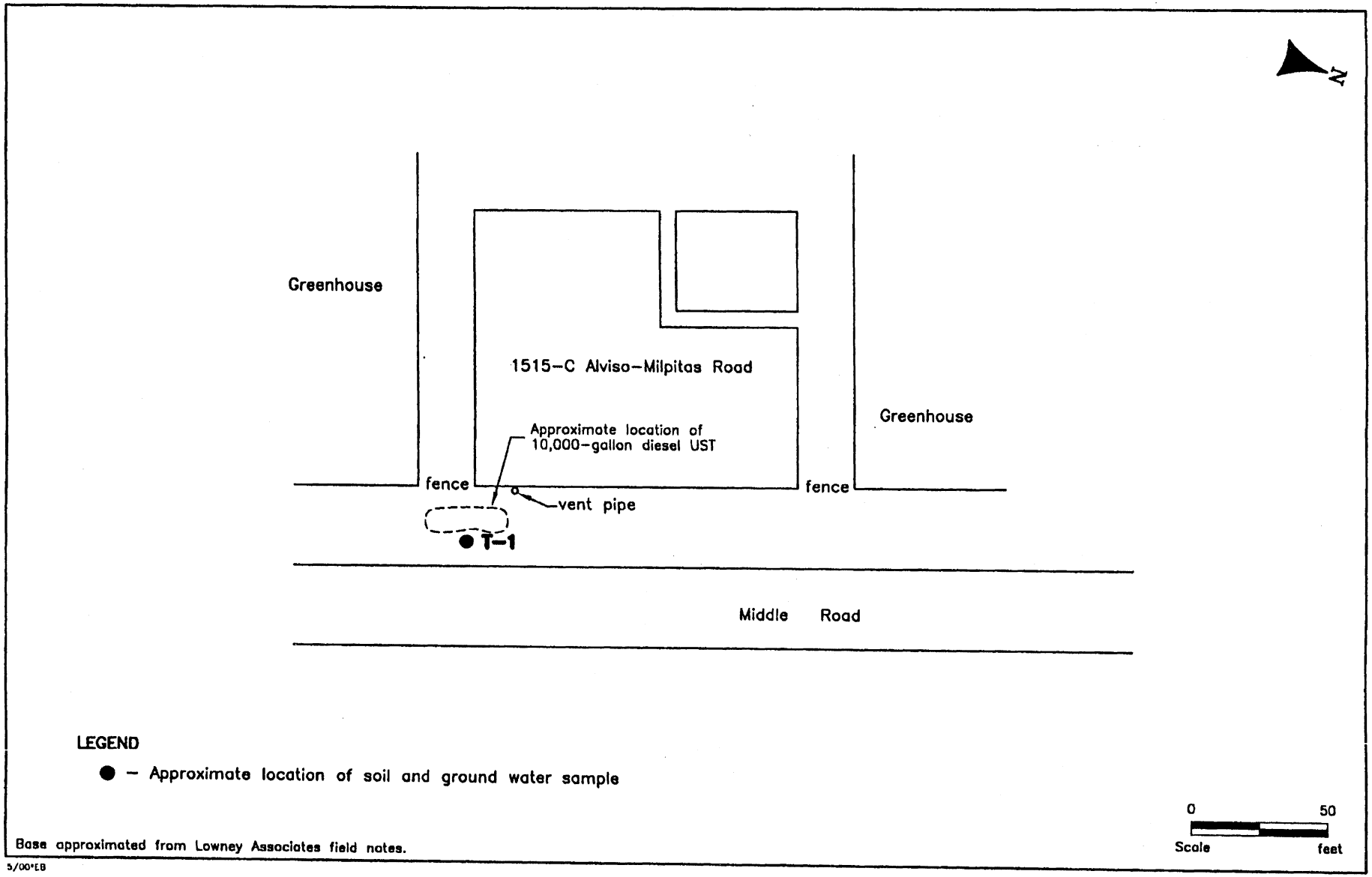
FIGURE 1
587–12(




SITE PLAN
55-ACRE LIN/HOM PROPERTY
San Jose, California

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 3
687-12F

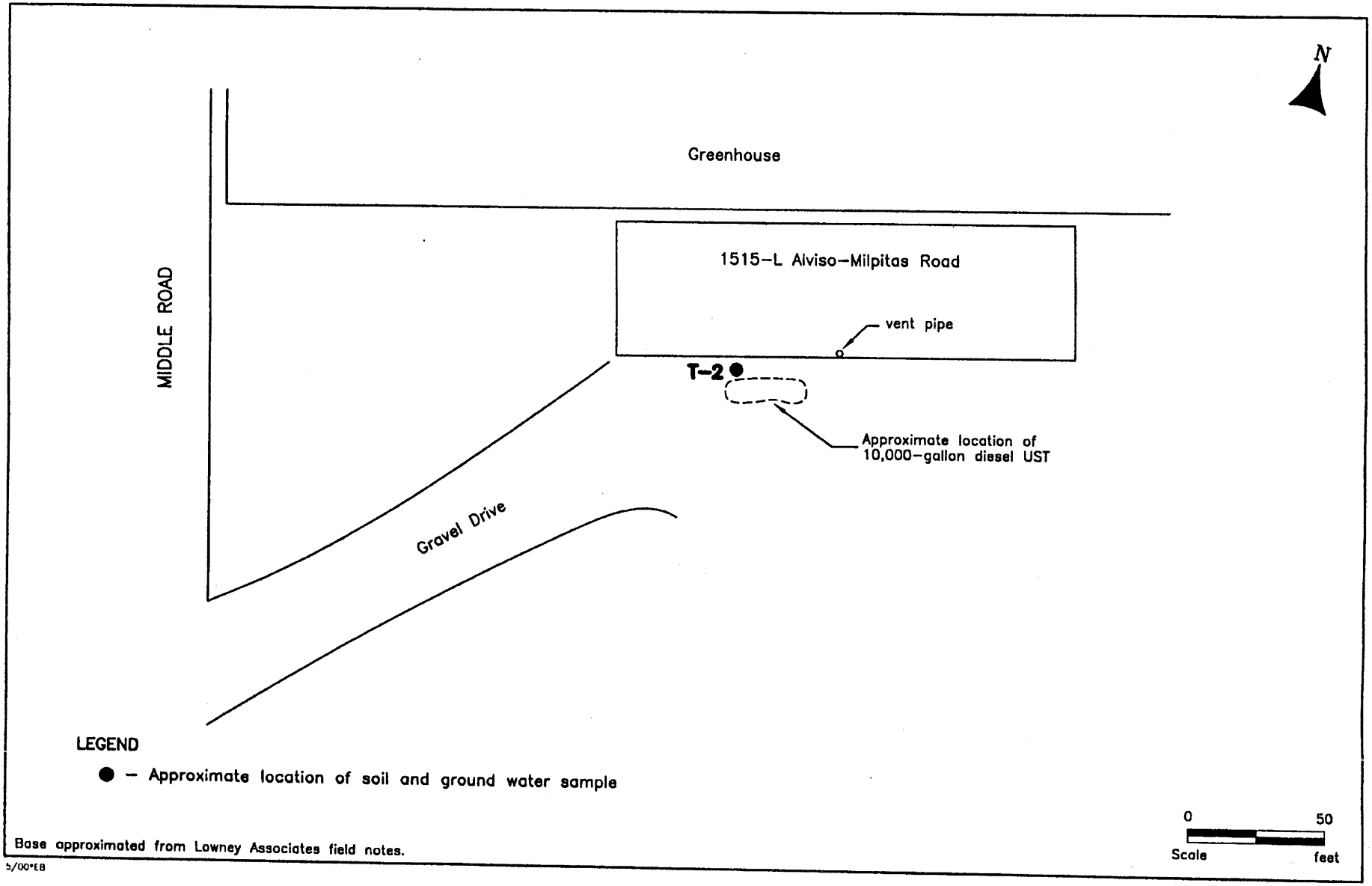



**SITE PLAN**

55-ACRE LIN/HOM PROPERTY
San Jose, California

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

**FIGURE 4**
587-12F

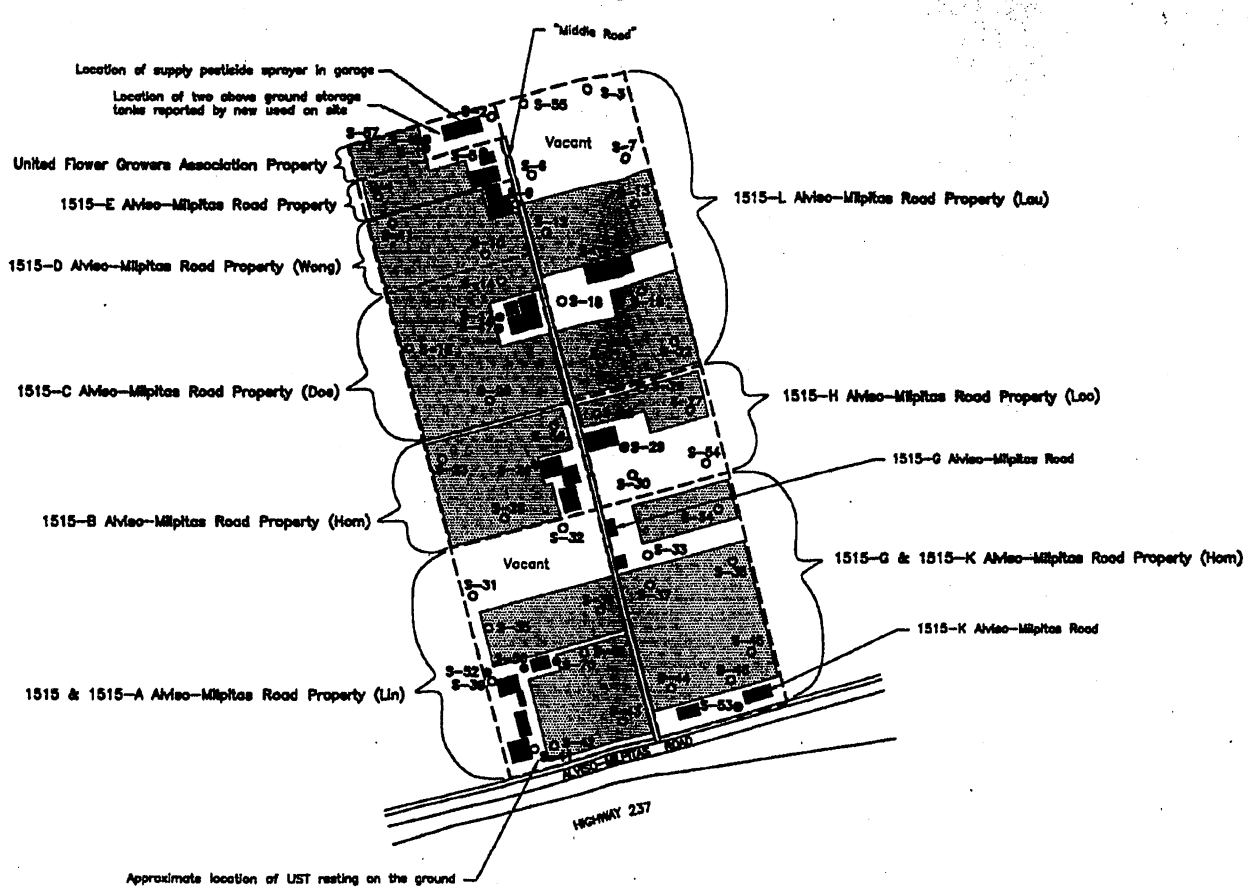



**SITE PLAN**

55-ACRE LIN/HOM PROPERTY
San Jose, California

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

**FIGURE 5**
**587-12F**




LEGEND

- O – Approximate location of greenhouse area/former agricultural area soil sample
- ● – Approximate location of pesticide mixing/storage area soil sample and ground water sample (if applicable)
- ▒ – Approximate location of on-site greenhouse/nursery
- ■ – Approximate location of on-site structures

Base by Unknown.

**SITE PLAN**
**55-ACRE LIN/HOM PROPERTY**
**San Jose, California**

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 6
587-12F

## APPENDIX A

## SAMPLING PROTOCOL AND ANALYTICAL RESULTS

**Soil Borings:** Fifty-nine soil borings were drilled to depths of approximately 2½ to 10 feet. The borings were drilled using a Geoprobe (macro-core), a hand auger and slide hammer, or a macro-core hand sampler.

**Soil Sampling:** Soil samples for laboratory analysis were collected in acetate or brass liners. The ends of the liners were covered in aluminum foil or Teflon film, fitted with plastic end caps, taped, and labeled with a unique identification number. The samples were then placed in an ice-chilled cooler, and transported to a state-certified analytical laboratory with chain of custody documentation.

**Ground Water Sampling:** Borings S-29, S-47, and S-50 were converted into "temporary" wells with the installation of 1-inch I.D. flush-threaded, Schedule 40 PVC casing. The casing in the lower portion of the well had 0.02-inch factory machined slots. Ground water grab samples were collected from the temporary wells with a Teflon bailer. Samples were collected in appropriate sampled bottles, labeled, and immediately placed into an ice-chilled chest for delivery to a state-certified analytical laboratory for analysis.

A Teflon bailer was used to collect the samples from borings S-24, S-51, and S-53 that were completed to ground water depth. Samples were collected in appropriate sample bottles, labeled, and immediately placed into an ice-chilled chest for delivery to a state-certified analytical laboratory for analysis.

**Equipment Decontamination:** All drilling and sampling equipment was cleaned in a solution of laboratory grade detergent and distilled water or steam cleaned before use at each sampling point.

**Analytical Results:** The chilled samples were delivered to a state-certified analytical laboratory. Chain of custody documentation was maintained for all samples. Attached are copies of the analytical results and the chain of custody forms.

# *Los Esteros Critical Energy Facility*

# *Appendix 8.14-B*
# *Phase II Supplemental Soil Quality Evaluation*

***December 2003***

**LOWNEY**ASSOCIATES
Environmental/Geotechnical/Engineering Services

*Mountain View*
*Oakland*
*San Ramon*
*Fullerton*

July 20, 2000
587-12F

Mr. Neal Pospisil
**CALPINE**
620 Coolidge Drive, Suite 200
Folsom, California 95630

**RE: SUPPLEMENTAL SOIL QUALITY EVALUATION**
**55-ACRE LIN/HOM PARCEL**
**SAN JOSE, CALIFORNIA**

Dear Mr. Pospisil:

Lowney Associates is pleased to present this supplemental soil quality evaluation for the 55-acre Lin/Hom Parcel located in San Jose, California. This soil quality evaluation was initiated when elevated concentrations of organochlorine pesticides and metals were detected in near-surface soil samples collected during the Phase II investigation of the site (Lowney 2000). This letter presents the results of the additional work performed.

## SITE BACKGROUND

The approximately 55-acre parcel is located near the northwest intersection of Highway 237 and Coyote Creek. The site is located in an agricultural, residential, and commercial area and is bounded by McCarthy Lane to the north; Alviso-Milpitas Road to the south; agricultural, residential, and commercial properties to the east; and vacant land to the west (Figure 1). This parcel currently is being used for various agricultural farming purposes. The site is developed with several nursery/greenhouse complexes and residential structures.

During the Phase II investigation of the 55-acre Lin/Hom parcel, elevated concentrations of metals and organochlorine pesticides were detected in shallow soil samples collected at the site. Lead and arsenic were detected at concentrations (up to 310 parts per million [ppm] and 67 ppm, respectively) above what would typically be expected as background concentrations. With regards to organochlorine pesticides, in about half of the samples, concentrations of total DDT were reported above the 1,000 ppb hazardous waste threshold (TTLC), but below the EPA's health-based Preliminary Remediation Goal (PRG) of 12,000 ppb. Additionally, toxaphene was detected in one shallow sample (S-52) at 12,000 ppb, above both the PRG and TTLC for this constituent.

## PURPOSE/ SCOPE OF WORK

To evaluate the vertical extent of impacted soil, selected deeper soil samples (collected during the Phase II investigation and preserved at the laboratory) were analyzed for lead, arsenic, and organochlorine pesticides. These additional samples (collected at 1½ and

405 Clyde Avenue Mountain View, CA 94043-2209 Tel: 650.967.2365 Fax: 650.967.2785
P.O. Box 1388 Mountain View, CA 94042-1388 E-mail: mail@lowney.com http://www.lowney.com

2½ feet below the ground surface) were selected from borings S-6, S-15, S-26, and S-31 (see Figure 2 for boring locations). These samples were selected based on analytical results and distribution across the site.

To better evaluate the distribution of toxaphene-impacted soil, the deeper samples collected during the Phase II investigation from boring S-52 were analyzed for organochlorine pesticides. In addition, four additional borings were advanced (SS-1, SS-2, SS-3, and SS-4) to a depth of approximately 1½ feet on July 5, 2000 to evaluate the distribution of toxaphene in the vicinity of boring S-52 (Figure 3). As shown on Figure 3, these additional borings encircled boring S-52 with an approximately 10-foot radius. Two soil samples were collected from each additional boring at depths of ½ and 1½ feet below the ground surface. The eight samples were analyzed for toxaphene only.

## RESULTS

The soil samples were analyzed at a state-certified analytical laboratory. A summary of the analytical results for organochlorine pesticides in the selected deeper samples and from the toxaphene-impacted area are presented in Table 1. The prior results from the shallow (½-foot depth) samples are also shown for comparison. Laboratory reports are presented in Attachment A. A brief summary of the deeper sample results is presented below.

- Total DDT was detected at concentrations ranging up to 1,210 ppb. However, in only one of the deeper samples did the concentration exceed the TTLC value for total DDT. None of the concentrations detected exceeded the PRG for an industrial use site.

- Beta- and delta-BHC were detected at concentrations ranging up to 240 and 1,200 ppb, respectively. The levels of beta-BHC detected do not exceed the PRG value, while delta-BHC has no established PRG value.

- At the S-52 sample location, toxaphene was detected in the 1½-foot sample at 15,000 ppb, but decreased to 2,000 ppb in the 2½-foot sample. The lower concentration does not exceed either the PRG or TTLC value.

- All other organochlorine pesticide constituents were not detected.

**Table 1. Analytical Results of Soil Samples – Organochlorine Pesticides**
(concentrations in parts per billion)

| Boring Number | Depth (feet) | DDT | DDE | DDD | Toxaphene | Beta-BHC | Delta-BHC | Alpha-BHC |
|---|---|---|---|---|---|---|---|---|
| S-6** | 0 – ½ | **483** | **1,800** | ND | ND | ND | ND | ND |
| S-6 | 1 – 1½ | **61** | **383** | ND | ND | ND | ND | ND |
| S-6 | 2 – 2½ | **27** | **167** | ND | ND | ND | ND | ND |
| | | | | | | | | |
| S-15** | 0 – ½ | ND | **379** | ND | ND | ND | ND | ND |
| S-15 | 1 – 1½ | ND | ND | ND | ND | ND | ND | ND |
| S-15 | 2 – 2½ | ND | ND | ND | ND | ND | ND | ND |
| | | | | | | | | |
| S-26** | 0 – ½ | ND | **1,730** | ND | ND | ND | ND | ND |
| S-26 | 1 – 1½ | ND | **15** | ND | ND | ND | ND | ND |
| S-26 | 2 – 2½ | ND | ND | ND | ND | ND | ND | ND |
| | | | | | | | | |
| S-31** | 0 – ½ | **1,780** | ND | ND | ND | ND | ND | ND |
| S-31 | 1 – 1½ | ND | **1,210** | ND | ND | ND | ND | ND |
| S-31 | 2 – 2½ | ND | **4.7** | ND | ND | ND | ND | ND |
| | | | | | | | | |
| S-52** | 0 – ½ | **98** | **23** | **14** | **12,000** | **230** | **1,400** | **130** |
| S-52 | 1 – 1½ | ND | ND | ND | **15,000** | **240** | **1,200** | ND |
| S-52 | 2 – 2½ | ND | ND | ND | **2,000** | **36** | **140** | ND |
| | | | | | | | | |
| SS-1 | 0 – ½ | NA | NA | NA | ND | NA | NA | NA |
| SS-1 | 1 – 1½ | NA | NA | NA | ND | NA | NA | NA |
| | | | | | | | | |
| SS-2 | 0 – ½ | NA | NA | NA | ND | NA | NA | NA |
| SS-2 | 1 – 1½ | NA | NA | NA | ND | NA | NA | NA |
| | | | | | | | | |
| SS-3 | 0 – ½ | NA | NA | NA | ND | NA | NA | NA |
| SS-3 | 1 – 1½ | NA | NA | NA | ND | NA | NA | NA |
| | | | | | | | | |
| SS-4 | 0 – ½ | NA | NA | NA | ND | NA | NA | NA |
| SS-4 | 1 – 1½ | NA | NA | NA | ND | NA | NA | NA |
| PRG | -- | 12,000 | 12,000 | 17,000 | 2,200 | 2,100 | NE | 590 |
| TTLC | -- | 1,000* | 1,000* | 1,000* | 5,000 | NE | NE | NE |

ND Not Detected (detection limits vary)
NA Not Analyzed
PRG Preliminary Remediation Goal for industrial site use-EPA Region 9, 1999
TTLC Total Threshold Limit Concentration
NE Not Established
* Total DDT = DDT + DDE + DDD
** Shallow samples collected during Phase II investigation

Table 2 presents a summary of the analytical results for arsenic and lead in the selected deeper samples. The prior results from the shallow (½-foot samples) are shown for comparison.

- Arsenic was detected in the deeper samples at concentrations ranging up to 36 parts per million (ppm). In general, the concentrations decreased with depth.
- Lead was detected in all but one of the deeper samples. However, only in the 1½-foot sample from boring S-31 did the lead concentration (120 ppm) exceed typical background levels. This concentration does not exceed either the PRG or the TTLC value.

**Table 2. Analytical Results of Selected Soil Samples – Metals**
(concentrations in parts per million)

| Boring Number | Depth (feet) | Arsenic | Lead |
|---|---|---|---|
| S-6* | 0 – ½ | **48** | **140** |
| S-6 | 1 – 1½ | **27** | **14** |
| S-6 | 2 – 2½ | **26** | **11** |
| | | | |
| S-15* | 0 – ½ | **19** | **41** |
| S-15 | 1 – 1½ | **24** | **8.6** |
| S-15 | 2 – 2½ | **20** | **5.4** |
| | | | |
| S-26* | 0 – ½ | **49** | **110** |
| S-26 | 1 – 1½ | <5.0 | <5.0 |
| S-26 | 2 – 2½ | <5.0 | **7.3** |
| | | | |
| S-31* | 0 – ½ | **34** | **88** |
| S-31 | 1 – 1½ | **36** | **120** |
| S-31 | 2 – 2½ | <5.0 | **5.2** |
| PRG | -- | 2.7 | 1,000 |
| TTLC | -- | 500 | 1,000 |

< Indicates that the compound was not detected at or above the stated laboratory reporting limit
* Shallow samples collected during Phase II investigation
PRG Preliminary Remediation Goal for industrial site use-EPA Region 9, 1999
TTLC Total Threshold Limit Concentration

## CONCLUSIONS AND RECOMMENDATIONS

### Vertical Distribution of Impacted Soil

The lead, arsenic, and pesticide concentrations detected in the deeper soil samples appear to generally decrease within depth with the upper 1 or 2 feet of soil. The pesticide levels detected in both the near-surface (½ foot) and deeper samples generally do not exceed their respective PRG values (for industrial site use), with the exception of toxaphene in sample S-52 (as discussed below). Therefore, the concentrations detected do not appear to pose a significant threat to human health in a commercial/industrial setting. Although the metal concentrations detected in shallow soil appear to be above

typical background levels, they also do not appear to pose a significant threat to human health in a commercial/industrial setting. If property use were to be changed to a residential setting, additional work would likely be required. Since the site is planned for commercial use and will be largely capped by buildings and associated concrete drives and parking areas, risk to human health and the environment will be significantly reduced.

As discussed in the Phase II report, due to the presence of residual pesticides and elevated levels of metals, a construction worker health and safety plan should be developed for the earthwork portion of the proposed development. In addition, if on-site soil is to be off-hauled, additional characterization should be performed prior to transport. Total DDT concentrations in mainly the upper ½ foot of soil appear to exceed California's hazardous waste criteria (TTLC of 1,000 ppb). Since off-site disposal of this soil could be costly, we recommend that the planned development be designed to minimize the amount of soil to be exported.

**Impacted Soil at Mixing/Storage Areas**

Based on the sampling performed, the level of toxaphene in soil near boring S-52 exceeds both the PRG value for industrial site use (2,200 ppb) and the TTLC (1,000 ppb). These elevated levels appear to extend only to a depth of approximately 2 feet. The horizontal extent of toxaphene-impacted soil also appears to be localized around boring S-52. This is demonstrated by the non-detection of toxaphene in samples S-1 through S-4. We understand that this was an area containing a former pesticide storage and mixing structure with dimensions of approximately 5 feet by 5 feet. Since the impacted soil in this area appears to be related to storage and mixing activities and not due to typical agricultural pesticide application, we recommend excavation and proper off-site disposal of the soil in a 7- by 7-foot square around the former extent of the structure, and down to a depth of 2 feet. The estimated volume to be removed consists of approximately 4 cubic yards (6 tons) of material.

An additional pesticide storage/mixing area is located near sample S-24. Total DDT was detected at a concentration of 11,030 ppb in the near-surface sample from this boring during the Phase II investigation. Since the area also appears to have been impacted by storage/mixing activities, we recommend that soil in this area be excavated and properly disposed off-site. Based on the storage area configuration, we estimate that approximately 15 cubic yards (25 tons) of material may need to be excavated and removed from this area. Following removal of the soil, verification soil samples should be collected to document that the impacted soil was adequately removed.

We estimate that the cost to excavate, transport, and dispose the soil will range from $150 to $250 per ton. Verification sampling and consulting services likely will range from $5,000 to $10,000. Due to waste classification laws, soil disposal costs could be higher if it is determined that pure DDT or toxaphene were purchased for use at the site. However, this typically is not the case.

## LIMITATIONS

This report was prepared for the sole use of Calpine in evaluating soil quality at selected on-site locations at the time of this study. We make no warranty, expressed or implied, except that our services have been performed in accordance with environmental principles generally accepted at this time and location. The chemical and other data presented in this report can change over time and are applicable only to the time this study was performed. We are not responsible for the data presented by others.

If you have any questions, please call and we will be glad to discuss them with you.

Very truly yours,

**LOWNEY ASSOCIATES**

James P. Kiernan
Staff Environmental Engineer

Douglas T. Young, R.G.
Senior Project Geologist

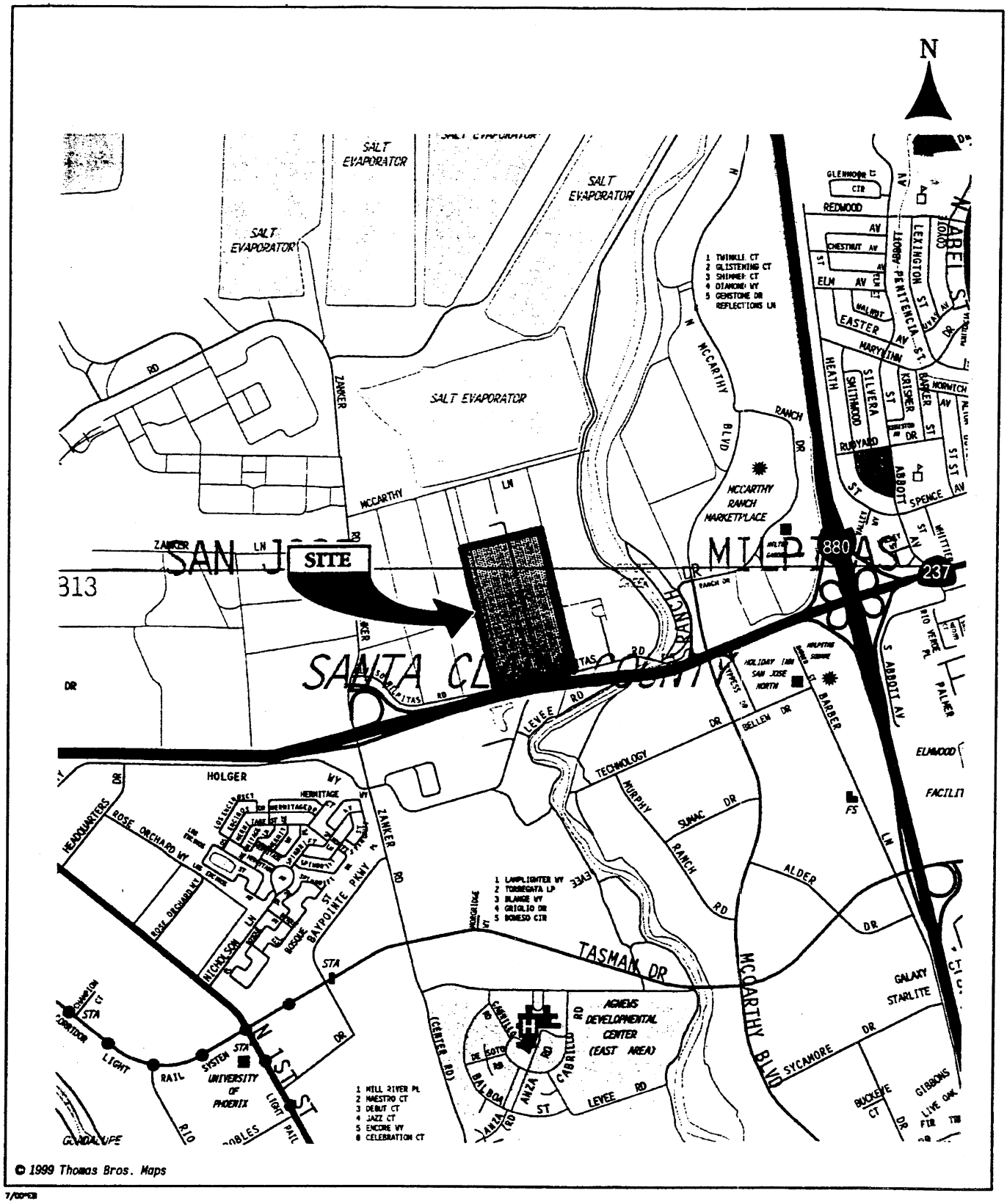
SIF:DTY:JPK:tjc

Copies: Addressee (6)

Attachments: Vicinity Map
Site Plans
Analytical Results

MV, 587-12F phase III letter ver2.doc

REGISTERED GEOLOGIST
DOUGLAS T YOUNG
5850
STATE OF CALIFORNIA




7/00

**VICINITY MAP**

55-ACRE LIN/HOM PROPERTY

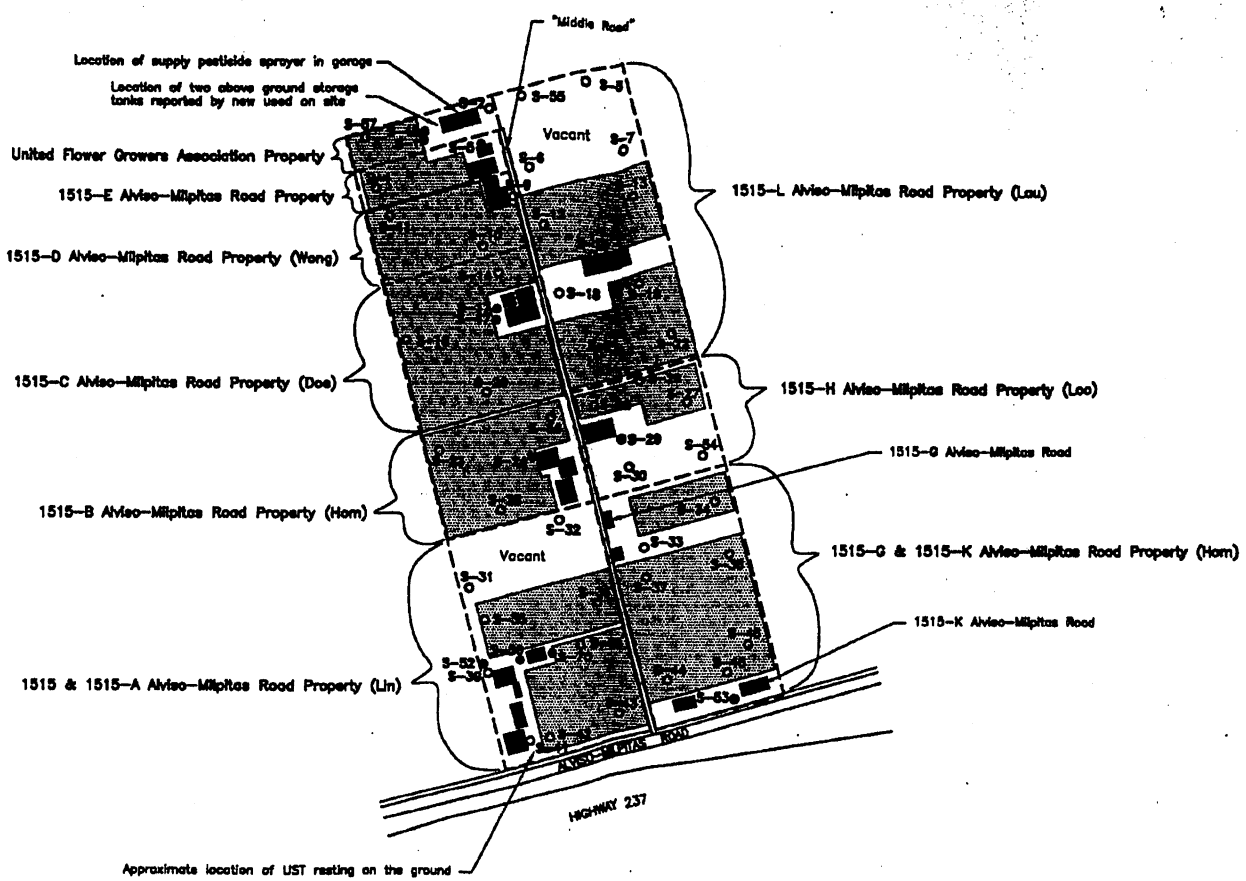
San Jose, California

**LOVNEY ASSOCIATES**

Environmental/Geotechnical/Engineering Services

**FIGURE 1**

**587-12F**




LEGEND

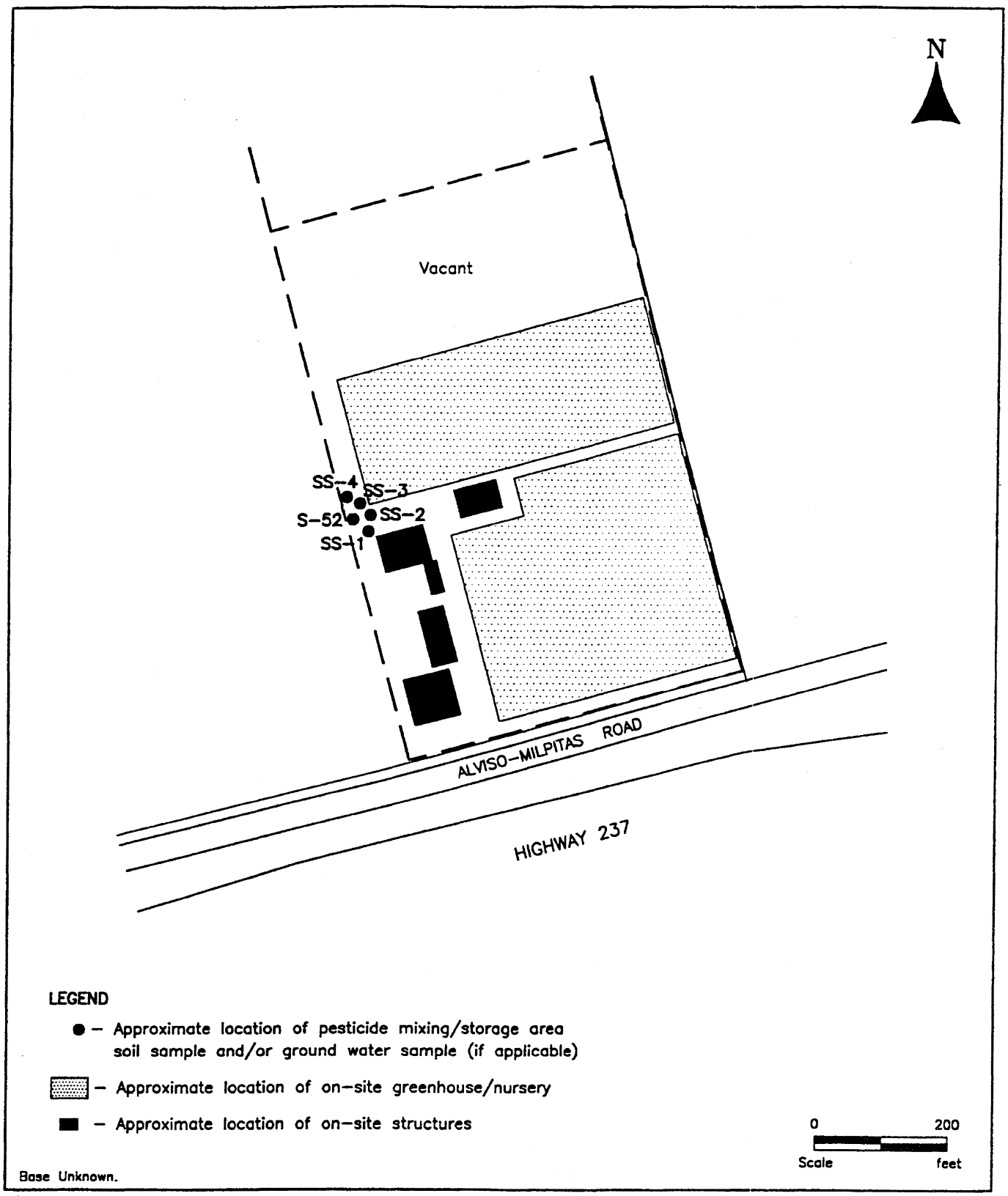
- O – Approximate location of greenhouse area/former agricultural area soil sample
- ● – Approximate location of pesticide mixing/storage area soil sample and ground water sample (if applicable)
- ▒ – Approximate location of on–site greenhouse/nursery
- ■ – Approximate location of on–site structures

Base by Unknown.

**SITE PLAN**
**55–ACRE LIN/HOM PROPERTY**
**San Jose, California**

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 6
587–12F




7/00-EB

**SITE PLAN**

55-ACRE LIN/HOM PROPERTY
San Jose, California

LOVNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

**FIGURE 3**
587-12F

# ATTACHMENT A

# ANALYTICAL RESULTS

ELAP No.: 1838

Entech Analytical Labs, Inc.
525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

ATTN: Michelle Anderson
**SUBJECT: AMENDED REPORT**

Client's Project: 20391
Lab No.: 44184-001/004

The report was amended for the following:

Client Sample I.D. for 44184-004 was corrected.

Please disregard all previous documentation that corresponds to the pages(s) enclosed.

Sincerely,

Date: 6/26/01

Cheryl De Los Reyes
Technical Operations Manager
CDR/jh

Enclosures

This cover letter is an integral part of this analytical report.

This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the client to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20391 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

Date Amended: 06/12/00

## EPA Method 8081

| Lab No.: | Method Blank | | 44184-001 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | -- | | 20391-005 S-6(1-1 1/2) | | | | | | | | | |
| Date Sampled: | -- | | 05/09/00 | | | | | | | | | |
| QC Batch #: | G008080S225 | | G008080S225 | | | | | | | | | |
| Date Extracted: | 05/23/00 | | 05/23/00 | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | 05/30/00 | | | | | | | | | |
| Analyst Initials: | NN | | NN | | | | | | | | | |
| Dilution Factor: | 1 | | 10 | | | | | | | | | |
| ANALYTE | MDL | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Heptachlor | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Aldrin | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | 20 | ND | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | 40 | 383 | | | | | | | | |
| Dieldrin | 4 | 4 | ND | 40 | ND | | | | | | | | |
| Endrin | 4 | 4 | ND | 40 | ND | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | 40 | ND | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | 40 | ND | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | 40 | 61 | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | 40 | ND | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | 40 | ND | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | 170 | ND | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | 20 | ND | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | 20 | ND | | | | | | | | |
| Toxaphene | 170 | 170 | ND | 1700 | ND | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | 40 | ND | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec. | Limits | %Rec. | Limits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 103 | 30-150 | 120 | 30-150 | | | | | | | | |
| Decachlorobiphenyl | 150 | 30-150 | 197* | 30-150 | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

* = Surrogate recoveries outside of limits due to matrix interference.

Reviewed/Approved By: E. Morrison

Edgar Morrison
Organics Supervisor

Date: 06/12/00

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories

1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20391 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

Date Amended: 06/12/00

## EPA Method 8081

| Lab No.: | 44184-002 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | 20391-006 S-6(2-2 1/2) | | | | | | | | | | | | |
| Date Sampled: | 05/09/00 | | | | | | | | | | | | |
| QC Batch #: | G008080S225 | | | | | | | | | | | | |
| Date Extracted: | 05/23/00 | | | | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | | | | | | | | | | | |
| Analyst Initials: | NN | | | | | | | | | | | | |
| Dilution Factor: | 5 | | | | | | | | | | | | |
| ANALYTE | MDL | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 10 | ND | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 10 | ND | | | | | | | | | | |
| Beta-BHC | 2 | 10 | ND | | | | | | | | | | |
| Heptachlor | 2 | 10 | ND | | | | | | | | | | |
| Delta-BHC | 2 | 10 | ND | | | | | | | | | | |
| Aldrin | 2 | 10 | ND | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 10 | ND | | | | | | | | | | |
| Endosulfan I | 2 | 10 | ND | | | | | | | | | | |
| 4,4'-DDE | 4 | 20 | 167 | | | | | | | | | | |
| Dieldrin | 4 | 20 | ND | | | | | | | | | | |
| Endrin | 4 | 20 | ND | | | | | | | | | | |
| 4,4'-DDD | 4 | 20 | ND | | | | | | | | | | |
| Endosulfan II | 4 | 20 | ND | | | | | | | | | | |
| 4,4'-DDT | 4 | 20 | 27 | | | | | | | | | | |
| Endrin Aldehyde | 4 | 20 | ND | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 20 | ND | | | | | | | | | | |
| Methoxychlor | 17 | 85 | ND | | | | | | | | | | |
| gamma-Chlordane | 2 | 10 | ND | | | | | | | | | | |
| alpha-Chlordane | 2 | 10 | ND | | | | | | | | | | |
| Toxaphene | 170 | 850 | ND | | | | | | | | | | |
| Total Chlordane | 17 | 20 | ND | | | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec. | Limits | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 109 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 177* | 30-150 | | | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

* = Surrogate recoveries outside of limits due to matrix interference.

Reviewed/Approved By: Edgar Morrison
Organics Supervisor

Date: 06/12/00

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

| | |
|---|---|
| **Client:** | **Entech Analytical Labs, Inc.** |
| **Attn:** | **Michelle Anderson** |
| **Client's Project:** | **20391** |
| **Date Received:** | **05/23/00** |
| **Extraction Method:** | **3550B** |
| **Matrix:** | **Solid** |
| **Units:** | **ug/kg** |

**Date Amended: 06/12/00**

## EPA Method 8081

| Lab No.: | 44184-003 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | 20391-017 S-15(1-1 1/2) | | | | | | | | | | | | |
| Date Sampled: | 05/09/00 | | | | | | | | | | | | |
| QC Batch #: | G008080S225 | | | | | | | | | | | | |
| Date Extracted: | 05/23/00 | | | | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | | | | | | | | | | | |
| Analyst Initials: | NN | | | | | | | | | | | | |
| Dilution Factor: | 1 | | | | | | | | | | | | |
| **ANALYTE** | **MDL** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** |
| Alpha-BHC | 2 | 2 | ND | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | | | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor | 2 | 2 | ND | | | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Aldrin | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | | | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | | | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | | | | | | | | | | |
| Dieldrin | 4 | 4 | ND | | | | | | | | | | |
| Endrin | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | | | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | | | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | | | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| Toxaphene | 170 | 170 | ND | | | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | | | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec. | Limits | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 87 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 136 | 30-150 | | | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

**Reviewed/Approved By:** _____ **Date:** 06/12/00

**Edgar Morrison**
**Organics Supervisor**

The cover letter is an integral part of this analytical report.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| **Client:** | **Entech Analytical Labs, Inc.** |
| **Attn:** | **Michelle Anderson** |
| **Client's Project:** | **20391** |
| **Date Received:** | **05/23/00** |
| **Extraction Method:** | **3550B** |
| **Matrix:** | **Solid** |
| **Units:** | **ug/kg** |

**Date Amended: 06/12/00, 06/26/00**

**EPA Method 8081**

| **Lab No.:** | 44184-004 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Client Sample I.D.:** | 20391-018 S-15(2-2 1/2) | | | | | | | | | | | | |
| **Date Sampled:** | 05/09/00 | | | | | | | | | | | | |
| **QC Batch #:** | G008080S225 | | | | | | | | | | | | |
| **Date Extracted:** | 05/23/00 | | | | | | | | | | | | |
| **Date Analyzed :** | 05/30/00 | | | | | | | | | | | | |
| **Analyst Initials:** | NN | | | | | | | | | | | | |
| **Dilution Factor:** | 1 | | | | | | | | | | | | |
| **ANALYTE** | **MDL** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** |
| Alpha-BHC | 2 | 2 | ND | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | | | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor | 2 | 2 | ND | | | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Aldrin | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | | | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | | | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | | | | | | | | | | |
| Dieldrin | 4 | 4 | ND | | | | | | | | | | |
| Endrin | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | | | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | | | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | | | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| Toxaphene | 170 | 170 | ND | | | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | | | | | | | | | | |

**Surrogate Recovery**

| Surrogate | %Rec. | Limits |
|---|---|---|
| Tetrachloro-m-xylene | 90 | 30-150 |
| Decachlorobiphenyl | 140 | 30-150 |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

**Reviewed/Approved By:** _____ **Date:** 6/26/00

**Edgar Morrison**
**Organics Supervisor**

The cover letter is an integral part of this analytical report.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20391 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

## EPA Method 8081

| Lab No.: | LCS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | -- | | | | | | | | | | | | |
| Date Sampled: | -- | | | | | | | | | | | | |
| QC Batch #: | G008080S225 | | | | | | | | | | | | |
| Date Extracted: | 05/23/00 | | | | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | | | | | | | | | | | |
| Analyst Initials: | NN | | | | | | | | | | | | |
| Dilution Factor: | 1 | | | | | | | | | | | | |
| ANALYTE | MDL | %Rec | Limits | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 124 | 26-143 | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 123 | 26-143 | | | | | | | | | | |
| Beta-BHC | 2 | 106 | 26-143 | | | | | | | | | | |
| Heptachlor | 2 | 111 | 26-143 | | | | | | | | | | |
| Delta-BHC | 2 | 119 | 26-143 | | | | | | | | | | |
| Aldrin | 2 | 115 | 26-143 | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 112 | 26-143 | | | | | | | | | | |
| Endosulfan I | 2 | 111 | 26-143 | | | | | | | | | | |
| 4,4'-DDE | 4 | 117 | 26-143 | | | | | | | | | | |
| Dieldrin | 4 | 118 | 26-143 | | | | | | | | | | |
| Endrin | 4 | 123 | 26-143 | | | | | | | | | | |
| 4,4'-DDD | 4 | 115 | 26-143 | | | | | | | | | | |
| Endosulfan II | 4 | 117 | 26-143 | | | | | | | | | | |
| 4,4'-DDT | 4 | 122 | 26-143 | | | | | | | | | | |
| Endrin Aldehyde | 4 | 105 | 26-143 | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 127 | 26-143 | | | | | | | | | | |
| Methoxychlor | 17 | 134 | 26-143 | | | | | | | | | | |
| gamma-Chlordane | 2 | 113 | 26-143 | | | | | | | | | | |
| alpha-Chlordane | 2 | 114 | 26-143 | | | | | | | | | | |
| Toxaphene | 170 | NS | NS | | | | | | | | | | |
| Total Chlordane | 17 | NS | NS | | | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec. | Limits | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 98 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 150 | 30-150 | | | | | | | | | | |

NS = Not Spiked

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

Reviewed/Approved By: Ed. Morrison Date: 06/12/00

Edgar Morrison
Organics Supervisor

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Spike Recovery and RPD Summary Report - SOIL(ug/kg)

Method : C:\HPCHEM\1\METHODS\8080526.M (Chemstation Integrator)
Title :
Last Update : Sat May 27 19:08:17 2000
Response via : Initial Calibration

Non-Spiked Sample: C0526071.D

| | Spike Sample | Spike Duplicate Sample |
|---|---|---|
| File ID : | C0526073.D | C0526074.D |
| Sample : | 000523BLKS1,MS, | 000523BLKS1,MSD, |
| Acq Time: | 28 May 2000 5:40 am | 28 May 2000 6:15 am |

| Compound | Sample Conc | Spike Added | Spike Res | Dup Res | Spike %Rec | Dup %Rec | RPD | QC Limits RPD | QC Limits % Rec |
|---|---|---|---|---|---|---|---|---|---|
| gamma-BHC | 0.0 | 40 | 41 | 47 | 103 | 117 | 12# | 9 | 50-127 |
| Heptachlor | 0.0 | 40 | 38 | 43 | 95 | 106 | 12 | 12 | 35-136 |
| Aldrin | 0.0 | 40 | 42 | 47 | 105 | 118 | 11 | 15 | 47-143 |
| Dieldrin | 0.0 | 80 | 83 | 93 | 104 | 117 | 12# | 8 | 54-134 |
| Endrin | 0.0 | 80 | 82 | 90 | 102 | 112 | 9 | 16 | 61-138 |
| 4,4' -DDT | 0.0 | 80 | 84 | 95 | 106 | 118 | 11 | 22 | 15-155 |

# - Failed RPD limits. Batch validated by LCS passing.

QCBATCH#C008080S225

Reviewed/Approved by: _____ Date: 06/09/00
Edgar Morrison
Department Supervisor

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

# Entech Analytical Labs, Inc.

CA ELAP # 1-2346

525 Del Rey Avenue, Suite E, Sunnyvale, CA 94086 (408) 735-1550 FAX (408) 735-1554

## Subcontract Chain of Custody

| Subcontract Lab: | Project Name: | Date Sent: | Due Date: | PO Number: |
|---|---|---|---|---|
| ATL | 20391 | 5/22/00 | 5/30/00 | 20391 |

| Sample Number: | Customer Sample Number: | Matrix: | Test: | Method: | Collect Date: | Collect Time: | Bottle Type: | Preservative: |
|---|---|---|---|---|---|---|---|---|
| 20391-005 | S-6 (1-1½) | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | | 4 oz jar | |
| 20391-006 | S-6 (2-2½) | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | | 4 oz jar | |
| 20391-017 | S-15 (1-1½) | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | | 4 oz jar | |
| 20391-018 | S-15 (2-2½) | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | | 4 oz jar | |

| Relinquished By: | Received By: | Date: | Time: |
|---|---|---|---|
| Marc Gusli | Golden State | 5/22/00 | 1800 |
| Relinquished By: | Received By: Diane Galvan | Date: 5-23-00 | Time: 0900 |
| Relinquished By: | Received By: | Date: | Time: |

Notes: Hold time up on 5/23/00

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

May 31, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

| | | | |
|---|---|---|---|
| **Order:** | 20399 | **Date Collected:** | 5/9/00 |
| **Project Name:** | US Data Port 50-Acre Parcel | **Date Received:** | 5/10/00 |
| **Project Number:** | 587-12F | **P.O. Number:** | |
| **Project Notes:** | | | |

On May 10, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | Arsenic | EPA 6010B |
| | EPA 8081-ATL | EPA 8081 |
| | Lead | EPA 6010B |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

**Lowney Associates**
**405 Clyde Avenue**
**Mountain View, CA 94043**
**Attn: Doug Young**

Date: 5/31/00
Date Received: 5/10/00
Project Name: US Data Port 50-Acre Parcel
Project Number: 587-12F
P.O. Number:
Sampled By: Ryan Gerber

## Certified Analytical Report

**Order ID:** 20399 **Lab Sample ID:** 20399-007 **Client Sample ID:** S-26 1-1 1/2
**Sample Time:** 5:00 PM **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | ND | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/30/00 | SM000524 | EPA 6010B |
| Lead | ND | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/30/00 | SM000524 | EPA 6010B |

**Order ID:** 20399 **Lab Sample ID:** 20399-008 **Client Sample ID:** S-26 2-2 1/2
**Sample Time:** 5:00 PM **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | ND | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/30/00 | SM000524 | EPA 6010B |
| Lead | 7.3 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/30/00 | SM000524 | EPA 6010B |

DF = Dilution Factor ND = Not Detected DLR = Detection Limit Reported PQL = Practical Quantitation Limit

Analysis performed by Entech Analytical Labs, Inc. (CA ELAP #2346)

Michelle L. Anderson, Laboratory Director



*Environmental Analysis Since 1983*

May 30, 2000 ELAP No.: 1838

Entech Analytical Labs, Inc.
525 Del Rey Avenue, Suite E,
Sunnyvale, CA 94086

ATTN: Michelle Anderson

Client's Project: 20399
Lab No.: 44185-001/002

Enclosed are the results for sample(s) received by Advanced Technology Laboratories and tested for the parameters indicated in the enclosed chain of custody.

Thank you for the opportunity to service the needs of your company. Please feel free to call me at (562) 989 - 4045 if I can be of further assistance to your company.

Sincerely,

Cheryl De Los Reyes
Technical Operations Manager
CDR/jh

Enclosures

This cover letter is an integral part of this analytical report.

This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the client to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20399 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

Date Amended: 06/12/00

EPA Method 8081

| Lab No.: | Method Blank | | 44185-001 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | -- | | 20399-007 S-26 1-1 1/2 | | | | | | | | | |
| Date Sampled: | -- | | 05/09/00 | | | | | | | | | |
| QC Batch #: | G008080S225 | | G008080S225 | | | | | | | | | |
| Date Extracted: | 05/23/00 | | 05/23/00 | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | 05/31/00 | | | | | | | | | |
| Analyst Initials: | NN | | NN | | | | | | | | | |
| Dilution Factor: | 1 | | 1 | | | | | | | | | |
| ANALYTE | MDL | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Heptachlor | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Aldrin | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | 2 | ND | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | 4 | 15 | | | | | | | | |
| Dieldrin | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endrin | 4 | 4 | ND | 4 | ND | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | 4 | ND | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | 17 | ND | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | 2 | ND | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Toxaphene | 170 | 170 | ND | 170 | ND | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | 4 | ND | | | | | | | | |

Surrogate Recovery

| Surrogate | %Rec. | Limits | %Rec. | Limits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 103 | 30-150 | 89 | 30-150 | | | | | | | | |
| Decachlorobiphenyl | 150 | 30-150 | 145 | 30-150 | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

Reviewed/Approved By: E. Morrison Date: 06/12/00

Edgar Morrison
Organics Supervisor

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

| | |
|---|---|
| **Client:** | **Entech Analytical Labs, Inc.** |
| **Attn:** | **Michelle Anderson** |
| **Client's Project:** | **20399** |
| **Date Received:** | **05/23/00** |
| **Extraction Method:** | **3550B** |
| **Matrix:** | **Solid** |
| **Units:** | **ug/kg** |

**Date Amended: 06/12/00**

**EPA Method 8081**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lab No.:** | | 44185-002 | | | | | | | | | | | |
| **Client Sample I.D.:** | | 20399-008 S-26 2-2 1/2 | | | | | | | | | | | |
| **Date Sampled:** | | 05/09/00 | | | | | | | | | | | |
| **QC Batch #:** | | G008080S225 | | | | | | | | | | | |
| **Date Extracted:** | | 05/23/00 | | | | | | | | | | | |
| **Date Analyzed :** | | 05/31/00 | | | | | | | | | | | |
| **Analyst Initials:** | | NN | | | | | | | | | | | |
| **Dilution Factor:** | | 1 | | | | | | | | | | | |
| **ANALYTE** | **MDL** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** |
| Alpha-BHC | 2 | 2 | ND | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | | | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor | 2 | 2 | ND | | | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Aldrin | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | | | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | | | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | | | | | | | | | | |
| Dieldrin | 4 | 4 | ND | | | | | | | | | | |
| Endrin | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | | | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | | | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | | | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| Toxaphene | 170 | 170 | ND | | | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | | | | | | | | | | |

**Surrogate Recovery**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Surrogate** | **%Rec.** | **Limits** | | | | | | | | | | |
| Tetrachloro-m-xylene | 92 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 149 | 30-150 | | | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

**Reviewed/Approved By:** Ed Morrison **Date:** 06/12/00

**Edgar Morrison**
**Organics Supervisor**

The cover letter is an integral part of this analytical report.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20399 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

## EPA Method 8081

| Lab No.: | LCS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | -- | | | | | | | | | | | | |
| Date Sampled: | -- | | | | | | | | | | | | |
| QC Batch #: | G008080S225 | | | | | | | | | | | | |
| Date Extracted: | 05/23/00 | | | | | | | | | | | | |
| Date Analyzed : | 05/30/00 | | | | | | | | | | | | |
| Analyst Initials: | NN | | | | | | | | | | | | |
| Dilution Factor: | 1 | | | | | | | | | | | | |
| ANALYTE | MDL | %Rec | Limits | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 124 | 26-143 | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 123 | 26-143 | | | | | | | | | | |
| Beta-BHC | 2 | 106 | 26-143 | | | | | | | | | | |
| Heptachlor | 2 | 111 | 26-143 | | | | | | | | | | |
| Delta-BHC | 2 | 119 | 26-143 | | | | | | | | | | |
| Aldrin | 2 | 115 | 26-143 | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 112 | 26-143 | | | | | | | | | | |
| Endosulfan I | 2 | 111 | 26-143 | | | | | | | | | | |
| 4,4'-DDE | 4 | 117 | 26-143 | | | | | | | | | | |
| Dieldrin | 4 | 118 | 26-143 | | | | | | | | | | |
| Endrin | 4 | 123 | 26-143 | | | | | | | | | | |
| 4,4'-DDD | 4 | 115 | 26-143 | | | | | | | | | | |
| Endosulfan II | 4 | 117 | 26-143 | | | | | | | | | | |
| 4,4'-DDT | 4 | 122 | 26-143 | | | | | | | | | | |
| Endrin Aldehyde | 4 | 105 | 26-143 | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 127 | 26-143 | | | | | | | | | | |
| Methoxychlor | 17 | 134 | 26-143 | | | | | | | | | | |
| gamma-Chlordane | 2 | 113 | 26-143 | | | | | | | | | | |
| alpha-Chlordane | 2 | 114 | 26-143 | | | | | | | | | | |
| Toxaphene | 170 | NS | NS | | | | | | | | | | |
| Total Chlordane | 17 | NS | NS | | | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec. | Limits | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 98 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 150 | 30-150 | | | | | | | | | | |

NS = Not Spiked

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

Reviewed/Approved By: _____ Date: 06/12/00

Edgar Morrison
Organics Supervisor

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Spike Recovery and RPD Summary Report - SOIL(ug/kg)

Method : C:\HPCHEM\1\METHODS\8080526.M (Chemstation Integrator)
Title :
Last Update : Sat May 27 19:08:17 2000
Response via : Initial Calibration

Non-Spiked Sample: C0526071.D

| | Spike Sample | Spike Duplicate Sample |
|---|---|---|
| File ID : | C0526073.D | C0526074.D |
| Sample : | 000523BLKS1,MS, | 000523BLKS1,MSD, |
| Acq Time: | 28 May 2000 5:40 am | 28 May 2000 6:15 am |

| Compound | Sample Conc | Spike Added | Spike Res | Dup Res | Spike %Rec | Dup %Rec | RPD | QC Limits RPD | QC Limits % Rec |
|---|---|---|---|---|---|---|---|---|---|
| gamma-BHC | 0.0 | 40 | 41 | 47 | 103 | 117 | 12# | 9 | 50-127 |
| Heptachlor | 0.0 | 40 | 38 | 43 | 95 | 106 | 12 | 12 | 35-136 |
| Aldrin | 0.0 | 40 | 42 | 47 | 105 | 118 | 11 | 15 | 47-143 |
| Dieldrin | 0.0 | 80 | 83 | 93 | 104 | 117 | 12# | 8 | 54-134 |
| Endrin | 0.0 | 80 | 82 | 90 | 102 | 112 | 9 | 16 | 61-138 |
| 4,4' -DDT | 0.0 | 80 | 84 | 95 | 106 | 118 | 11 | 22 | 15-155 |

# - Failed RPD limits. Batch validated by LCS passing.

QCBATCH#C008080S225

Reviewed/Approved by: E. Morrison for Date: 06/09/00
Edgar Morrison
Department Supervisor

# Entech Analytical Labs, Inc.

CA ELAP # I-2346

525 Del Rey Avenue, Suite E, Sunnyvale, CA 94086 (408) 735-1550 FAX (408) 735-1554

## Subcontract Chain of Custody

| Subcontract Lab: | Project Name: | Date Sent: | Due Date: | PO Number: |
|---|---|---|---|---|
| ATL | 20399 | 5/22/00 | 5/30/00 | 20399 |

| Sample Number: | Customer Sample Number: | Matrix: | Test: | Method: | Collect Date: | Collect Time | Bottle Type: | Preservative: |
|---|---|---|---|---|---|---|---|---|
| 20399-007 | S-26 1-1 1/2 | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | 5:00 PM | 4 oz jar | |
| 20399-008 | S-26 2-2 1/2 | Solid | EPA 8081-ATL | EPA 8081 | 5/9/00 | 5:00 PM | 4 oz jar | |

| Relinquished By: | Received By: | Date: | Time: |
|---|---|---|---|
| Marc Gisler | Golden State | 5/22/00 5/22/00 | 18:00 |
| Relinquished By: | Received By: Diane Galvan | Date: 5-23-00 | Time: 0900 |
| Relinquished By: | Received By: | Date: | Time: |

Notes: Hold time up on 5/23/00!!

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

May 18, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

| | | | |
|---|---|---|---|
| **Order:** | 20391 | **Date Collected:** | 5/9/00 |
| **Project Name:** | US Data Port 50-Acre Parcel | **Date Received:** | 5/9/00 |
| **Project Number:** | 587-12F | **P.O. Number:** | |
| **Project Notes:** | | | |

On May 09, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | EPA 8151-APCL | EPA 8151 |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

May 31, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

| | | | |
|---|---|---|---|
| **Order:** | 20391 | **Date Collected:** | 5/9/00 |
| **Project Name:** | US Data Port 50-Acre Parcel | **Date Received:** | 5/9/00 |
| **Project Number:** | 587-12F | **P.O. Number:** | |
| **Project Notes:** | | | |

On May 09, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | Arsenic | EPA 6010B |
| | EPA 8081-ATL | EPA 8081 |
| | Lead | EPA 6010B |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

**Lowney Associates**
**405 Clyde Avenue**
**Mountain View, CA 94043**
**Attn: Doug Young**

Date: 5/30/00
Date Received: 5/9/00
Project Name: US Data Port 50-Acre Parcel
Project Number: 587-12F
P.O. Number:
Sampled By: Client

## Certified Analytical Report

**Order ID:** 20391 **Lab Sample ID:** 20391-005 **Client Sample ID:** S-6 (1-1½)
**Sample Time:** **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 27 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |
| Lead | 14 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |

**Order ID:** 20391 **Lab Sample ID:** 20391-006 **Client Sample ID:** S-6 (2-2½)
**Sample Time:** **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 26 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |
| Lead | 11 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |

**Order ID:** 20391 **Lab Sample ID:** 20391-017 **Client Sample ID:** S-15 (1-1½)
**Sample Time:** **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 24 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |
| Lead | 8.6 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |

**Order ID:** 20391 **Lab Sample ID:** 20391-018 **Client Sample ID:** S-15 (2-2½)
**Sample Time:** **Sample Date:** 5/9/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 20 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |
| Lead | 5.4 | 5 | 1 | 5 | mg/Kg | 5/25/00 | 5/26/00 | SM000524 | EPA 6010B |

DF = Dilution Factor ND = Not Detected DLR = Detection Limit Reported PQL = Practical Quantitation Limit

Analysis performed by Entech Analytical Labs, Inc. (CA ELAP #2346)

Michelle L. Anderson, Laboratory Director



*Environmental Analysis Since 1983*

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

May 31, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

**Order:** 20420
**Project Name:** US Data Port 50-Acre Parcel
**Project Number:** 587-12F
**Project Notes:**

**Date Collected:** 5/10/00
**Date Received:** 5/10/00
**P.O. Number:**

On May 10, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | Arsenic | EPA 6010B |
| | EPA 8081-ATL | EPA 8081 |
| | Lead | EPA 6010B |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

**Lowney Associates**
**405 Clyde Avenue**
**Mountain View, CA 94043**
**Attn: Doug Young**

Date: 5/31/00
Date Received: 5/10/00
Project Name: US Data Port 50-Acre Parcel
Project Number: 587-12F
P.O. Number:
Sampled By: John McCain

## Certified Analytical Report

**Order ID:** 20420 **Lab Sample ID:** 20420-011 **Client Sample ID:** S-31 (1- 1 1/2')
**Sample Time:** **Sample Date:** 5/10/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 36 | 5 | 1 | 5 | mg/Kg | 5/30/00 | 5/30/00 | SM000526 | EPA 6010B |
| Lead | 120 | 5 | 1 | 5 | mg/Kg | 5/30/00 | 5/30/00 | SM000526 | EPA 6010B |

**Order ID:** 20420 **Lab Sample ID:** 20420-012 **Client Sample ID:** S-31 (2-2 1/2')
**Sample Time:** **Sample Date:** 5/10/00 **Matrix:** Solid

| Parameter | Result | DF | PQL | DLR | Units | PrepDate | Analysis Date | QC Batch ID | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | ND | 5 | 1 | 5 | mg/Kg | 5/30/00 | 5/30/00 | SM000526 | EPA 6010B |
| Lead | 5.2 | 5 | 1 | 5 | mg/Kg | 5/30/00 | 5/30/00 | SM000526 | EPA 6010B |

DF Dilution Factor ND = Not Detected DLR = Detection Limit Reported PQL = Practical Quantitation Limit

Analysis performed by Entech Analytical Labs, Inc. (CA ELAP #2346)

Michelle L. Anderson, Laboratory Director



*Environmental Analysis Since 1983*

May 30, 2000 ELAP No.: 1838

Entech Analytical Labs, Inc.
525 Del Rey Avenue, Suite E,
Sunnyvale, CA 94086

ATTN: Michelle Anderson

Client's Project: 20420
Lab No.: 44186-001/002

Enclosed are the results for sample(s) received by Advanced Technology Laboratories and tested for the parameters indicated in the enclosed chain of custody.

Thank you for the opportunity to service the needs of your company. Please feel free to call me at (562) 989 - 4045 if I can be of further assistance to your company.

Sincerely,

Cheryl De Los Reyes
Technical Operations Manager
CDR/jh

Enclosures

This cover letter is an integral part of this analytical report.

This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the client to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20420 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

Date Amended: 06/12/00

## EPA Method 8081

| Lab No.: | | Method Blank | | 44186-001 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | | -- | | 20420-011 S-31 (1-1 1/2') | | | | | | | | |
| Date Sampled: | | -- | | 05/10/00 | | | | | | | | |
| QC Batch #: | | G008080S225 | | G008080S225 | | | | | | | | |
| Date Extracted: | | 05/23/00 | | 05/23/00 | | | | | | | | |
| Date Analyzed : | | 05/30/00 | | 05/31/00 | | | | | | | | |
| Analyst Initials: | | NN | | NN | | | | | | | | |
| Dilution Factor: | | 1 | | 1 | | | | | | | | |
| ANALYTE | MDL | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Heptachlor | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Aldrin | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | 2 | ND | | | | | | | | |
| 4,4'-DDE | 4 | 4 | ND | 4 | 1210 | | | | | | | | |
| Dieldrin | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endrin | 4 | 4 | ND | 4 | ND | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | 4 | ND | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | 4 | ND | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | 17 | ND | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | 2 | ND | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | 2 | ND | | | | | | | | |
| Toxaphene | 170 | 170 | ND | 170 | ND | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | 4 | ND | | | | | | | | |

## Surrogate Recovery

| Surrogate | %Rec. | Limits | %Rec. | Limits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 103 | 30-150 | DO | 30-150 | | | | | | | | |
| Decachlorobiphenyl | 150 | 30-150 | DO | 30-150 | | | | | | | | |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

DO = Diluted out

Reviewed/Approved By: E. Persaud Jr

Edgar Morrison
Organics Supervisor

Date: 06/12/00

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories

1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

| | |
|---|---|
| **Client:** | **Entech Analytical Labs, Inc.** |
| **Attn:** | **Michelle Anderson** |
| **Client's Project:** | **20420** |
| **Date Received:** | **05/23/00** |
| **Extraction Method:** | **3550B** |
| **Matrix:** | **Solid** |
| **Units:** | **ug/kg** |

**Date Amended: 06/12/00**

## EPA Method 8081

| Lab No.: | 44186-002 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | 20420-012 S-31 (2-2 1/2') | | | | | | | | | | | |
| Date Sampled: | 05/10/00 | | | | | | | | | | | |
| QC Batch #: | G008080S225 | | | | | | | | | | | |
| Date Extracted: | 05/23/00 | | | | | | | | | | | |
| Date Analyzed : | 05/31/00 | | | | | | | | | | | |
| Analyst Initials: | NN | | | | | | | | | | | |
| Dilution Factor: | 1 | | | | | | | | | | | |
| **ANALYTE** | **MDL** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** | **DLR** | **Results** |
| Alpha-BHC | 2 | 2 | ND | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 2 | ND | | | | | | | | | | |
| Beta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor | 2 | 2 | ND | | | | | | | | | | |
| Delta-BHC | 2 | 2 | ND | | | | | | | | | | |
| Aldrin | 2 | 2 | ND | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 2 | ND | | | | | | | | | | |
| Endosulfan I | 2 | 2 | ND | | | | | | | | | | |
| 4,4'-DDE | 4 | 4 | 4.7 | | | | | | | | | | |
| Dieldrin | 4 | 4 | ND | | | | | | | | | | |
| Endrin | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDD | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan II | 4 | 4 | ND | | | | | | | | | | |
| 4,4'-DDT | 4 | 4 | ND | | | | | | | | | | |
| Endrin Aldehyde | 4 | 4 | ND | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 4 | ND | | | | | | | | | | |
| Methoxychlor | 17 | 17 | ND | | | | | | | | | | |
| gamma-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| alpha-Chlordane | 2 | 2 | ND | | | | | | | | | | |
| Toxaphene | 170 | 170 | ND | | | | | | | | | | |
| Total Chlordane | 17 | 4 | ND | | | | | | | | | | |

### Surrogate Recovery

| Surrogate | %Rec | Limits |
|---|---|---|
| Tetrachloro-m-xylene | 89 | 30-150 |
| Decachlorobiphenyl | 145 | 30-150 |

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

**Reviewed/Approved By:** E. Morrison for

**Edgar Morrison**
**Organics Supervisor**

**Date:** 06/12/00

The cover letter is an integral part of this analytical report.

*Advanced Technology Laboratories*

*1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040*

| | |
|---|---|
| Client: | Entech Analytical Labs, Inc. |
| Attn: | Michelle Anderson |
| Client's Project: | 20420 |
| Date Received: | 05/23/00 |
| Extraction Method: | 3550B |
| Matrix: | Solid |
| Units: | ug/kg |

**EPA Method 8081**

| Lab No.: | | LCS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample I.D.: | | -- | | | | | | | | | | | |
| Date Sampled: | | -- | | | | | | | | | | | |
| QC Batch #: | | G008080S225 | | | | | | | | | | | |
| Date Extracted: | | 05/23/00 | | | | | | | | | | | |
| Date Analyzed : | | 05/31/00 | | | | | | | | | | | |
| Analyst Initials: | | NN | | | | | | | | | | | |
| Dilution Factor: | | 1 | | | | | | | | | | | |
| ANALYTE | MDL | %Rec | Limits | DLR | Results | DLR | Results | DLR | Results | DLR | Results | DLR | Results |
| Alpha-BHC | 2 | 124 | 26-143 | | | | | | | | | | |
| Gamma-BHC (Lindane) | 2 | 123 | 26-143 | | | | | | | | | | |
| Beta-BHC | 2 | 106 | 26-143 | | | | | | | | | | |
| Heptachlor | 2 | 111 | 26-143 | | | | | | | | | | |
| Delta-BHC | 2 | 119 | 26-143 | | | | | | | | | | |
| Aldrin | 2 | 115 | 26-143 | | | | | | | | | | |
| Heptachlor Epoxide | 2 | 112 | 26-143 | | | | | | | | | | |
| Endosulfan I | 2 | 111 | 26-143 | | | | | | | | | | |
| 4,4'-DDE | 4 | 117 | 26-143 | | | | | | | | | | |
| Dieldrin | 4 | 118 | 26-143 | | | | | | | | | | |
| Endrin | 4 | 123 | 26-143 | | | | | | | | | | |
| 4,4'-DDD | 4 | 115 | 26-143 | | | | | | | | | | |
| Endosulfan II | 4 | 117 | 26-143 | | | | | | | | | | |
| 4,4'-DDT | 4 | 122 | 26-143 | | | | | | | | | | |
| Endrin Aldehyde | 4 | 105 | 26-143 | | | | | | | | | | |
| Endosulfan Sulfate | 4 | 127 | 26-143 | | | | | | | | | | |
| Methoxychlor | 17 | 134 | 26-143 | | | | | | | | | | |
| gamma-Chlordane | 2 | 113 | 26-143 | | | | | | | | | | |
| alpha-Chlordane | 2 | 114 | 26-143 | | | | | | | | | | |
| Toxaphene | 170 | NS | NS | | | | | | | | | | |
| Total Chlordane | 17 | NS | NS | | | | | | | | | | |

**Surrogate Recovery**

| Surrogate | %Rec. | Limits | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloro-m-xylene | 78 | 30-150 | | | | | | | | | | |
| Decachlorobiphenyl | 50 | 30-150 | | | | | | | | | | |

NS = Not Spiked

MDL = Method Detection Limit
ND = Not Detected (Below DLR).
DLR = MDL X Dilution Factor
NA = Not Analyzed

Reviewed/Approved By: E. Morrison for

Edgar Morrison
Organics Supervisor

Date: 06/12/00

The cover letter is an integral part of this analytical report.

Advanced Technology Laboratories

1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Spike Recovery and RPD Summary Report - SOIL(ug/kg)

Method : C:\HPCHEM\1\METHODS\8080526.M (Chemstation Integrator)
Title :
Last Update : Sat May 27 19:08:17 2000
Response via : Initial Calibration

Non-Spiked Sample: C0526071.D

| | Spike Sample | Spike Duplicate Sample |
|---|---|---|
| File ID : | C0526073.D | C0526074.D |
| Sample : | 000523BLKS1,MS, | 000523BLKS1,MSD, |
| Acq Time: | 28 May 2000 5:40 am | 28 May 2000 6:15 am |

| Compound | Sample Conc | Spike Added | Spike Res | Dup Res | Spike %Rec | Dup %Rec | RPD | QC Limits RPD | QC Limits % Rec |
|---|---|---|---|---|---|---|---|---|---|
| gamma-BHC | 0.0 | 40 | 41 | 47 | 103 | 117 | 12# | 9 | 50-127 |
| Heptachlor | 0.0 | 40 | 38 | 43 | 95 | 106 | 12 | 12 | 35-136 |
| Aldrin | 0.0 | 40 | 42 | 47 | 105 | 118 | 11 | 15 | 47-143 |
| Dieldrin | 0.0 | 80 | 83 | 93 | 104 | 117 | 12# | 8 | 54-134 |
| Endrin | 0.0 | 80 | 82 | 90 | 102 | 112 | 9 | 16 | 61-138 |
| 4,4' -DDT | 0.0 | 80 | 84 | 95 | 106 | 118 | 11 | 22 | 15-155 |

# - Failed RPD limits. Batch validated by LCS passing.

QCBATCH#C008080S225

Reviewed/Approved by: E. Morrison for Date: 06/09/00
Edgar Morrison
Department Supervisor

Advanced Technology Laboratories
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

# Entech Analytical Labs, Inc.

CA ELAP # 1-2346

525 Del Rey Avenue, Suite E, Sunnyvale, CA 94086 (408) 735-1550 FAX (408) 735-1554

## Subcontract Chain of Custody

| Subcontract Lab: | Project Name: | Date Sent: | Due Date: | PO Number: |
|---|---|---|---|---|
| ATL | 20420 | 5/22/00 | 5/30/00 | 20-20 |

| Sample Number: | Customer Sample Number: | Matrix: | Test: | Method: | Collect Date: | Collec. Time | Bottle Type: | Preservative: |
|---|---|---|---|---|---|---|---|---|
| 20420-011 | S-31 (1- 1 1/2') | Solid | EPA 8081-ATL | EPA 8081 | 5/10/00 | | 4 oz jar | |
| 20420-012 | S-31 (2-2 1/2') | Solid | EPA 8081-ATL | EPA 8081 | 5/10/00 | | 4 oz jar | |

| Relinquished By: | Received By: | Date: | Time: |
|---|---|---|---|
| Mara Gusles | Golden State | 5/22/00 | 1800 |
| Relinquished By: | Received By: Diane Graham | Date: 5-23-00 | Time: 0900 |
| Relinquished By: | Received By: | Date: | Time: |

Notes: Hold time up on 5/24/00

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

June 20, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

| | | | |
|---|---|---|---|
| **Order:** | 20997 | **Date Collected:** | 5/13/00 |
| **Project Name:** | US Data Port 50-Acre Parcel | **Date Received:** | 5/15/00 |
| **Project Number:** | 587-12F | **P.O. Number:** | |
| **Project Notes:** | | | |

On May 15, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | EPA 8081-Acculabs | EPA 8081 |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

ACCULABS, INC.

Sample Log 21437
June 20, 2000

Michelle Anderson
Entech Analytical Labs, Inc.
525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

Subject : 2 Soil samples
Project Name : 20997
Project Number :
P.O. Number : 20997

Dear Ms. Anderson,

Chemical analysis on the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. USEPA protocols for sample storage and preservation were followed.

Acculabs - Davis is certified by the State of California (# 2330), the State of Arizona (AZ0583) and the State of Nevada. If you have any questions regarding procedures or results, please call me at 530-757-0920.

Sincerely,

Tom Kwoka

Tom Kwoka

1046 OLIVE DRIVE, DAVIS, CALIFORNIA 95616
TELEPHONE (530)757-0920 FAX (530)753-6091 WWW.ACCULABS.COM

ACCULABS, INC.

Sample Log 21437
June 20, 2000

Subject : 2 Soil samples
Project Name : 20997
Project Number :
P.O. Number : 20997

# Case Narrative

Analysis: EPA 8081A

Multiple dilutions are being reported for samples that have analytes whose concentration has exceeded the linear range of the GC curve. This allows for an accurate concentration of analytes which would be diluted out in the higher dilution.

Tom Kwoka

ACCULABS, INC.

Sample Log 21437
June 20, 2000

# EPA 8081A

Sample Name : **S-52(1-1 1/2) (20997-001)**

Project Name : 20997
Project Number :
Sample Date : 05/13/00
Date Extracted : 06/19/00
Extr. Method : EPA 3550
QC Batch : PS000606

Date Analyzed : 06/20/00
Date Received : 06/19/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21437-01

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| **alpha-BHC** | **0.0050** | **0.12** | mg/Kg |
| gamma-BHC | 0.0050 | <0.0050 | mg/Kg |
| **beta-BHC** | **0.0050** | **0.23** | mg/Kg |
| Heptachlor | 0.0050 | <0.0050 | mg/Kg |
| **delta-BHC** | **0.0050** | **1.1 E** | mg/Kg |
| Aldrin | 0.0050 | <0.0050 | mg/Kg |
| Heptachlor Epoxide | 0.0050 | <0.0050 | mg/Kg |
| gamma-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Endosulfan 1 | 0.0050 | <0.0050 | mg/Kg |
| alpha-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Dieldrin | 0.010 | <0.010 | mg/Kg |
| DDE | 0.010 | <0.010 | mg/Kg |
| Endrin | 0.010 | <0.010 | mg/Kg |
| Endosulfan 2 | 0.010 | <0.010 | mg/Kg |
| DDD | 0.010 | <0.010 | mg/Kg |
| Endrin Aldehyde | 0.010 | <0.010 | mg/Kg |
| DDT | 0.010 | <0.010 | mg/Kg |
| Endosulfan Sulfate | 0.010 | <0.010 | mg/Kg |
| Methoxychlor | 0.050 | <0.050 | mg/Kg |
| Chlordane Technical | 0.10 | <0.10 | mg/Kg |
| **Toxaphene** | **0.20** | **13 E** | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 102 | % Recovery |
| Decachlorobiphenyl (sur) | | 102 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21437
June 20, 2000

# EPA 8081A

Sample Name : **S-52(1-1 1/2) (20997-001)**

Project Name : 20997
Project Number :
Sample Date : 05/13/00
Date Extracted : 06/19/00
Extr. Method : EPA 3550
QC Batch : PS000606

Date Analyzed : 06/20/00
Date Received : 06/19/00
Dilution : 1:20
Sample Matrix : Soil
Lab Number : 21437-01

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| alpha-BHC | 0.10 | < 0.10 | mg/Kg |
| gamma-BHC | 0.10 | < 0.10 | mg/Kg |
| **beta-BHC** | **0.10** | **0.24** | mg/Kg |
| Heptachlor | 0.10 | < 0.10 | mg/Kg |
| **delta-BHC** | **0.10** | **1.2** | mg/Kg |
| Aldrin | 0.10 | < 0.10 | mg/Kg |
| Heptachlor Epoxide | 0.10 | < 0.10 | mg/Kg |
| gamma-Chlordane | 0.10 | < 0.10 | mg/Kg |
| Endosulfan 1 | 0.10 | < 0.10 | mg/Kg |
| alpha-Chlordane | 0.10 | < 0.10 | mg/Kg |
| Dieldrin | 0.20 | < 0.20 | mg/Kg |
| DDE | 0.20 | < 0.20 | mg/Kg |
| Endrin | 0.20 | < 0.20 | mg/Kg |
| Endosulfan 2 | 0.20 | < 0.20 | mg/Kg |
| DDD | 0.20 | < 0.20 | mg/Kg |
| Endrin Aldehyde | 0.20 | < 0.20 | mg/Kg |
| DDT | 0.20 | < 0.20 | mg/Kg |
| Endosulfan Sulfate | 0.20 | < 0.20 | mg/Kg |
| Methoxychlor | 1.0 | <1.0 | mg/Kg |
| Chlordane Technical | 2.0 | <2.0 | mg/Kg |
| **Toxaphene** | **4.0** | **15** | mg/Kg |
| Tetrachloro-m-xylene (sur) | | DIL OUT | % Recovery |
| Decachlorobiphenyl (sur) | | DIL OUT | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21437
June 20, 2000

# EPA 8081A

Sample Name : **S-52(2-2 1/2) (20997-002)**

Project Name : 20997
Project Number :
Sample Date : 05/13/00
Date Extracted : 06/19/00
Extr. Method : EPA 3550
QC Batch : PS000606

Date Analyzed : 06/20/00
Date Received : 06/19/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21437-02

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| **alpha-BHC** | **0.0050** | **0.011** | mg/Kg |
| gamma-BHC | 0.0050 | <0.0050 | mg/Kg |
| **beta-BHC** | **0.0050** | **0.044** | mg/Kg |
| Heptachlor | 0.0050 | <0.0050 | mg/Kg |
| **delta-BHC** | **0.0050** | **0.16** | mg/Kg |
| Aldrin | 0.0050 | <0.0050 | mg/Kg |
| Heptachlor Epoxide | 0.0050 | <0.0050 | mg/Kg |
| gamma-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Endosulfan 1 | 0.0050 | <0.0050 | mg/Kg |
| alpha-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Dieldrin | 0.010 | <0.010 | mg/Kg |
| DDE | 0.010 | <0.010 | mg/Kg |
| Endrin | 0.010 | <0.010 | mg/Kg |
| Endosulfan 2 | 0.010 | <0.010 | mg/Kg |
| DDD | 0.010 | <0.010 | mg/Kg |
| Endrin Aldehyde | 0.010 | <0.010 | mg/Kg |
| DDT | 0.010 | <0.010 | mg/Kg |
| Endosulfan Sulfate | 0.010 | <0.010 | mg/Kg |
| Methoxychlor | 0.050 | <0.050 | mg/Kg |
| Chlordane Technical | 0.10 | <0.10 | mg/Kg |
| **Toxaphene** | **0.20** | **2.0 E** | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 81 | % Recovery |
| Decachlorobiphenyl (sur) | | 83 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21437
June 20, 2000

# EPA 8081A

Sample Name : **S-52(2-2 1/2) (20997-002)**

Project Name : 20997
Project Number :
Sample Date : 05/13/00
Date Extracted : 06/19/00
Extr. Method : EPA 3550
QC Batch : PS000606

Date Analyzed : 06/20/00
Date Received : 06/19/00
Dilution : 1:5
Sample Matrix : Soil
Lab Number : 21437-02

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| alpha-BHC | 0.025 | < 0.025 | mg/Kg |
| gamma-BHC | 0.025 | < 0.025 | mg/Kg |
| **beta-BHC** | **0.025** | **0.036** | mg/Kg |
| Heptachlor | 0.025 | < 0.025 | mg/Kg |
| **delta-BHC** | **0.025** | **0.14** | mg/Kg |
| Aldrin | 0.025 | < 0.025 | mg/Kg |
| Heptachlor Epoxide | 0.025 | < 0.025 | mg/Kg |
| gamma-Chlordane | 0.025 | < 0.025 | mg/Kg |
| Endosulfan 1 | 0.025 | < 0.025 | mg/Kg |
| alpha-Chlordane | 0.025 | < 0.025 | mg/Kg |
| Dieldrin | 0.050 | < 0.050 | mg/Kg |
| DDE | 0.050 | < 0.050 | mg/Kg |
| Endrin | 0.050 | < 0.050 | mg/Kg |
| Endosulfan 2 | 0.050 | < 0.050 | mg/Kg |
| DDD | 0.050 | < 0.050 | mg/Kg |
| Endrin Aldehyde | 0.050 | < 0.050 | mg/Kg |
| DDT | 0.050 | < 0.050 | mg/Kg |
| Endosulfan Sulfate | 0.050 | < 0.050 | mg/Kg |
| Methoxychlor | 0.25 | < 0.25 | mg/Kg |
| Chlordane Technical | 0.50 | < 0.50 | mg/Kg |
| **Toxaphene** | **1.0** | **2.0** | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 74 | % Recovery |
| Decachlorobiphenyl (sur) | | 74 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21437
June 20, 2000

# EPA 8081A

Sample Name : **Method Blank**

Project Name : 20997
Project Number :
Sample Date : 05/13/00
Date Extracted : 06/19/00
Extr. Method : EPA 3550
QC Batch : PS000606

Date Analyzed : 06/20/00
Date Received : 06/19/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21437-03

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| alpha-BHC | 0.0050 | <0.0050 | mg/Kg |
| gamma-BHC | 0.0050 | <0.0050 | mg/Kg |
| beta-BHC | 0.0050 | <0.0050 | mg/Kg |
| Heptachlor | 0.0050 | <0.0050 | mg/Kg |
| delta-BHC | 0.0050 | <0.0050 | mg/Kg |
| Aldrin | 0.0050 | <0.0050 | mg/Kg |
| Heptachlor Epoxide | 0.0050 | <0.0050 | mg/Kg |
| gamma-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Endosulfan 1 | 0.0050 | <0.0050 | mg/Kg |
| alpha-Chlordane | 0.0050 | <0.0050 | mg/Kg |
| Dieldrin | 0.010 | <0.010 | mg/Kg |
| DDE | 0.010 | <0.010 | mg/Kg |
| Endrin | 0.010 | <0.010 | mg/Kg |
| Endosulfan 2 | 0.010 | <0.010 | mg/Kg |
| DDD | 0.010 | <0.010 | mg/Kg |
| Endrin Aldehyde | 0.010 | <0.010 | mg/Kg |
| DDT | 0.010 | <0.010 | mg/Kg |
| Endosulfan Sulfate | 0.010 | <0.010 | mg/Kg |
| Methoxychlor | 0.050 | <0.050 | mg/Kg |
| Chlordane Technical | 0.10 | <0.10 | mg/Kg |
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 87 | % Recovery |
| Decachlorobiphenyl (sur) | | 85 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

# Acculabs Inc. - Davis

ACCULABS, INC.

## EPA 8081 QC Report

| | |
|---|---|
| Matrix: Soil | Date Extracted: 6/19/00 |
| QC Batch: PS000606 | Date Analyzed: 6/20/00 |
| QC Limits Set: 8/18/99 | Spiked Sample ID : 21437-02 * |

| Parameter | Spike Conc mg/kg | LCS % Rec | Matrix Spike % Rec | Matrix Spike Dup % Rec | RPD | Control Chart Limits Lower | Control Chart Limits Upper |
|---|---|---|---|---|---|---|---|
| gamma-BHC | 0.050 | 77 | 117 | 110 | 6 | 62 | 117 |
| Heptachlor | 0.050 | 82 | 87 | 91 | 4 | 63 | 117 |
| Aldrin | 0.050 | 77 | 85 | 85 | 0 | 71 | 107 |
| Dieldrin | 0.100 | 88 | 151 | 124 | 20 | 68 | 117 |
| Endrin | 0.100 | 87 | 109 | 161 | 39 | 40 | 161 |
| 4,4'-DDT | 0.100 | 66 | 218 | 157 | 33 | 43 | 128 |

| Surrogate Compounds | Control Chart Limits Lower | Control Chart Limits Upper |
|---|---|---|
| Tetrachloro-m-xylene | 75 | 144 |
| Decachlorobiphenyl | 78 | 141 |

* Sample had a high concentration of toxaphene, which interfered with recovery for Dieldrin, Endrin, and DDT.

Tom Kwoka
Laboratory Director

C:\EXCEL\QC\Ps000606

# Entech Analytical Labs, Inc.

CA ELAP # I-2346

525 Del Rey Avenue, Suite E, Sunnyvale, CA 94086 (408) 735-1550 FAX (408) 735-1554

## Subcontract Chain of Custody

21437

| Subcontract Lab: | Project Name: | Date Sent: | Due Date: | PO Number: |
|---|---|---|---|---|
| ACCULABS | 20997 | 6/16/00 | 6/20/00 | 20997 |

| | Sample Number: | Customer Sample Number: | Matrix: | Test: | Method: | Collect Date: | Collect Time: | Bottle Type: | Preservative: |
|---|---|---|---|---|---|---|---|---|---|
| 01 | 20997-001 | S-52(1-1½) | Solid | EPA 8081-Acculabs | EPA 8081 | 5/13/00 | | 4 OZ JAR | |
| 02 | 20997-002 | S-52(2-2½) | Solid | EPA 8081-Acculabs | EPA 8081 | 5/13/00 | | 4 OZ JAR | |

| Relinquished By: | Received By: | Date: | Time: |
|---|---|---|---|
| Amy Dombeski | Golden State | 6/18/00 | 1800 |
| Golden State | [illegible] | 6-17-00 | 1000 |
| | | | |

Notes: 24 Hr. Rush!! Due6/20/00

# Entech Analytical Labs, Inc.

CA ELAP # I-2346

525 Del Rey Avenue, Suite E, Sunnyvale, CA 94086 (408) 735-1550 FAX (408) 735-1554

## Subcontract Chain of Custody

| Subcontract Lab: | Project Name: | Date Sent: | Due Date: | PO Number: |
|---|---|---|---|---|
| ACCULABS | 20997 | 6/16/00 | 6/20/00 | 20997 |

| Sample Number: | Customer Sample Number: | Matrix: | Test: | Method: | Collect Date: | Collect Time: | Bottle Type: | Preservative: |
|---|---|---|---|---|---|---|---|---|
| 20997-001 | S-52(1-1½) | Solid | EPA 8081-Acculabs | EPA 8081 | 5/13/00 | | 4 OZ JAR | |
| 20997-002 | S-52(2-2½) | Solid | EPA 8081-Acculabs | EPA 8081 | 5/13/00 | | 4 OZ JAR | |

| Relinquished By: | Received By: | Date: | Time: |
|---|---|---|---|
| Amy Dombeedo | Golden State | 6/16/00 | 1300 |
| Relinquished By: | Received By: | Date: | Time: |
| | | | |
| Relinquished By: | Received By: | Date: | Time: |
| | | | |

Notes: 24 Hr. Rush!! Due6/20/00

(2)

# LOWNEY ASSOCIATES
## CHAIN OF CUSTODY RECORD

Send Results To: ☒ Mountain View Office, 405 Clyde Avenue, Mountain View, CA 94043, 415-967-2365 ☐ Oakland Office, 129 Filbert Street, Oakland, CA 94607, 510-267-1970

Fax Copy To: ☒ 415-967-2785 (fax) ☐ 510-267-1972 (fax)

Project Name: US Data Port 50-Acre Parcel

Job Number: 587-12F

Report To: Doug Young

Sampler (print): John McCain

Sampler (signature): John [signature]

QC Requirements: ☒ Level A (standard) ☐ Level B ☐ Level C ☐ Level D

Turnaround Requirements: ☐ 10 working days ☒ 5 working days ☐ 3 working days ☐ 48 hours ☐ 24 hours ☐ 2-3 hours (RUSH)

ANALYSES REQUESTED

00 MAY 15 12:57

| Sample I.D. | Date | Time | Sample Matrix | # of Cont. | Laboratory I.D. | Organochlorine Pesticides (8080) | Mercury + Arsenic | Selenium + Lead | Chlorinated Herbicides (8151) | Organophosphorous Pesticides (8141) | N-methyl-carbamates (8318) | | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S-45 (0-½') | 5-13-00 | | soil | | 005 | X | X | X | | | | | | | | | | |
| S-45 (1-1½') | | | | | 024 | | | | | | | | | | | | | Hold |
| S-45 (2-2½') | | | | | 025 | | | | | | | | | | | | | Hold |
| S-46 (0-½') | | | | | 004 | X | X | X | | | | | | | | | | |
| S-46 (1-1½') | | | | | 026 | | | | | | | | | | | | | Hold |
| S-46 (2-2½') | | | | | 027 | | | | | | | | | | | | | Hold |
| S-51 (0-½') | | | | 2 ✓ | 007 | X | X | X | X | X | X | | | | | | | |
| S-51 (1-1½') | | | | 2 ✓ | 028 | X | X | X | X | X | X | | | | | | | Hold |
| S-51 (2-2½') | | | | 2 ✓ | 029 | X | X | X | X | X | X | | | | | | | Hold |
| S-52 (0-½') | | | | 1 | 006 | X | X | X | | | | | | | | | | |
| S-52 (1-1½') | | | | | 030 | | | | | | | | | | | | | Hold |
| S-52 (2-2½') | | | | | 031 | | | | | | | | | | | | | Hold |

Relinquished By: [signature] Date: Time:

Relinquished By: Leo Rodgers Date: 5/15/00 Time: 1245

Relinquished By: Date: Time:

Received By: Leo Rodgers Date: 5/15/00 Time: 1230

Received By: Date: Time:

Lab of Record:

PM Initials

Temperature

# Entech Analytical Labs, Inc.

CA ELAP# 2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

July 07, 2000

Doug Young
Lowney Associates
405 Clyde Avenue
Mountain View, CA 94043

| | | | |
|---|---|---|---|
| **Order:** | 21243 | **Date Collected:** | 7/5/00 |
| **Project Name:** | US Data Port 55-Acre Lin/Hom Parcel | **Date Received:** | 7/5/00 |
| **Project Number:** | 587-12F | **P.O. Number:** | |
| **Project Notes:** | | | |

On July 05, 2000, samples were received under documentented chain of custody. Results for the following analyses are attached:

| Matrix | Test | Method |
|---|---|---|
| Solid | EPA 8081-Acculabs | EPA 8081 |

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,

Michelle L. Anderson
Lab Director

ACCULABS, INC.

Sample Log 21492
July 07, 2000

Michelle Anderson
Entech Analytical Labs, Inc.
525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

Subject : 8 Soil Samples
Project Name :
Project Number : 21243

Dear Ms. Anderson,

Chemical analysis on the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. USEPA protocols for sample storage and preservation were followed.

Acculabs - Davis is certified by the State of California (# 2330), the State of Arizona (AZ0583) and the State of Nevada. If you have any questions regarding procedures or results, please call me at 530-757-0920.

Sincerely,

Tom Kwoka

1046 Olive Drive, Davis, California 95616
Telephone (530)757-0920 Fax (530)753-6091 WWW.ACCULABS.COM

ACCULABS, INC.

Sample Log 21492
July 07, 2000

Subject : 8 Soil Samples
Project Name :
Project Number : 21243

# Case Narrative

Analysis: EPA 8081A

The Decachlorobiphenyl surrogate recoveries for samples SS-1 @ 1-1 1/2 and SS3 @ 0-1/2 were below laboratory control chart limits due to the coloration of the sample extract.

Troy D. Jeppson for
Tom Kwoka

ACCULABS, INC.
Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : **SS-1 @ 0-1/2**

Project Name :
Project Number : 21243
Sample Date : 07/05/00
Date Extracted : 07/06/00
Extr. Method : EPA 3550
QC Batch : PS000702

Date Analyzed : 07/06/00
Date Received : 07/06/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21492-01

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 104 | % Recovery |
| Decachlorobiphenyl (sur) | | 99 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.
Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : **SS-1 @ 1-1 1/2**

Project Name :
Project Number : 21243
Sample Date : 07/05/00
Date Extracted : 07/06/00
Extr. Method : EPA 3550
QC Batch : PS000702

Date Analyzed : 07/06/00
Date Received : 07/06/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21492-02

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 77 | % Recovery |
| Decachlorobiphenyl (sur) | | 67 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Troy B. Tungon for
Tom Kwoka

ACCULABS, INC.
Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : SS2 @ 0-1/2

Project Name :
Project Number : 21243
Sample Date : 07/05/00
Date Extracted : 07/06/00
Extr. Method : EPA 3550
QC Batch : PS000702

Date Analyzed : 07/06/00
Date Received : 07/06/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21492-03

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 103 | % Recovery |
| Decachlorobiphenyl (sur) | | 105 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Tom D. Ferguson for
Tom Kwoka

ACCULABS, INC.
Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : SS2 @ 1-1 1/2

| | | | |
|---|---|---|---|
| Project Name | : | Date Analyzed | : 07/06/00 |
| Project Number | : 21243 | Date Received | : 07/06/00 |
| Sample Date | : 07/05/00 | Dilution | : 1:1 |
| Date Extracted | : 07/06/00 | Sample Matrix | : Soil |
| Extr. Method | : EPA 3550 | Lab Number | : 21492-04 |
| QC Batch | : PS000702 | | |

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 108 | % Recovery |
| Decachlorobiphenyl (sur) | | 111 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Troy D. Tuppen for
Tom Kwoka

ACCULABS, INC.

Sample Log 21492
July 07, 2000

# EPA 8081A

**Sample Name : SS3 @ 0-1/2**

| | | | |
|---|---|---|---|
| Project Name | : | Date Analyzed | : 07/07/00 |
| Project Number | : 21243 | Date Received | : 07/06/00 |
| Sample Date | : 07/05/00 | Dilution | : 1:1 |
| Date Extracted | : 07/06/00 | Sample Matrix | : Soil |
| Extr. Method | : EPA 3550 | Lab Number | : 21492-05 |
| QC Batch | : PS000702 | | |

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 108 | % Recovery |
| Decachlorobiphenyl (sur) | | 77 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : SS3 @ 1-1 1/2

Project Name :
Project Number : 21243
Sample Date : 07/05/00
Date Extracted : 07/06/00
Extr. Method : EPA 3550
QC Batch : PS000702

Date Analyzed : 07/07/00
Date Received : 07/06/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21492-06

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 119 | % Recovery |
| Decachlorobiphenyl (sur) | | 98 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Tom Kiwoka

ACCULABS, INC.

Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : SS4 @ 0-1/2

| | | | |
|---|---|---|---|
| Project Name | : | Date Analyzed | : 07/07/00 |
| Project Number | : 21243 | Date Received | : 07/06/00 |
| Sample Date | : 07/05/00 | Dilution | : 1:1 |
| Date Extracted | : 07/06/00 | Sample Matrix | : Soil |
| Extr. Method | : EPA 3550 | Lab Number | : 21492-07 |
| QC Batch | : PS000702 | | |

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 105 | % Recovery |
| Decachlorobiphenyl (sur) | | 97 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Troy D. Turpin for
Tom Kwoka

ACCULABS, INC.

Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : SS4 @ 1-1 1/2

Project Name :
Project Number : 21243
Sample Date : 07/05/00
Date Extracted : 07/06/00
Extr. Method : EPA 3550
QC Batch : PS000702

Date Analyzed : 07/07/00
Date Received : 07/06/00
Dilution : 1:1
Sample Matrix : Soil
Lab Number : 21492-08

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 100 | % Recovery |
| Decachlorobiphenyl (sur) | | 80 | % Recovery |

MRL = Method Reporting Limit
Conc. = Concentration
E = Concentration exceeded calibration range.

Approved By : Tom Kwoka

ACCULABS, INC.

Sample Log 21492
July 07, 2000

# EPA 8081A

Sample Name : **Method Blank**

| | | | |
|---|---|---|---|
| Project Name | : | Date Analyzed | : 07/06/00 |
| Project Number | : 21243 | Date Received | : 07/06/00 |
| Sample Date | : 07/05/00 | Dilution | : 1:1 |
| Date Extracted | : 07/06/00 | Sample Matrix | : Soil |
| Extr. Method | : EPA 3550 | Lab Number | : 21492-09 |
| QC Batch | : PS000702 | | |

| Parameter | MRL | Measured Conc. | Units |
|---|---|---|---|
| Toxaphene | 0.20 | <0.20 | mg/Kg |
| Tetrachloro-m-xylene (sur) | | 108 | % Recovery |
| Decachlorobiphenyl (sur) | | 109 | % Recovery |

MRL = Method Reporting Limit

Conc. = Concentration

E = Concentration exceeded calibration range.

Approved By : Troy D. Jurgens for
Tom Kwoka

ACCULABS, INC.

# Acculabs Inc. - Davis

## EPA 8081 QC Report

| | |
|---|---|
| Matrix: Soil | Date Extracted: 7/6/00 |
| QC Batch: PS000702 | Date Analyzed: 7/6/00 |
| QC Limits Set: 8/18/99 | Spiked Sample ID: 21492-01 |

| Parameter | Spike Conc mg/kg | LCS % Rec | Matrix Spike % Rec | Matrix Spike Dup % Rec | RPD | Control Chart Limits Lower | Control Chart Limits Upper |
|---|---|---|---|---|---|---|---|
| gamma-BHC | 0.050 | 108 | 110 | 64 | 53 | 62 | 117 |
| Heptachlor | 0.050 | 114 | 112 | 68 | 49 | 63 | 117 |
| Aldrin | 0.050 | 106 | 106 | 67 | 45 | 71 | 107 |
| Dieldrin | 0.100 | 117 | 135 | 75 | 57 | 68 | 117 |
| Endrin | 0.100 | 121 | 133 | 76 | 55 | 40 | 161 |
| 4,4'-DDT | 0.100 | 112 | 93 * | 32 * | #VALUE! | 43 | 128 |

| Surrogate Compounds | Control Chart Limits Lower | Control Chart Limits Upper |
|---|---|---|
| Tetrachloro-m-xylene | 75 | 144 |
| Decachlorobiphenyl | 78 | 141 |

* Sample 21492-01 had high concentrations of DDT which interfered with matrix spike and duplicate recoveries for DDT. Also, matrix spike duplicate had a small loss of sample during the extraction process which resulted in low recoveries. LCS was within limits.

Troy A. Fuqua for
Tom Kwoka
Laboratory Director

C:\EXCEL\QC\Ps000702

# LOWNEY ASSOCIATES

## CHAIN OF CUSTODY RECORD

SEND RESULTS TO:

☒ Mountain View Office
405 Clyde Ave
Mountain View, Ca 94043
415-967-2365
FAX COPY: ☒ 415-967-2785 (FAX)

☐ Walnut Creek Office
1600 S. Main St, Suite 125
Walnut Creek, Ca 94596
510-938-9356
FAX COPY: ☐ 510-938-9359 (FAX)

Project Name: US DataPort 55-Acre Lin/Hom Parcel

Job No.: 587-12F

Report To: Doug Young / James Kiernan

Sampler (print): James Kiernan

Sampler (signature): [signature]

QC Requirements:

☒ Level A (standard) ☐ Level B ☐ Level C ☐ Level D

Turnaround Requirements:

☐ 10 Working days
☐ 5 Working days
☐ 3 Working days
☒ 48 Hours
☐ 24 Hours
☐ 2-3 Hours (RUSH)

ANALYSIS REQUESTED

| Sample I.D. | Date | Time | Lab I.D. | Sample Matrix | No. of Cont. | TPHgas/BTEX (8015/8020) | TPH as diesel (8015M) | TRPH (5520) EF/BF | Halogenated VOCs (8010) | Purgeable Organics (8240) | Extractable Organics (8270) | Toxaphene Only (8081) | | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS-1 @ 0-½' | 7/5/00 | | | Soil | 1 | | | | | | | X | | | 21243 | | | | -001 |
| SS-1 @ 1-1½' | | | | | | | | | | | | X | | | | | | | 002 |
| SS-2 @ 0-½' | | | | | | | | | | | | X | | | | | | | 003 |
| SS-2 @ 1-1½' | | | | | | | | | | | | X | | | | | | | 004 |
| SS-3 @ 0-½' | | | | | | | | | | | | X | | | | | | | 005 |
| SS-3 @ 1-1½' | | | | | | | | | | | | X | | | | | | | 006 |
| SS-4 @ 0-½' | | | | | | | | | | | | X | | | | | | | 007 |
| SS-4 @ 1-1½' | | | | | | | | | | | | X | | | | | | | 008 |

48 HR RUSH

Relinquished By: [signature] Date: 7/5/00 Time: 11:10

Received By: [signature] Date: 7/5/00 Time: 1:07

PM Initial:

Relinquished By: Date: Time:

Received By: Date: Time:

Relinquished By: Date: Time:

Lab Of Record:

Temperature:

Jul. 7. 2000 11:45AM No. 0011 P. 15/15

# *Los Esteros Critical Energy Facility*

# *Appendix 10-A*
# *Civil Engineering Design Criteria*

***December 2003***

# APPENDIX 10A

# CIVIL ENGINEERING DESIGN CRITERIA

## 10A1 INTRODUCTION

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and construction of civil engineering systems. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

## 10A2 CODES AND STANDARDS

The design of civil engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, the County of Santa Clara, the City of San Jose and industry standards. For Phase 1, the current issue or edition of the documents at the time of filing of the original Application for Certification (AFC) applied, unless otherwise noted. For Phase 2, the current issue or edition of the documents at the time of filing of this AFC will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

### 10A2.1 Civil Engineering Codes and Standards

The following codes and standards have been identified as applicable, in whole or in part, to civil engineering design and construction of power plants.

- American Association of State Highway and Transportation Officials (AASHTO) - Standards and Specifications
- American Concrete Institute (ACI) - Standards and Recommended Practices
- American Institute of Steel Construction (AISC) - Standards and Specifications
- American National Standards Institute (ANSI) - Standards
- American Society of Testing and Materials (ASTM) - Standards, Specifications and Recommended Practices
- American Water Works Association (AWWA) - Standards and Specifications
- American Welding Society (AWS) - Codes and Standards
- Asphalt Institute (AI) - Asphalt Handbook
- California Energy Commission (CEC) - Recommended Seismic Design Criteria for Non-Nuclear Generating Facilities in California, 1989
- Concrete Reinforcing Steel Institute (CRSI) - Standards
- Factory Mutual (FM) - Standards
- National Fire Protection Association (NFPA) – Standards and Recommended Practices
- International Conference of Building Officials (ICBO) - Uniform Building Code (UBC), 1997
- Steel Structures Painting Council (SSPC) - Standards and Specifications

## 10A2.2 Engineering Geology Codes, Standards and Certifications

Engineering geology activities will conform to the applicable federal, state and local laws, regulations, ordinances and industry codes and standards.

### 10A2.2.1 Federal

None are applicable.

### 10A2.2.2 State

The Warren-Alquist Act, PRC, Section 25000 et seq. and the California Energy Commission (CEC) Code of Regulations (CCR), Siting Regulations, Title 20 CCR, Chapter 2, require that Application for Certification (AFC) address the geologic and seismic aspects of the project.

The California Environmental Quality Act (CEQA), PRC 21000 et seq. and the CEQA Guidelines require that potentially significant effects, including geologic hazards, be identified and a determination made as to whether they can be substantially reduced.

### 10A2.2.3 City

California State Planning Law, Government Code Section 65302, requires each city and county to adopt a general plan, consisting of nine mandatory elements, to guide its physical development. Section 65302(f) requires that a seismic safety element be included in the general plan.

## 10A2.3 Storm Drainage Codes, Standards and Certifications

Storm drainage design activities will conform to the applicable federal, state and local laws, regulations, ordinances and industry codes and standards. The design of all storm drainage will be performed by, or under the direct supervision of a licensed civil engineer.

### 10A2.2.1 Federal

All finish floors shall be higher than the 100-year flood plain elevation as established by the Federal Emergency Management Agency.

### 10A2.2.2 State

None are applicable.

### 10A2.2.3 Local

Both the City of San Jose and the Santa Clara Valley Water District have specific design requirements for storm water management design that will be met by this project.

# *Los Esteros Critical Energy Facility*

# *Appendix 10-B*
# *Structural Engineering Design Criteria*

***December 2003***

# APPENDIX 10B

# STRUCTURAL ENGINEERING DESIGN CRITERIA

## 10B.1 INTRODUCTION

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of structural engineering systems for the LECEF. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications.

## 10B.2 CODES AND STANDARDS

The design of structural engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, City of San Jose ordinances, and industry standards. For Phase 1, the current issue or edition of the documents at the time of filing of the original Application for Certification (AFC) applied, unless otherwise noted. For Phase 2, the current issue or edition of the documents at the time of filing of this AFC will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

The following codes and standards have been identified as applicable, in whole or in part, to structural engineering design and construction of power plants.

- California Building Code (CBC), 2001 Edition
- American Institute of Steel Construction (AISC):
  - Manual of Steel Construction—9th Edition
  - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings—ASD
  - Specification for Structural Joints Using ASTM A325 or A490 Bolts
  - Code of Standard Practice for Steel Buildings and Bridges
- American Concrete Institute (ACI):
  - ACI 318-99, Building Code Requirements for Structural Concrete
  - ACI 301-99, Specifications for Structural Concrete for Buildings
  - ACI 543R-00, Design, Manufacture, and Installation of Concrete Piles
- American Society of Civil Engineers (ASCE):
  - ASCE 7-98, Minimum Design Loads for Buildings and Other Structures
- American Welding Society (AWS):
  - D1.1—Structural Welding Code—Steel
  - D1.3—Structural Welding Code—Sheet Steel
- Code of Federal Regulations, Title 29—Labor, Chapter XVII, Occupational Safety and Health Administration (OSHA).
  - Part 1910—Occupational Safety and Health Standards.
  - Part 1926—Construction Safety and Health Regulations

- National Association of Architectural Metal Manufacturers (NAAMM)—Metal Bar Grating Manual.
- Hoist Manufacturers Institute (HMI), Standard Specifications for Electric Wire Rope Hoists (HMI 100).
- National Electric Safety Code (NESC), C2-1993
- National Fire Protection Association (NFPA Recommend Practices).
  - NFPA 850 Fire Protection for Electric Generating Plants.
- OSHA Williams-Steiger Occupational Safety and Health Act of 1970.
- Steel Deck Institute (SDI)—Design Manual for Floor Decks and Roof Decks.
- Design of Large Steam Turbine-Generator Foundations, ASCE 1987

### 10B.2.1 CEC Special Requirements

Prior to the start of construction for the structures listed below, the proposed lateral-force procedures for project structures and the applicable designs, plans and drawings for project structures will be submitted for approval.

Proposed lateral-force procedures, designs, plans, and drawings shall be those for:

- Major project structures
- Major foundations, equipment supports, and anchorage
- Large, field-fabricated tanks
- Turbine/generator pedestal
- Switchyard structures

## 10B.3 STRUCTURAL DESIGN CRITERIA

### 10B.3.1 Datum

Site topographic elevations will be based on an elevation survey conducted using known elevation benchmarks.

### 10B.3.2 Frost Penetration

The site is located in an area free of frost penetration. Bottom elevation of all foundations for structures and equipment, however, will be maintained at a minimum of 1 inch below the finished grade.

### 10B.3.3 Temperatures

The design basis temperatures for civil and structural engineering systems will be as follows:

| | |
|---|---|
| Maximum | 100 Degrees F (°F) |
| Minimum | 25°F |

### 10B.3.4 Design Loads

#### 10B.3.4.1 General

Design loads for structures and foundations will comply with all applicable building code requirements.

### 10B.3.4.2 Dead Loads

Dead loads will consist of the weights of structure and all equipment of a permanent or semi-permanent nature including tanks, bins, wall panels, partitions, roofing, drains, piping, cable trays, bus ducts, and the contents of tanks and bins measured at full operating capacity. The contents of the tanks and bins, however, will not be considered as effective in resisting structure uplift due to wind forces; but will be considered as effective for seismic forces.

### 10B.3.4.3 Live Loads

Live load will consist of uniform floor live loads and equipment live loads. Uniform live loads are assumed equivalent unit loads that are considered sufficient to provide for movable and transitory loads, such as the weights of people, portable equipment and tools, small equipment or parts, which may be moved over or placed on the floors during maintenance operations, and planking. The uniform live loads will not be applied to floor areas that will be permanently occupied by equipment.

Lateral earth pressures, hydrostatic pressures, and wheel loads from trucks, will be considered as live loads.

Uniform live loads will be in accordance with ASCE Standard 7, but will not be less than the following:

- Roofs — 20 pounds per square foot (psf)
- Floors and Platforms (steel grating and checkered plates) — 100 psf
- Piping and Cable Tray — Actual loads will be used. If the actual loads are not known at the time of design a uniform load of 50 psf will be used.

Furthermore, a concentrated load of 5 kips will be applied concurrently to the supporting beams of the floors to maximize stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Floors (elevated concrete floors) — 100 psf

In addition, elevated concrete slabs will be designed to support an alternate concentrated load of 2 kips in lieu of the uniform loads, whichever governs. The concentrated load will be treated as a uniformly distributed load acting over an area of 2.5 square feet, and will be located in a manner to produce the maximum stress conditions in the slabs.

- Control Room Floor — 150 psf
- Stairs, Landings, and Walkways — 100 psf

In addition, a concentrated load of 2 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Pipe Racks — 50 psf

Where the piping and cable tray loads exceed the design uniform load, the actual loads will be used. In addition, a concentrated load of 5 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Hand Railings

Hand railings will be designed for either a uniform horizontal force of 50 pounds per linear foot (plf) applied simultaneously with a 100 plf uniform vertical live load, or a 200-pound concentrated load applied at any point and in any direction, whichever governs.

| | |
|---|---|
| • Slabs on Grade | 250 psf |
| • Truck Loading Surcharge Adjacent to Structures | 250 psf |
| • Truck Support Structures | AASHTO-HS-20-44 |
| • Special Loading Conditions | Actual loadings |

Laydown loads from equipment components during maintenance and floor areas where trucks, forklifts or other transports will have access, will be considered in the design of live loads.

Live loads may be reduced in accordance with the provisions of UBC Section 1606.

Posting of the floor load capacity signs for all roofs, elevated floors, platforms and walkways will be in compliance with the OSHA Occupational Safety and Health Standard, Walking and Working Surfaces, Subpart D. Floor load capacity for slabs on grade will not be posted.

### 10B.3.4.4 Earth Pressures

Earth pressures will be in accordance with the recommendations contained in the project-specific geotechnical report.

### 10B.3.4.5 Groundwater Pressures

Hydrostatic pressures due to groundwater or temporary water loads will be considered.

### 10B.3.4.6 Wind Loads

The wind forces will be calculated in accordance with CBC 1998 with a basic wind speed of 80 miles per hour (mph) and an exposure category of 'C.'

### 10B.3.4.7 Seismic Loads

The plant site is located in Seismic Zone 4, as determined from Figure No.16-2, "Seismic Zone Map of the United States", of UBC 1997.The occupancy category of the structure is 3 (Special Occupancy Structure) and corresponding importance factor (I) is 1.0. Other seismic parameters will be obtained from the geotechnical report.

### 10B.3.4.8 Snow Loads

The plant site is located in a zero ground snow load area, therefore snow loads will not be considered.

### 10B.3.4.9 Turbine-Generator Loads

The combustion turbine-generator and the steam-turbine generator loads for pedestal and foundation design will be furnished by the equipment manufacturers, and will be applied in accordance with the equipment manufacturers' specifications, criteria, and recommendations.

### 10B.3.4.10 Special Considerations for Steel Stacks

Steel stacks are designed to withstand the normal and abnormal operating conditions in combination with wind loads and seismic loads, and will include the along-wind and across-wind effects on the stacks. The

design meets the requirements of ASME/ANSI STS-1-1986, "Steel Stacks," using allowable stress design method, except that increased allowable stress for wind loads as permitted by AISC were not used.

#### 10B.3.4.11 Special Considerations for Structures and Loads During Construction

For temporary structures, or permanent structures left temporarily incomplete to facilitate equipment installations, or temporary loads imposed on permanent structures during construction, the allowable stresses may be increased by 33 percent.

Structural backfill may be placed against walls, retaining walls, and similar structures when the concrete strength attains 80 percent of the design compressive strength ($f'_c$), as determined by sample cylinder tests. Restrictions on structural backfill, if any, will be shown on the engineering design drawings.

Design restrictions imposed on construction shoring removal that are different from normal practices recommended by the ACI Codes will be shown on engineering design drawings.

Metal decking used as forms for elevated concrete slabs will be evaluated to adequately support the weight of concrete plus a uniform construction load of 50 psf, without increase in allowable stresses.

## 10B.4 DESIGN BASES

### 10B.4.1 General

Reinforced concrete structures will be designed by the strength design method, in accordance with ACI 318, "Building Code Requirements for Structural Concrete."

Steel structures will be designed by the working stress method, in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

Allowable soil bearing pressures for foundation design will be in accordance with the "Final Subsurface Investigation and Foundation Report" for the Facility.

### 10B.4.2 Factors of Safety

The factor of safety for all structures, tanks, and equipment supports will be as follows:

| | |
|---|---|
| Against Overturning | 1.50 |
| Against Sliding | 1.50 for Wind Loads<br>1.10 for Seismic Loads |
| Against Uplift Due to Wind | 1.50 |
| Against Buoyancy | 1.25 |

### 10B.4.3 Allowable Stresses

Calculated stresses from the governing loading combinations for structures and equipment supports will not exceed the allowable limits permitted by the applicable codes, standards, and specifications.

### 10B.4.4 Load Factors and Load Combinations

For reinforced concrete structures and equipment supports, using the strength method, the strength design equations will be determined based on CBC 2001, Sections 1612.2, 1612.4, 1909.2 and ACI-318-99 Eqs (9-2), (9-3). The Allowable Stress Design load combinations of CBC 2001 section 1612.3 will be used to

assess soil bearing pressure and stability of structures per CBC 2001 sections 1805 and 1629.1, respectively.

Steel-framed structures will be designed in accordance with CBC 2001, Chapter 22, Divisions I, III and IV and the AISC Specification for the Structural Steel Buildings, Allowable Stress Design and Plastic Design, June 1, 1989. Connections will conform to Research Council on Structural Connections of the Engineering Foundation Specification for Structural Joints.

## 10B.5 CONSTRUCTION MATERIALS

### 10B.5.1 Concrete and Grout

The design compressive strength ($f'_c$) of concrete and grout, as measured at 28 days, will be as follows:

| | |
|---|---|
| Electrical ductbank encasement and lean concrete backfill (Class L-1) | 300 psi |
| Structural concrete (Class S-1) | 3000 psi |
| Structural concrete (Class S-2) | 4000 psi |
| Grout (Class G-1) | 5000 psi |

The classes of concrete and grout to be used will be shown on engineering design drawings or indicated in design specifications.

### 10B.5.2 Reinforcing Steel

Reinforcing steel bars for concrete will be deformed bars of billet steel, conforming to ASTM A 615, Grade 60.

Welded wire fabric for concrete will conform to ASTM A 185.

### 10B.5.3 Structural and Miscellaneous Steel

Structural and miscellaneous steel will generally conform to ASTM A 36, ASTM A 572, or ASTM A992 except in special situations where higher strength steel is required.

High strength structural bolts, including nuts and washers, will conform to ASTM A 325 or ASTM A 490.

Bolts other than high-strength structural bolts will conform to ASTM 307, Grade A.

### 10B.5.4 Concrete Masonry

Concrete masonry units will be hollow, normal weight, non-load bearing Type I, conforming to ASTM C 129.

Mortar will conform to ASTM C 270, Type S.

Grout will conform to ASTM C 476.

### 10B.5.5 Other Materials

Other materials for construction, such as anchor bolts, shear connectors, concrete expansion anchors, embedded metal, etc., will conform to industry standards and will be identified on engineering design drawings or specifications.

# *Los Esteros Critical Energy Facility*

# *Appendix 10-C*
# *Mechanical Engineering Design Criteria*

***December 2003***

# APPENDIX 10C

# MECHANICAL ENGINEERING DESIGN CRITERIA

## 10C1 INTRODUCTION

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and construction of mechanical engineering systems for the project. More specific project information will be developed prior to construction of the project to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

## 10C2 CODES AND STANDARDS

The design of the mechanical systems and components will be in accordance with the laws and regulations of the federal government, state of California, and industry standards. For Phase 1, the current issue or revision of the documents, at the time of the filing of this AFC applied, unless otherwise noted. For Phase 2, the current issue or edition of the documents at the time of filing of this AFC will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirements shall apply.

The following codes and standards agencies are applicable to the mechanical aspects of the power facility.

- California Building Code
- Uniform Plumbing Code
- ASME Boiler and Pressure Vessel Code
- ASME/ANSI 31.1 Power Piping Code
- ASME Standard TDP-1
- ANSI B16.5, B16.34, and B133.8
- American Petroleum Institute (API) – except for electrical requirements
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American Welding Society (AWS)
- Manufacturing Standardization Society (MSS) of the Valve and Fitting Industry
- National Fire Protection Association (NFPA) – Recommended Practices

## 10C3 MECHANICAL ENGINEERING GENERAL DESIGN CRITERIA

### 10C3.1 General

The systems, equipment, materials, and their installation will be designed in accordance with the applicable codes; industry standards; and local, state, and federal regulations, as well as the design criteria; manufacturing processes and procedures; and material selection, testing, welding, and finishing procedures specified in this section.

Detailed equipment design will be performed by the equipment vendors in accordance with the performance and general design requirements specified by the Design Engineer or Owner. Equipment vendors will be responsible for using construction materials suited for the intended use.

Asbestos will not be used in the materials and equipment supplied. Flanges manufactured in the People's Republic of China will be prohibited from use on any mechanical equipment. Where feasible, materials will be selected to withstand the design operating conditions, including expected ambient conditions, for the design life of the plant. It is anticipated that some materials will require replacement during the life of the plant due to corrosion, erosion, etc.

### 10C3.2 Pumps

Pumps will be sized in accordance with industry standards. Where feasible, pumps will be sized for maximum efficiency at the normal operating point. Pumps will be designed to be free from excessive vibration throughout the operating range.

### 10C3.3 Tanks

Large outdoor storage tanks will not be insulated.

Overflow connections and lines will be provided. Maintenance drain connections will be provided for complete tank drainage.

Manholes, where provided, will be at least 18 in. in diameter and hinged to facilitate removal. Storage tanks will have ladders and cleanout doors as required to facilitate access/maintenance. Provisions will be included for proper tank ventilation during internal maintenance.

### 10C3.4 Heat Exchangers

Heat exchangers will be provided as components of mechanical equipment packages and may be shell-and-tube or plate type. Heat exchangers will be designed in accordance with Tubular Exchanger Manufacturers Association (TEMA) or manufacturer's standards. Fouling factors will be specified in accordance with TEMA.

### 10C3.5 Pressure Vessels

Pressure vessels will include the following features/appurtenances:

- Process, vent, and drain connections for startup, operation, and maintenance
- Materials compatible with the fluid being handled
- A minimum of one manhole and one air ventilation opening (e.g., handhole) where required for maintenance or cleaning access
- For vessels requiring insulation, shop-installed insulation clips spaced not greater than 18 in. on center
- Relief valves in accordance with the applicable codes

### 10C3.6 Piping and Piping Supports

Stainless steel pipe may be Schedule 5S or 10S where design pressure permits. Underground piping may be high density polyethylene (HDPE) where permitted by code, operating conditions, and fluid properties. In general, water system piping will be HDPE where embedded or underground and carbon steel where above ground.

Steam piping will either be chrome alloy or carbon steel depending on the process temperature and pressure. Boiler feedwater piping will be carbon steel.

Threaded joints will not be used in piping used for lubricating oil, and natural gas service. Natural gas piping components will not use synthetic lubricants. Victaulic, or equal, couplings will be used for low energy aboveground piping, where feasible.

Piping systems will have high point vents and low point drains. Drains with restricting orifices or traps with startup and blowdown drains and strainers/crud traps will be installed in low points of steam lines where condensate can collect during normal operation.

Hose and process tubing connections to portable components and systems will be compatible with the respective equipment suppliers' standard connections for each service.

Stainless steel piping will be used for the lubricating oil system.

Hot piping (above 300 °F) will be analyze for thermal growth and stress. The direction and amount of thermal growth will be designed to optimize the piping arrangement. Hot piping will be top or bottom supported taking into account constructability and maintenance. The load generated by the thermal growth will be applied to pipe supports and structural steel in accordance with the applicable codes.

## 10C3.7 Valves

### 10C3.7.1 General Requirements

Valves will be arranged for convenient operation from floor level where possible and, if required, will have extension spindles, chain operators, or gearing. Hand-actuated valves will be operable by one person.

Valves will be arranged to close when the handwheel is rotated in a clockwise direction when looking at the handwheel from the operating position. The direction of rotation to close the valve will be clearly marked on the face of each handwheel.

The stops that limit the travel of each valve in the open or closed position will be arranged on the exterior of the valve body. Valves will be fitted with an indicator to show whether they are open or closed; however, only critical valves will be remotely monitored for position.

Valve materials will be suitable for operation at the maximum working pressure and temperature of the piping to which they are connected. Steel valves will have cast or forged steel spindles. Seats and faces will be of low friction, wear-resistant materials. Valves in throttling service will be selected with design characteristics and of materials that will resist erosion of the valve seats when the valves are operated partly closed.

Valves operating at less than atmospheric pressure will include means to prevent air in-leakage. No provision will be made to repack valve glands under pressure.

### 10C3.7.2 Drain and Vent Valves and Traps

Drains and vents in 900 pound class or higher piping and 500° F or higher service will be double valved.

Drain traps will include air cock and easing mechanism. Internal parts will be constructed from corrosion-resistant materials and will be renewable.

Trap bodies and covers will be cast or forged steel and will be suitable for operating at the maximum working pressure and temperature of the piping to which they are connected. Traps will be piped to drain collection tank or sumps and returned to the cycle if convenient.

### 10C3.7.3 Low Pressure Water Valves

Large bore LP water valves will be the butterfly type of cast iron or steel construction. Cast iron valves will have cast iron bodies, covers, gates (discs), and bridges; the spindles, seats, and faces will be bronze. Fire protection valves will be UL-approved butterfly valves meeting NFPA requirements.

### 10C3.7.4 Instrument Air Valves

Instrument air valves will be the ball type of bronze construction, with valve face and seat of approved wear-resistant alloy.

### 10C3.7.5 Nonreturn Valves

Nonreturn valves in vertical positions will have bypass and drain valves were applicable. Bodies will have removable access covers to enable the internal parts to be examined or renewed without removing the valve from the pipeline.

### 10C3.7.6 Motor-Actuated Valves

Motor-actuated valves will be fitted with both hand and motor operating gear. The hand and motor actuation mechanisms will be interlocked so that the hand mechanism is disconnected before the motor is started.

Motor actuators will include torque switches to stop the motor automatically when the valve gate has reached the "full open" or "full closed" position.

The motor actuator will be placed in a position relative to the valve that prevents leakage of liquid, steam, or corrosive gas from valve joints onto the motor or control equipment.

### 10C3.7.7 Safety and Relief Valves

Safety valves and/or relief valves will be provided as required by code for pressure vessels, heaters, and boilers. Safety and relief valves will be installed vertically. Piping systems that can be over-pressurized by a higher pressure source will also be protected by pressure relief valves. Equipment or parts of equipment that can be over-pressurized by thermal expansion of the contained liquid will have thermal relief valves. HRSG safety valves will be flanged.

### 10C3.7.8 Instrument Root Valves

Instrument root valves will be specified for operation at the working pressure and temperature of the piping to which they are connected. Test points and sample lines in systems that are 600 pound class or higher service will be double valved.

## 10C3.8 Heating, Ventilating, and Air Conditioning

HVAC system design will be based on site ambient conditions specified in Section 1.0.

Except for the HVAC systems serving the control room and administration areas, the systems will not be designed to provide comfort levels for extended human occupancy.

Air conditioning will include both heating and cooling of the inlet filtered air. Air velocities in ducts and from louvers and grills will be low enough not to cause unacceptable noise levels in areas where personnel are normally located.

Fans and motors will be mounted on anti-vibration bases to isolate the units from the building structure. Exposed fan outlets and inlets will be fitted with guards. Wire guards will be specified for belt-driven fans and arranged to enclose the pulleys and belts.

Air filters will be housed in a manner that facilitates removal. The filter frames will be specified to pass the air being handled through the filter without leakage.

Ductwork, filter frames, and fan casings will be constructed of mild steel sheets stiffened with mild steel flanges and galvanized. Ductwork will be the sectional bolted type and will be adequately supported. Duct joints will be leaktight.

Grills and louvers will be of adjustable metal construction.

## 10C3.9 Thermal Insulation and Cladding

Parts of the project requiring insulation to reduce heat loss or afford personnel safety will be thermally insulated. Minimum insulation thickness for hot surfaces near personnel will be designed to limit the outside lagging surface temperature to a maximum of 140 °F, based on 80 °F ambient temperature and 1 mph/hr air velocity.

The thermal insulation will have as its main constituent calcium silicate, foam glass, fiber glass, or mineral wool, and will consist of pre-formed slabs or blankets, where feasible. Asbestos materials will be prohibited. An aluminum jacket or suitable coating will be provided on the outside surface of the insulation. Where a hard-setting compound is used as an outer coating, it will be nonabsorbent and noncracking. Thermal insulation will be chemically inert even when saturated with water. Insulation system materials, including jacketing, will have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.

Insulation at valves, pipe joints, or other points to which access may be required for maintenance will be specified to be removable with a minimum of disturbance to the pipe insulation. At each flanged joint, the molded material will terminate on the pipe at a distance from the flange equal to the overall length of the flange bolts to permit their removal without damaging the molded insulation.

Above ground insulated piping will be clad with pebbled or corrugated aluminum of not less than 30 mil thickness and frame reinforced. At the joints, the sheets will be sufficiently overlapped and corrugated to prevent moisture from penetrating the insulation.

Design temperature limits for thermal insulation will be based on system operating temperature during normal operation.

Outdoor and underground insulation, if required, will be moisture resistant.

## 10C3.10 Testing

Hydrostatic testing will be specified per applicable codes and standards and performed for pressure boundary components where an in-service test is not feasible or permitted by code.

## 10C3.11 Welding

Welders and welding procedures will be certified in accordance with the requirements of the applicable codes and standards before performing any welding. The contractor will maintain indexed records of welder qualifications and weld procedures.

## 10C3.12 Painting

Except as otherwise specified, equipment will receive the respective manufacturer's standard shop finish. Finish colors will be selected from among the paint manufacturer's standard colors.

Finish painting of uninsulated piping will be limited to that required by OSHA for safety or for protection from the elements.

Piping to be insulated will not be painted.

## 10C3.13 Lubrication

The types of lubrication specified for facility equipment will be suited to the operating conditions and will comply with the recommendations of the equipment manufacturers.

The initial startup charge of flushing oil will be provided by the equipment manufacturer and will be the manufacturer's standard lubricant for the intended service. Subsequently, such flushing oil will be sampled and analyzed to determine whether it can also be used for normal operation or must be replaced in accordance with the equipment supplier's recommendations.

Rotating equipment will be splash lubricated, force lubricated, or self-lubricated. Oil cups will be provided as necessary. Where automatic lubricators are fitted to equipment, provision for emergency hand lubrication will also be specified. Where applicable, equipment will be designed to be manually lubricated while in operation without the removal of protective guards. Lubrication filling and drain points will be readily accessible.

# *Los Esteros Critical Energy Facility*

# *Appendix 10-D*
# *Electrical Engineering Design Criteria*

***December 2003***

# APPENDIX 10D

# ELECTRICAL ENGINEERING DESIGN CRITERIA

## 10D1 INTRODUCTION

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems for the facility. More specific project information will be developed prior to construction of the project to support detailed design, engineering, material procurement, and construction specifications as required by the California Energy Commission.

## 10D2 CODES AND STANDARDS

The design of the electrical systems and components will be in accordance with the laws and regulations of the federal government, State of California and industry standards. For Phase 1, the current issue or edition of the documents at the time of filing of the original Application for Certification (AFC) apply, unless otherwise noted. For Phase 2, the current issue or edition of the documents at the time of filing of this AFC will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement shall apply.

The following codes and standards are applicable to the electrical aspects of the power facility.

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories, Inc. (UL)

## 10D3 SWITCHYARD AND TRANSFORMERS

### 10D3.1 Switchyard

For Phase 1, the switchyard is located on the north end of the site and interconnects to the PG&E 115 kV Nortech-Los Esteros circuit via overhead cables immediately to the west of the LECEF switchyard. For Phase 2, the switchyard will interconnect to the Silicon Valley Power (SVP) 230 kV Switching Station immediately north of the LECEF site via overhead cables.

The switchgear consists of GI CB (Gas Insulated Circuit Breakers), compact modular design type. Circuit breakers will have disconnect switches on each side. Each line will be equipped with the appropriate instrument transformers for protection and metering. Instrument transformers will also be used for generator synchronizing.

Current and voltage transformer modules will be located at points within the bay to provide for metering and relaying.

Surge arrester modules will be connected directly by flange to the Switchgear module.

The termination modules connect the bays of the gas insulated switchgear to air insulated underground interconnects to the generator step-up transformers.

All the control, protection and gas monitoring is located in the breaker control cubicle.

The switchyard design will meet the requirements of the National Electrical Safety Code—ANSI C2.

A grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. All equipment, structures and fencing will be connected to the grounding grid of buried copper conductors and ground rods, as required. The substation ground grid will be tied to the plant ground grid.

Lightning protection will be provided by shield wires and/or lightning masts for any overhead lines. The lightning protection system will be designed in accordance with IEEE 998 guidelines.

All faults shall be detected, isolated, and cleared in a safe and coordinated manner as soon as practical to insure the safety of Equipment, Personnel, and the Public. Protective relaying will meet IEEE requirements and will be coordinated with the utilities requirements.

Each bus will be provided with a redundant high impedance differential relay system. The outgoing line from the 115kv bus will be provided with redundant high-speed relay systems with transfer trip capability. Each GI Circuit Breaker will be provided with independent breaker failure relay protection schemes. Breaker failure protection will be accomplished by fault detector relays and timing relays for each breaker. Each high voltage breaker will have 2 redundant trip coils.

Interface with the utility supervisory control and data acquisition (SCADA) system will be provided. Interface will be at the interface terminal box and RTU. Communication between the facility switchyard and the control building to which it is connected will be included. Remote Terminal Units (RTUs) will allow interface to the CA ISO.

Revenue metering will be provided on the 115 kV outgoing lines recording net power to or from the PG&E or SVP interconnection (bi-directional). Meters and the metering panel will be provided.

## 10D3.2 Transformers

Each generator is connected to the 115kV switchyard through a separate 13.8 kV to 115 kV step-up transformer and a Generator Circuit Breaker. The step-up transformers will be designed in accordance with ANSI standards C57.12.00, C57.12.90, and C57.116. The transformers will be two-winding, delta-wye, OA/FA/FOA, 65 degees rise. The neutral point of the HV winding connected to ground by a Neutral Ground Transformer solidly grounded. Each main step-up transformer will have metal oxide surge arrestors adjacent to the HV terminals and will have manual de-energized ("no-load") tap changers located in the HV windings.

Two-winding, delta-wye 115 kV to 4.16 kV transformers are provided.

The connection to SVP will include two 115 kV to 230 kV two-winding transformers.

# *Los Esteros Critical Energy Facility*

# *Appendix 10-E*
# *Control Engineering Design Criteria*

***December 2003***

# APPENDIX 10E

# CONTROL ENGINEERING DESIGN CRITERIA

## 10E1 INTRODUCTION

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and installation for instrumentation and controls for the Facility. More specific project information will be developed prior to construction of the project to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

## 10E2 CODES AND STANDARDS

The design specification of all work will be in accordance with the laws and regulations of the federal government and the state of California. For Phase 1, the current issue or edition of the documents at the time of filing of the original Application for Certification (AFC) apply, unless otherwise noted. For Phase 2, the current issue or edition of the documents at the time of filing of this AFC will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement shall apply. A summary of general codes and industry standards applicable to design and construction follows.

- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- The Institute of Electrical and Electronics Engineers (IEEE)
- Instrument Society of America (ISA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- American Society for Testing and Materials (ASTM)

## 10E3 CONTROL SYSTEMS DESIGN CRITERIA

### 10E3.1 General Requirements

Pneumatic signal levels, where used, will be 3–15 psig for pneumatic transmitter outputs, controller outputs, electric-to-pneumatic converter outputs, and valve positioner inputs.

The primary sensor full-scale signal level, other than thermocouples, will be between 10 mV and 125 V.

### 10E3.2 Pressure Instruments

In general, pressure instruments will have linear scales with units of measurement in pounds per square inch gauge.

Pressure gauges will have either a blowout disk or a blowout back and an acrylic or shatterproof glass face.

Pressure gauges on process piping will be resistant to plant atmospheres.

Pressure test points will have isolation valves and caps or plugs. Pressure devices on pulsating services will have pulsation dampers.

### 10E3.3 Temperature Instruments

In general, temperature instruments will have scales with temperature units in degrees Fahrenheit. Exceptions to this are electrical machinery RTDs and transformer winding temperatures, which are in degrees Celsius.

Dial thermometers will have 4-1/2- or 5-inch-in-diameter (minimum) dials and white faces with black scale markings and will be every-angle type and bimetal actuated. Dial thermometers will be resistant to plant atmospheres.

Temperature elements and dial thermometers will be protected by thermowells except when measuring gas or air temperatures at atmospheric pressure. Temperature test points will have thermowells and caps or plugs.

RTDs will be 100 ohm platinum, three-wire circuits ($R_{100}/R_0$-1.385). The element will be spring-loaded, mounted in a thermowell, and connected to a cast iron head assembly.

Thermocouples will be dual-element, ungrounded, spring-loaded, type J or K for general service. Thermocouple heads will be the cast type with an internal grounding screw.

### 10E3.4 Level Instruments

Reflex-glass or magnetic level gauges will be used. Level gauges for high-pressure service will have suitable personnel protection.

Gauge glasses used in conjunction with level instruments will cover a range that is covered by the instrument. Level gauges will be selected so that the normal vessel level is approximately at gauge center.

A single remote water level indicating system will be provided for each HRSG drum.

### 10E3.5 Flow Instruments

Flow transmitters will be the differential pressure type with the range matching the primary element. In general, linear scales and charts will be used for flow indication and recording. In general, airflow measurements will be temperature compensated.

### 10E3.6 Control Valves

Control valves in throttling service will generally be the globe-body cage type with body materials, pressure rating, and valve trims suitable for the service involved. Other style valve bodies (e.g., butterfly, eccentric disk) may also be used when suitable for the intended service.

Valves will be designed to fail in a safe position.

Control valve body size will not be more than two sizes smaller than line size, unless the smaller size is specifically reviewed for stresses in the piping.

Control valves in 600 class service and below will be flanged where economical. Where flanged valves are used, minimum flange rating will be ANSI 300 Class.

Critical service valves will be defined as ANSI 900 Class and higher valves in sizes larger than 2 inches.

Severe service valves will be defined as valves requiring anticavitation trim, low noise trim, or flashing service, with differential pressures greater than 100 psid.

In general, control valves will be specified for a noise level no greater than 90 dBA when measured 3 feet downstream and 3 feet away from the pipe surface.

Valve actuators will use positioners and the highest pressure, smallest size actuator, and will be the pneumatic-spring diaphragm or piston type. Actuators will be sized to shut off against at least 110 percent of the maximum shutoff pressure and designed to function with instrument air pressure ranging from 60 to 125 psig.

Handwheels will be furnished only on those valves that can be manually set and controlled during system operation (to maintain plant operation) and do not have manual bypasses.

Control valve accessories, excluding controllers, will be mounted on the valve actuator unless severe vibration is expected.

Solenoid valves supplied with the control valves will have Class H coils. The coil enclosure will normally be a minimum of NEMA 4 but will be suitable for the area of installation. Terminations will typically be by pigtail wires.

Valve position switches (with input to the DCS for display) will be provided for MOVs and open/close pneumatic valves.

### 10E3.7 Instrument Tubing and Installation

Tubing used to connect instruments to the process line will be 3/8- or 1/2-inch, outside-diameter copper or stainless steel as necessary for the process conditions.

Instrument tubing fittings will be the compression type. One manufacturer will be selected for use and will be standardized as much as practical throughout the plant.

Differential pressure (flow) instruments will be fitted with three-valve manifolds; two-valve manifolds will be specified for other instruments as appropriate.

Instrument installation will be designed to correctly sense the process variable. Taps on process lines will be located so that sensing lines do not trap air in liquid service or liquid in gas service. Taps on process lines will be fitted with a shutoff (root or gauge valve) close to the process line. Root and gauge valves will be main-line class valves.

Instrument tubing will be supported in both horizontal and vertical runs as necessary. Expansion loops will be provided in tubing runs subject to high temperatures. The instrument tubing support design will allow for movement of the main process line.

### 10E3.8 Pressure and Temperature Switches

Field-mounted pressure and temperature switches will have either NEMA Type 4 housings or housings suitable for the environment.

In general, switches will be applied such that the actuation point is within the center one-third of the instrument range.

## 10E3.9 Field-Mounted Instruments

Field-mounted instruments will be of a design suitable for the area in which they are located. They will be mounted in areas accessible for maintenance and relatively free of vibration and will not block walkways or prevent maintenance of other equipment. Freeze protection will be provided.

Field-mounted instruments will be grouped on racks. Supports for individual instruments will be prefabricated, off-the-shelf, 2-inch pipestand. Instrument racks and individual supports will be mounted to concrete floors, to platforms, or on support steel in locations not subject to excessive vibration.

Individual field instrument sensing lines will be sloped or pitched in such a manner and be of such length, routing, and configuration that signal response is not adversely affected.

Local control loops will generally use a locally mounted indicating controller (pressure, temperature, flow, etc.).

Liquid level controllers will generally be the nonindicating, displacement type with external cages.

## 10E3.10 Instrument Air System

Branch headers will have a shutoff valve at the takeoff from the main header. The branch headers will be sized for the air usage of the instruments served, but will be no smaller than 3/8 inch. Each instrument air user will have a shutoff valve and filter at the instrument.

# *Los Esteros Critical Energy Facility*

# *Appendix 10-F*
# *Geotechnical Investigation Report – LECEF Phase 1*

***December 2003***

LOWNEY ASSOCIATES
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# Geotechnical Investigation

North San Jose Energy Center

San Jose, California

Report No. 587-12I has been prepared for:

**Calpine Corporation c/o WRMS Engineering**

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July 23, 2001

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# GEOTECHNICAL INVESTIGATION
# NORTH SAN JOSE ENERGY CENTER
# SAN JOSE, CALIFORNIA

## 1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the project to be located in San Jose, California. The location of the site is shown on the Vicinity Map, Figure 1. The purpose of our investigation was to evaluate the subsurface conditions at the site and to provide geotechnical recommendations for design of the proposed energy center.

As you know, we performed a final level geotechnical investigation for a larger site which included this site and presented the results in our report titled "Final Geotechnical Investigation, US DataPort Site, San Jose, California dated September 11, 2000. For our use, we received a set of development, topographic, and approximate boring layout plans dated June 15, 2001.

### 1.1 Project Description

Based on our conversation with you, we understand that the project will consist of developing the approximately 15-acre site for a new energy center. The new center will most likely be completed in several phases. When completed, the energy center will consist of two recycled water storage tanks, cooling towers, gas turbine generators and transformers, a 115kv switchyard building and control room, a service building, and other pertinent equipment and structures. In addition, paved site access roads also are planned.

Based on the information provided to us, structural loads on the order of 180 to 500 kips are anticipated for new equipment dead loads. Grading plans are not yet finalized, however, we assumed that cuts and fills up to 3 feet may be expected. New underground utilities also are planned as part of the over all site development.

### 1.2 Scope of Services

Our scope of services was presented in our Fax Confirmation of Requested Services agreement with you dated June 21, 2001. To accomplish this work, we provided the following services:

- Exploration of subsurface conditions by drilling three conventional borings and retrieving soil samples for observation and laboratory testing, and advancing four cone penetration test (CPT) borings.

- Evaluation of the physical and engineering properties of the subsurface soils by visually classifying the samples and performing various laboratory tests on selected samples.
- Engineering analysis to evaluate site earthwork, building foundations, slabs-on-grade, retaining walls, and pavements.
- Performed corrosion evaluation of the in-situ soils.
- Preparation of this report to summarize our findings and to present our conclusions and recommendations.

## 2.0 SITE CONDITIONS

### 2.1 Exploration Program

Subsurface exploration was performed on June 26 and 27, 2001, using conventional, truck-mounted drilling and CPT equipment to investigate, sample, and log the subsurface soils. Three exploratory borings were drilled to depths ranging from 30 to 40 feet. Four CPT borings were advanced to depths ranging from approximately 35½ to 98¼ feet. Borings were permitted and backfilled in accordance with local agency guidelines. The approximate locations of the borings are shown on the Site Plan, Figure 2. Logs of our borings and details regarding our field investigation are included in Appendix A; our laboratory tests are discussed in Appendix B. We also have included our previous field exploration and laboratory program in Appendix B and D, respectively.

### 2.2 Surface

We performed a brief surface reconnaissance during our site exploration. The approximately 15-acre site is located north of Highway 237 and east of Zanker Road in San Jose. It is bounded by Alviso-Milpitas Road to the south, agricultural fields to the north and east, and the San Jose/Santa Clara Water Pollution Control Plant to the west.

At the time of our field investigation, the site was a former plant nursery. It was occupied by remnants of greenhouses, trellises, and other gardening equipment and structures. The existing structures were not currently being used. An open field with scattered mounds of soil was located in the southwest corner of the site.

### 2.3 Subsurface

Our exploratory borings encountered very stiff to hard clayey silt to a depth of approximately 4 feet below the ground surface. Below the surficial silt, our borings encountered medium stiff to very stiff silty clay to depths ranging from approximately 27 to 28 feet which was underlain by medium stiff to stiff sandy clay and stiff silty clay to 40 feet, the maximum depth explored.

## 2.4 Ground Water

The depth to free ground water was not determined during this investigation as a result of the rotary-wash drilling method used. However, we recorded depth to free ground water and installed two ground water monitoring wells to track ground water depth during our previous investigations. Ground water depths are summarized in Table 1. Fluctuations in the level of the ground water depths may occur due to variations in rainfall, and other factors not evident at the time our measurements were made.

**Table 1. Depth to Ground Water**

| Boring | Date Drilled | Depth to Ground Water during Drilling (feet) | Depth to Ground Water after Drilling (feet) | Date Measured |
|---|---|---|---|---|
| EB-1 | 01/26/2000 | 19 | 19 | 1/26/2000 |
| EB-2 | 01/26/2000 | NE | 6½ | 1/26/2000 |
| EB-3 | 01/26/2000 | 14 | 14 | 1/26/2000 |
| MW-21 | 07/06/2000 | NE | 7 | 7/7/2000 |
| MW-22 | 07/06/2000 | NE | 10½ | 7/7/2000 |
| MW-21 | 07/06/2000 | NE | 10¾ | 7/18/2001 |
| MW-22 | 07/06/2000 | NE | ND | 7/18/2001 |

NE = Not Encountered
ND = Not Determined because the well was destroyed

## 3.0 GEOLOGIC HAZARDS

A brief qualitative evaluation of geologic hazards was made during this investigation. Our comments concerning these hazards are presented below.

### 3.1 Fault Rupture Hazard

A Regional Fault Map illustrating known active faults relative to the site is presented in Figure 3. The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone (known formerly as a Special Studies Zone) or a City of San Jose Potential Hazard Zone. As shown on Figure 3, no known surface expression of active faults is believed to cross the site. Fault rupture through the site, therefore, is not anticipated.

### 3.2 Ground Shaking

Strong ground shaking can be expected at the site during moderate to severe earthquakes in the general region. This is common to virtually all developments in the San Francisco Bay Area. The "Seismicity" section that follows summarizes potential levels of ground shaking at the site.

### 3.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded, fine-grained sands. Empirical evidence indicates that loose, silty sands are also potentially liquefiable. Based on our review of published data (Rogers and Williams, 1974), and data collected during our previous investigations, the site has been designated as an area with a high potential for liquefaction.

However, sand was not encountered in our borings performed during this site-specific investigation, except for CPT-29. Sand also was encountered in one of the borings drilled during our September 2000 investigation in this general area. The sand encountered was generally medium dense to dense. In addition, based on the subsurface condition encountered during this investigation, the site appeared to be capped by at least 25 feet of non-liquefiable, clayey soils. Based on the subsurface conditions encountered, our review of the CPT data and engineering judgment, in our opinion, the potential impacts to the planned development due to liquefaction are low.

### 3.4 Differential Compaction

If near-surface soils vary in composition both vertically and laterally, strong earthquake shaking can cause non-uniform compaction of soil strata, resulting in movement of the near-surface soils. Because the subsurface soils encountered at the site are generally very stiff to hard, cohesive and do not appear to change in thickness or consistency abruptly over short distances, we judge the probability of significant differential compaction at the site to be low.

### 3.5 Lateral Spreading

Lateral spreading typically occurs as a form of horizontal displacement of relatively flat-lying alluvial material toward an open or "free" face such as an open body of water, channel, or excavation. In soils this movement is generally due to failure along a weak plane, and may often be associated with liquefaction. As cracks develop within the weakened material, blocks of soil displace laterally towards the open face. Cracking and lateral movement may gradually propagate away from the face as blocks continue to break free. Generally, failure in this mode is analytically unpredictable, since it is difficult to determine where the first tension crack will occur.

The channelized portion of Coyote Creek is approximately 1,000 feet east of the site. Based on the subsurface conditions encountered at the site and the low potential for liquefaction, in our opinion, the potential for impacts to the planned structures at the site due to lateral spreading during a seismic event is low.

### 3.6 Flooding

As shown on the December 16, 1988 Federal Emergency Management Agency (FEMA) "Flood Insurance Rate Map" (FIRM), the eastern portion of the site is within Zone A, described as "Area of 100-year flood, base flood elevations and flood hazard factors not determined." The remainder of the site is outside of the city limits. However, based on the Letter of Map Revision (LOMR) and information provided to us by the City of San Jose, the above portion of the site was revised to Zone B, described as "This area protected from the one (1) percent annual chance (100-year) flood by levee, dike, or other structures subject to possible failure or overtopping during larger floods." The zone revision was effective as of July 10, 1997.

## 4.0 SEISMICITY

### 4.1 Regional Active Faults

The San Francisco Bay Area is recognized by geologists and seismologists as one of the most seismically active regions in the United States. The significant earthquakes that occur in the Bay Area are generally associated with crustal movement along well-defined, active fault zones of the San Andreas Fault system, which regionally trend in a northwesterly direction. The San Andreas Fault, which generated the great San Francisco earthquake of 1906, passes about 14 miles southwest of the site. Two other major active faults in the area are the Hayward Fault (total length), located about 5½ miles northeast, and the Calaveras Fault, located about 7 miles northeast of the site. In addition, the Hayward Fault (southeast extension) is located about 3 miles to the northeast.

### 4.2 Maximum Estimated Ground Shaking

We performed a Deterministic Seismic Hazard Analysis (DSHA) for this site. This analysis utilizes the maximum Moment Magnitude ($M_w$) for the controlling faults, published attenuation curves, the shortest distance to the fault, and site-specific response characteristics. Based on the attenuation methods of Campbell and Bozorgnia (1994), the mean peak ground acceleration (PGA) expected for this site is 0.40g from a magnitude 7.10 $M_w$ event on the Hayward (Total Length) Fault, located about 5½ miles from the site.

We also performed a Probabilistic Seismic Hazard Analysis (PSHA) that included the project site during our September 2000 investigation. Three levels of probability of exceedance, including 2 and 10 percent in 50 years, and 10 percent in 100 years, were developed. Results were included in our September 11, 2000 report.

### 4.3 Future Earthquake Probabilities

Although research on earthquake prediction has greatly increased in recent years, seismologists cannot predict when or where an earthquake will occur. The U.S.

Geological Survey's Working Group on California Earthquake Probabilities (1999), referred to as WG99, determined that there is a 70 percent chance (±10%) of at least one magnitude 6.7 or greater earthquake striking the San Francisco Bay region between 2000 and 2030. This result is the most important outcome of WG99's work, because any major earthquake can cause damage throughout the region.

This was dramatically demonstrated when the 1989 Loma Prieta earthquake caused severe damage in Oakland and San Francisco, more than 50 miles from the fault rupture. Although earthquakes can inflict damage at a considerable distance, shaking will be very intense near the fault rupture. Therefore, earthquake located in urbanized areas of the region have the potential to cause much more damage than the 1989 Loma Prieta earthquake.

## 4.4 UBC Site Coefficient

The California Division of Mines and Geology (CDMG) has recently issued maps locating "Active Fault Near-Source Zones" to be used with the 1997 Uniform Building Code ("Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada," CDMG/ICBO February 1998). Faults are classified as either "A," "B," or "C" as shown in Table 2. Only faults classified as "A" or "B" are mapped since faults classified as "C" do not increase the near-source factor.

**Table 2. Seismic Source Definitions**

| Seismic Source Type | Seismic Source Description | Seismic Source Definition* | |
|---|---|---|---|
| | | Maximum Moment Magnitude, M | Slip Rate, SR (mm/yr) |
| A | Faults that are capable of producing large magnitude events and that have a high rate of seismic activity. | $M \geq 7.0$ | $SR \geq 5$ |
| B | All faults other than Types A and C. | $M \geq 7.0$<br>$M < 7.0$<br>$M \geq 6.5$ | $SR < 5$<br>$SR > 2$<br>$SR < 2$ |
| C | Faults that are not capable of producing large magnitude earthquakes and that have a relatively low rate of seismic activity. | $M < 6.5$ | $SR \leq 2$ |

*Note: Both maximum moment magnitude and slip rate conditions must be satisfied concurrently when determining seismic source type.

The following table lists Type A and Type B faults within 25 kilometers of the site:

**Table 3. Approximate Distance to Seismic Sources**

| Fault | Seismic Source Type | Distance (kilometers) |
|---|---|---|
| **Hayward (Southeast Extension) | B | 5.2 |
| *Hayward (Total Length) | A | 9.1 |
| Calaveras | B | 11 |
| Monte Vista – Shannon | B | 18 |
| San Andreas (1906) | A | 23 |

*Nearest Type A fault
**Nearest Type B fault

Based on this information, the site may be characterized for design based on Chapter 16 of the 1997 UBC using the information in Table 4.

**Table 4. 1997 UBC Site Categorization and Site Coefficients**

| Categorization/Coefficient | Design Value |
|---|---|
| Soil Profile Type (Table 16-J) | $S_D$ |
| Seismic Zone (Figure 16-2) | 4 |
| Seismic Zone Factor (Table 16-I) | 0.4 |
| Seismic Source Name | Hayward (Total Length) |
| Seismic Source Type (Table 16-U) | A |
| Distance to Seismic Source (kilometers) | 9.1 |
| *Near Source Factor $N_a$ (Table 16-S) | 1.04 |
| Near Source Factor $N_v$ (Table 16-T) | 1.27 |
| Seismic Coefficient $C_a$ (Table 16-Q) | 0.46 |
| Seismic Coefficient $C_v$ (Table 16-R) | 0.81 |

*Note: For Seismic Zone 4, the near-source factor Na used to determine Ca need not exceed 1.1 for structures complying with all the conditions within UBC Section 1629.4.2.

## 5.0 CORROSION EVALUATION

To evaluate the corrosion potential of the subsurface soils at the site we performed two in-situ resistivity tests using the Wenner four-point method. We also have submitted four samples collected during our subsurface investigation to an analytical laboratory for pH, soluble sulfate and chloride content testing. To meet your project timeline, we will provide test results and the approximate corrosion potential of the in-situ soil in a supplemental letter.

# 6.0 CONCLUSIONS AND DEVELOPMENT CONSIDERATIONS

## 6.1 Conclusions

From a geotechnical engineering viewpoint the proposed development may be constructed as planned, provided design and construction is performed in accordance with the recommendations presented in this report.

The primary geotechnical concern at the site is the presence of relatively shallow ground water. As discussed in Section 2.4, free ground water was encountered at depths as shallow as 6½ feet below the existing ground surface. Therefore, ground water will likely be encountered during deeper excavations and utility installation. Of additional concern is the presence of localized undocumented fills located in the southwest corner of the site. Though we did not encountered fills in our borings, we did observed piles of soil at the site and therefore some undocumented fills should be anticipated. Detailed recommendations are provided in Section 7.0.

## 6.2 Plans, Specifications, and Construction Review

Because subsurface conditions may vary from those predicted by relatively small diameter, widely spaced borings, and to check that our recommendations have been properly implemented, we recommend we be retained to 1) review final construction plans and specifications and 2) observe the earthwork and foundation construction. Also, geotechnical conditions can be affected by the construction process. For the above reasons our geotechnical recommendations are contingent upon our firm providing geotechnical observation and testing services during construction.

# 7.0 EARTHWORK

## 7.1 Clearing and Site Preparation

The site should be cleared of all surface and subsurface deleterious materials including existing building foundations, slabs, irrigation lines, fills, pavements, debris, designated trees, shrubs, and associated roots. Abandonment of existing buried utilities is discussed below. Excavations extending below the planned finished site grades should be cleaned and backfilled with suitable material compacted as recommended in the "Compaction" section of this report. We recommend that the backfilling be carried out under our observation.

After clearing, any vegetated areas should be stripped to sufficient depth to remove all surface vegetation and topsoil containing greater than 3 percent organic matter by weight. At the time of our field investigation, we estimated that a stripping depth of approximately 2 to 3 inches would be required in vegetated areas. The actual stripping depth required depends on site usage prior to construction and should be established in the field by us at the time of construction. The stripped

materials should be removed from the site or may be stockpiled for use in landscaped areas, if desired.

### 7.2 Removal of Undocumented Fill

As discussed above, areas of undocumented fills were observed during our site exploration. We recommend that all fills be removed down to native soil. If the fill material meets the requirements in the "Material for Fill" section below, it may be reused as engineered fill. Side slopes of fill excavations in building and pavement areas should be sloped at inclinations no greater than 3:1 (horizontal to vertical) to minimize abrupt variations in fill thickness. All fill should be compacted in accordance with the recommendations for fill presented in the "Compaction" section of this report. We should confirm fill thickness and limits in the field at the time of construction.

### 7.3 Abandoned Utilities

Abandoned utilities within the proposed building area should be removed in their entirety. Utilities within the proposed building area would only be considered for in-place abandonment provided they do not conflict with new improvements, that the ends and all laterals are located and completely grouted, and the previous fills associated with the utility do not pose a risk to the structure.

Utilities outside the building area should be removed or abandoned in-place by grouting or plugging the ends with concrete. Fills associated with utilities abandoned in-place could pose some risk of settlement; utilities that are plugged could also pose some risk of future collapse or erosion should they leak or become damaged. The potential risks are relatively low for small diameter pipes (4 inches or less) abandoned in-place and increasingly higher with increasing diameter.

### 7.4 Subgrade Preparation

After the site has been properly cleared, stripped, and necessary excavations have been made, exposed surface soils in those areas to receive fill, slabs-on-grade, or pavements should be scarified to a depth of 6 inches, moisture conditioned, and compacted in accordance with the recommendations for fill presented in the "Compaction" section. The finished compacted subgrade should be firm and non-yielding under the weight of compaction equipment.

### 7.5 Ground Water

Based on our subsurface exploration, the site was generally capped by a clay layer on the order of 25 feet. The thickness and composition of this clay stratum appeared to be relatively consistent across the site. As shown in Table 1, free ground water was encountered during our January 2000 investigation at depths ranging from approximately 6½ to 19 feet below the ground surface. Monitoring wells installed at the site during our September 2000 investigation did not encountered free ground water during drilling to a maximum depth of 20 feet.

However, ground water was recorded at a depth of approximately 7 and 10½ feet for MW-21, and MW-22, respectively one day after the completion of drilling. In addition, we also visited the site on July 18,2001 to measure ground water depth in monitoring well MW21 and MW22.

Based on the information collected for this and previous investigations, temporary excavations greater than 5 feet below existing grades may potentially be impacted by shallow ground water, depending how long excavations are left open. This depth might be higher depending on the time of the year. In our opinion, provided excavations are completed and backfilled within the same day, they will most likely remain relatively dry. Excavations left open overnight will likely accumulate ground water. If significant ground water does accumulate, it should be removed from excavations prior to backfilling. Contractors completing excavations on site should anticipate the need for local dewatering.

## 7.6 Material for Fill

All on-site soils below the stripped layer having an organic content of less than 3 percent by weight are suitable for use as fill at the site. In general, fill material should not contain rocks or lumps larger than 6 inches in greatest dimension, with no more than 15 percent larger than 2½ inches. Imported fill material should be inorganic and should have a Plasticity Index of 15 or less. Import should have sufficient binder to prevent caving of the foundation and utility trenches. Proposed import material should be approved by a member of our staff prior to delivery to the site.

Consideration should also be given to the environmental characteristics as well as the corrosion potential of import soils. Laboratory testing, including pH, soluble sulfates, chlorides, and resistivity will provide information regarding corrosion potential. Import soils should not be more corrosive than the native materials.

## 7.7 Compaction

All fill, as well as scarified surface soils in those areas to receive fill or slabs-on-grade, should be compacted to at least 90 percent relative compaction as determined by ASTM Test Designation D1557, latest edition. Fill greater than 5 feet in thickness should be compacted to at least 95 percent compaction for the portion below the upper 5 feet. Fill should be placed in lifts no greater than 8 inches in uncompacted thickness at a moisture content near the laboratory optimum. Each successive lift should be firm and non-yielding under the weight of construction equipment.

In pavement areas, the upper 6 inches of subgrade and full depth of aggregate base should be compacted to at least 95 percent relative compaction (ASTM D1557, latest edition). Aggregate base and all import soils should be compacted at a moisture content near the laboratory optimum.

## 7.8 Wet Weather Conditions

Earthwork contractors should be made aware of the moisture sensitivity of silty and clayey soils and potential compaction difficulties. If construction is undertaken during wet weather conditions, the surficial soils may become saturated, soft and unworkable. Subgrade stabilization techniques might include the use of engineering fabrics and/or crushed rock or chemical treatment. Therefore, we recommend that consideration be given to construction during late spring, summer, or fall months. We should determine the type, level and extent of mitigation alternatives in the field at the time of construction.

## 7.9 Trench Backfill

Bedding and shading materials to be used around underground utility pipes should be predominantly granular and should be placed and compacted in accordance with project specifications, local requirements or governing jurisdiction. General fill to be used above shading materials should be placed and compacted in accordance with local requirements or the recommendations contained in this section, whichever is more stringent.

On-site soils may be used as general fill above shading materials provided they meet the requirements of the "Material for Fill" section of this report. General fill should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90 percent relative compaction (ASTM D1557, latest edition) by mechanical means only. Jetting of trench backfill will not be allowed.

Where granular backfill is used in trenches, we recommend that a cut-off plug of impermeable material be placed where such trenches enter the building and pavement areas. This would reduce the likelihood of water entering the trenches from the landscaped areas and seeping through the trench backfill into the building and pavement areas.

## 7.10 Temporary Slopes and Trench Excavations

The contractor should be responsible for all temporary slopes and trenches excavated at the site and design of any required temporary shoring. Shoring, bracing, and benching should be performed by the contractor in accordance with the strictest governing safety standards.

## 7.11 Surface Drainage

Positive surface water drainage gradients should be provided adjacent to the structures to direct surface water away from foundations and slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Roof runoff should be carried away from foundations and slabs and directed to suitable discharge facilities.

### 7.12 Construction Observation

All grading and earthwork should be performed under the observation of our representative to check that the site is properly prepared, that selected fill materials are satisfactory, and that placement and compaction of fills is performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is essential. The project plans and specifications should incorporate all recommendations contained in this report.

## 8.0 FOUNDATIONS

### 8.1 Footings

The proposed service and switchyard buildings, and energy plant equipment may be supported on conventional continuous and/or isolated spread footings bearing on natural, undisturbed soil or compacted fill. All footings should have a minimum width of 15 inches and should extend at least 18 inches below lowest adjacent finished grade. Lowest adjacent finished grade may be taken as the bottom of interior slab-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower.

Footings constructed in accordance with the above recommendations would be capable of supporting maximum allowable bearing pressures of 3,000 pounds per square foot (psf) for dead loads, 4,500 psf for combined dead and live loads, and 6,000 psf for all loads including wind or seismic. These allowable bearing pressures are based upon factors of safety of 3.0, 2.0, and 1.5 for dead, dead plus live, and seismic loads, respectively.

These maximum allowable bearing pressures are net values; the weight of the footing may be neglected for design purposes. All footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing.

All continuous footings should be reinforced with top and bottom steel to provide structural continuity and to help span local irregularities. Footing excavations should be kept moist by regular sprinkling with water to prevent desiccation. It is essential that we observe the all footing excavations before reinforcing steel is placed.

Based on the information provided to us, typical equipment dead load on the order of 180 to 500 kips are expected. Based on these assumed loads and the maximum allowable bearing pressures recommended above, we estimate that total foundation movement under static loads will be less than ½-inch, with post-construction differential movement of less than ¼-inch. We should be retained to review final loads, bearing pressures and founding elevations to confirm the above settlement estimates.

## 8.2 Reinforced Mat Foundations

The proposed buildings and equipment may be alternatively supported on conventionally reinforced mat foundations. Mat foundations may be designed for an average allowable bearing pressure of 1,000 pounds per square foot (psf) for dead plus live loads, with maximum localized allowable bearing pressures of 2,000 psf. Allowable bearing pressures may be increased by one-third for all loads including wind or seismic. These allowable bearing pressures are net values; the weight of the mat can be neglected for design purposes.

All mats should be reinforced with top and bottom steel, as appropriate, to provide structural continuity and to help span local irregularities. These recommendations may be revised depending on the particular design method selected by the structural engineer. It is essential that we observe the mat foundation pads prior to placement of reinforcing steel.

## 8.3 Building Slabs-on-Grade

To limit moisture rise through slabs-on-grade, we recommend a moisture barrier be installed beneath the floor slab. This should consist of 2 inches of clean, fine sand over a minimum 10-mil-thick vapor barrier. At least 4 inches of free-draining gravel such as ½-inch or ¾-inch crushed rock with no more than 5 percent passing the ASTM No. 200 sieve should be placed beneath the vapor barrier to serve as a capillary break. Pea gravel should not be used as a capillary break as it provides weak lateral resistance during seismic ground shaking. The sand should be lightly moistened just prior to placing the concrete. If a higher degree of moisture protection is desired, the vapor barrier should be sealed at seams and all penetrations.

## 8.4 Lateral Loads

Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.30 may be used for design. In addition, lateral resistance may be provided by passive pressure acting against foundations poured neat against competent soil. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 300 pounds per cubic foot be used in design.

# 9.0 RETAINING WALLS

## 9.1 Lateral Earth Pressures

Any proposed retaining walls should be designed to resist lateral earth pressures from adjoining natural materials, backfill, and surcharge loads. Provided that adequate drainage is provided as recommended below, we recommend that walls restrained from movement at the top be designed to resist an equivalent fluid pressure of 45 pounds per cubic foot (pcf) plus a uniform pressure of 8H pounds per square foot, where H is the distance in feet between the bottom of the footing and the top of the wall. Restrained walls should also be designed to resist an additional uniform pressure equivalent to one-half of any surcharge loads applied at the surface. Any unrestrained retaining walls with adequate drainage should be designed to resist an equivalent fluid pressure of 45 pcf plus one-third of any surcharge loads.

The above lateral earth pressures assume level backfill conditions and sufficient drainage behind the walls to prevent build-up of hydrostatic pressure from surface water infiltration and/or a rise in the ground water level. If adequate drainage is not provided, we recommend an equivalent fluid pressure of 40 pcf be added to the values recommended above for both restrained and unrestrained walls. Damp-proofing of the walls should be included in areas where wall moisture and efflorescence would be undesirable.

## 9.2 Drainage

Adequate drainage may be provided by a subdrain system behind the walls. This system should consist of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe should be bedded and backfilled with Class 2 Permeable Material per Caltrans Standard Specifications, latest edition. The permeable backfill should extend at least 2 feet out from the wall and to within 2 feet of outside finished grade. Alternatively, ½-inch to ¾-inch crushed rock may be used in place of the Class 2 Permeable Material provided the crushed rock and pipe are enclosed in filter fabric, such as TCMirafi 40/30A or equivalent. The upper 2 feet of wall backfill should consist of relatively impervious compacted on-site clayey soil. The subdrain outlet should be connected to a free-draining outlet or sump.

Miradrain, Geotech Drainage Panels, or Enkadrain drainage matting may be used for wall drainage as an alternative to the Class 2 Permeable Material or drain rock backfill. The drainage panel should be connected to the perforated pipe at the base of the wall.

### 9.3 Backfill

Backfill placed behind the walls should be compacted to at least 90 percent relative compaction using light compaction equipment. If heavy compaction equipment is used, the walls should be temporarily braced.

### 9.4 Foundation

Retaining walls may be supported on a continuous spread footing designed in accordance with the recommendations presented in the "Footings" section of this report. Lateral load resistance for the walls may be developed in accordance with the recommendations presented in the "Lateral Loads" section.

## 10.0 PAVEMENTS

### 10.1 Asphalt Concrete

We obtained a representative bulk sample of the surface soil during our September 2000 investigation and performed an R-value test to provide data for pavement design. Test results indicated an R-value of 28 and is included in Appendix D. Based on the subsurface conditions encountered during this investigation and because surface soils may vary across the site, in our opinion, we judged an R-value of 20 to be applicable for design. Using estimated traffic indices for various pavement-loading requirements, we developed the following recommended pavement sections based on Procedure 608 of the Caltrans Highway Design Manual, presented in Table 5. Pavement design alternatives presented below should be confirmed at the time of construction.

**Table 5. Recommended Asphalt Concrete Pavement Design Alternatives**
**Pavement Components**
**Design R–Value = 20**

| General Traffic Condition | Design Traffic Index | Asphalt Concrete (Inches) | Aggregate Baserock* (Inches) | Total Thickness (Inches) |
|---|---|---|---|---|
| Automobile | 4.0 | 2.5 | 6.0 | 8.5 |
| Parking | 4.5 | 2.5 | 7.0 | 9.5 |
| Automobile | 5.0 | 3.0 | 8.0 | 11.0 |
| Parking Channel | 5.5 | 3.0 | 10.0 | 13.0 |
| Truck Access & | 6.0 | 3.5 | 10.0 | 13.5 |
| Parking Areas | 6.5 | 4.0 | 10.0 | 14.0 |

*Caltrans Class 2 aggregate base; minimum R-value equal to 78.

The traffic indices used in our pavement design are considered reasonable values for the proposed development and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. The traffic parameters used for design were selected based on engineering judgment and not

on information furnished to us such as an equivalent wheel load analysis or a traffic study.

### 10.2 Asphalt Concrete, Aggregate Base and Subgrade

Asphalt concrete and aggregate base should conform to and be placed in accordance with the requirements of Caltrans Standard Specifications, latest edition, except that ASTM Test Designation D1557 should be used to determine the relative compaction of the aggregate base. Pavement subgrade should be prepared and compacted as described in the "Earthwork" section of this report.

### 10.3 Exterior Concrete Sidewalk

Exterior concrete sidewalks should be at least 4 inches thick and underlain by at least 4 inches of Class 2 aggregate base compacted to a minimum of 90 percent relative compaction in accordance with ASTM Test Method D1557, latest edition.

## 11.0 LIMITATIONS

This report has been prepared for the sole use of Calpine Corporation and WRMS Engineering, specifically for design of the North San Jose Energy Center project to be located in San Jose, California. The opinions presented in this report have been formulated in accordance with generally accepted geotechnical engineering practices that exist in the San Francisco Bay Area at the time this report was prepared. No other warranty, expressed or implied, is made or should be inferred. We are not responsible for data presented by others.

The opinions, conclusions and recommendations contained in this report are based upon information obtained from explorations at widely separated locations, site reconnaissance, review of data made available to us, and upon local experience and engineering judgment. The recommendations presented in this report are based on the assumption that soil and geologic conditions at or between borings do not deviate substantially from those encountered. In addition, geotechnical issues may arise that are not apparent at this time.

The geotechnical engineer should be retained to review final plans and specifications when they are available to verify these documents are consistent with the intent of the geotechnical recommendations. The recommendations provided in this report are based on the assumption that we will be retained to provide observation and testing services during construction in order to evaluate compliance with our recommendations. If we are not retained for these services, Lowney Associates cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of Lowney Associates' report by others. Furthermore, Lowney Associates will cease to be the Geotechnical-Engineer-of-Record at the time another consultant is retained for follow-up service to this report.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man, on this or adjacent properties. In addition, changes in applicable standards of practice can occur, whether from legislation or the broadening of knowledge. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years, nor should it be used, or is it applicable, for any property other than that evaluated.

## 12.0 REFERENCES

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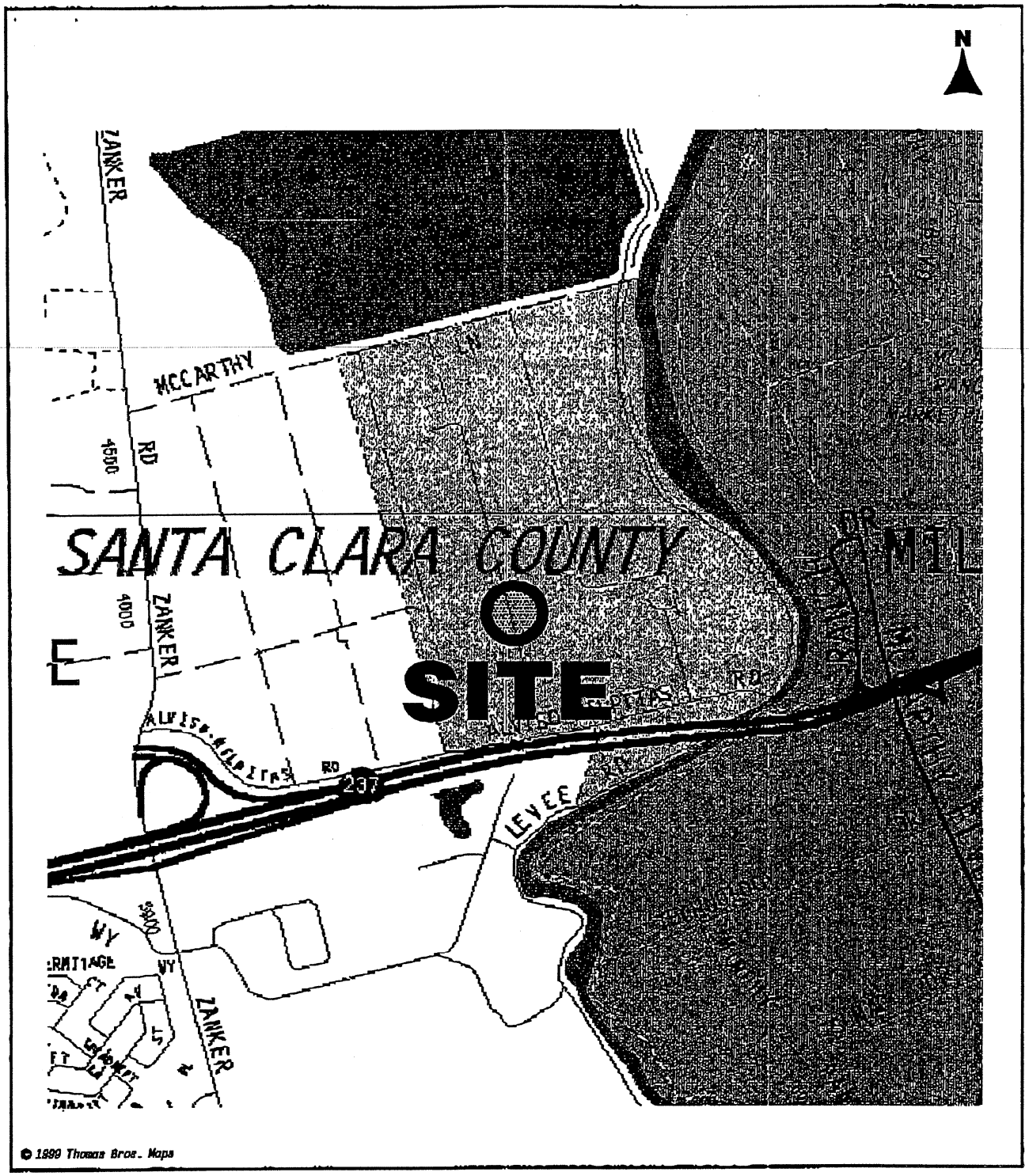
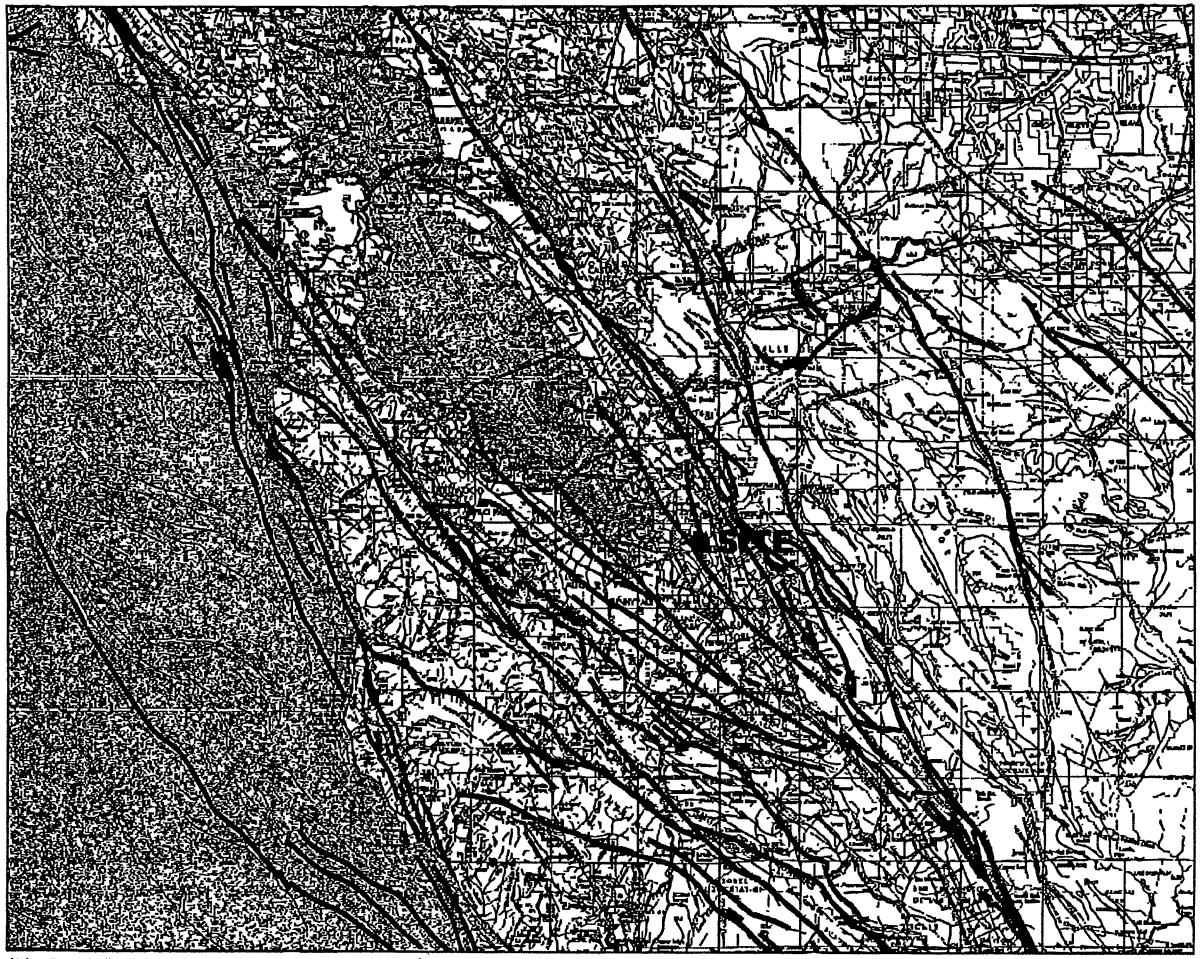



**VICINITY MAP**

NORTH SAN JOSE ENERGY CENTER
San Jose, California

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

**FIGURE 1**
587-121



Note: Some faults highlighted in purple are not considered active (Holocene Movement) by the State of California.

Division of Mines and Geology, James F. Davis, State Geologist

| Geologic Time Scale | | | Years Before Present Approx. | Fault Symbol | Recency of Movement on Land Offshore | DESCRIPTION |
|---|---|---|---|---|---|---|
| Quaternary | Late Quaternary | Holocene | 200 | | | [illegible] |
| | | Pleistocene | 10,000 | | | [illegible] |
| | | | 500,000 | | | [illegible] |
| | Early Quaternary | Pleistocene | 2,000,000 | | | [illegible] |
| Pre-Quaternary | Pliocene | | 5,000,000 | | | [illegible] |

Base map is a composite of part the San Francisco 1:250,000 scale map (reference code 37 122-A1-TF-250-00, 1980) and the San Jose 1:250,000 scale map (reference code 37 124-A1-TF-250-00, 1969). For cartographic details, refer to these maps. Bathymetric information is not intended for navigational purposes.

Transverse Mercator Projection 10,000-meter Universal Transverse Mercator grid, zone 10.

Minor corrections and additions to culture by California Division of Mines and Geology 1987.

From: Bortugno & others (1991)

0 10 20 Miles

Scale 1:500,000

**REGIONAL FAULT MAP**
NORTH SAN JOSE POWER CENTER
San Jose, California

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FIGURE 3
587-121

# APPENDIX A

## FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program using both truck-mounted, rotary-wash drilling equipment and cone penetration test (CPT) sounding equipment. Three 4-7/8-inch-diameter exploratory borings were drilled on June 27, 2001, to depths ranging from 30 to 40 feet. Four CPT borings were advanced on June 26, 2001, to a maximum depth of approximately 98¼ feet. The approximate locations of the exploratory and CPT borings are shown on the Site Plan, Figure 2. The soils encountered were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). The logs of the borings, as well as a key to the classification of the soil, are included as part of this appendix.

Boring and CPT locations were approximately determined by portable Global Positioning Systems (GPS) equipment. Elevations of the borings were determined by interpolating using the topographic plan provided to us. Boring locations and elevations should be considered accurate only to the degree implied by the method used.

Representative soil samples were obtained from the borings at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing. The standard penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2.5-inch I.D. Modified California Sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration (ASTM D1586). Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows required to drive the last 12 inches. The various samplers are denoted at the appropriate depth on the boring logs and symbolized as shown on Figure A-1.

Field tests included an evaluation of the undrained shear strength of soil samples using a Torvane device, and the unconfined compressive strength of the soil samples using a pocket penetrometer device. The results of these tests are presented on the individual boring logs at the appropriate sample depths.

The attached boring logs and related information depict subsurface conditions at the locations indicated and on the date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

* * * * * * * * * * * * *

| PRIMARY DIVISIONS | | | SOIL TYPE | SECONDARY DIVISIONS |
|---|---|---|---|---|
| COARSE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE) | GRAVELS (MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE) | CLEAN GRAVELS (Less than 5% Fines) | GW | Well graded gravels, gravel–sand mixtures, little or no fines |
| | | | GP | Poorly graded gravels or gravel–sand mixtures, little or no fines |
| | | GRAVEL WITH FINES | GM | Silty gravels, gravel–sand–silt mixtures, plastic fines |
| | | | GC | Clayey gravels, gravel–sand–clay mixtures, plastic fines |
| | SANDS (MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE) | CLEAN SANDS (Less than 5% Fines) | SW | Well graded sands, gravelly sands, little or no fines |
| | | | SP | Poorly graded sands or gravelly sands, little or no fines |
| | | SANDS WITH FINES | SM | Silty sands, sand–silt–mixtures, non–plastic fines |
| | | | SC | Clayey sands, sand–clay mixtures, plastic fines |
| FINE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE) | SILTS AND CLAYS (LIQUID LIMIT IS LESS THAN 50 %) | | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | | OL | Organic silts and organic silty clays of low plasticity |
| | SILTS AND CLAYS (LIQUID LIMIT IS GREATER THAN 50 %) | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | | CH | Inorganic clays of high plasticity, fat clays |
| | | | OH | Organic clays of medium to high plasticity, organic silts |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils |

## DEFINITION OF TERMS

U.S. STANDARD SIEVE SIZE: 200, 40, 10, 4 — CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

| SILTS AND CLAY | SAND | | | GRAVEL | | COBBLES | BOULDERS |
|---|---|---|---|---|---|---|---|
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

0.08, 0.4, 2, 5, 19, 76mm

## GRAIN SIZES

TERZAGHI SPLIT SPOON. STANDARD PENETRATION — MODIFIED CALIFORNIA — D&M UNDERWATER SAMPLER — SHELBY TUBE — NO RECOVERY

## SAMPLERS

| SAND AND GRAVEL | BLOWS/FOOT* |
|---|---|
| VERY LOOSE | 0–4 |
| LOOSE | 4–10 |
| MEDIUM DENSE | 10–30 |
| DENSE | 30–50 |
| VERY DENSE | OVER 50 |

## RELATIVE DENSITY

| SILTS AND CLAYS | STRENGTH+ | BLOWS/FOOT* |
|---|---|---|
| VERY SOFT | 0–1/4 | 0–2 |
| SOFT | 1/4–1/2 | 2–4 |
| MEDIUM STIFF | 1/2–1 | 4–8 |
| STIFF | 1–2 | 8–16 |
| VERY STIFF | 2–4 | 16–32 |
| HARD | OVER 4 | OVER 32 |

## CONSISTENCY

*Number of blows of 140 pound hammer falling 30 inches to drive a 2–inch O.D. (1–3/8 inch I.D.) split spoon (ASTM D–1586).
+Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D–1586), pocket penetrometer, torvane, or visual observation.

# KEY TO EXPLORATORY BORING LOGS

**Unified Soil Classification System (ASTM D–2487)**

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE A–1

# EXPLORATORY BORING: EB-23

Sheet 1 of 2

DRILL RIG: FAILING 1500
BORING TYPE: 4 7/8-INCH ROTARY WASH
LOGGED BY: BAH
START DATE: 6-27-01 FINISH DATE: 6-27-01

PROJECT NO: 587-12I
PROJECT: NORTH SAN JOSE ENERGY CENTER
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 35.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

SURFACE ELEVATION: 14 FT. (+/-)

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 14 | 0 | **CLAYEY SILT (ML)** hard, moist, brown, some fine sand, low plasticity | ML | 8 | | 21 | | |
| 9.5 | | **SILTY CLAY (CL)** medium stiff, moist, brown, some fine sand, moderate plasticity | CL | 17 | | 22 | 97 | |
| 8.5 | 5 | **SILTY CLAY (CL)** stiff to very stiff, moist, dark olive brown, moderate plasticity | CL | 28 | | 25 | 99 | |
| | 10 | | CL | 38 | | 23 | 105 | |
| 1.5 | | **SILTY CLAY (CL)** stiff, moist, olive, low to moderate plasticity | CL | 27 | | 27 | 99 | |
| | 15 | | CL | 28 | | 23 | 101 | |
| | 20 | gradual color change from olive to brown/grey mottled | | | | | | |
| -10.0 | | **SILTY CLAY (CL)** stiff, moist, brown/grey mottled, some fine sand, low plasticity | CL | 28 | | 23 | 103 | |
| | 25 | increasing sand | | | | | | |
| -13.8 | | **SANDY CLAY (CL)** stiff, moist, olive, fine sand, low plasticity | CL | 17 | | 25 | 100 | |
| -16.5 | 30 | *Continued Next Page* | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

Northing: 1,980,603
Easting: 6,145,377

LA CORP-GDT 7/23/01 MV BAH

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-23 Cont'd

Sheet 2 of 2

DRILL RIG: FAILING 1500
BORING TYPE: 4 7/8-INCH ROTARY WASH
LOGGED BY: BAH
START DATE: 6-27-01 FINISH DATE: 6-27-01

PROJECT NO: 587-121
PROJECT: NORTH SAN JOSE ENERGY CENTER
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 35.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| -17 | 30 | | **SANDY CLAY (CL)** stiff, moist, olive, fine sand, low plasticity decreasing sand | CL | | | | | |
| -18.8 | | | **SILTY CLAY (CL)** stiff, moist, brown, low plasticity | CL | 31 | | 19 | 111 | |
| -21.5 | 35 | | Bottom of boring at 35 feet | | | | | | |
| | 40 | | | | | | | | |
| | 45 | | | | | | | | |
| | 50 | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

Northing: 1,980,603
Easting: 6,145,377

LA CORP.GDT 7/23/01 MV BAH

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-24

Sheet 1 of 2

DRILL RIG: FAILING 1500
BORING TYPE: 4 7/8-INCH ROTARY WASH
LOGGED BY: BAH
START DATE: 6-27-01 FINISH DATE: 6-27-01

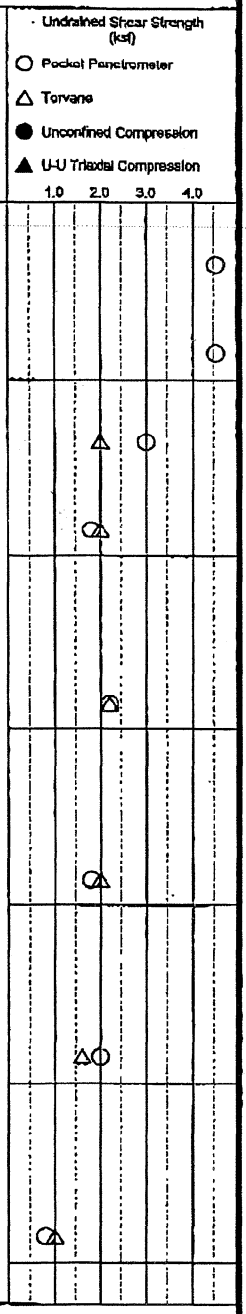
PROJECT NO: 587-12I
PROJECT: NORTH SAN JOSE ENERGY CENTER
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 40.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

SURFACE ELEVATION: 15 FT. (+/-)

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| 15 | 0 | **CLAYEY SILT (ML)** very stiff to hard, dry, light brown to brown, fine sand, low plasticity | ML | 25 | X | 11 | 101 | |
| 10.9 | 5 | **SILTY CLAY (CL)** stiff to very stiff, moist, dark olive brown, trace fine sand, moderate plasticity decreasing sand | CL | 56 | X | 18 | 109 | |
| | | | | 40 | X | 20 | 106 | |
| | | | | 40 | X | 22 | 106 | |
| | 10 | gradual color change from dark olive to olive | | | | | | |
| 2.9 | | **SILTY CLAY (CL)** stiff, moist, olive brown, low to moderate plasticity | CL | 34 | X | 24 | 102 | |
| | 15 | | | | | | | |
| | | | | 38 | X | 28 | 97 | |
| | 20 | | | | | | | |
| -8.6 | | **SILTY CLAY (CL)** stiff, moist, grey/olive/brown mottled, low plasticity | CL | 28 | X | 24 | 102 | |
| | 25 | increasing fine sand | | | | | | |
| -13.1 | | **SANDY CLAY (CL)** medium stiff, moist, olive, fine sand, low plasticity | CL | 21 | X | 25 | 101 | |
| -15.1 | 30 | | | | | | | |

*Continued Next Page*




GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

Northing: 1,980,033
Easting: 6,145,517

LA CORP.GDT 7/19/01 MV BAH

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-24 Cont'd

Sheet 2 of 2

DRILL RIG: FAILING 1500
BORING TYPE: 4 7/8-INCH ROTARY WASH
LOGGED BY: BAH
START DATE: 6-27-01 FINISH DATE: 6-27-01

PROJECT NO: 587-121
PROJECT: NORTH SAN JOSE ENERGY CENTER
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 40.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| -15 | 30 | | **SANDY CLAY (CL)** medium stiff, moist, olive, fine sand, low plasticity | | | | | | |
| | | | | CL | 18 | | 23 | 104 | |
| | 35 | | | | | | | | |
| | | | | | 20 | | 24 | 102 | |
| -25.1 | 40 | | Bottom of boring at 40 feet | | | | | | |
| | 45 | | | | | | | | |
| | 50 | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

Northing: 1,980,033
Easting: 6,145,517

LA CORP.GDT 7/19/01 MV* BAH

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Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-27

Sheet 1 of 1

DRILL RIG: FAILING 1500
BORING TYPE: 4 7/8-INCH ROTARY WASH
LOGGED BY: BAH
START DATE: 6-27-01 FINISH DATE: 6-27-01

PROJECT NO: 587-12I
PROJECT: NORTH SAN JOSE ENERGY CENTER
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 30.0 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

SURFACE ELEVATION: 16 FT. (+/-)

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|
| 16 | 0 | **CLAYEY SILT (ML)** very stiff to hard, dry, light brown, some fine sand, low plasticity | ML | 22 | 8 | 96 |
| 11.8 | 5 | **SILTY CLAY (CL)** medium stiff, moist, dark olive brown, some fine sand, moderate plasticity decreasing fine sand | CL | 19 | 12 | 100 |
| | | | | 40 | 21 | 105 |
| | 10 | | | 55 | 20 | 108 |
| 3.3 | 15 | **SILTY CLAY (CL)** very stiff to hard, moist, olive brown, low to moderate plasticity | CL | 64 | 18 | 111 |
| -2.7 | 20 | **SILTY CLAY (CL)** stiff, moist, brown, low plasticity gradual color change from brown to grey/brown mottled | CL | 30 | 30 | 94 |
| -7.2 | 25 | **SILTY CLAY (CL)** stiff, moist, grey/brown mottled, low plasticity increasing sand | CL | 44 | 23 | 101 |
| -12.2 | | **SANDY CLAY(CL)** medium stiff to stiff, moist, brown, fine sand, low plasticity | CL | 23 | 19 | 111 |
| -14.2 | 30 | Bottom of boring at 30 feet | | | | |

SAMPLER

PERCENT PASSING NO. 200 SIEVE

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

Northing: 1,980,350
Easting: 6,145,958

LA CORP.GDT 7/18/01 MV* BAH

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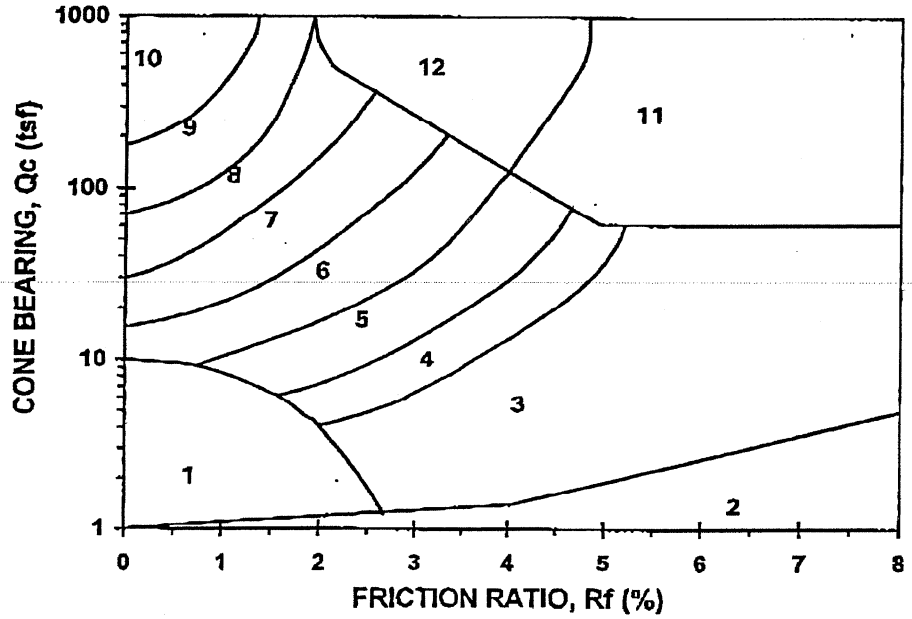
Environmental/Geotechnical/Engineering Services

## SIMPLIFIED SOIL BEHAVIOR TYPE CLASSIFICATION FOR STANDARD ELECTRONIC CONE PENETROMETER




| ZONE | Qc/N[1] | Su Factor (Nk)[2] | SOIL BEHAVIOR TYPE[1] |
|---|---|---|---|
| 1 | 2 | 15 (10 for Qc <= 9 tsf) | Sensitive Fine Grained |
| 2 | 1 | 15 (10 for Qc <= 9 tsf) | Organic Material |
| 3 | 1 | 15 (10 for Qc <= 9 tsf) | CLAY |
| 4 | 1.5 | 15 | Silty CLAY to CLAY |
| 5 | 2 | 15 | Clayey SILT to Silty CLAY |
| 6 | 2.5 | 15 | Sandy SILT to Clayey SILT |
| 7 | 3 | — | Silty SAND to Sandy SILT |
| 8 | 4 | — | SAND to Silty SAND |
| 9 | 5 | — | SAND |
| 10 | 6 | — | Gravelly SAND to SAND |
| 11 | 1 | 15 | Very Stiff Fine Grained (*) |
| 12 | 2 | — | SAND to Clayey SAND (*) |

(*) Overconsolidated or Cemented

Qc = Tip Bearing
Fs = Sleeve Friction
Rf = Fs/Qc*100 = Friction Ratio

References: [1]Robertson, 1986, Olsen, 1988
[2]Bonaparte & Mitchell, 1979 (young bay mud Qc <= 9)
[2]Estimated from local experience (fine grained soils Qc > 9)
Note: Testing performed in accordance with ASTM D3441

KEY TO CONE PENETROMETER TESTS

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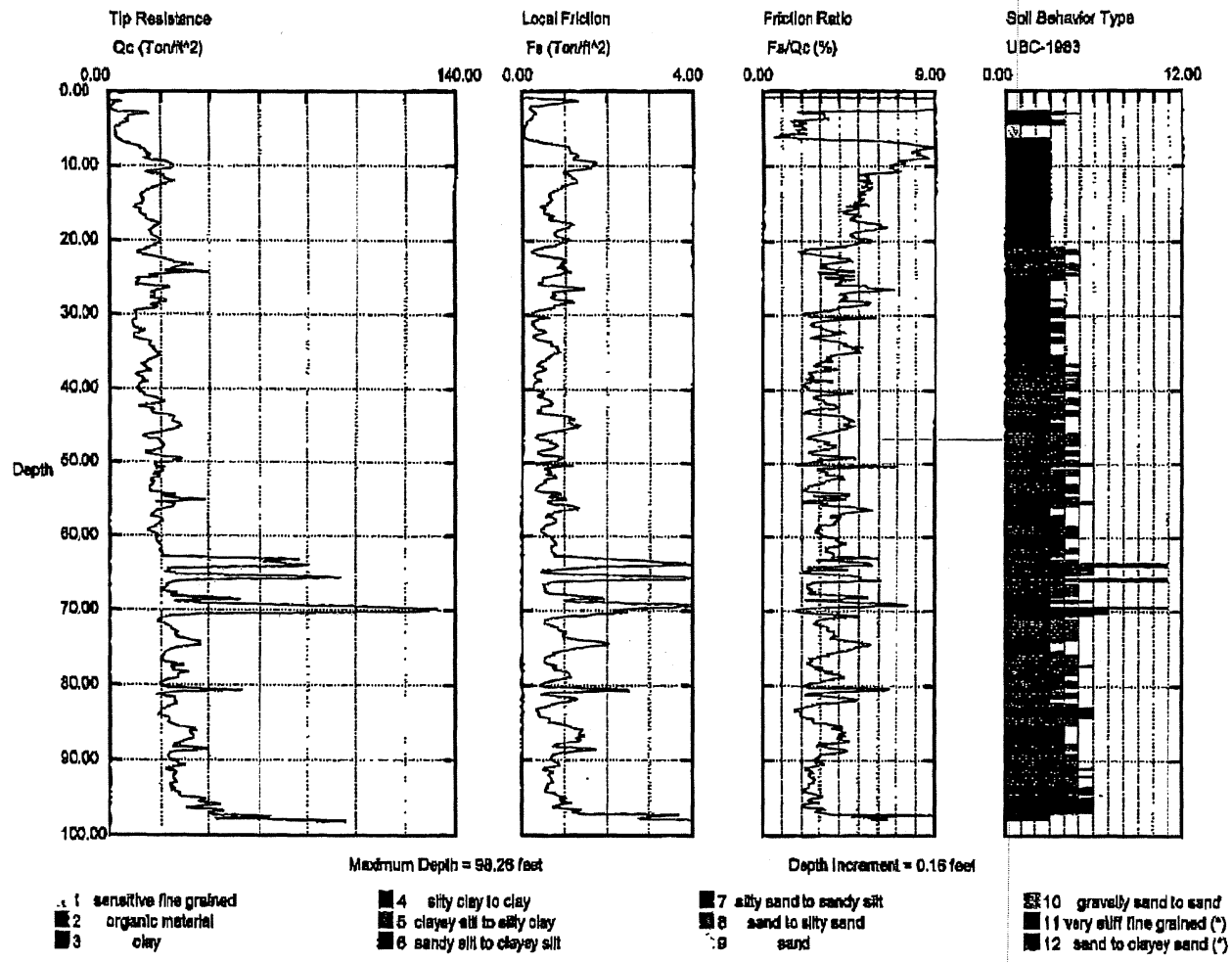
APPENDIX A

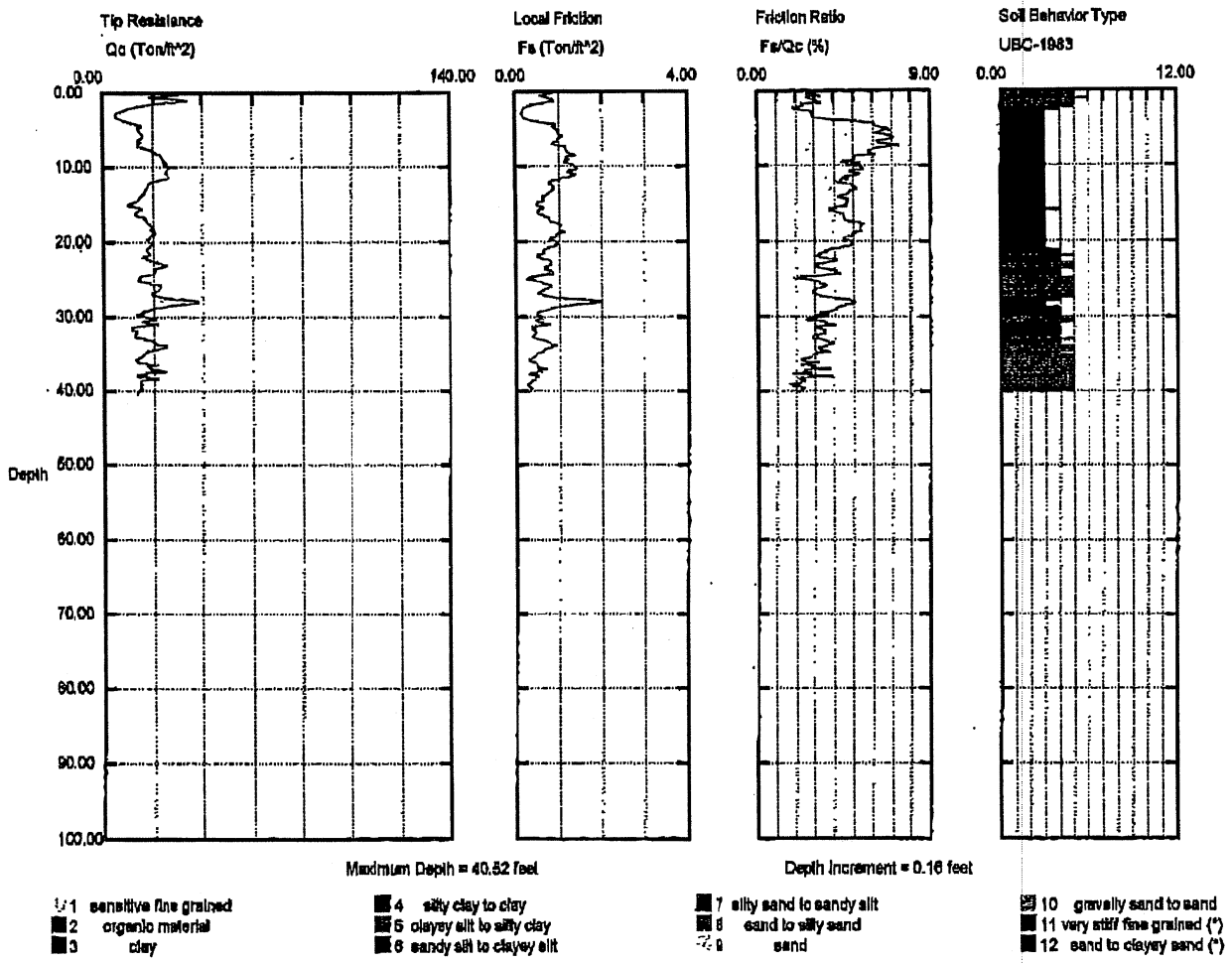



2001*EB

## CONE PENETRATION TEST - CPT-25

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

**CPT-25**
587-121

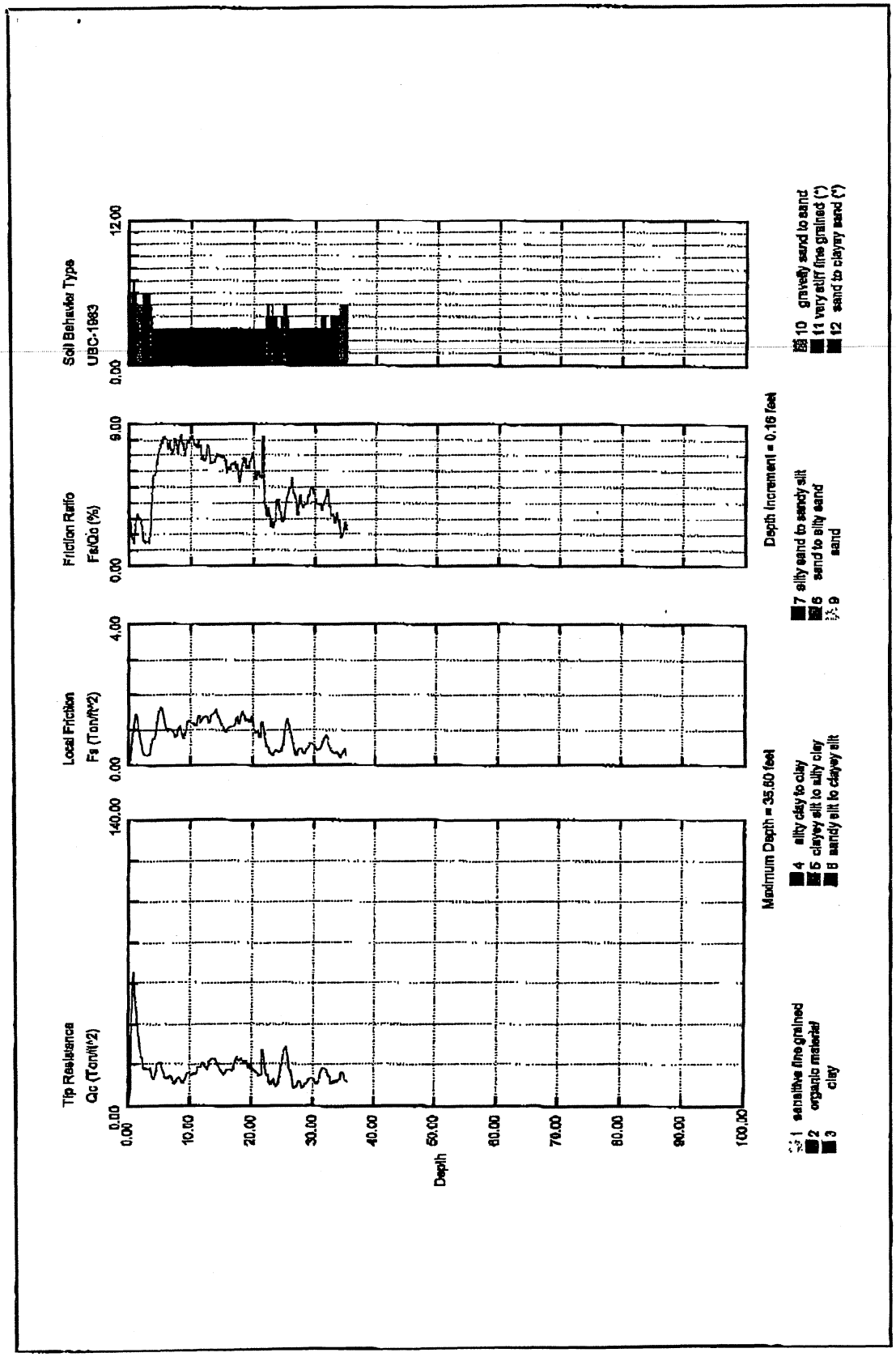



2001*EB

## CONE PENETRATION TEST - CPT-26

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

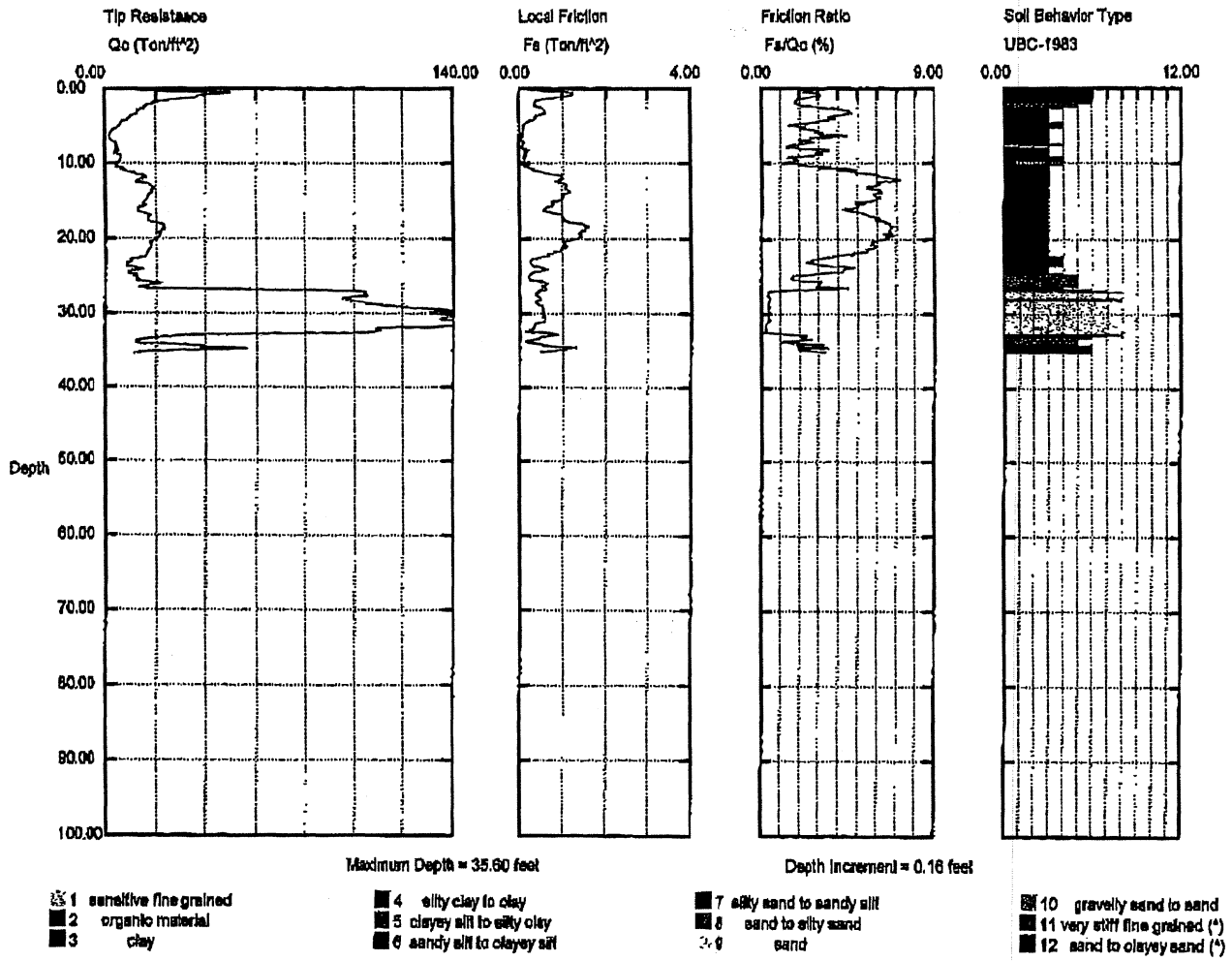
**CPT-26**
587-121




**CONE PENETRATION TEST - CPT-28**

**CPT-28**
587-121

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services




2001*EB

## CONE PENETRATION TEST - CPT-29

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**CPT-29**
587-121

# APPENDIX B

## PREVIOUS FIELD INVESTIGATION

| PRIMARY DIVISIONS | | | SOIL TYPE | SECONDARY DIVISIONS |
|---|---|---|---|---|
| COARSE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE) | GRAVELS (MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE) | CLEAN GRAVELS (Less than 5% Fines) | GW | Well graded gravels, gravel–sand mixtures, little or no fines |
| | | | GP | Poorly graded gravels or gravel–sand mixtures, little or no fines |
| | | GRAVEL WITH FINES | GM | Silty gravels, gravel–sand–silt mixtures, plastic fines |
| | | | GC | Clayey gravels, gravel–sand–clay mixtures, plastic fines |
| | SANDS (MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE) | CLEAN SANDS (Less than 5% Fines) | SW | Well graded sands, gravelly sands, little or no fines |
| | | | SP | Poorly graded sands or gravelly sands, little or no fines |
| | | SANDS WITH FINES | SM | Silty sands, sand–silt–mixtures, non–plastic fines |
| | | | SC | Clayey sands, sand–clay mixtures, plastic fines |
| FINE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE) | SILTS AND CLAYS (LIQUID LIMIT IS LESS THAN 50 %) | | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | | OL | Organic silts and organic silty clays of low plasticity |
| | SILTS AND CLAYS (LIQUID LIMIT IS GREATER THAN 50 %) | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | | CH | Inorganic clays of high plasticity, fat clays |
| | | | OH | Organic clays of medium to high plasticity, organic silts |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils |

## DEFINITION OF TERMS

| | U.S. STANDARD SIEVE SIZE 200 | 40 | 10 | 4 | CLEAR SQUARE SIEVE OPENINGS 3/4" | 3" | 12" |
|---|---|---|---|---|---|---|---|
| SILTS AND CLAY | SAND | | | GRAVEL | | COBBLES | BOULDERS |
| | FINE | MEDIUM | COARSE | FINE | COARSE | | |

## GRAIN SIZES

TERZAGHI SPLIT SPOON STANDARD PENETRATION

MODIFIED CALIFORNIA

D&M UNDERWATER SAMPLER

SHELBY TUBE

NO RECOVERY

## SAMPLERS

| SAND AND GRAVEL | BLOWS/FOOT* |
|---|---|
| VERY LOOSE | 0–4 |
| LOOSE | 4–10 |
| MEDIUM DENSE | 10–30 |
| DENSE | 30–50 |
| VERY DENSE | OVER 50 |

## RELATIVE DENSITY

| SILTS AND CLAYS | STRENGTH+ | BLOWS/FOOT* |
|---|---|---|
| VERY SOFT | 0–1/4 | 0–2 |
| SOFT | 1/4–1/2 | 2–4 |
| MEDIUM STIFF | 1/2–1 | 4–8 |
| STIFF | 1–2 | 8–16 |
| VERY STIFF | 2–4 | 16–32 |
| HARD | OVER 4 | OVER 32 |

## CONSISTENCY

*Number of blows of 140 pound hammer falling 30 inches to drive a 2–inch O.D. (1–3/8 inch I.D.) split spoon (ASTM D–1586).
+Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D–1586), pocket penetrometer, torvane, or visual observation.

# KEY TO EXPLORATORY BORING LOGS

**Unified Soil Classification System (ASTM D–2487)**

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FIGURE A–1

# EXPLORATORY BORING: EB-4

Sheet 1 of 2

| | |
|---|---|
| DRILL RIG: FAILING | PROJECT NO: 587-12H |
| BORING TYPE: 4-7/8" ROTARY WASH | PROJECT: U.S. DATAPORT |
| LOGGED BY: JGH | LOCATION: SAN JOSE, CA |
| START DATE: 7-5-00 FINISH DATE: 7-5-00 | COMPLETION DEPTH: 35.0 FT. |

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MATERIAL DESCRIPTION AND REMARKS

SURFACE ELEVATION:

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| | 0 | **SANDY CLAY (SC)** medium stiff, brown, fine sand, low plasticity | SC | | | | | |
| | | **SILTY CLAY (CL)** stiff, moist, brown, trace fine sand, low plasticity | CL | 12 | | | | |
| | | | | 13 | | 25 | 98 | |
| | 5 | | | 20 | | 26 | 102 | |
| | | | | 22 | | 25 | 99 | |
| | 10 | | | | | | | |
| | | **SILTY CLAY (CL)** very stiff, moist, gray with brown mottles, moderate plasticity | CL | 36 | | 27 | 96 | |
| | 15 | | | | | | | |
| | | | | 56 | | 22 | 108 | |
| | 20 | | | | | | | |
| | | **SILTY CLAY (CL)** stiff, moist, brown, some fine sand, low plasticity | CL | 41 | | 25 | 105 | |
| | 25 | | | | | | | |
| | | | | 35 | | 21 | 110 | |
| | 30 | | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ UU Triaxial Compression
1.0 2.0 3.0 4.0

*Continued Next Page*

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,981,640
Easting: 6,145,260

LA CORP.GDT 8/28/00 MV* FLL

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# EXPLORATORY BORING: EB-4 Cont'd

Sheet 2 of 2

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-5-00 FINISH DATE: 7-5-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 35.0 FT.

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| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| | 30 | | SILTY CLAY (CL) stiff to very stiff, moist, brown, some fine sand, low plasticity | CL | 60 | | 18 | 112 | |
| | 35 | | Bottom of Boring at 35 feet | | | | | | |
| | 40 | | | | | | | | |
| | 45 | | | | | | | | |
| | 50 | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,981,640
Easting: 6,145,260

LA CORP.GDT 8/25/00 MV FLL

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# EXPLORATORY BORING: EB-5

Sheet 1 of 1

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-5-00 FINISH DATE: 7-5-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 25.0 FT.

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Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (1.0, 2.0, 3.0, 4.0)

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS (SURFACE ELEVATION:) | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| | 0 | **SILTY CLAY (CL)** stiff, very moist, brown, some fine sand, low plasticity | CL | 26 | ▲ | 19 | 107 | |
| | | **SANDY SILT (ML)** medium stiff to stiff, moist, brown, fine sand, low plasticity | ML | 10 | ▲ | 19 | 97 | |
| | 5 | **SILTY CLAY (CL)** medium stiff, moist, grayish brown, moderate plasticity | CL | 26 | ▲ | 27 | 101 | |
| | | | | 24 | ▲ | 24 | 98 | |
| | 10 | | | | | | | |
| | | **SILTY CLAY (CL)** very stiff, moist, brown with black specks, low plasticity | CL | 44 | ▲ | 19 | 106 | |
| | 15 | | | | | | | |
| | | **CLAYEY SILT WITH SAND (ML)** very stiff, moist, brown with gray mottles, fine sand, low plasticity | ML | 19 | ▲ | 24 | 103 | |
| | 20 | | | | | | | |
| | | **SAND (SP)** medium dense, wet, brown, fine sand | SP | 28 | ▲ | 22 | | 6 |
| | 25 | Bottom of Boring at 25 feet | | | | | | |
| | 30 | | | | | | | |

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,981,454
Easting: 6,146,097

LA CORP.GDT 8/25/00 MV FLL

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# EXPLORATORY BORING: EB-6

Sheet 1 of 1

| | |
|---|---|
| DRILL RIG: FAILING | PROJECT NO: 587-12H |
| BORING TYPE: 4-7/8" ROTARY WASH | PROJECT: U.S. DATAPORT |
| LOGGED BY: JGH | LOCATION: SAN JOSE, CA |
| START DATE: 7-5-00 FINISH DATE: 7-5-00 | COMPLETION DEPTH: 30.0 FT. |

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SURFACE ELEVATION:

| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | gravel access road with aggregate base | | | | | | |
| | | | **SILTY CLAY (CL)** stiff, moist, gray, trace fine sand, moderate plasticity, Plasticity Index = 9, Liquid Limit = 28 | CL | 18 | | 22 | 88 | |
| | 5 | | medium stiff | | 5 | | 30 | 83 | |
| | | | very stiff | | 28 | | 21 | 106 | |
| | 10 | | | | 57 | | 25 | 102 | |
| | 15 | | | | | | | | |
| | | | **SILTY CLAY (CL)** very stiff, moist, gray with brown mottles and white streaks, low plasticity | | 35 | | 23 | 105 | |
| | 20 | | | CL | 36 | | 24 | 103 | |
| | 25 | | very stiff | | | | | | |
| | | | | | 73 | | | | |
| | 30 | | Bottom of Boring at 30 feet | | | | | | |

Undrained Shear Strength (ksf)

○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression

1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,980,856
Easting: 6,145,756

LA CORP.GDT 8/25/00 NV* FLL

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-7

Sheet 1 of 2

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-6-00 FINISH DATE: 7-6-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 60.0 FT.

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Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ U-U Triaxial Compression (1.0, 2.0, 3.0, 4.0)

| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS (SURFACE ELEVATION:) | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| | 0 | **SILT (ML)** stiff, moist, brown, with some fine sand, low plasticity | ML | 15 | ■ | 18 | | |
| | | | | 8 | ■ | 28 | | 85 |
| | 5 | **SILTY CLAY (CL)** stiff, moist, gray, moderate plasticity | CL | 29 | ■ | 24 | 98 | |
| | | | | 21 | ■ | 23 | 102 | |
| | 10 | | | | | | | |
| | | | | 50 | ■ | 19 | 104 | |
| | 15 | **SILTY CLAY (CL)** stiff to very stiff, moist, brown with gray mottles and black specs, moderate plasticity | CL | 29 | ■ | 24 | 100 | |
| | 20 | | | | | | | |
| | | increasing fine sand | CL | 22 | ■ | 24 | 103 | |
| | 25 | | | | | | | |
| | | | | 63 | ■ | 17 | 116 | |
| | 30 | | | | | | | |

*Continued Next Page*

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,980,620
Easting: 6,146,320

LA CORP.GDT 8/25/00 MV FLL

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# EXPLORATORY BORING: EB-7 Cont'd

Sheet 2 of 2

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-6-00 FINISH DATE: 7-6-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 60.0 FT.

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Undrained Shear Strength (ksf): ○ Pocket Penetrometer; △ Torvane; ● Unconfined Compression; ▲ UU Triaxial Compression (1.0, 2.0, 3.0, 4.0)

| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|---|
| | 35 | | **SILTY CLAY (CL)** stiff to very stiff, moist, brown with gray mottles and black specs, moderate plasticity increasing fine subrounded gravel | CL | 38 | | 23 | 107 | |
| | 40 | | **SANDY CLAY (CL)** medium stiff, wet, brown, fine sand, moderate plasticity | CL | 21 | | 24 | 105 | |
| | 45 | | **SILTY CLAY (CL)** stiff, moist, gray with orangish brown mottles, moderate plasticity | CL | 26 | | 28 | 97 | |
| | 50 | | some fine sand | CL | 23 | | 21 | 109 | |
| | 55 | | trace fine gravel | CL | 31 | | 28 | 96 | |
| | 60 | | **SILTY CLAY (CL)** stiff, moist, bluish-gray to grayish brown mottled, moderate plasticity | CL | 44 | | 32 | 94 | |
| | | | Bottom of Boring at 60 feet | | | | | | |

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,980,620
Easting: 6,146,320

LA CORP.GDT 8/25/00 MV* FLL

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# EXPLORATORY BORING: EB-8

Sheet 1 of 2

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-5-00 FINISH DATE: 7-5-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 35.0 FT.

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| ELEVATION (FT) | DEPTH (FT) | MATERIAL DESCRIPTION AND REMARKS (SURFACE ELEVATION:) | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE |
|---|---|---|---|---|---|---|---|---|
| | 0 | Gravel access road with aggregate base | | | | | | |
| | | **SANDY CLAY (CL)** medium stiff to stiff, wet, brown, fine sand, low plasticity | CL | 6 | | 20 | 116 | |
| | 5 | | | 3 | | 33 | 90 | |
| | | **SILTY CLAY (CL)** very stiff, moist, grayish brown, moderate plasticity | | 32 | | 21 | 108 | |
| | 10 | | | | | | | |
| | | color grades to brown | | 35 | | 23 | 107 | |
| | 15 | | | | | | | |
| | | some fine sand | CL | 13 | | 23 | 101 | |
| | 20 | | | | | | | |
| | | | | 20 | | 24 | 99 | |
| | 25 | | | | | | | |
| | | | | 30 | | 18 | 113 | |
| | 30 | *Continued Next Page* | | | | | | |

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,979,680
Easting: 6,146,120

LA CORP.GDT 8/25/03 MV-FLL

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Environmental/Geotechnical/Engineering Services

# EXPLORATORY BORING: EB-8 Cont'd

Sheet 2 of 2

DRILL RIG: FAILING
BORING TYPE: 4-7/8" ROTARY WASH
LOGGED BY: JGH
START DATE: 7-5-00 FINISH DATE: 7-5-00

PROJECT NO: 587-12H
PROJECT: U.S. DATAPORT
LOCATION: SAN JOSE, CA
COMPLETION DEPTH: 35.0 FT.

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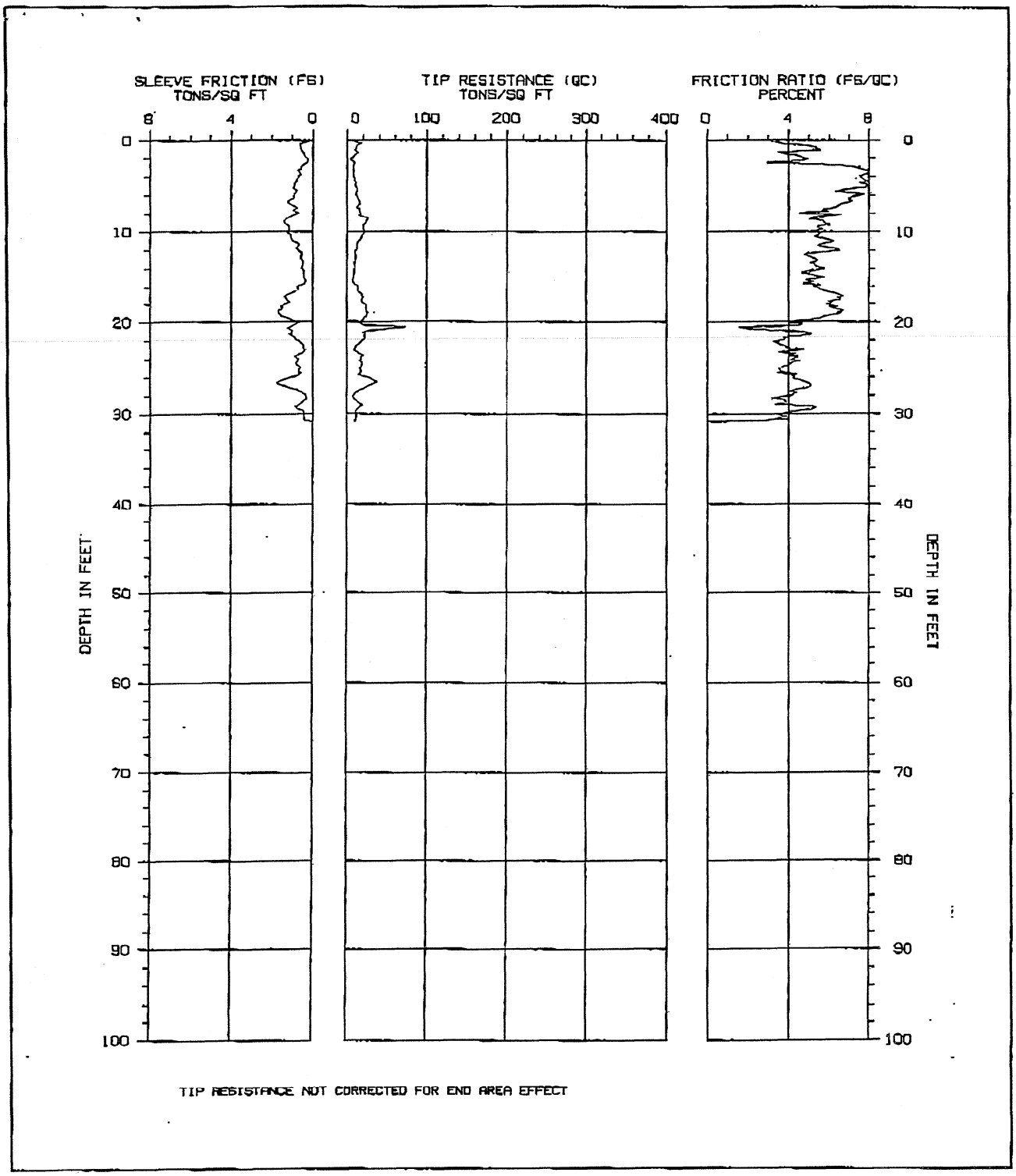
| ELEVATION (FT) | DEPTH (FT) | SOIL LEGEND | MATERIAL DESCRIPTION AND REMARKS | SOIL TYPE | PENETRATION RESISTANCE (BLOWS/FT.) | SAMPLER | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | PERCENT PASSING NO. 200 SIEVE | Undrained Shear Strength (ksf) ○ Pocket Penetrometer △ Torvane ● Unconfined Compression ▲ U-U Triaxial Compression (1.0, 2.0, 3.0, 4.0) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | **SILTY CLAY (CL)** stiff, moist, grayish brown, moderate plasticity increasing fine sand | CL | 24 | X | 19 | 111 | | △ ○ |
| | 35 | | Bottom of Boring at 35 feet | | | | | | | |
| | 40 | | | | | | | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |
| | 60 | | | | | | | | | |

GROUND WATER OBSERVATIONS:
FREE GROUNDWATER WAS NOT DETERMINED

Northing: 1,979,680
Easting: 6,146,120

LA CORP.GDT 8/25/00 MV" FLL

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services




CONE PENETRATION TEST LOG – CPT-9

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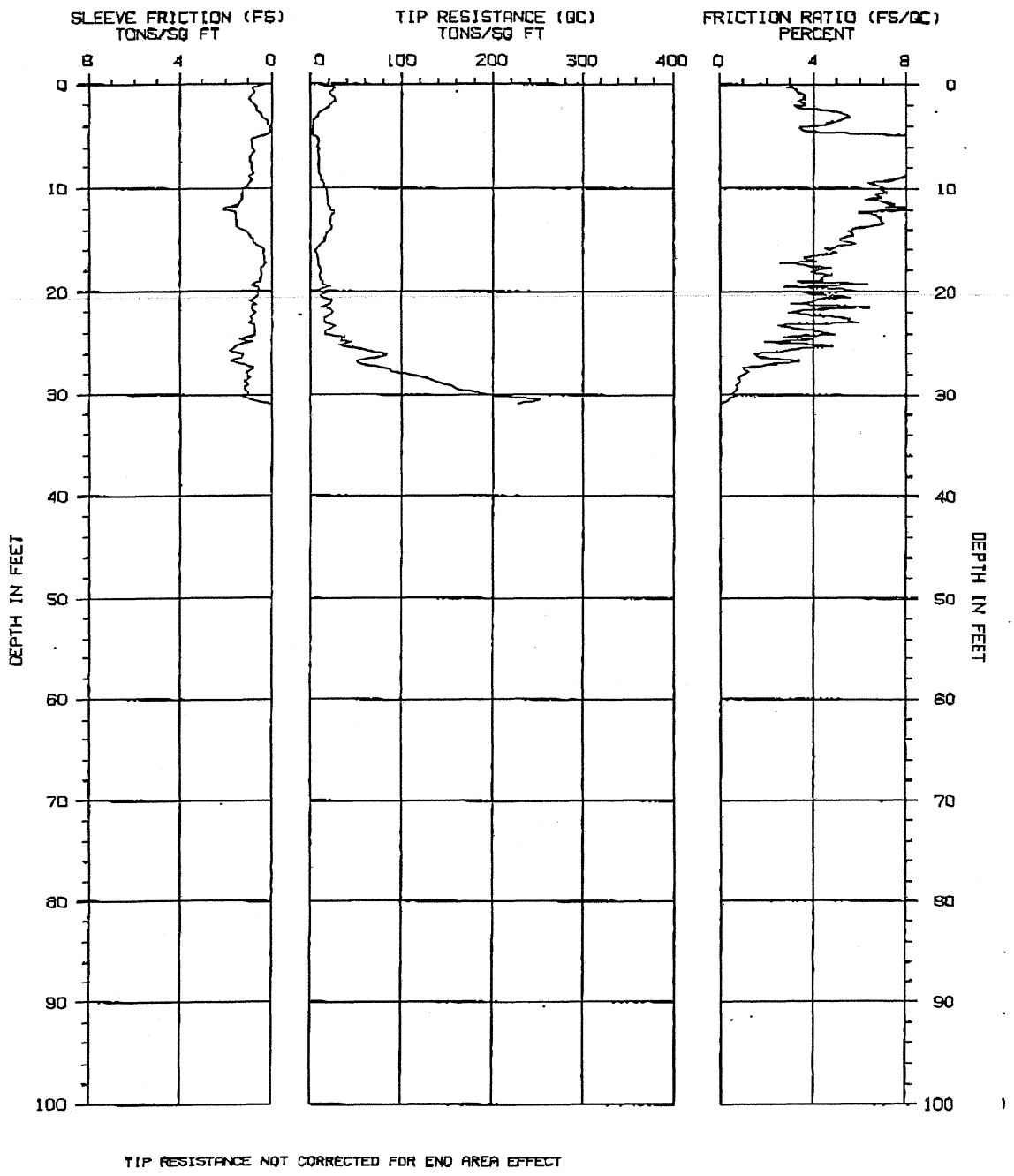


CONE PENETRATION TEST LOG - CPT-10

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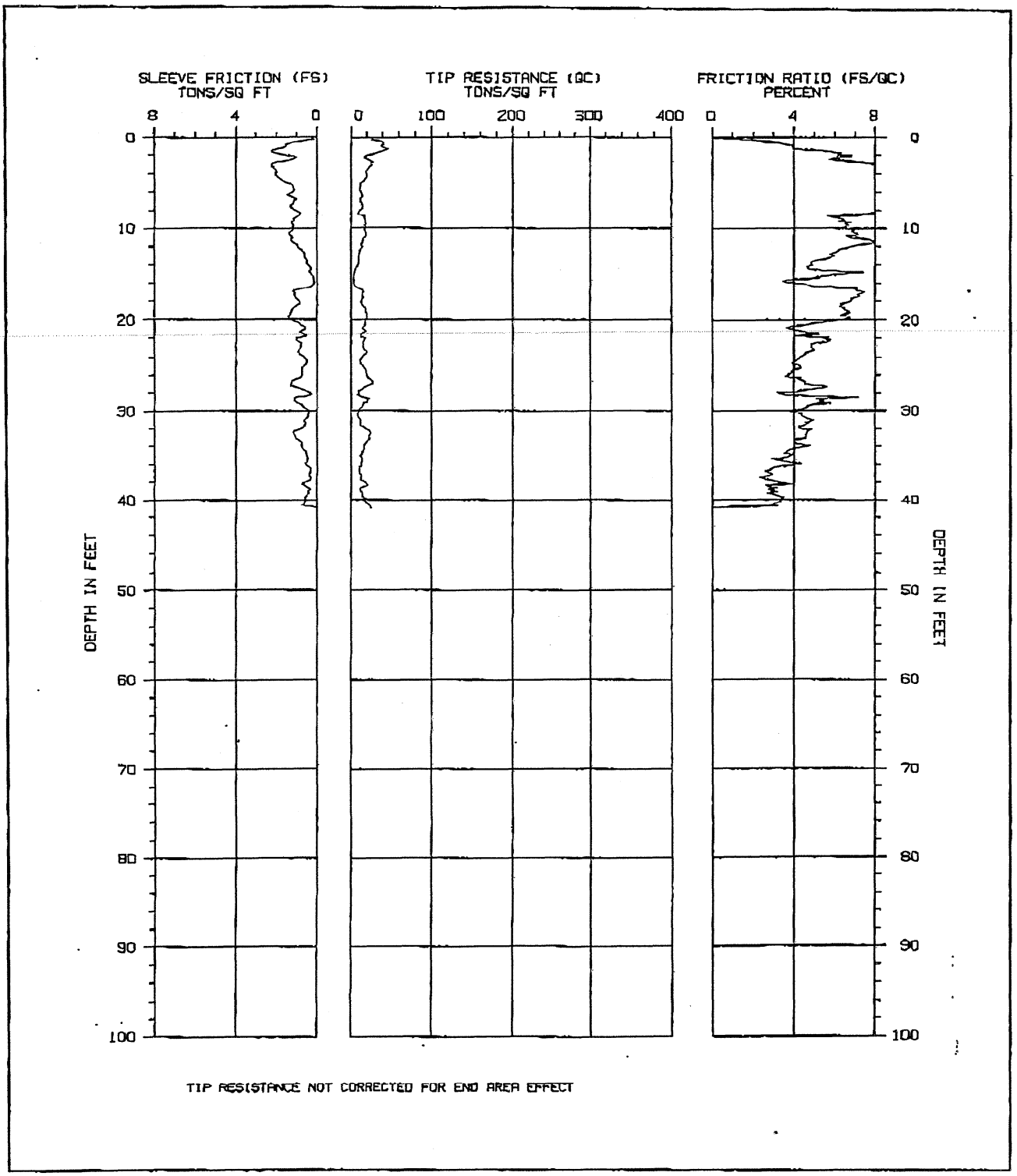


CONE PENETRATION TEST LOG – CPT-11

LOWNEY ASSOCIATES
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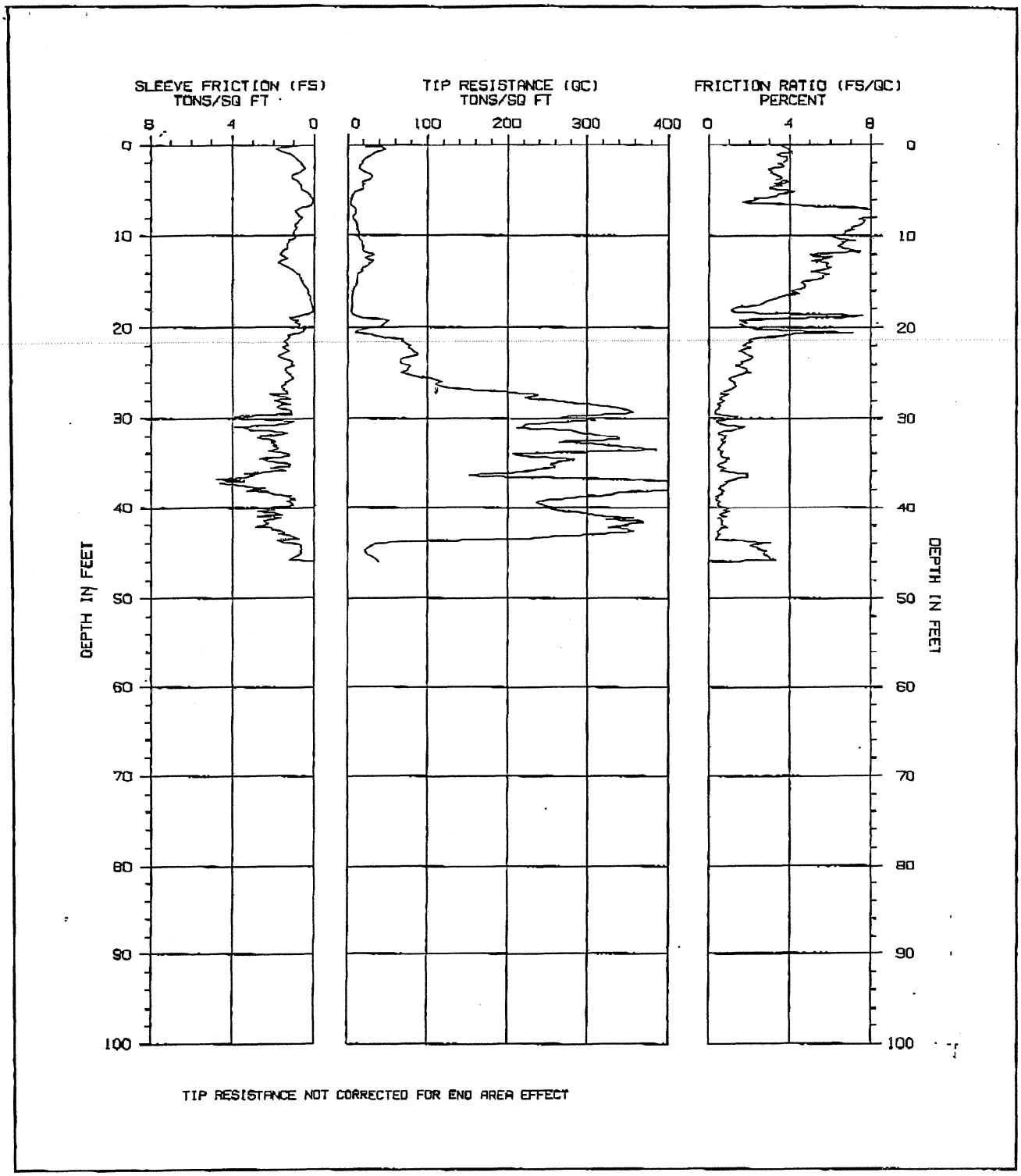


CONE PENETRATION TEST LOG – CPT-12

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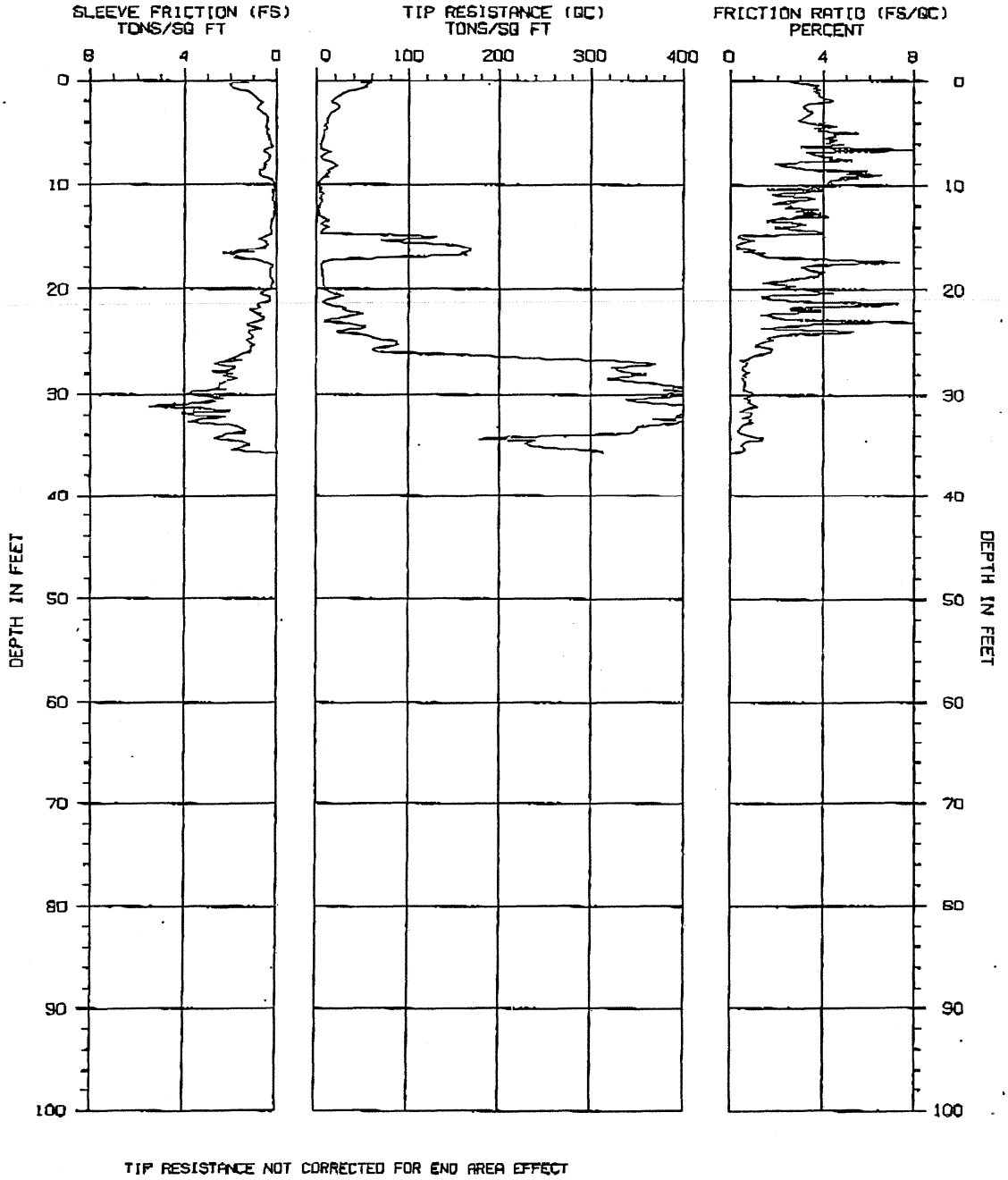


CONE PENETRATION TEST LOG – CPT-13

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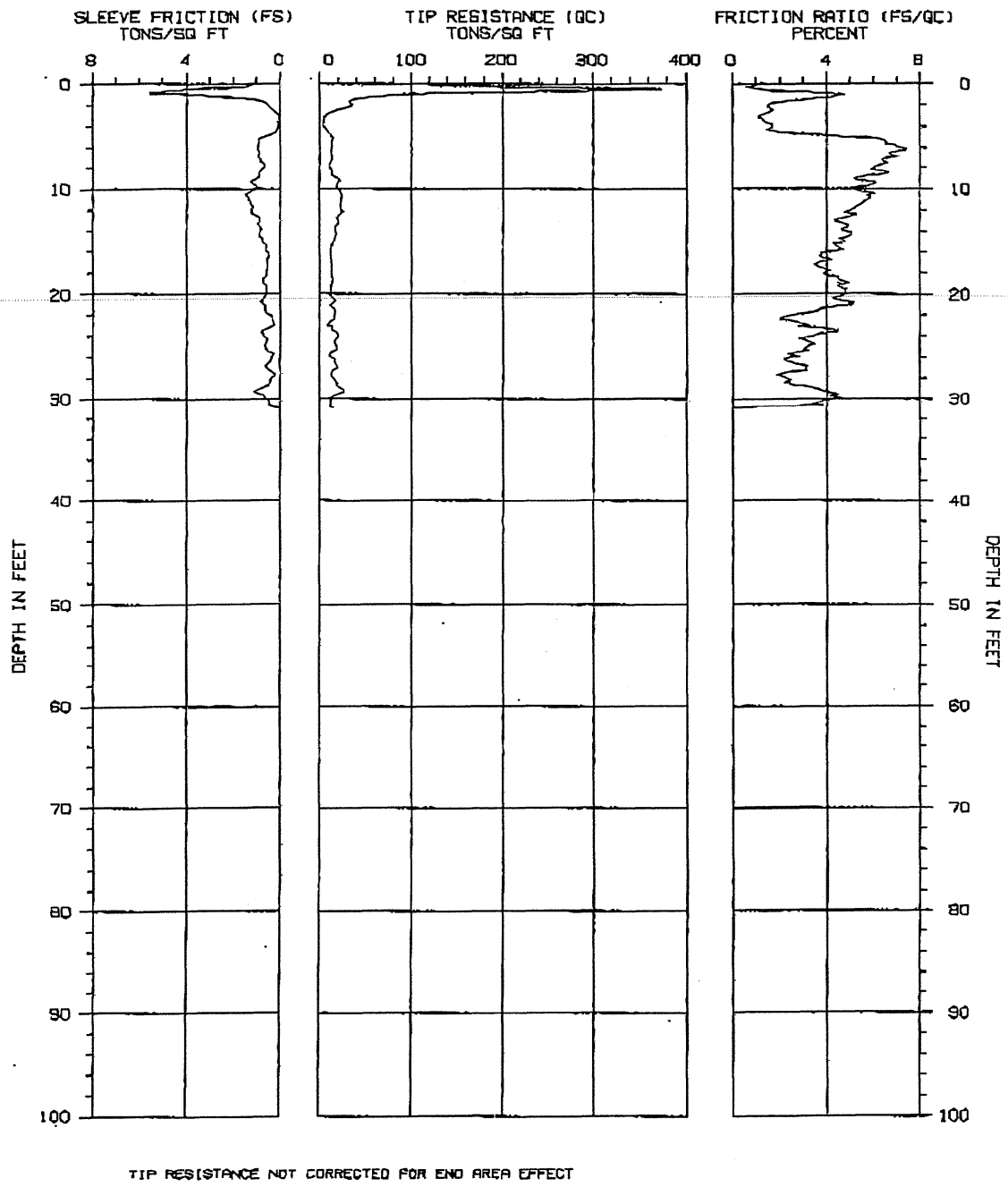
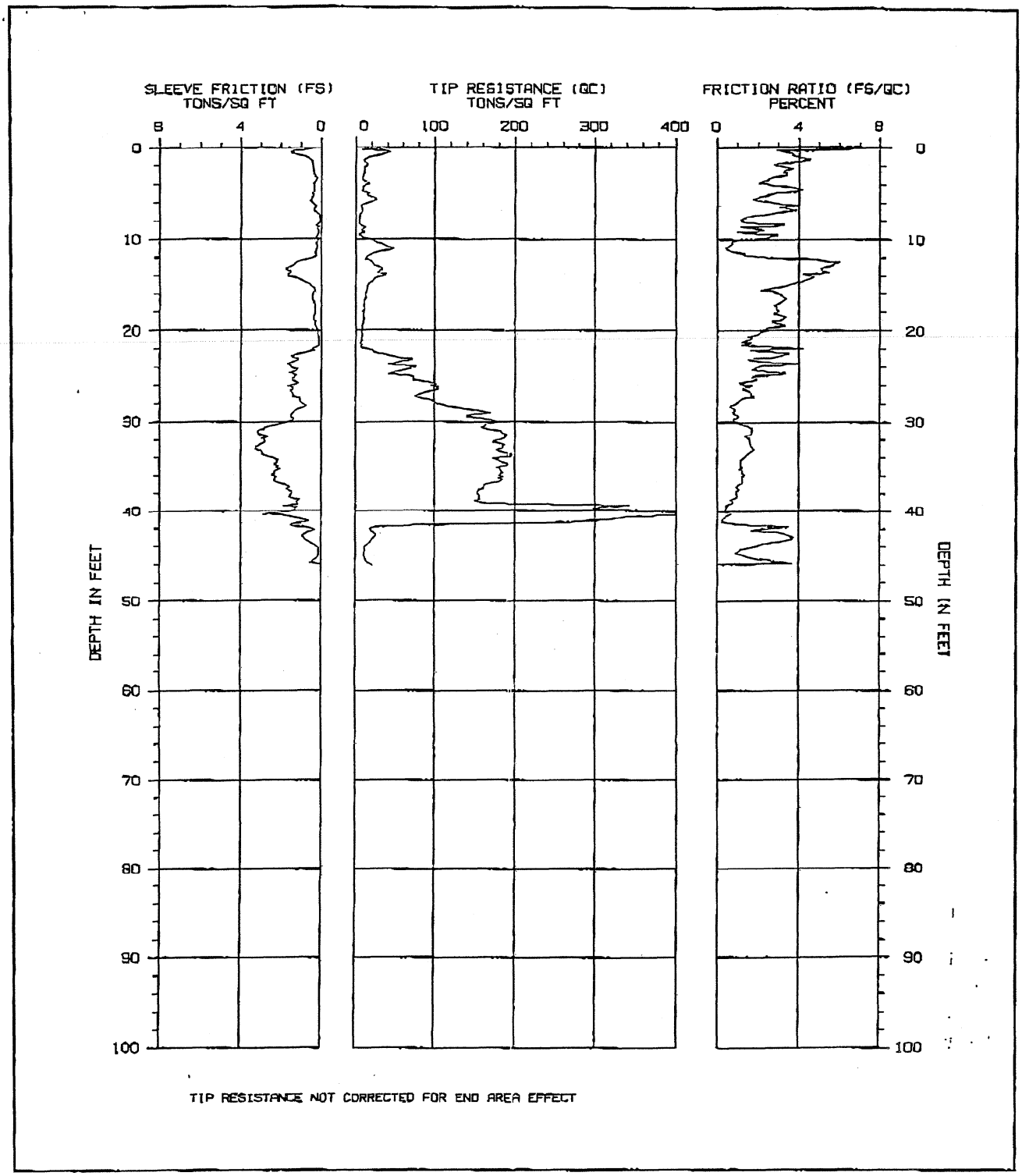



CONE PENETRATION TEST LOG - CPT-14

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services




CONE PENETRATION TEST LOG – CPT-15

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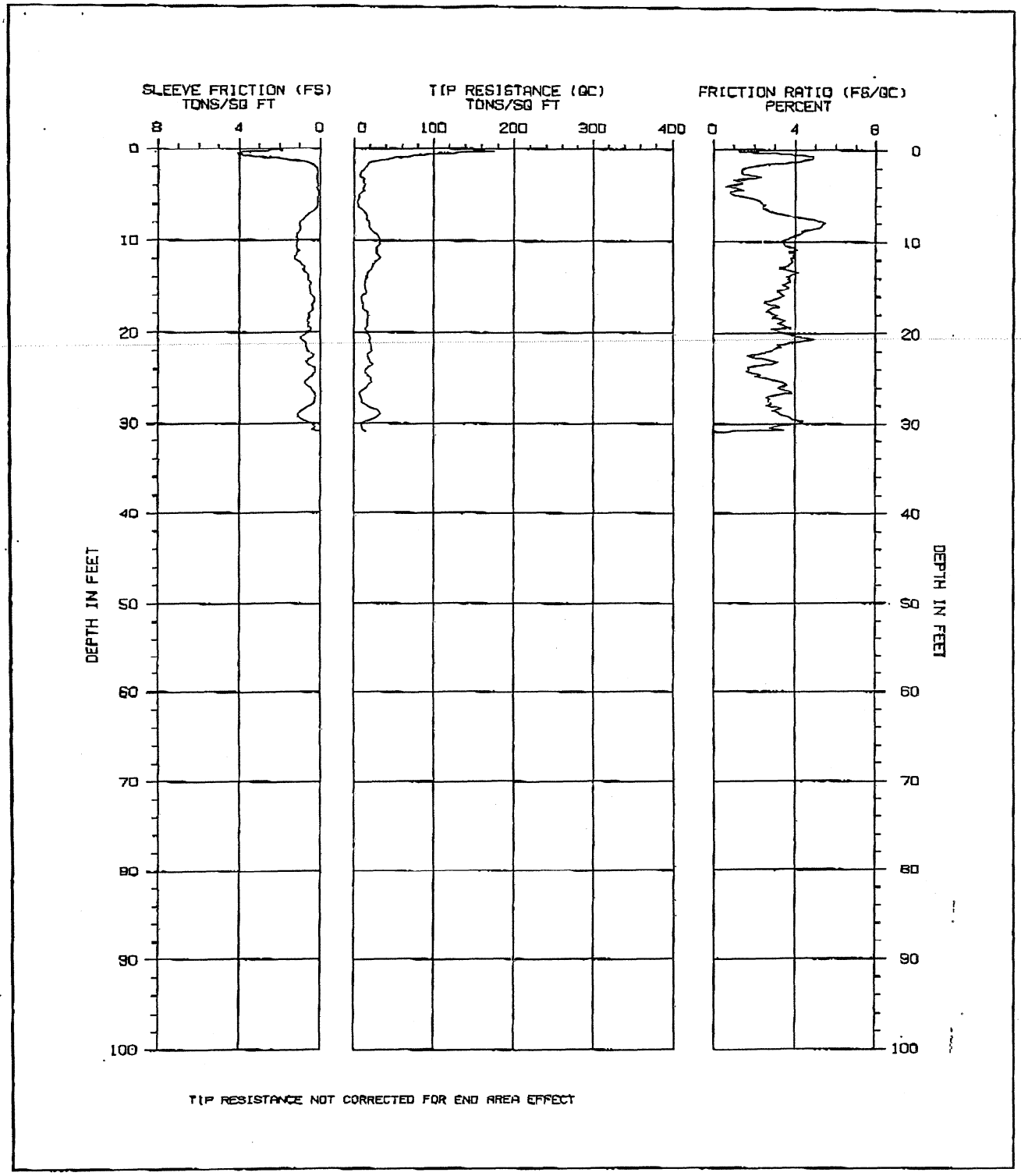


CONE PENETRATION TEST LOG – CPT–16

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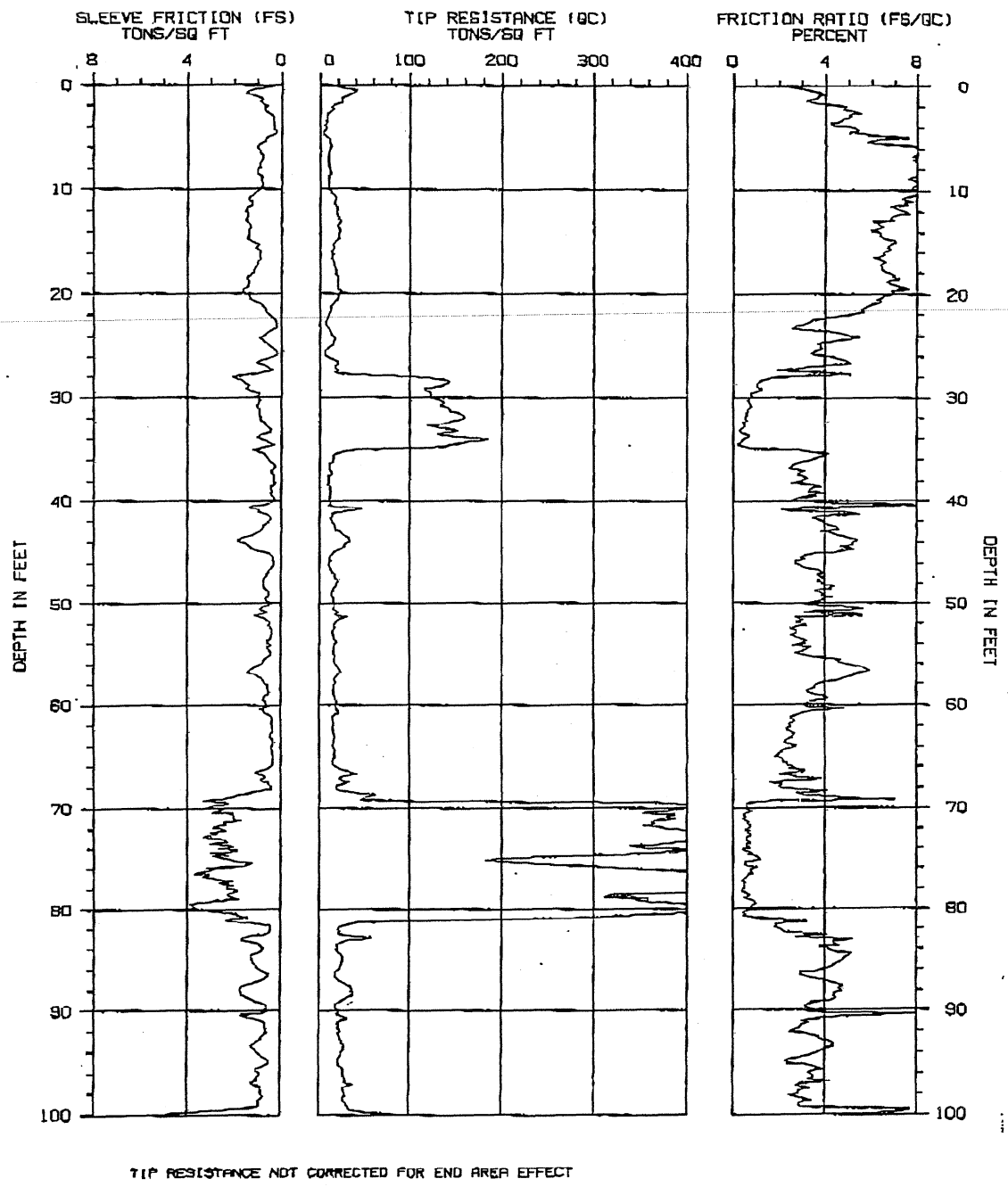




CONE PENETRATION TEST LOG - CPT-17

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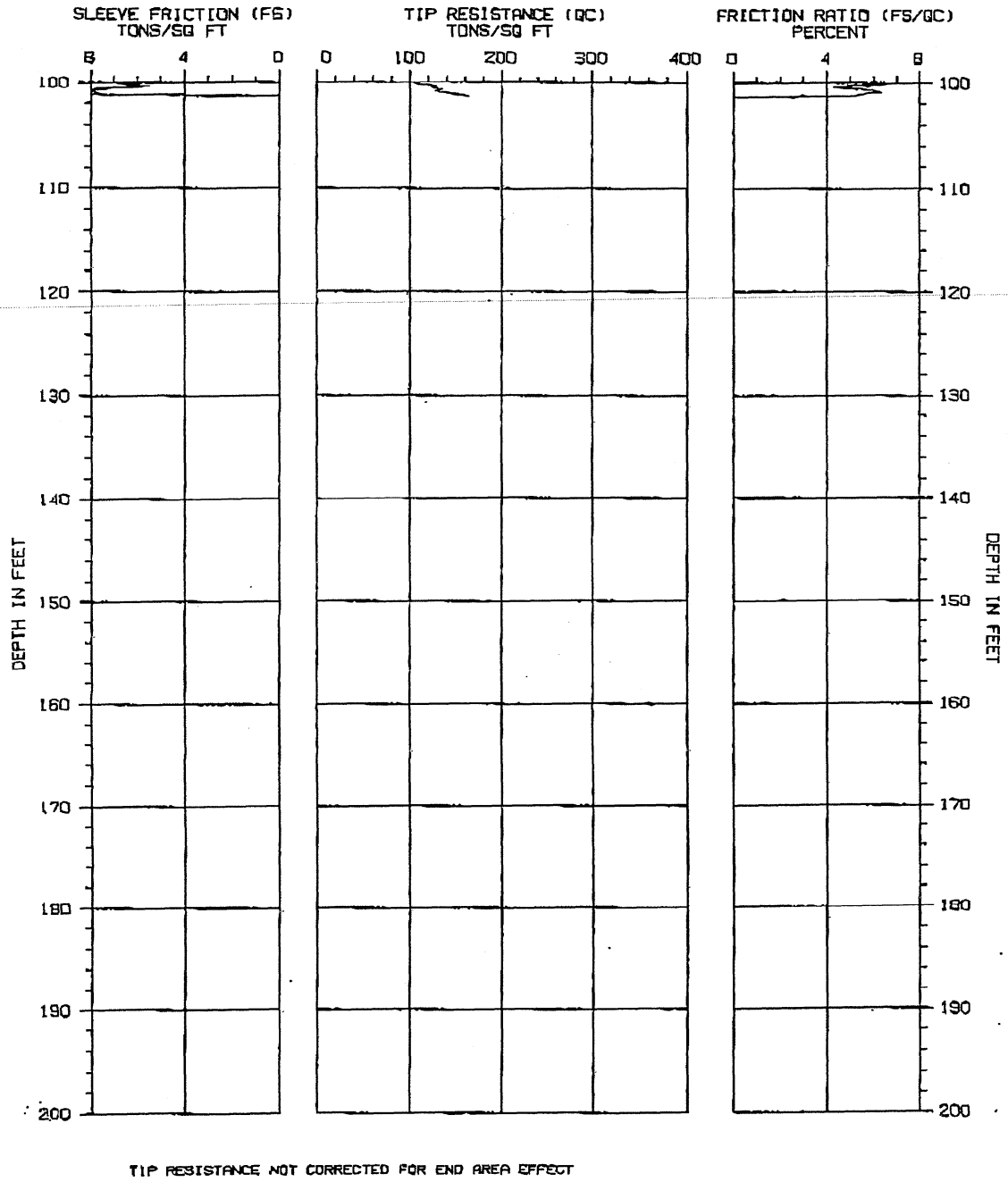
CPT-17
587-12H



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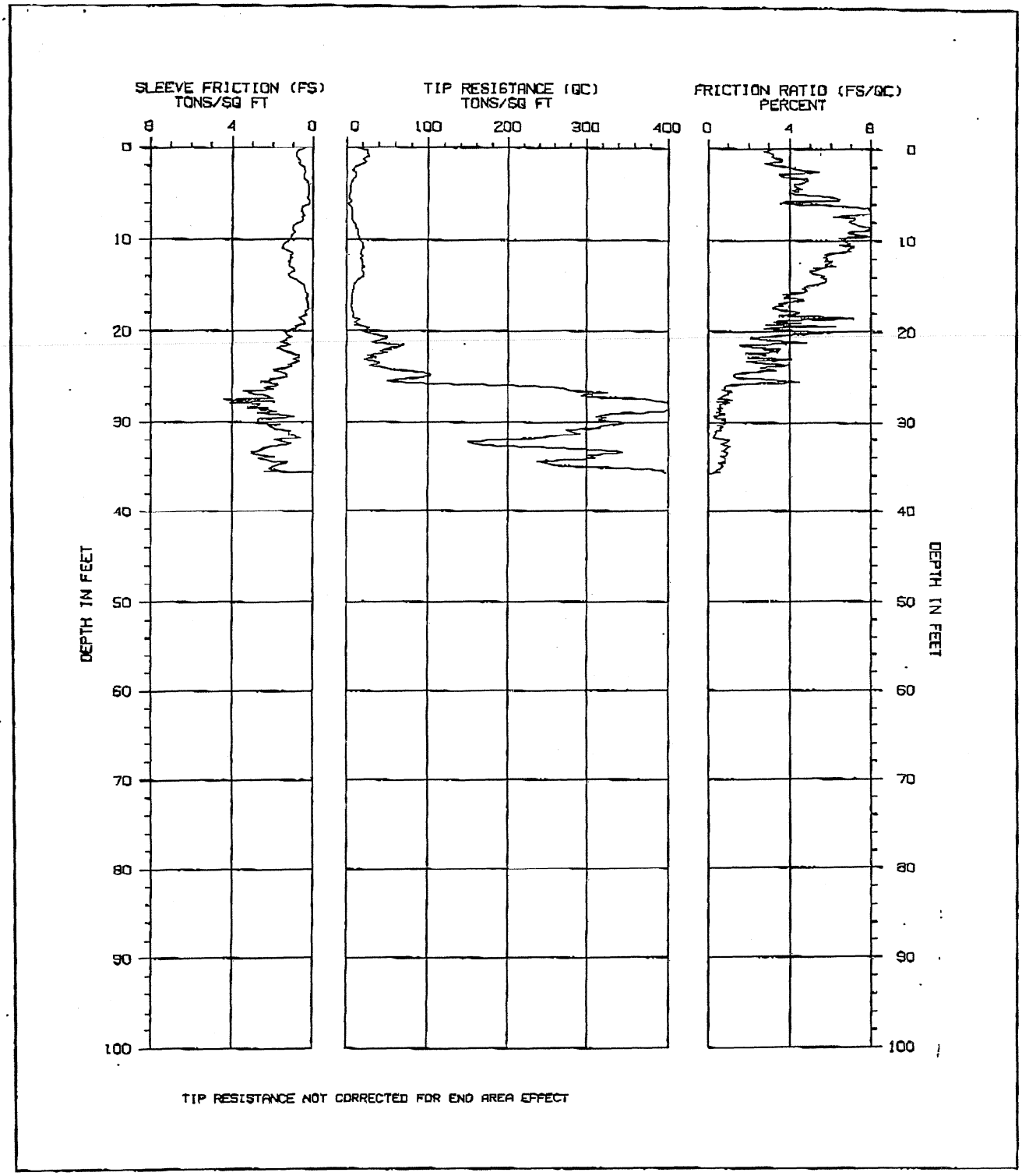


CONE PENETRATION TEST LOG - CPT-18

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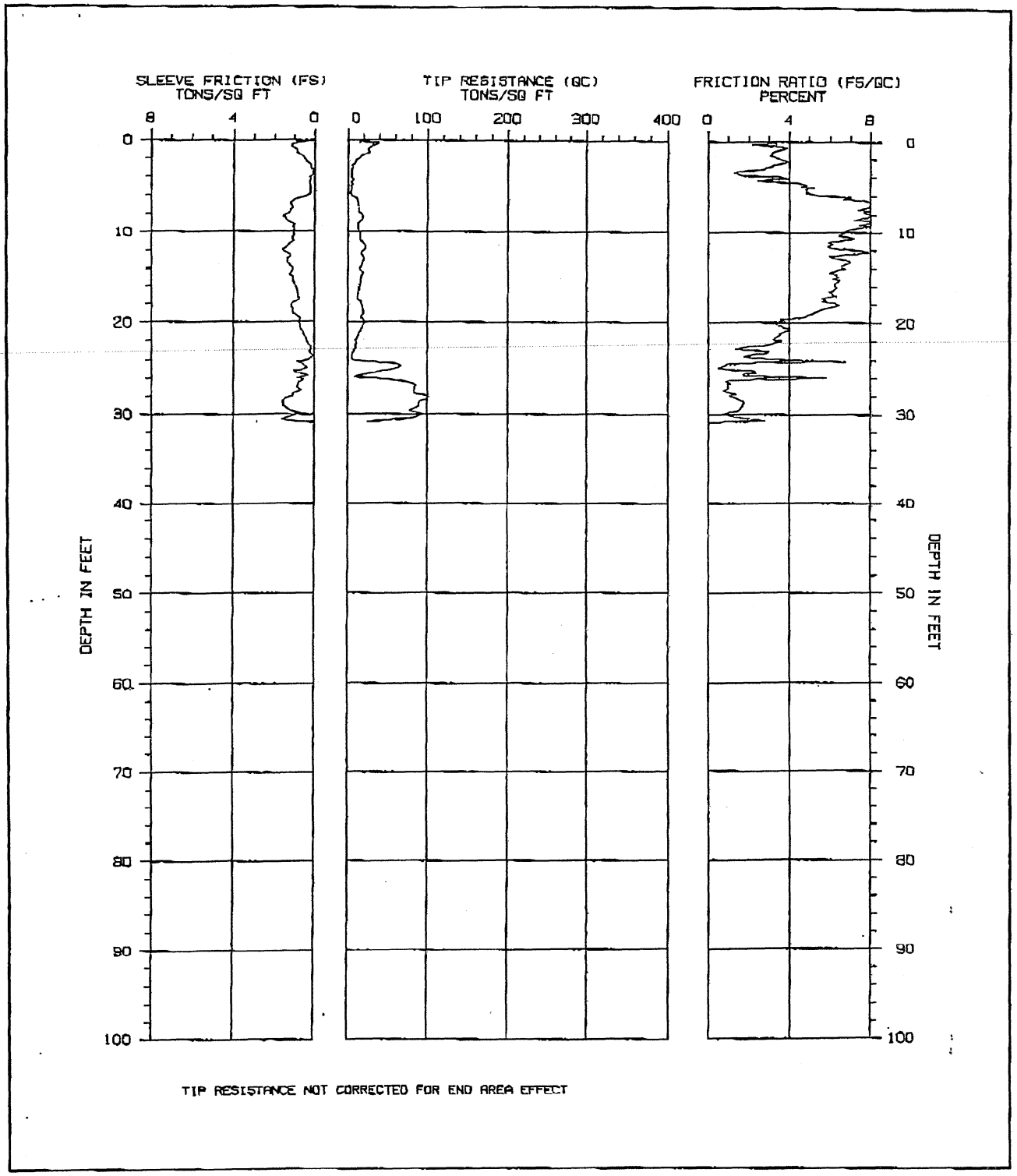


CONE PENETRATION TEST LOG – CPT–19

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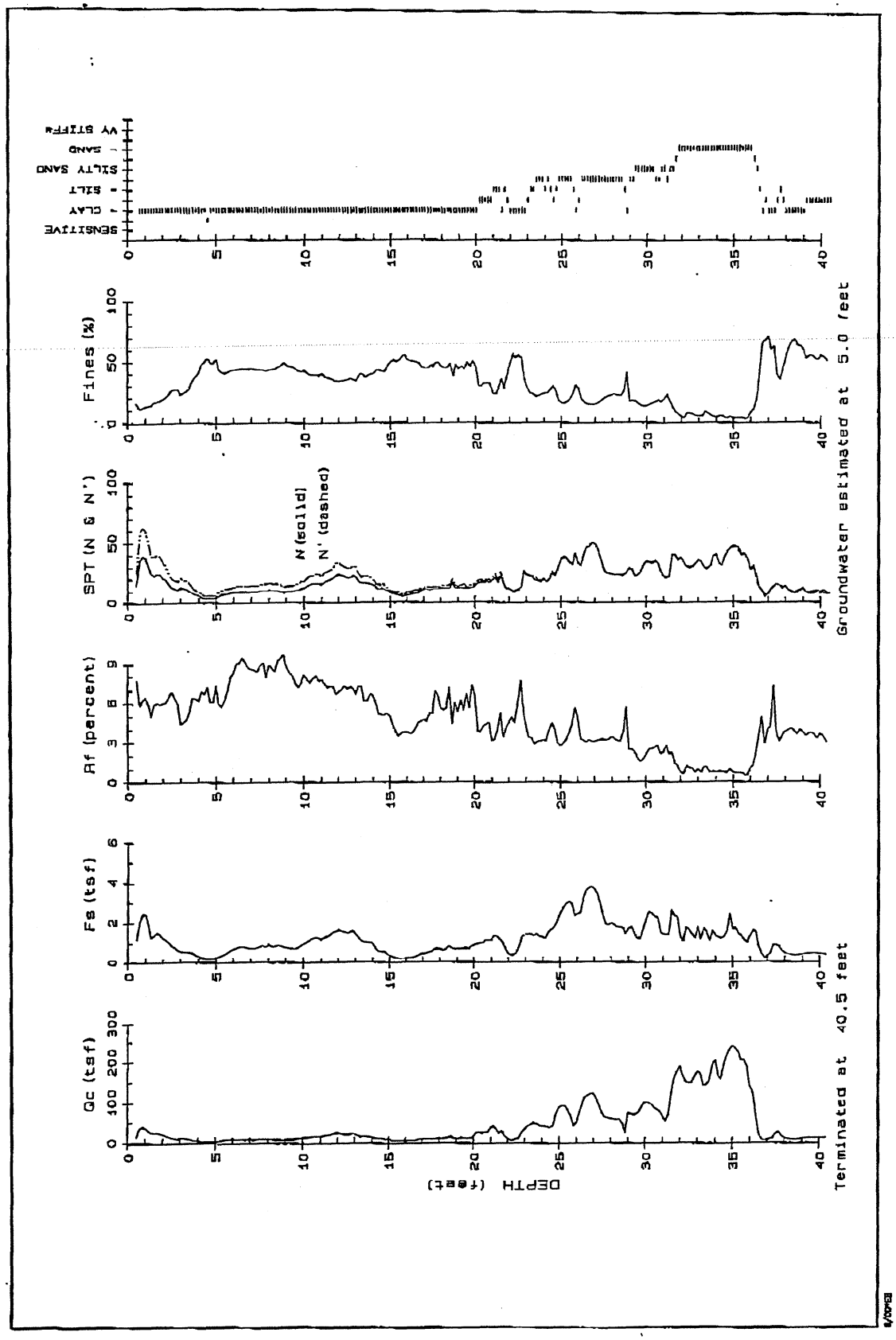
CPT–19
587–12H

CPT-20
587-12H




CONE PENETRATION TEST LOG - CPT-20

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# APPENDIX C

## LABORATORY PROGRAM

The laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site and to aid in verifying soil classification.

**Moisture Content:** The natural water content was determined (ASTM D2216) on 27 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

**Dry Densities:** In place dry density determinations (ASTM D2937) were performed on 26 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

* * * * * * * * * * * * *

# APPENDIX D
# PREVIOUS LABORATORY PROGRAM

# APPENDIX C

## LABORATORY PROGRAM

The laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site and to aid in verifying soil classification.

**Moisture Content:** The natural water content was determined (ASTM D2216) on 44 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

**Dry Densities:** In place dry density determinations (ASTM D2937) were performed on 41 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

**Plasticity Index:** One Plasticity Index determination (ASTM D4318) was performed on a sample of the subsurface soils to measure the range of water contents over which this material exhibits plasticity. The Plasticity Index was used to classify the soil in accordance with the Unified Soil Classification System and to evaluate the soil expansion potential. Results of this test are presented on the Plasticity Chart of this appendix and on the log of the boring at the appropriate sample depth.

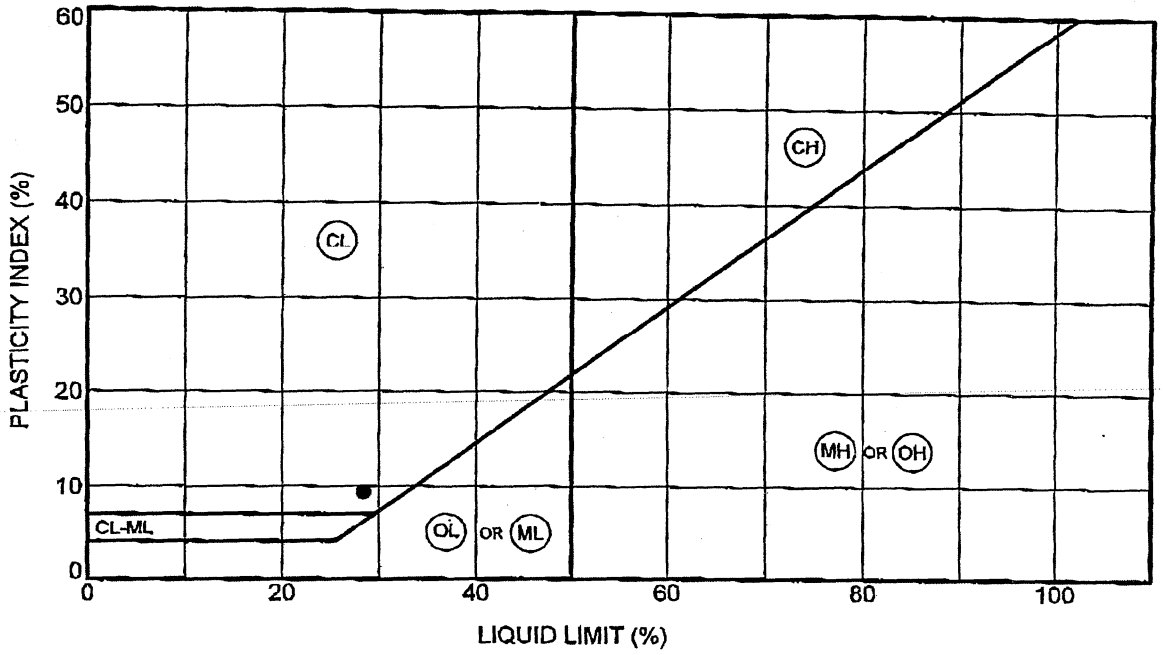
**Washed Sieve Analyses:** The percent soil fraction passing the No. 200 sieve (ASTM D1140) was determined on two samples of the subsurface soils to aid in the classification of these soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

**R-Value:** An R-value resistance test (California Test Method No. 301) was performed on a representative sample of the surface soils at the site to provide data for the pavement design. The test indicated an R-value of 28 at an exudation pressure of 300 pounds per square inch. The results of the test are presented on Table C-1.

**Table C-1. Results of R-Value Tests**

| Sample | Description of Material | Water Content (%) | Dry Density (pcf) | Exudation Pressure (psi) | "R" value | Expansion Pressure (psf) |
|---|---|---|---|---|---|---|
| | Brown Clay | 14 | 117.1 | 369 | 34 | 151 |
| B-1 | with Fine | 16.8 | 110.6 | 166 | 6 | 30 |
| | Sand | 15.4 | 112.4 | 211 | 18 | 65 |

* * * * * * * * * * * * *




| Symbol | Boring No. | Depth | Natural Water Content | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Passing No. 200 Sieve | Unified Soil Classification Description |
|---|---|---|---|---|---|---|---|---|
| ● | EB-6 | 2.0 | | 28 | 19 | 9 | | SILTY CLAY (CL) |

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**PLASTICITY CHART AND DATA**

Project: U.S. DATAPORT

Location: SAN JOSE, CA

Project No.: 587-12H

LA CORP.GDT 8/25/00 MV-FLL

**LOWNEY ASSOCIATES**
Environmental/Geotechnical/Engineering Services

Mountain View
Oakland
San Ramon
Fullerton

August 1, 2001
587-121

Mr. Charles J. Vosicka, P.E.
**CALPINE CORPORATION**
**c/o WRMS ENGINEERING**
1556 Parkside Drive
Walnut Creek, California 94596

**RE: SUPPLEMENTAL GEOTECHNICAL RECOMMENDATIONS NORTH SAN JOSE ENERGY CENTER SAN JOSE, CALIFORNIA**

Dear Mr. Vosicka:

This letter provides approximate corrosion potential evaluation for the above referenced project. As you know, we performed a geotechnical investigation for the site and presented the results in our report titled "Geotechnical Investigation, North San Jose Energy Center, San Jose, California" dated July 23, 2001. We also provide supplemental foundation recommendations in our letter dated July 25, 2001.

To evaluate the corrosion potential of the subsurface soils, we performed two in-situ resistivity tests using the Wenner four-point method and submitted four samples collect during our site investigation to an analytical laboratory for resistivity (100% saturation), pH, soluble sulfate and chloride content testing. The results of these tests are summarized in Table 1.

**Table 1. Results of Corrosivity Testing**

| Location No./Sample | Depth (feet) | Chloride (mg/kg) | Sulfate (mg/kg) | PH | Resistivity (ohm-cm) | Estimated Corrosivity Based on Resistivity | Estimated Corrosivity Based on Sulfates |
|---|---|---|---|---|---|---|---|
| W-1 | 2.5 | | | | 3,112 | Moderately Corrosive | |
| W-1 | 5.0 | | | | 1,383 | Severely Corrosive | |
| W-1 | 7.5 | | | | 958 | Severely Corrosive | |
| W-1 | 10.0 | | | | 718 | Very Severely Corrosive | |
| W-1 | 15 | | | | 410 | Very Severely Corrosive | |
| W-2 | 2.5 | | | | 4,166 | Moderately Corrosive | |
| W-2 | 5.0 | | | | 2,192 | Severely Corrosive | |

(continued)

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**Table 1. Results of Corrosivity Testing**
(continued)

| Location No./Sample | Depth (feet) | Chloride (mg/kg) | Sulfate (mg/kg) | PH | Resistivity (ohm-cm) | Estimated Corrosivity Based on Resistivity | Estimated Corrosivity Based on Sulfates |
|---|---|---|---|---|---|---|---|
| W-2 | 7.5 | | | | 1,436 | Severely Corrosive | |
| W-2 | 10.0 | | | | 479 | Very Severely Corrosive | |
| W-2 | 15 | | | | 575 | Very Severely Corrosive | |
| EB23-2B | 4.0 | N.D. | 53 | 8.2 | 1,300 | Severely Corrosive | Negligible |
| EB23-4A | 8.5 | N.D. | 140 | 6.7 | 910 | Very Severely Corrosive | Negligible |
| EB24-2B | 4.0 | 100 | 820 | 8.2 | 400 | Very Severely Corrosive | Negligible |
| EB-24-5A | 13.5 | 54 | 300 | 8.5 | 710 | Very Severely Corrosive | Negligible |

Note: mg/kg – milligram per kilogram
N.D. – None Detected

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on the findings of studies presented in ASTM STP 1013 titled "Effects of Soil Characteristics on Corrosion" (February, 1989), the approximate relationship between soil resistivity and soil corrosiveness was developed as shown in Table 2.

**Table 2. Relationship Between Soil Resistivity and Soil Corrosivity**

| Soil Resistivity (ohm-cm) | Classification of Soil Corrosiveness |
|---|---|
| 0 to 900 | Very Severe Corrosion |
| 900 to 2,300 | Severely Corrosive |
| 2,300 to 5,000 | Moderately Corrosive |
| 5,000 to 10,000 | Mildly Corrosive |
| 10,000 to >100,000 | Very Mildly Corrosive |

Chloride and sulfate ion concentrations, and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This

reaction is accompanied by expansion and eventual disruption of the concrete matrix. A potentially high sulfate content could also cause corrosion of the reinforcing steel in concrete. The 1997 Uniform Building Code (UBC) Table No. 19-A-4 provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 3.

**Table 3. Relationship Between Sulfate Concentration and Sulfate Exposure (UBC Table No. 19-A-4)**

| Water-Soluble Sulfate ($SO_4$) in soil, mg/kg | Sulfate Exposure |
|---|---|
| 0 to 1,000 | Negligible |
| 1,000 to 2,000 | Moderate[1] |
| 2,000 to 20,000 | Severe |
| over 20,000 | Very Severe |

[1]= seawater

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.

As shown in Table 1, soil resistivity results range from 410 to 4,166 ohm-centimeters. In our opinion, based on the results shown in Table 1 and the resistivity correlations presented in Table 2, it appears that the corrosion potential to buried metallic improvements may be characterized as moderately corrosive in the upper 2 feet increasing to severely corrosive to very corrosive at depths ranging from approximately 2 to 15 feet. Therefore, we recommend that you retain a corrosion engineer to develop detailed corrosion protection recommendations.

Based on our previous experience, laboratory test results, and Table 2, in our opinion, sulfate exposure to Portland Cement Concrete (PCC) may be considered negligible for surficial soils within the upper 15 feet at the site. Therefore, no special precautions would be required based on the UBC. If increased protection from sulfate exposure is desired, we recommend using a Type II cement and a low water/cement ratio in your mix design.

We hope this provide you with the information you need at this time. If you have any questions concerning this letter, please contact our office.

Very truly yours,

LOWNEY ASSOCIATES

REGISTERED PROFESSIONAL ENGINEER
DANH T. TRAN
No. 59705
Exp. 12/31/2003
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STATE OF CALIFORNIA

Danh T. Tran, P.E.
Project Engineer

SML:DT:sct

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**LOWNEY**ASSOCIATES
Environmental/Geotechnical/Engineering Services

Mountain View
Oakland
San Ramon
Fullerton

July 25, 2001
587-121

Mr. Chuck Vosicka
**CALPINE CORPORATION**
**c/o WRMS ENGINEERING**
1556 Parkside Drive
Walnut Creek, California 94596

**RE: SUPPLEMENTAL FOUNDATION RECOMMENDATIONS**
**NORTH SAN JOSE ENERGY CENTER**
**SAN JOSE, CALIFORNIA**

Dear Mr. Vosicka:

As requested, this letter will provide supplemental foundation recommendations for the proposed energy center as referenced above. As you know, we completed a geotechnical investigation for the site and presented the results in our report titled "Geotechnical Investigation, North San Jose Energy Center, San Jose, California" dated July 23, 2001.

## General

As discussed in the above referenced report, the project will consist of a new energy center. When completed, it will consist of two recycled water storage tanks, cooling towers, gas turbine generators and transformers, a 115kv switchyard building and control room, a service building, and other pertinent equipment and structures. Based on the information provided to us, structural loads on the order of 180 to 500 kips are anticipated for new equipment dead loads. Based on our recent conversation with you, we understand that piles also are being considered as foundation support for some of the new structures. The following sections include or pile foundation recommendations.

## Pile Foundations

As an alternative to shallow foundations, the new energy center structures may be supported on pile foundations. For your project forward planning, we have computed allowable vertical and lateral capacities for 12- and 14-inch-square precast concrete piles. Pile support is expected to come from skin friction in the clays underlining the site.

Vertical capacity for a 12- and 14-inch-square friction pile is presented on the attached Figure 1. For our analysis, we assumed an existing site grade equal to approximately Elevation 15 feet with the bottom of the pile cap at Elevation 11 feet (Datum unspecified). The indicated capacities shown on Figure 1 are for dead plus live loads. Dead loads should not exceed two-thirds of the computed capacity. Uplift loads also should not exceed the computed downward capacities. The pile capacities shown may be increased by one-third under transient loading, including wind and seismic.

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For example, as shown on Figure 1, a ~~50~~ 55 foot long, 14-inch-square pile would have an allowable capacity of approximately 120 kips. Pile Capacity should not exceed the structural capacity of the pile, which is typically estimated at 250 and 334 kips for 12-inch and 14-inch-square precast, prestressed concrete piles (Santa Fe-Pomeroy, Inc.), respectively.

To effectively reduce pile group effects and a reduction in individual pile capacity, piles should be located with a minimum center-to-center spacing of three times the pile width. Structural loads and the number and configuration of pile groups are not known at this time. Based on the maximum allowable loads for a single pile, we estimate total settlements of less than 1-inch to mobilize allowable static capacities. Therefore, post-construction pile foundation settlements of less than ½-inch should be considered. Differential settlement between adjacent piles will be dependent on the final structural loading, pile spacing, and group size. Once final loads and pile groups are determined, we should review the foundation plans and structural loads to more accurately estimate foundation settlements.

### Predrilling

Our borings and CPTs did not encounter any potential obstructions within the upper 10 to 20 feet at the site. However, based on our site reconnaissance, fill debris and/or other obstructions may exist in the southern corner portion of the site. If obstructions are encountered and cannot be removed, predrilling may be required. Predrilling will minimized damage to the piles and may potentially reduce noise and vibrations during pile driving. Predrilled holes should have a diameter no larger in diameter than the least dimension of the pile. Predrilled holes exceeding the least dimension of the pile should have the annulus between the pile and the oversized predrilled hole backfilled with a sand slurry or other approved material.

### Lateral Loads on Piles

Lateral load resistance for the pile-supported structures may be developed through pile bending/soil interaction. The magnitude of the lateral load resistance is dependent upon many factors, including pile stiffness and embedment length, conditions of fixity at the pile cap, the physical properties of the surrounding soils, the tolerable top deflection, and the yield moment capacity of the pile.

Driven concrete piles would gain their lateral support primarily from the stiff to very stiff clayey soils underlining the site. To estimate lateral capacities of the piles, we used the computer program LPILE that models the soil response in the form of load-deflection (p-y) curves to estimate the capacity of the piles to resist the expected lateral loads. Table 1 shows the estimated lateral load capacities for 12- and 14-inch-square concrete piles. Lateral loads on piles will be governed by the maximum allowable bending moments, which are approximately 26 and 38 kip-feet for typical 12- and 14-inch-square piles (Santa Fe-Pomeroy, Inc.).

**TABLE 1. Ultimate Lateral Pile Capacities - Bottom of Pile Cap Assumed to be at Approximately Elevation 11 Feet[2]**

| Lateral Pile Capacities – Free Head Condition | | | |
|---|---|---|---|
| | | 12-inch Piles | 14-inch Piles |
| ¼-inch Deflection | Maximum Shear (kips) | 13.1 | 17.0 |
| | Maximum Moment[1] (kip-ft) | 33.8 | 48.5 |
| | Depth to Maximum Moment[1] (feet) | 4.2 | 5.8 |
| | Depth to Zero Moment[1] (feet) | 11.5 | 12.8 |
| | Depth to Zero Deflection[1] (feet) | 8.0 | 9.0 |
| ½-inch Deflection | Maximum Shear (kips) | 18.3 | 23.5 |
| | Maximum Moment[1] (kip-ft) | 53.5 | 77.3 |
| | Depth to Maximum Moment[1] (feet) | 5.5 | 6.5 |
| | Depth to Zero Moment[1] (feet) | 13.0 | 14.5 |
| | Depth to Zero Deflection[1] (feet) | 9.2 | 10.5 |

Note: [1]Assumes lateral loads that will cause ¼- and ½-inch of deflection.
[2]Datum unspecified on plans provided.
[3]THESE VALUES SHOULD BE LIMITED TO APPROXIMATELY 26 AND 38 KIP-FEET FOR TYPICAL 12- AND 14-INCH-SQUARE PILES.

The above results represent the probable response of the piles under short-term loading conditions and include no factor-of-safety. Suitable factors of safety should be selected on the basis of the type of loading. Pile stiffnesses (EI) of $7.3 \times 10^9$ lb-in$^2$ and $1.4 \times 10^{10}$ lb-in$^2$ have been assumed in our calculations of load deflection for 12- and 14-inch piles, respectively. A minimum compressive strength of 6,000 pounds per square inch was assumed for concrete modulus calculations. If pile stiffness varies by no more than 20 percent than that reported above, load deflection characteristics may be approximated by multiplying the deflection values by the ratio of the pile stiffness (EI). The response of piles with significantly different stiffnesses should be evaluated by us.

The above lateral load characteristics are for single piles and may not be characteristic of the lateral load capacity of piles in a group. Group effects may reduce the allowable lateral load for a given deflection. On a preliminary basis, we recommend that a pile group efficiency of 0.75 be used for pile groups 2-by-2 or smaller. For pile groups larger than 2-by-2, we recommend that we review the final pile group layout and structural loads to further evaluate the pile group efficiency under lateral loading.

### Passive Resistance Against Pile Caps and Grade Beams

If desired, the passive resistance of soil against pile caps and grade beams poured neat against site fills may be used for lateral resistance. We recommend that an ultimate passive pressure based on an equivalent fluid pressure of 400 pounds per cubic foot (pcf) be used in design.

### Indicator Pile Program

It has been our experience in highly variable alluvial deposits that an indicator pile program can considerably reduce uncertainties associated with production pile driving. An indicator pile program will also provide a better means to confirm the limits of layers where high driving resistance may be encountered, and to more accurately estimate final pile lengths and reduce costly production pile cutoffs and cast lengths. We also recommend that a Pile Driving Analyzer (PDA) be used during indicator driving to determine approximate pile capacities through dynamic analyses. PDA monitoring would be especially beneficial for checking tip capacities under high driving resistance and for evaluating pile integrity on any piles suspected of being damaged during driving. If high driving resistance is encountered during indicator pile installation, we can estimate the capacity at that tip elevation and develop realistic driving criteria to facilitate production pile driving. PDA monitoring may also allow a reduction in production pile lengths thus possibly reducing the length or total number of piles.

On a preliminary basis, we recommend that 10 to 20 indicator piles be installed across the proposed project site before the final pile casting lengths are selected. The indicator piles should be driven with the same equipment that will be used to drive the production piles. We should review or select the indicator pile locations when structural drawings are made available. The indicator pile cast lengths should be based on the design lengths required to meet the desired capacity. It is possible that some indicator piles will not be driven their entire length and will require cutting to provide the desired butt elevation. Indicator piles can be used for support of the structure and, therefore, should be located appropriately. In addition, we also suggest that one or more spare piles be delivered to the site during the indicator program.

### Production Pile Installation

We recommend that a pile hammer capable of delivering a minimum rated driving energy of 60,000 foot-pounds be used. The same hammer should be used for both the indicator piles and the production piles. The pile contractor should perform wave equation analysis to confirm the compatibility and driveability of the pile driving system with the pile type and soil conditions at the site. We should review the driveability results prior to mobilization of pile driving equipment to the site for indicator and production pile installation.

Since the piles are designed for skin friction support, they should be driven to the desired tip elevation. If difficult driving conditions are encountered, we should review the driving record and evaluate potential tip capacity to allow reduction in pile length. PDA

monitoring would be especially beneficial for checking restrike capacities of any piles short of required tip elevation or for evaluating pile integrity on any piles suspected of being damaged during driving. We should observe all indicator and production pile installation on a full-time basis.

## Closure

This letter has been prepared for the sole use of Calpine Corporation and WRMS Engineering, specifically for design of the North San Jose Energy Center project to be located in San Jose, California. In addition, this letter was prepared to supplement the findings and recommendations provided our July 23, 2001 geotechnical report. This report should be referred to for additional recommendations not given in this letter. The opinions presented in this letter have been formulated in accordance with generally accepted geotechnical engineering practices that exist in the San Francisco Bay Area at the time this report was prepared. No other warranty, expressed or implied, is made or should be inferred. We are not responsible for data presented by others.

Very truly yours,

LOWNEY ASSOCIATES

REGISTERED PROFESSIONAL ENGINEER
DANH. T. TRAN
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Danh T. Tran, P.E.
Project Engineer

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Attachments: Figure 1- Vertical Pile Capacities
CPT Logs from Previous Investigations

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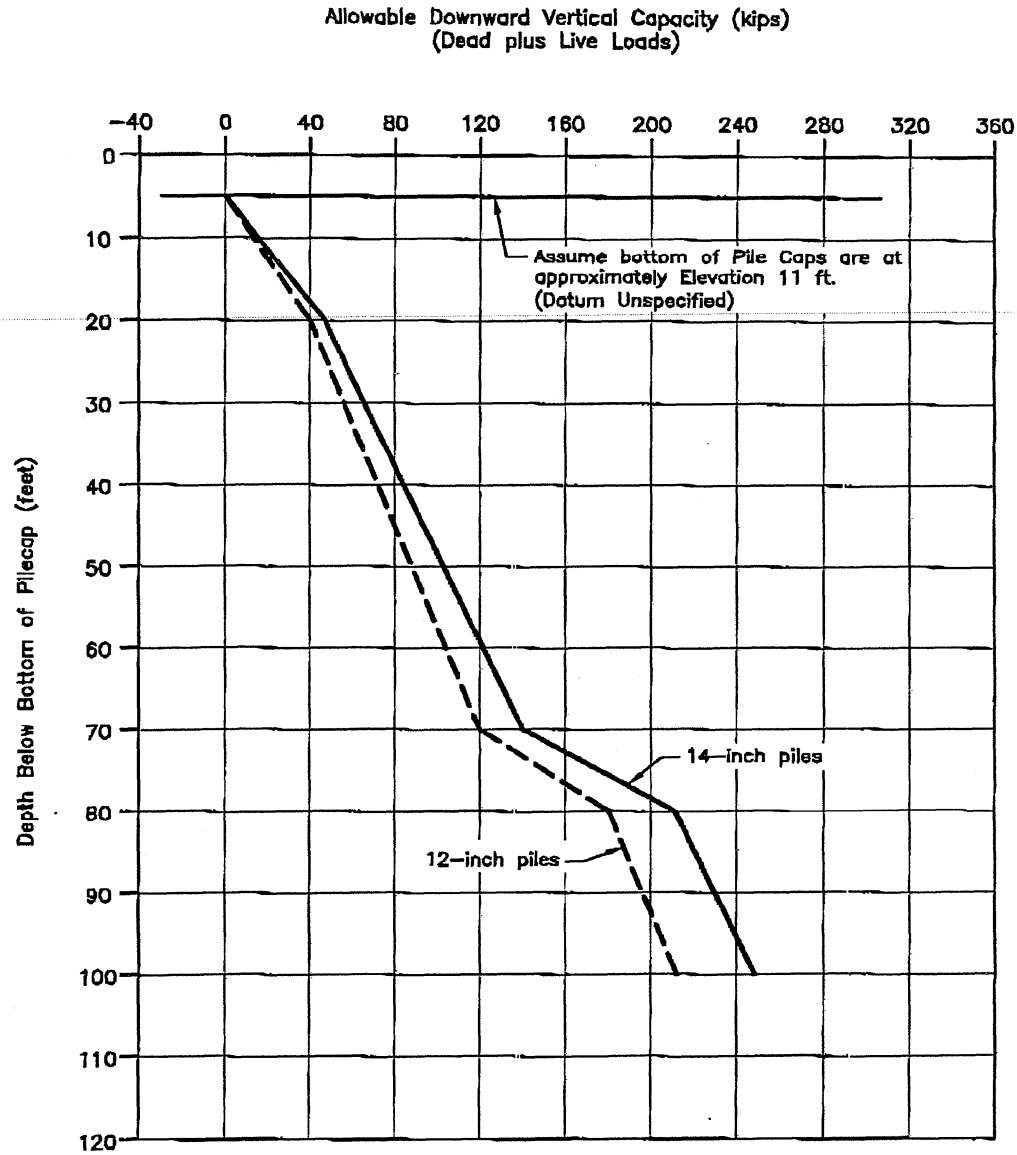
MV, P:\projects\500\587-12i\587-12i pile letter.doc




**VERTICAL PILE CAPACITIES**

NORTH SAN JOSE ENGERY CENTER

San Jose, California

LOWNEY ASSOCIATES

Environmental/Geotechnical/Engineering Services

**FIGURE 1**

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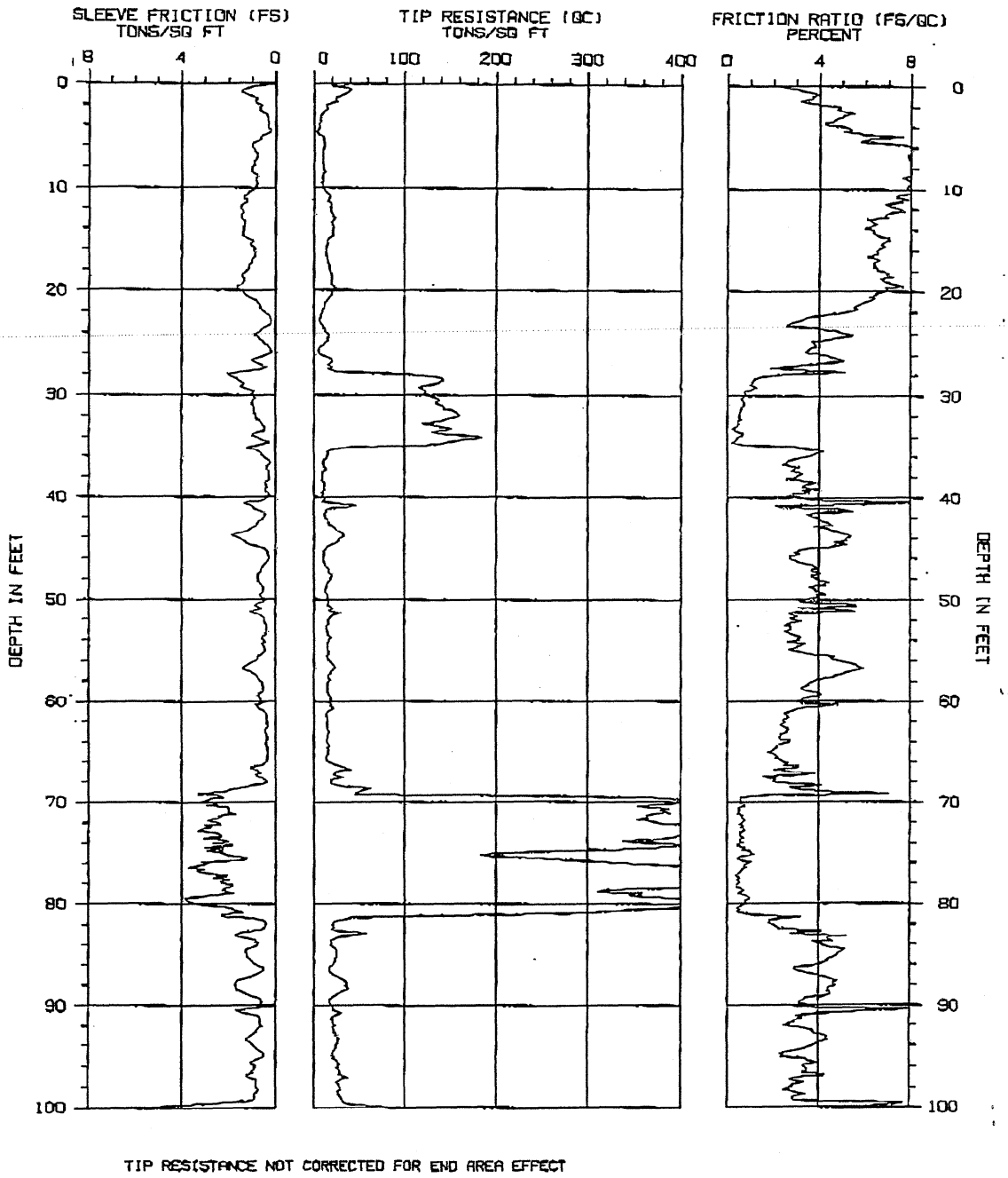




CONE PENETRATION TEST LOG - CPT-17

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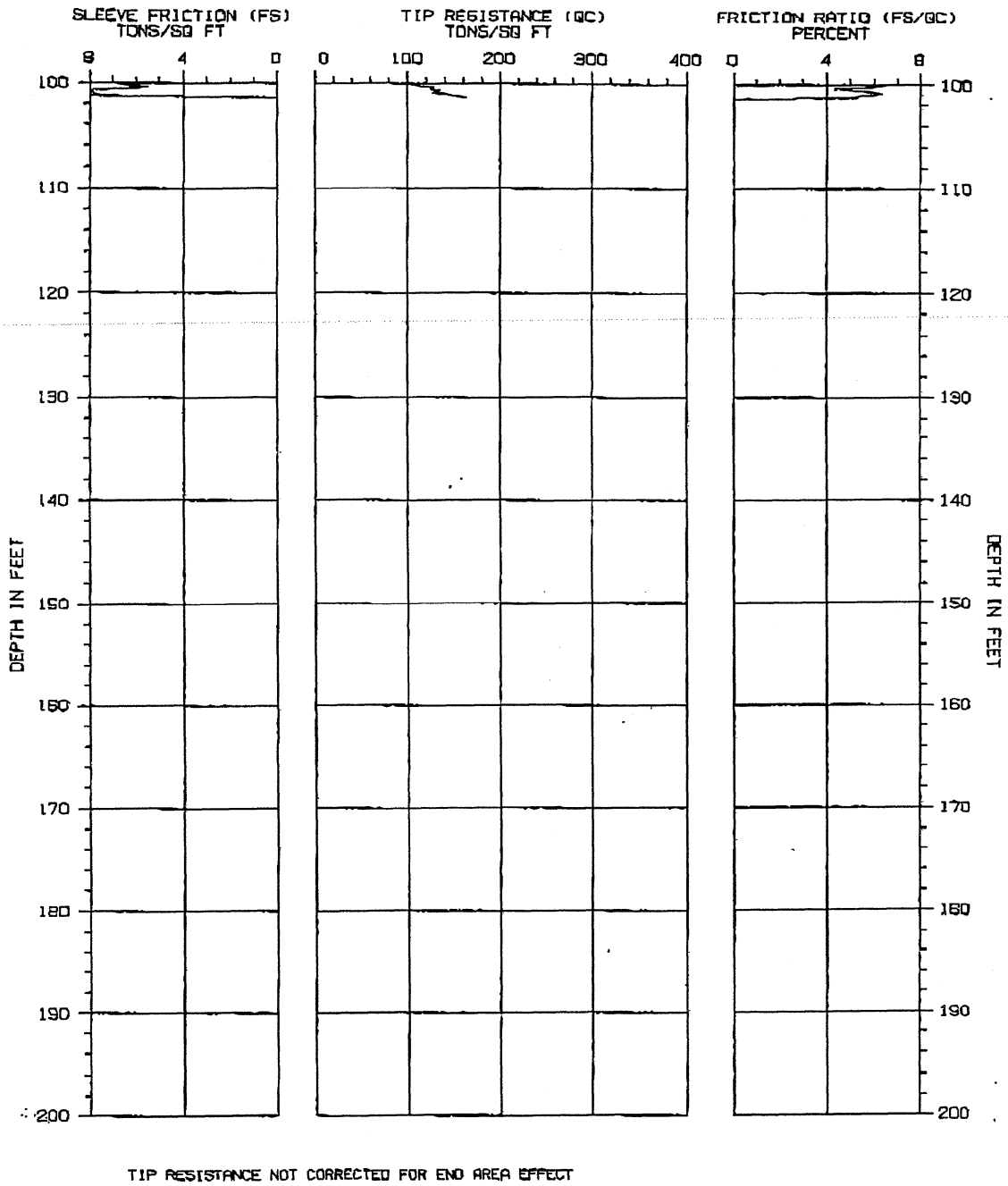


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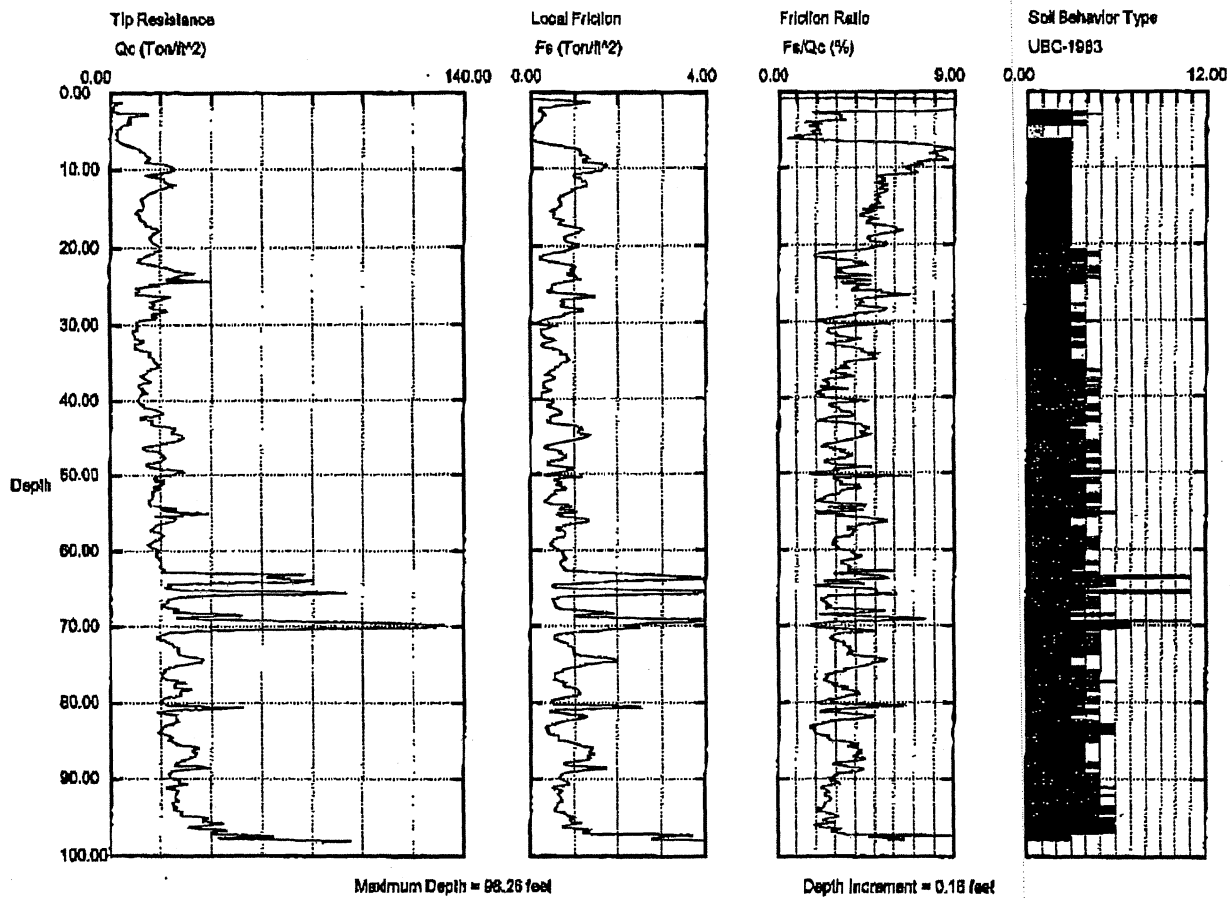


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

2001*EB

**CONE PENETRATION TEST - CPT-25**

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