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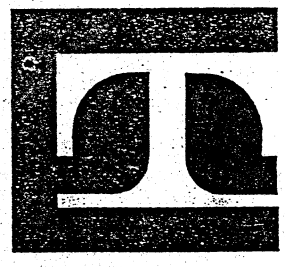
1986 TERRATECH GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION
LAFAYETTE STREET SUBSTATION
SANTA CLARA, CALIFORNIA

PROJECT 3953



TERRATECH

GEOTECHNICAL SERVICES

ENGINEERING — GEOLOGY — TESTING

GEOTECHNICAL INVESTIGATION
LAFAYETTE STREET SUBSTATION
SANTA CLARA, CALIFORNIA

PROJECT 3953

For

The City of Santa Clara
1500 Warburton Avenue
Santa Clara, California 95050

By

TERRATECH, INC.
1365 Vander Way
San Jose, California 95112

July 1986

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GEOTECHNICAL INVESTIGATION
LAFAYETTE STREET SUBSTATION
SANTA CLARA, CALIFORNIA

INTRODUCTION

The City of Santa Clara operates an electric power substation located on the west side of Lafayette Street about 300 feet north of the intersection of Lafayette Street and Comstock Street. Numerous transformers weighing as much as 125 tons are located on the 4(±) acre site. A layer of aggregate base material that covers the site serves as an operating surface (roadway) for cranes which are used to move the transformers about the site. Operation of the cranes has caused substantial rutting of the roadway. It is estimated that during the next 5 years, cranes carrying transformers will pass over the roadway as many as 20 times. Electrical conduits are located as shallow as 3 feet beneath the roadway.

A copy of the geotechnical investigation report for the substation site, performed by TERRATECH, INC., dated September 19, 1977, is appended. The site plan contained in that report was used to prepare the Site Plan on the opposite page.

SCOPE OF WORK

Our scope of work for this investigation was limited to the following tasks:

1. Reviewing information in our files regarding subsurface conditions at the site.

2. Excavating exploration trenches.

3. Logging and sampling soils encountered in the exploration trenches.

4. Performing laboratory tests on selected soil samples to measure their pertinent index and engineering properties.

5. Meeting with engineers of the City of Santa Clara Electric Department to discuss procedures for improving the serviceability of the substation roadway.

6. Preparing this report which summarizes our findings, conclusions and geotechnical recommendations for upgrading the substation roadway.

FINDINGS

Surface Conditions

The site surface is essentially the same as described in our appended geotechnical report, except that additional transformer stations have been added in the central portion of the site.

About 12 inches of well-graded, sandy GRAVEL has been placed over most of the original site surface (although as little as 6 inches has been placed along the west end of the site). The GRAVEL layer serves as an aggregate base road section for the heavy vehicles that operate on the site. The surface of the aggregate base layer is treated with oil and screenings. This treatment has not been entirely successful in preventing infiltration of water into underlying soils. Effects of the infiltration of water are discussed below in the section on Subsurface Conditions. R-Values of 78 and 82 were measured on near-surface samples of the base material obtained in exploration trenches T-3 and T-4 (see Site Plan), respectively. Results of gradation tests and R-Value tests performed on the base material are appended.

The roadway is nearly flat with the exception of vehicle ruts (as deep as 6 inches). Water ponds on the roadway after rainy periods.

Subsurface Conditions

Four exploration trenches were excavated on May 20, 1986 to study subsurface conditions beneath the site. The locations of the trenches are shown on the Site Plan.

The aggregate base layer is underlain by a 2(±) foot thick layer of black, highly plastic CLAY. The consistency of the CLAY layer varies from firm to very stiff, however, when this soil layer becomes saturated during periods of sustained heavy rain, it softens and loses much of its support capacity. When this occurs, vehicle tires push gravel from the aggregate base layer into the underlying CLAY, which results in rutting of the roadway. Evidence of this behaviour was observed in exploration trenches T-2 and T-3. A Liquid Limit of 68, a Plastic Limit of 18, and an R-Value of 6 were measured on a sample of this soil taken from exploration trench T-4. Results of the R-Value test as well as results of a compaction test performed on the same sample are appended.

Beneath the CLAY layer, a gray, stiff to very stiff, silty CLAY was encountered to a depth of about 5 feet, the maximum depth of our exploration trenches.

Descriptions of soils encountered in our exploration trenches are presented in the appended exploration trench logs.

Groundwater was encountered about 12 feet beneath the ground surface in our geotechnical investigation of this site during the summer of 1977. Groundwater depth is probably shallower during rainy winter months.

Crane Specifications

The crane that will be used for transporting transformers on the site has two front axles and two rear axles. Each of the two front axles has two tires and each of the two rear axles has 4 tires. The tires are 4 feet in diameter and about 20 inches wide. The inflation pressure of the tires is 110 psi. The crane weighs about 150 tons. For purposes of analysis, the anticipated crane traffic was replaced with 50 passes of an equivalent axle load of 90 tons. The effect of other vehicle loadings was assumed to be negligible in comparison with the crane loadings. An allowable rut depth of 3 inches was assumed.

Design Constraints

The City of Santa Clara Electric Department has stipulated the following design constraints:

1. The roadway may not be extended above its present elevation.

2. Road improvements may not impinge on existing utilities, some of which are located as shallow as 3 feet beneath the existing roadway.

3. A permanant concrete or asphalt pavement may not be used.

RECOMMENDATIONS

The following recommendations, presented as guidelines to be used by project planners and designers, have been prepared assuming TERRATECH, INC. will be commissioned to review grading plans prior to construction, and to observe, test and advise during site grading and road construction. This additional opportunity to inspect the project site will allow us to compare subsurface conditions that are exposed during construction with those that were observed during this investigation.

Design Alternatives

Alternatives that we considered for improving performance of the road and that satisfy the design constraints include:

1) placing a geotextile between the clay subgrade and a 20-inch thick aggregate base layer;

2) cement treating a 16-inch thick section of aggregate base;

3) replacing the layer of highly plastic clay with aggregate base material to produce a total aggregate base thickness of 32 inches.

Specific recommendations for implementing these design alternatives are presented below.

- Geotextile Reinforcement

A geotextile-reinforced, unpaved road section may be more effective than the other design alternatives because geotextile fabric separates the aggregate base layer from underlying clay soils and because the fabric transfers tire loads more evenly to underlying soils. These factors cause the performance of geotextile reinforced, unpaved roads to improve with time.

A geotextile-reinforced road section may be constructed as follows.

Material beneath the existing roadway surface should be subexcavated to a depth of about 20 inches. The existing aggregate base material should be subexcavated with care to minimize contamination with the underlying plastic clay. This base material should be stockpiled for subsequent reuse. The subexcavated plastic clay should be wasted off-site. The subgrade exposed by subexcavation should be graded smooth. A high-strength, woven, geotextile fabric, such as MIRAFI 500X, or similar, should then be placed on the subgrade. The geotextile sheets should be sown together, moderately tensioned, and anchored in a shallow trench at least 5 feet horizontally beyond the roadway edges.

After the fabric has been placed, the aggregate base layer should be brought to design grades by compacting aggregate base material from the existing road (and additional imported aggregate base as necessary) over the geotextile. Assuming 12 inches of aggregate are in-place and can be salvaged and reused, an additional 8-inch thickness of imported aggregate base will be required. Import should consist of durable, well-graded, angular gravel that complies with CALTRANS Specifications, Section 26 for Class II aggregate base.

The aggregate base layer should be compacted in lifts, each not exceeding 8 inches in thickness before compaction. Each lift should be compacted to a density corresponding to at least 95 percent relative compaction based on ASTM Test D1557-78. When the road has been brought to design grades, the roadway surface may be treated with oil and screenings to help reduce infiltration of water.

If it is necessary to excavate through the fabric subsequent to construction of the road, fabric should be replaced and sown to adjacent, inplace fabric. The road may then be brought to grade as described above.

- Cement Treatment

A cement treated road section may be constructed as follows.

Material beneath the existing roadway surface should be subexcavated to a depth of about 16 inches. The existing aggregate base material should be subexcavated with care to minimize contamination with the underlying plastic clay. This base material should be stockpiled for subsequent reuse. The subexcavated plastic clay should be wasted off-site.

After subexcavation is completed, the road section should be brought to design grades by cement treating and compacting aggregate base material from the existing road (and additional imported aggregate base) over the subgrade exposed by subexcavation. Assuming 12 inches of aggregate are in-place and can be salvaged and reused, an additional 4-inch thickness of imported aggregate base will be required. Import should consist of durable, well-graded, angular gravel that complies with CALTRANS Specifications, Section 26 for Class II aggregate base.

Sufficient cement should be mixed with the aggregate base material to produce a mixture with a compressive strength of at least 12000 pounds per square foot. If the cement treatment alternative is chosen for improving road serviceability, a test program to determine the required cement percentage will be necessary. For planning purposes, a 6% mixture of cement, by weight, should be assumed.

Cement-treated aggregate base should be compacted in lifts, each not exceeding 8 inches in thickness before compaction. Each lift should be compacted to a density corresponding to at least 95 percent relative compaction based on ASTM Test D1557-78.

Cement treatment should provide a road section that is relatively impervious to water infiltration and which will be relatively easy to excavate and patch. In addition, a cement treated road section should require only a small amount of subexcavation (or raising of grade).

- Replacement of Clay Layer With Aggregate Base

The "replacement" alternative road section may be constructed as follows.

Material beneath the roadway surface should be subexcavated to a depth of about 32 inches. The existing aggregate base material should be subexcavated with care to minimize contamination with the underlying plastic clay. This aggregate base material should be stockpiled for subsequent reuse. The subexcavated plastic clay should be wasted off-site.

After subexcavation is completed, the road section should be brought to design grades by compacting aggregate base from the existing roadway and additional imported aggregate base over the subgrade exposed by

subexcavation. Import should consist of durable, well-graded, angular gravel that complies with CALTRANS Specifications, Section 26 for Class II aggregate base. Assuming 12 inches of aggregate are in-place and can be salvaged and reused, an additional 20-inch thickness of imported aggregate base will be required.

The proposed road section should be compacted in lifts, each not exceeding 8 inches in thickness before compaction. Each lift should be compacted to a density corresponding to at least 95 percent relative compaction based on ASTM Test D1557-78. After the roadway has been brought to grade, the roadway surface may be treated with oil and screenings to help reduce infiltration of water.

The "replacement" alternative satisfies the design constraints listed above, however, the quantity of material that would have to be subexcavated and the quantity of import that would be required will probably make this alternative prohibitively expensive.

- Other Alternatives

Design alternatives we considered also included lime treatment of the highly plastic clay layer and compacting the clay layer without lime treatment. Although these alternatives are probably suitable on the basis of geotechnical considerations, they require thicknesses of aggregate base and subexcavation depths that violate design constraints #1 and #2 set by the City of Santa Clara Electric Department.

Surface Drainage

Regardless of which design alternative is chosen, rutting of the roadway will probably occur in areas where water ponds. To reduce this risk, the slope of the surface of the new roadway should be carefully designed to promote rapid and complete drainage of water away from the roadway. If minor rutting does occur in the surface of the new roadway, repairs should be made as soon as practical after the rutting is observed.

CONCLUSIONS

The serviceability of the Lafayette Street Substation roadway may be satisfactorally upgraded either by construction of a geotextile reinforced road section or by cement treating of aggregate base materials as described above.

POST-REPORT GEOTECHNICAL SERVICES

We recommend that TERRATECH, INC. be commissioned to perform the following services.

1. Review project grading and pavement plans and specifications.

2. Perform a test program to determine required cement content of cement-treated roadway aggregate (if the cement treatment alternative is selected).

3. Observe, test and advise during construction of the proposed road.

LIMITATIONS

Changes in development proposals will render our recommendations invalid unless the changes are reviewed by our staff to check if any modifications of our recommendations are necessary.

Our recommendations have been made in accordance with the foundation engineering principles and practices generally employed by the engineering profession. This is in lieu of all other warranties, express or implied.

Subsurface exploration of any site is necessarily confined to selected locations, and conditions may and often do vary between and around these locations. If varied conditions are discovered during construction, additional exploration, testing and construction modification may be required. To compare the generalized site conditions assumed in this report with those found at the site at the time of construction, all earthwork and associated operations should be observed by our field representative, and tested where necessary.

Any person concerned with this project who observes conditions or features of the site or surrounding areas which are different from those described in this report, should report them immediately to this office for evaluation.

Report prepared by:

TERRATECH, INC.

Martin J. Goodman

Martin J. Goodman

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER DENNIS E. ECCLES NO. 26181 STATE OF CALIFORNIA

Dennis E. Eccles
CE 26181

Exp. 3/31/90

EXPLORATION TRENCH LOGS

TRENCH 1

0'— Gravel treated with oil and screenings

Gray, dry, medium dense, silty, fine to course sandy GRAVEL (GW/GM)

Tan - brown, medium dense, dry to damp, gravelly, fine to course SAND (SW)

2'— Black, firm to stiff, damp to moist CLAY (CH) ← Bulk 1 (Trench 1)

Bottom of Trench

4'—

TRENCH 2

0'— Gravel treated with oil and screenings

Gray, dry, medium dense, silty fine to course sandy GRAVEL (GW/GM) ← Bulk 1 (Trench 2)

Gray, moist, medium - dense, silty - clayey, fine to course, sandy GRAVEL (GC)

Tan - orange, moist, medium dense, silty - clayey GRAVEL (GC)

2'— Black, firm, moist CLAY (CH) ← Bulk 2 (Trench 2)

Bottom of Trench

4'—

SCALE: 1" = 2'

TRENCHED ON 5/20/86

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EXPLORATION TRENCH LOGS

LAFAYETTE STREET SUBSTATION
SANTA CLARA COUNTY, CALIFORNIA

FIGURE 2a

PROJECT 3953

TRENCH 3

0'— Gray, dry to damp, medium dense, silty, fine to coarse sandy GRAVEL (GW/GM); R=78 ← Bulk 1 (Trench 3)

Gray - brown, moist, damp, firm to stiff, gravelly, silty CLAY

Black, firm, damp CLAY (CH) ← Bulk 2 (Trench 3)

2'—

Gray, firm to stiff, silty CLAY (CI) ← Bulk 3 (Trench 3)

4'—

Bottom of Trench

6'—

TRENCH 4

0'— Asphalt

Yellow - tan, damp, medium dense, silty, gravelly, fine to coarse SAND (SW/SM); ← Bulk 1 (Trench 4)
R = 82

Black, damp to moist, stiff CLAY; R = 6 ← Bulk 2 (Trench 4)

2'—

Gray, damp to moist, stiff to very stiff, silty CLAY (CI)

Bottom of Trench

4'—

SCALE: 1" = 2'

TRENCHED ON 5/20/86

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EXPLORATION TRENCH LOGS

LAFAYETTE STREET SUBSTATION
SANTA CLARA COUNTY, CALIFORNIA

FIGURE 2b

PROJECT 3953

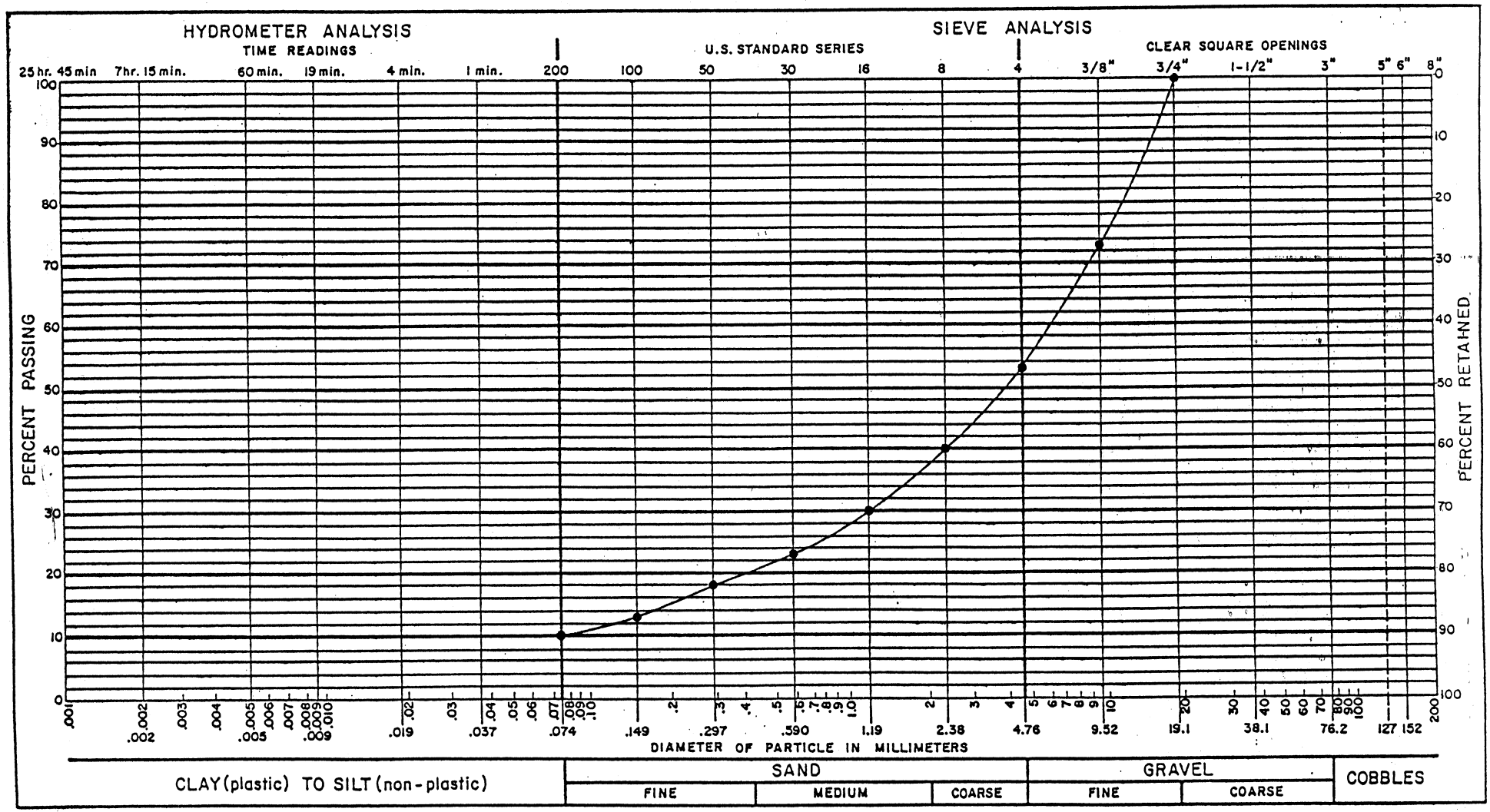
LABORATORY TEST RESULTS

GRADATION TEST RESULTS

PROJECT Lafayette Substation PROJECT NO. 3953

SAMPLE NO. Trench 3, Bulk #1 DEPTH 0.5'

SAMPLE DESCRIPTION Silty, fine to coarse sandy GRAVEL



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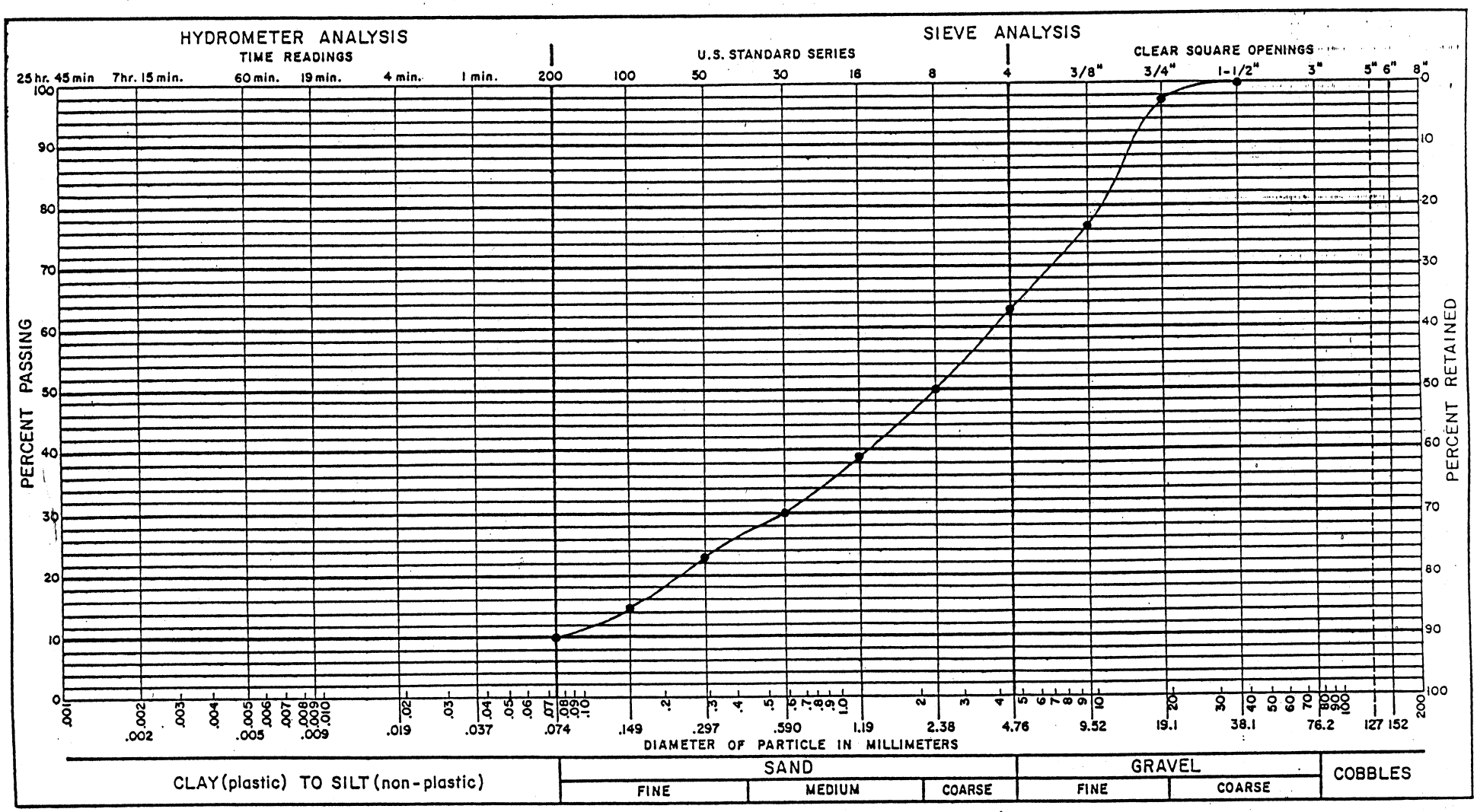
GRADATION TEST RESULTS

PROJECT Lafayette Substation PROJECT NO. 3953

SAMPLE NO. Trench 4, Bulk #1 DEPTH 0.5'

SAMPLE DESCRIPTION Silty, fine gravelly, fine to coarse SAND



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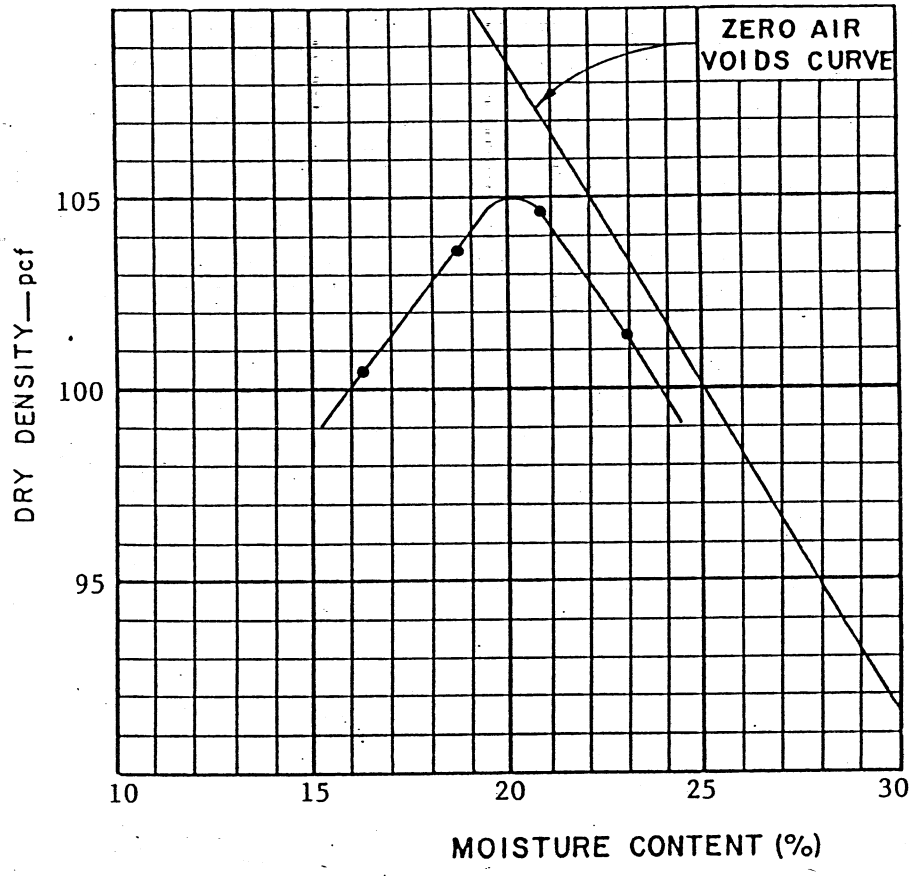
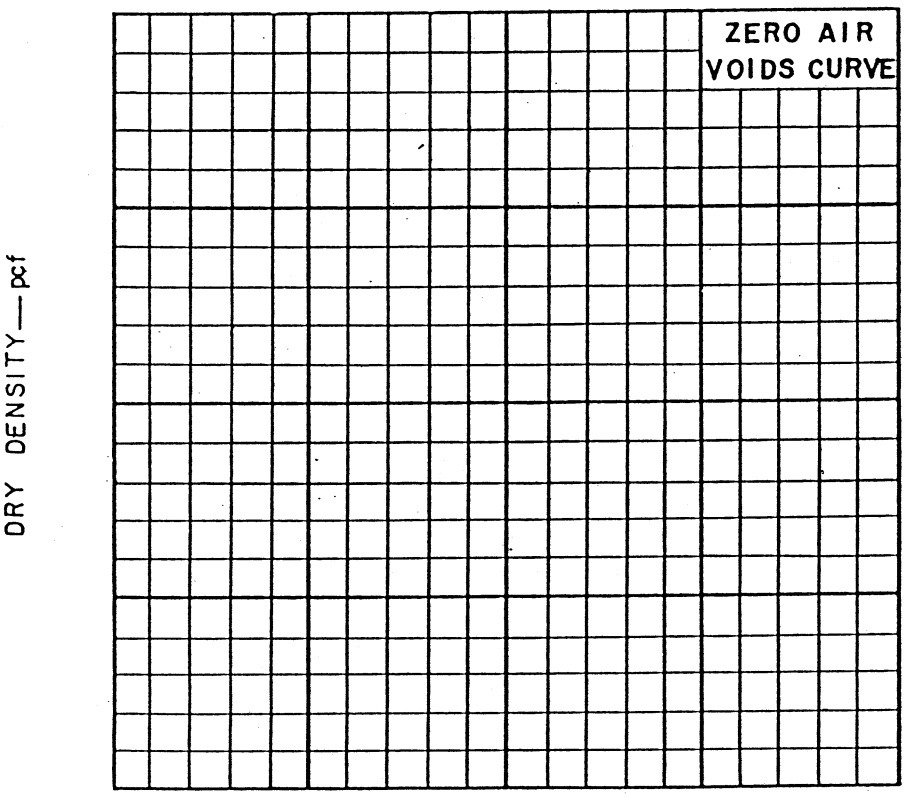
COMPACTION TEST



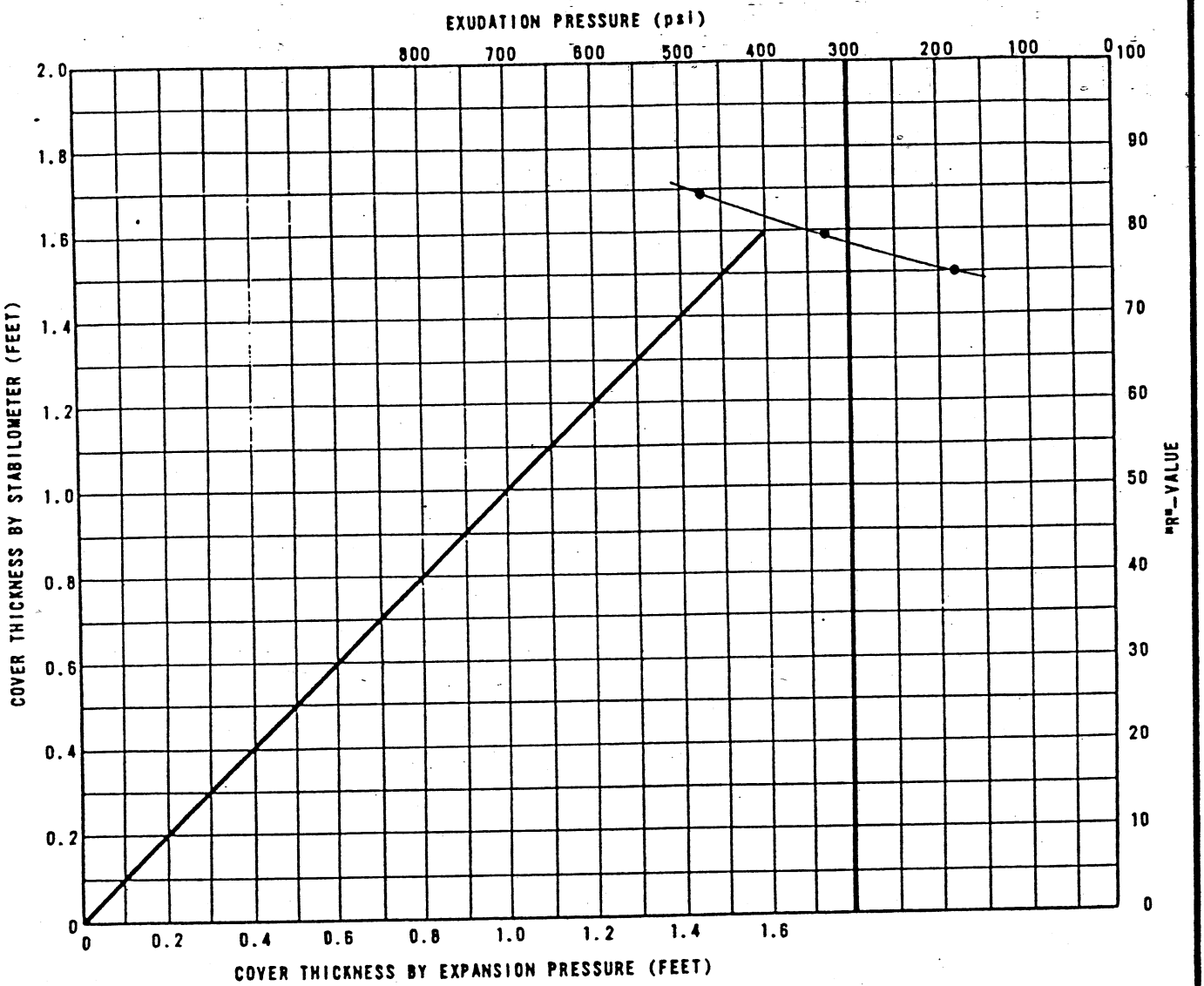
SAMPLE NO.	1
SAMPLE DEPTH	Trench 3, Bulk 2
SAMPLE DESCRIPTION	black CLAY (CH)
SPECIFIC GRAVITY	2.67
TEST DESIGNATION	D1557-78
MAXIMUM DRY DENSITY (pcf)	105.0
OPTIMUM MOISTURE CONTENT, %	20.0



SAMPLE NO.	
SAMPLE DEPTH	
SAMPLE DESCRIPTION	
SPECIFIC GRAVITY	
TEST DESIGNATION	
MAXIMUM DRY DENSITY (pcf)	
OPTIMUM MOISTURE CONTENT, %	

PROJECT NO. 3953

SAMPLE NO. Bulk 1 Trench 3	DEPTH (FT) 0.5'	LOCATION Santa Clara
SAMPLE DESCRIPTION	Silty, fine to coarse sandy GRAVEL	



SPECIMEN NO.	A	B	C	
EXUDATION PRESSURE (psi)	191	334	478	
EXPANSION DIAL (0.0001 inch)	0	0	0	
EXPANSION PRESSURE (psf)	0	0	0	
RESISTANCE VALUE "R"	75	79	84	
MOISTURE CONTENT AT TEST (%)	6.7	6.3	5.9	
DRY DENSITY AT TEST (pcf)	142.5	141.6	140.5	

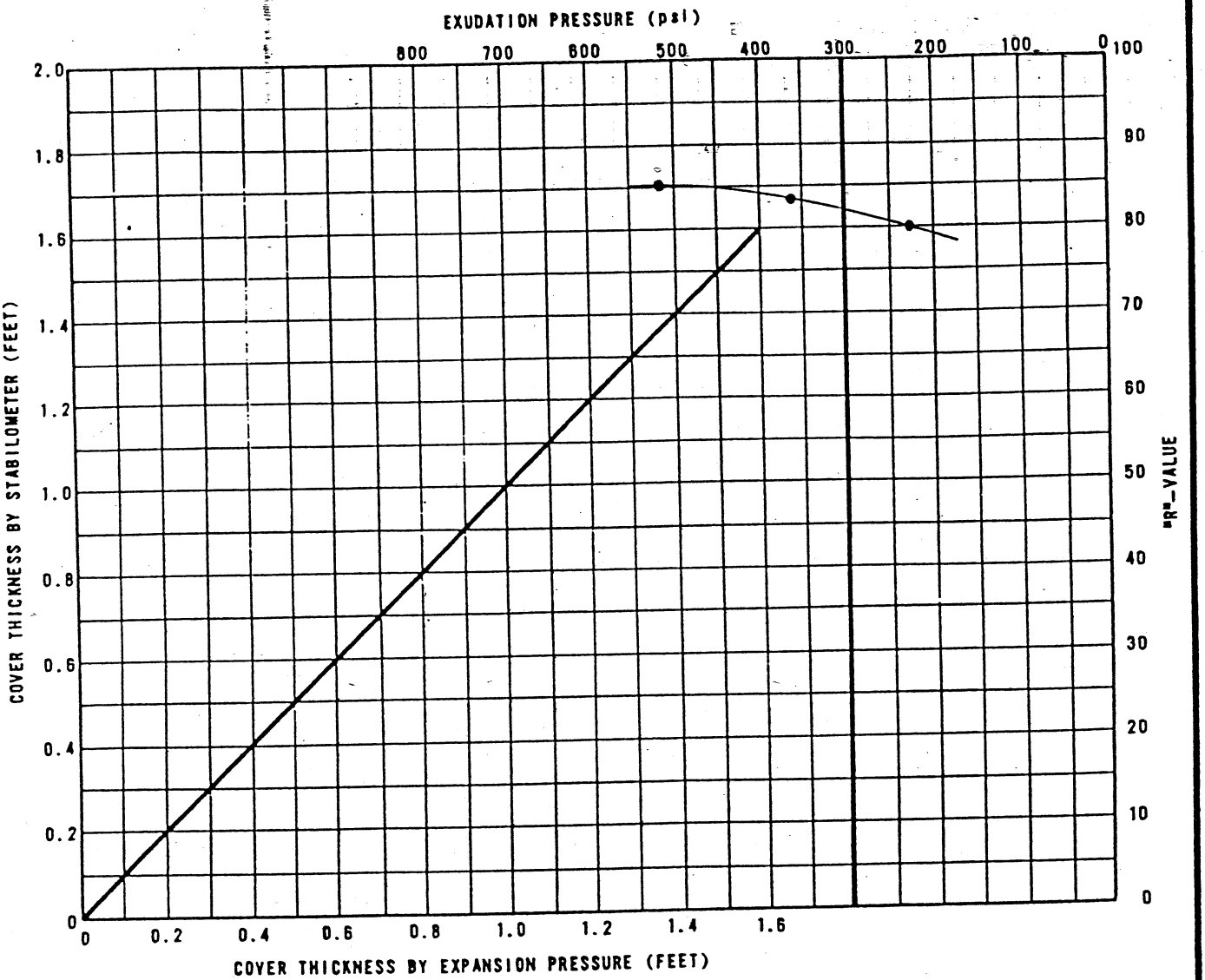
"R"-VALUE AT 300 psi EXUDATION PRESSURE = 78

LAFAYETTE STREET SUBSTATION

"R"-VALUE TEST RESULTS

PROJECT NO.	TEST NO.	DRAWING NO.

SAMPLE NO. Bulk 1 Trench 4	DEPTH (FT) 0.5'	LOCATION Santa Clara
SAMPLE DESCRIPTION	Silty, gravelly, fine to coarse SAND	



SPECIMEN NO.				
EXUDATION PRESSURE (psi)	228	358	518	
EXPANSION DIAL (0.0001 inch)	0	0	2	
EXPANSION PRESSURE (psf)	0	0	9	
RESISTANCE VALUE "R"	80	83	85	
MOISTURE CONTENT AT TEST (%)	18.2	17.7	17.3	
DRY DENSITY AT TEST (pcf)	108.3	109.5	110.2	

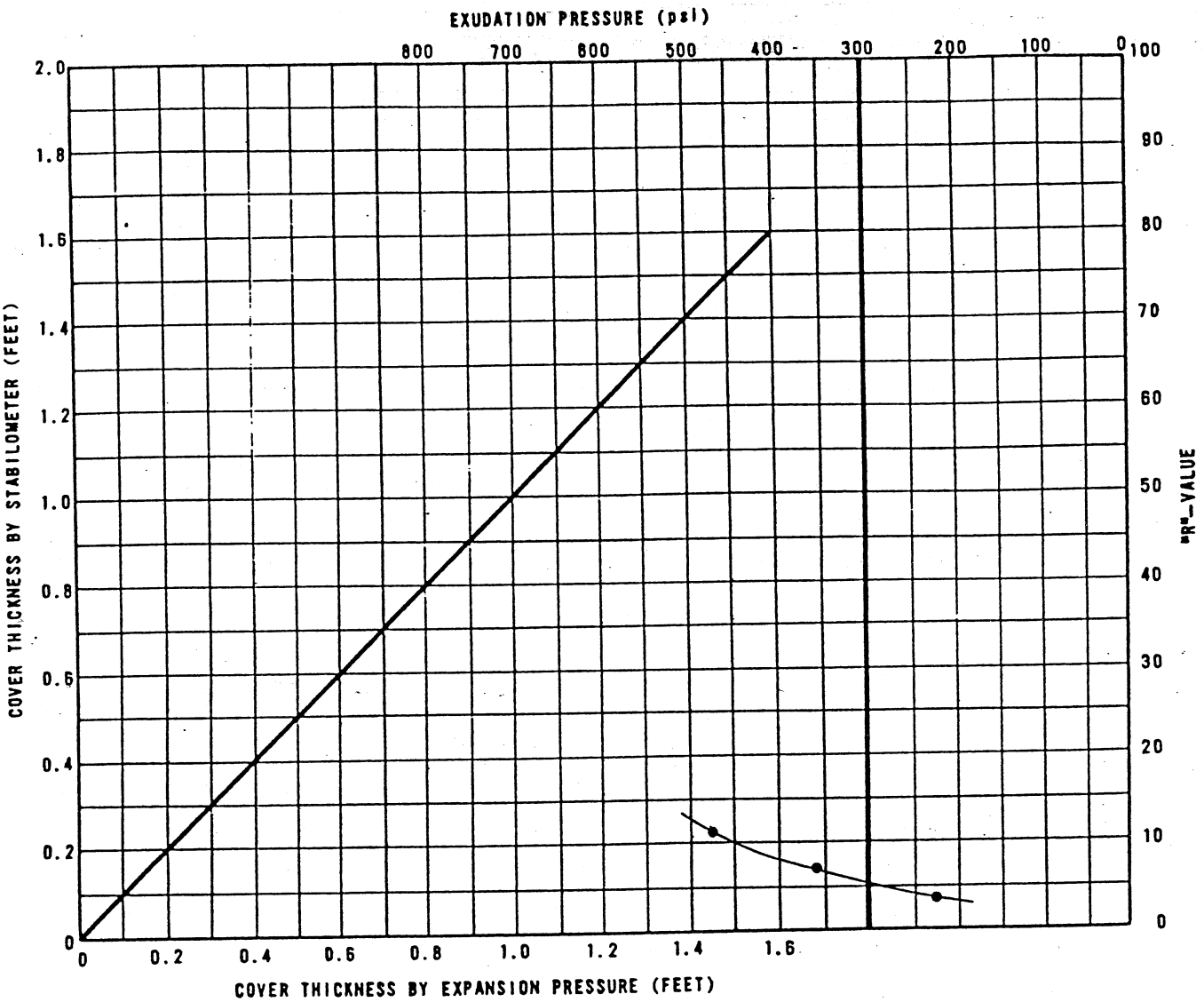
"R"-VALUE AT 300 psi EXUDATION PRESSURE = 82

LAFAYETTE STREET SUBSTATION

"R" VALUE TEST RESULTS

PROJECT NO.	TEST NO.	DRAWING NO.
3953		

SAMPLE NO. Bulk 2 Trench 4	DEPTH (FT) 1.5'	LOCATION Santa Clara
SAMPLE DESCRIPTION Black CLAY		



SPECIMEN NO.				
EXUDATION PRESSURE (psi)	223	358	478	
EXPANSION DIAL (0.0001 inch)	0	2	6	
EXPANSION PRESSURE (psf)	0	9	26	
RESISTANCE VALUE "R"	4	7	11	
MOISTURE CONTENT AT TEST (%)	23.8	22.0	20.3	
DRY DENSITY AT TEST (pcf)	109.1	111.8	113.4	

"R"-VALUE AT 300 psi EXUDATION PRESSURE = 6

LAFAYETTE STREET SUBSTATION

"R" VALUE TEST RESULTS

PROJECT NO.	TEST NO.	DRAWING NO.

GEOTECHNICAL INVESTIGATION REPORT
(September 19, 1977)

GEOTECHNICAL INVESTIGATION
KIFER RECEIVING STATION
SANTA CLARA, CALIFORNIA

For

City of Santa Clara
Electrical Department
1500 Warburton Avenue
Santa Clara, California

By

TERRATECH, INC.
326 Commercial Street
San Jose, California

September, 1977

GEOTECHNICAL INVESTIGATION
KIFER RECEIVING STATION
SANTA CLARA, CALIFORNIA

INTRODUCTION

The City of Santa Clara is planning to increase the capacity of the existing electrical facility at the Kifer Receiving Station, located on the west side of Lafayette Street about 300 feet north of its intersection with Central Expressway, in Santa Clara, California. The proposed electrical station improvements call for installation of several large transformers, and a 12 KV and a 60 KV bus structure within the confines of the existing recieving station.

INFORMATION PROVIDED

The following information was provided to us:

1. A 1" = 40' scale,undated Plot Plan, prepared by WTW, Inc.;

2. A 1" = 20' scale, undated Preliminary General Arrangement Plan of the Ultimate Station, prepared by Slinger and Associates, Inc., project electrical engineers;

3. A 1/8" = 1' scale,undated Preliminary Elevation View of the Ultimate Station, prepared by Slinger and Associates.

The Plot Plan was used in preparing the drawing on the opposite page, which also shows the locations of our 5 exploration drill holes.

SCOPE OF WORK

The following work was accomplished in this investigation:

1. Exploration, sampling and classification of foundation soils at the site in accordance with guidelines presented by Mr. Hercules P. Mihelis of Slinger and Associates, Inc.;

2. Laboratory testing of selected soil samples to determine their pertinent index and engineering properties;

3. Based on the findings in 1 and 2, provision of recommendations for grading and compaction; presentation of geotechnical design parameters for pier foundations and concrete slabs-on-grade; and provision of advice on utility trench construction and on the geotechnical aspects of surface drainage;

4. Preparation of this report presenting our investigation findings and recommendations.

FINDINGS

Surface conditions

The Kifer Recieving Station is presently surrounded by an 8(±) foot high Cyclone fence. Within the boundaries of the existing electrical station, the ground surface is essentially flat and is composed of imported sandy gravel. The northern portion of the site contains a large transformer, 115 KV bus structure, control house, light poles and other miscellaneous electrical equipment. The central portion of the site, on which the majority of the proposed improvements will be built , is presently vacant. The southern end of the site, which is approximately 1½ feet higher in elevation than the rest of the site, contains three, 75(±) foot high steel towers and miscellaneous electrical equipment.

Subsurface conditions

Within the 24 feet maximum depth of our exploration the site is underlain mainly by alluvial clays and sands. The upper 6 to 24 inches of material is imported free-draining sandy GRAVEL that was placed presumably to minimize ponding of water on the surface of the site. A dark gray to black, stiff to very stiff CLAY, which has a high plasticity and high expansion potential, underlies the imported gravel layer down to a depth of about 4½ feet. Below this expansive near-surface zone, the native clay soils generally contain an increasing amount of caliche with depth,which decreases their plasticity and expansion potential. A dense, clayey, gravelly SAND was encountered at about 12½ feet below ground surface in Drill Hole 2.

Groundwater was encountered in Drill Holes 2-5 at about 11½ to 13½ feet below ground surface. Groundwater was not encountered in Drill Hole 1 (drilled to 15½ feet). Groundwater levels could be expected to rise closer to the ground surface in years of heavy rainfall.

Drill hole logs are appended together with the results of laboratory tests performed on selected soil samples recovered from the borings.

Seismic considerations

The Kifer Recieving Station is located in the seismically active San Francisco Bay Region, but outside the Special Studies Zones defined by the Alquist-Priolo Geologic Hazards Act of 1972.

The nearest known active faults to the site are the San Andreas Fault, which passes about 11 miles southwest, and the Calaveras and Hayward Faults, whose confluence is located about 7 miles northeast of the site.

Seismic hazards can be divided into two general categories: hazards due to ground rupture and hazards due to ground shaking. Based on historic records and on the known general seismicity of the San Francisco Bay Region, we consider it probable that during the next 50 years, the site will be shaken by at least one earthquake of Richter Magnitude 6 or greater, and by numerous earthquakes of lesser magnitude, all having epicentral locations within 20 miles of the site. As no faults are known to cross the property, the likelihood of ground rupture is remote. Should a major earthquake occur with an epicentral location close to the receiving station, ground shaking at the site will probably be severe. However, even under the influence of severe ground shaking, the clays and dense sands that underlie the site within the depth of our exploration should not liquefy.

RECOMMENDATIONS

Site preparation

Existing structures and underground conduits that will not be incorporated into the proposed substation should be removed from the site.

Depressions and loose soil zones resulting from the removal of existing facilities should be carefully backfilled with thoroughly compacted, approved imported soil.

We recommend that existing gravel surfacing be left in place wherever possible to provide a suitable working platform for cranes and other equipment that will be required during installation of foundations and electrical equipment.

Grading and compaction

In developing our recommendations we have assumed that soil will not be available from within the Kifer Receiving Station boundaries for use as structural fill and any soil required to achieve final design grades will be imported.

Soil imported for use as structural fill (if required) should be inorganic, preferably of low expansion potential and should contain no rocks or chunks larger than 4 inches in greatest dimension. Prior to delivery to the site, proposed import should be tested in our laboratory to verify its suitability for use as structural fill and, if it is found to be suitable, to determine the water content and density to which it should be placed.

Native soil surfaces exposed by excavation for mat or slab foundations, should be scarified to a depth of at least 9 inches, conditioned with water (or allowed to dry) to produce a soil-water content of about 4 percent above the optimum value and then compacted to a density equivalent to between 85 and 90 percent of the maximum dry density of the soil as determined by ASTM Test D1557-70. The appended compaction test curve may be used as a guide in calculating the soil-water contents and densities to be achieved in the dark gray to black near-surface clays.

Electrical equipment foundations

We recommend that transformers and oil circuit breakers be supported on reinforced concrete mat foundations. Such mat foundations may be designed to apply pressures on foundation soils up to 1500 pounds per square foot from dead plus normal live loading. The bases of mat foundations should be formed at least 24 inches below final adjacent grade, or at least 6 inches below the surface of the native clay which underlies the surface gravels, whichever gives the greater embedment. For structural design of the mats, assume the modulus of vertical subgrade reaction is 100 tons per cubic foot for a 1 foot square bearing plate at ground surface.

Drilled piers may be constructed beneath mat foundations if additional resistance to overturning is required. For design of reinforced concrete piers beneath mat foundations, the passive resistance of the soil may be assumed to increase linearly with depth at a rate of 300 pounds per square foot per foot of embedment below the bottom of the mat.

The remainder of the proposed electrical facilities may be supported on drilled pier foundations. For design of reinforced concrete pier foundations that are not overlain by a mat or slab, the passive resistance of the soil may be assumed to increase linearly with depth at a rate of 200 pounds per square foot per foot of embedment. If the drilled pier foundation will be subjected to a sustained lateral line load (i.e.piers beneath the "dead end" structures), the passive resistance of the soil used for design of these piers should be assumed to increase linearly with depth at a rate of 150 pounds per square foot per foot of embedment. Passive resistance of the soil should be ignored in the upper 1 foot of embedment below adjacent finished grade.

All reinforced concrete piers may be designed for an allowable skin friction (adhesion) value of 500 pounds per square foot for piers in either tension or compression. Skin friction should be neglected in the upper 3 feet of pier embedment below final adjacent grade. End bearing support should also be neglected.

All allowable foundation pressures, passive pressures and skin friction values presented above may be increased by one-third when considering additional short-term wind or seismic loading.

We estimate that total settlement of the proposed substation equipment will be less than about 1 inch. The majority of this settlement should occur soon after the loads are applied to the foundation soils.

We would appreciate the opportunity to review final foundation plans and details prior to construction.

Utility trenches

Vertical trench excavations up to 5 feet deep should be capable of standing with minimal bracing for short construction periods. Trenches deeper than 5 feet should be cut and braced as specified in the State of California Safety Orders dealing with "Excavations and Trenches."

Utility trenches should be designed to prevent the transmission of water into foundation subgrade soils. In particular, where utilities cross electrical facility foundations, trenches should be plugged with compacted clay soil for their full depth over a distance of at least 2 feet on either side of the foundation.

For purposes of this section of the report, backfill is defined as material placed in a trench starting 1 foot above the conduit and bedding is all material placed in a trench below the backfill.

Unless concrete bedding is required around conduits, free-draining sand should be used as bedding. Sand bedding should be jetted or ponded into place and compacted by mechanical means to a density equivalent to at least 95 percent of the compaction test maximum based upon ASTM Test D1557-70. Sand proposed for use as bedding should be tested in our laboratory to determine its suitability. Jetting or ponding of sand bedding should be closely supervised and provisions made for the removal of excess water.

Inorganic clay soil or approved import may be used as utility trench backfill. Special compaction of trench backfill will be necessary under and adjacent to all structures, concrete slabs, and structural fill. In these areas, native soil backfill should be conditioned with water (or allowed to dry) to produce a soil-water content of about 4 percent above the optimum value and placed in horizontal layers not exceeding 6 inches in loose thickness. Each layer should then be compacted to a density equivalent to at least 85 percent of the maximum dry density of the soil as determined by ASTM Test D1557-70. Compaction requirements for imported soil can be determined once the material has been tested in our laboratory.

Surface drainage

Surface drainage gradients should be planned to prevent ponding and to direct water away from electrical equipment and toward suitable collection and discharge facilities.

We recommend placing (and compacting) a free-draining sandy gravel (similar to that presently in use) over native clay soils in areas that have been disturbed during construction, after the native clays surrounding the electrical equipment have been graded to provide positive drainage away from the electrical equipment.

Post report geotechnical services

We recommend that TERRATECH be commissioned to provide the following geotechnical services:

1. Review final grading and foundation details prior to construction.

2. Observe and advise during site preparation.

3. Test and advise on proposed import fill, prior to delivery to the site.

4. Observe, test and advise during grading and placement of structural fill,(if required).

5. Observe, test and advise during utility trench backfilling.

6. Observe, test and advise during mat and pier construction.

LIMITATIONS

Changes in development details will render our recommendations invalid unless such changes are reviewed by our staff and our specific recommendations modified accordingly.

Our recommendations have been made in accordance with the foundation engineering principles and practices generally employed by the engineering profession. They have been based upon data obtained from field explorations made at the locations indicated on the site plan.

Subsurface exploration of any site is necessarily confined to selected locations, and conditions may and often do vary between these locations. Should varied conditions come to light during project development, additional exploration, testing and construction modification may be required. To compare the generalized site conditions assumed in this report with those found on the site at the time of construction, all earthwork and associated operations should be observed by our field representative and tested where necessary.

Any person concerned with this project, who observes conditions or features of the site or its surrounding areas which are different from those described in this report, should report them immediately to this office for evaluation.

Report prepared by:

TERRATECH, INC.

Richard G. Woodard

RGW:kd

Reviewed By:

Dennis E. Eccles
CE 26181

EXPLORATION DRILL HOLE LOG

HOLE No. 1

PROJECT Kifer Receiving Station DATE 8/18/77 LOGGED BY JDM

DRILL RIG Cont. Flight HOLE DIA. 5" SAMPLER Mod. Cal.

GROUNDWATER DEPTH INITIAL - FINAL - HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)		LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY(pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Gray, dry, medium dense, silty, sandy GRAVEL / gravelly SAND	GM/SW	1											
		2											
Black, damp, very stiff CLAY	CH	3		18									
Brown, damp, medium dense, clayey, silty GRAVEL	GC	4											
Gray, damp, very stiff, silty CLAY, calcareous	CL	5		18	4.0				25 25		97 98	10	3400
		6											
		7											
		8											
Light gray to gray, moist, stiff, slightly sandy, silty CLAY, very calcareous		9											
		10		19	1.5				13		117	3	1280
		11											
		12											
		13											
		14											
very moist gray, sandy		15		19	4.5				20 16		110 120		
Bottom of Hole 15.5' No water encountered		16											
		17											
		18											
		19											
		20											

PROJECT 2317 TERRATECH

EXPLORATION DRILL HOLE LOG

HOLE No. 2

PROJECT Kifer Receiving Station — DATE - 8/18/77 — LOGGED BY JDM

DRILL RIG Cont. Flight — HOLE DIA. 5" — SAMPLER Mod. Cal.

GROUNDWATER DEPTH INITIAL 12.0' — FINAL 12.0' — HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)	LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY (pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Gray, dry, medium dense, slightly clayey, silty, sandy GRAVEL	GM	1										
		2										
Black, damp, stiff CLAY	CH	3		12	4.5							
		4										
Dark gray brown, very stiff, silty CLAY, calcareous	CL	5		16	3.5			23 23		101 101	10	2800
		6										
		7										
		8										
Light gray brown, damp, slightly sandy, silty CLAY with trace of gravel, very calcareous		9										
		10		17	3.7			14 16		119 114	3	1050
		11										
		12					▼					
Gray, wet, dense, slightly clayey, gravelly SAND	SW	13										
		14										
		15		32	4.5+							
Bottom of Hole 15.5'		16										
		17										
		18										
		19										
		20										

EXPLORATION DRILL HOLE LOG

HOLE No. 3

PROJECT Kifer Receiving Station - DATE 8/18/77 LOGGED BY JDM

DRILL RIG Cont. Flight HOLE DIA. 5" SAMPLER Mod. Cal.

GROUNDWATER DEPTH INITIAL 13.5' FINAL 13.3' HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)		LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY (pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Gray brown, dry, medium dense, silty, slightly clayey, sandy GRAVEL / gravelly SAND	GM/SW	1											
		2											
Black, damp, stiff CLAY	CH	3		12	3.5				32		86	6	1700
		4											
Gray brown, very stiff, silty CLAY, calcareous	CL	5		17	4.5				27		96	10	3900
		6											
		7											
		8											
Light gray brown, damp, very stiff slightly sandy, silty CLAY with trace of gravel, very calcareous		9											
		10		25	4.5+				14 11		118 123	3	1470
		11											
		12											
gravelly		13					▼						
		14											
		15		34	2.0				17 15		116 122		
		16											
		17											
		18											
		19											
		20											

EXPLORATION DRILL HOLE LOG

HOLE No. 3 (Cont.)

PROJECT Kifer Receiving Station DATE 8/18/77 LOGGED BY JDM

DRILL RIG Cont. Flight HOLE DIA. 5" SAMPLER Mod. Cal.

GROUNDWATER DEPTH INITIAL 13.5' FINAL 13.3' HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)		LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY (pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Light gray brown, damp, very stiff slightly sandy, silty CLAY with trace of gravel	CL	21 22 23 24											
Bottom of Hole 24.0'		25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40											

EXPLORATION DRILL HOLE LOG

HOLE No. 4

PROJECT Kifer Receiving Station DATE 8/18/77 LOGGED BY JDM

DRILL RIG Cont. Flight HOLE DIA. 5" SAMPLER Mod. Cal.

GROUNDWATER DEPTH INITIAL 12.0' FINAL 12.0' HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)	LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY (pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Gray, dry, med. dense sandy GRAVEL	GM	1										
Black, damp, very stiff CLAY	CH	2										
		3		17	4.5			27		94	6	3550
		4										
Dark gray brown, damp, very stiff, silty CLAY, calcareous	CI	5		18	4.5			26 24		97 101		
		6										
		7										
		8										
Light gray brown, damp, fine sandy, silty CLAY, with trace of gravel, very calcareous	CL	9										
		10		16	4.5+			14 13		114 120		
		11										
		12					▼					
very fine sandy		13										
		14										
(no sample recovered)		15		14								
Bottom of Hole 15.5'		16										
		17										
		18										
		19										
		20										

EXPLORATION DRILL HOLE LOG

HOLE No. 5

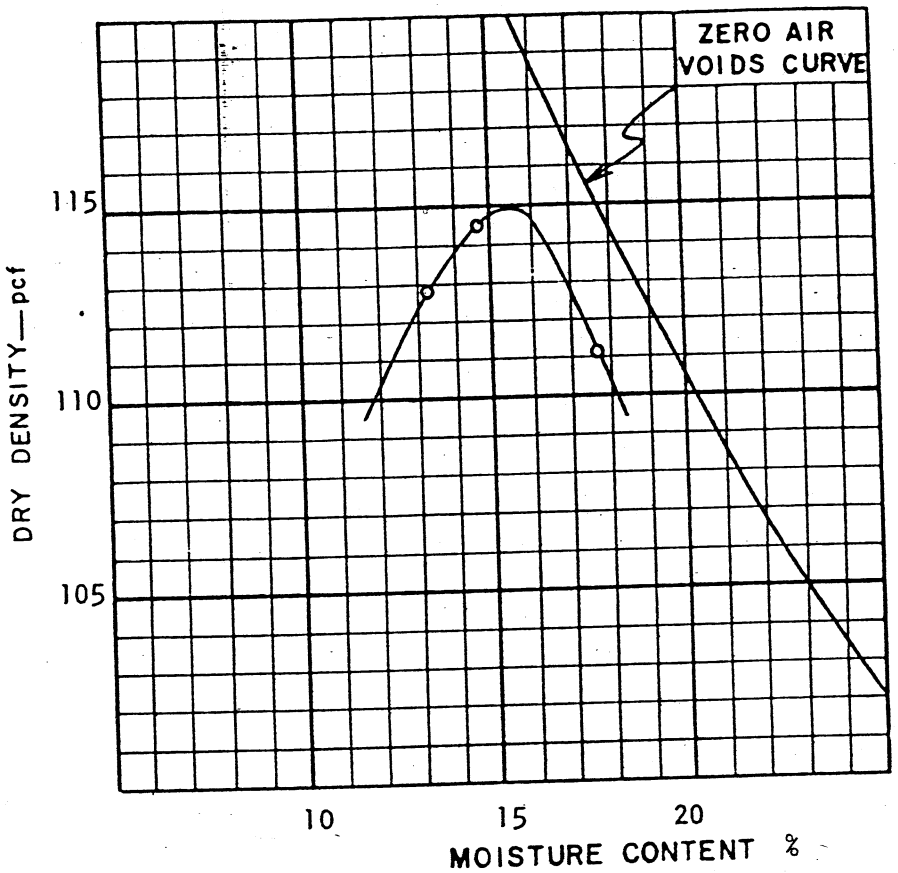
PROJECT Kifer Receiving Station DATE 8/18/77 LOGGED BY JDM

DRILL RIG Cont. Flight HOLE DIA. 5" SAMPLER Mod. Cal.

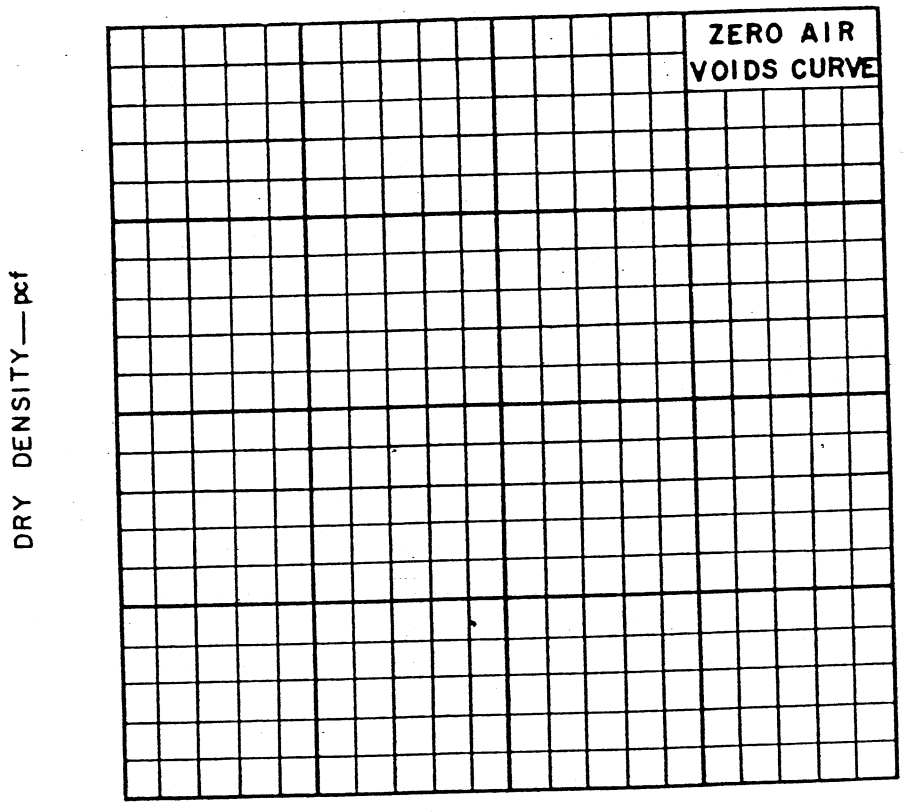
GROUNDWATER DEPTH INITIAL 12.0' FINAL 11.5' HOLE ELEV. -

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	POCKET PEN.(tsf)	TORVANE(tsf)	LIQUID LIMIT	WATER CONTENT	PLASTIC LIMIT	DRY DENSITY (pcf)	FAILURE STRAIN(%)	UNCONFINED SHEAR STRENGTH(psf)
Gray, dry, med. dense, sandy GRAVEL	GM	1										
Black, damp, stiff, slightly sandy, CLAY, with trace of gravel	CH	2						17		105		
		3		12	3.5			31		87	6	2500
		4										
Dark gray brown, damp, stiff, slightly sandy, silty CLAY, calcareous	CI	5		10	2.5			27		94	7	2360
		6										
		7										
Light gray brown with rusty mottles, damp, firm to stiff, slightly sandy silty CLAY, calcareous	CI	8										
		9										
		10		12	2.0			20		106	10	460
								19		111		
		11					▼					
		12										
Light brown, moist, stiff, silty CLAY, calcareous	CL	13										
		14	B					26				
(no sample recovered)		15		13								
Bottom of Hole 15.5'		16										
		17										
		18										
		19										
		20										

COMPACTION TEST



SAMPLE NO.	Bulk
SAMPLE DEPTH	2.0'
SAMPLE DESCRIPTION	Dark gray, slightly sandy silty CLAY
SPECIFIC GRAVITY	2.75 (est.)
TEST DESIGNATION	ASTM D1557-70
MAXIMUM DRY DENSITY (pcf)	115
OPTIMUM MOISTURE CONTENT, %	15.5



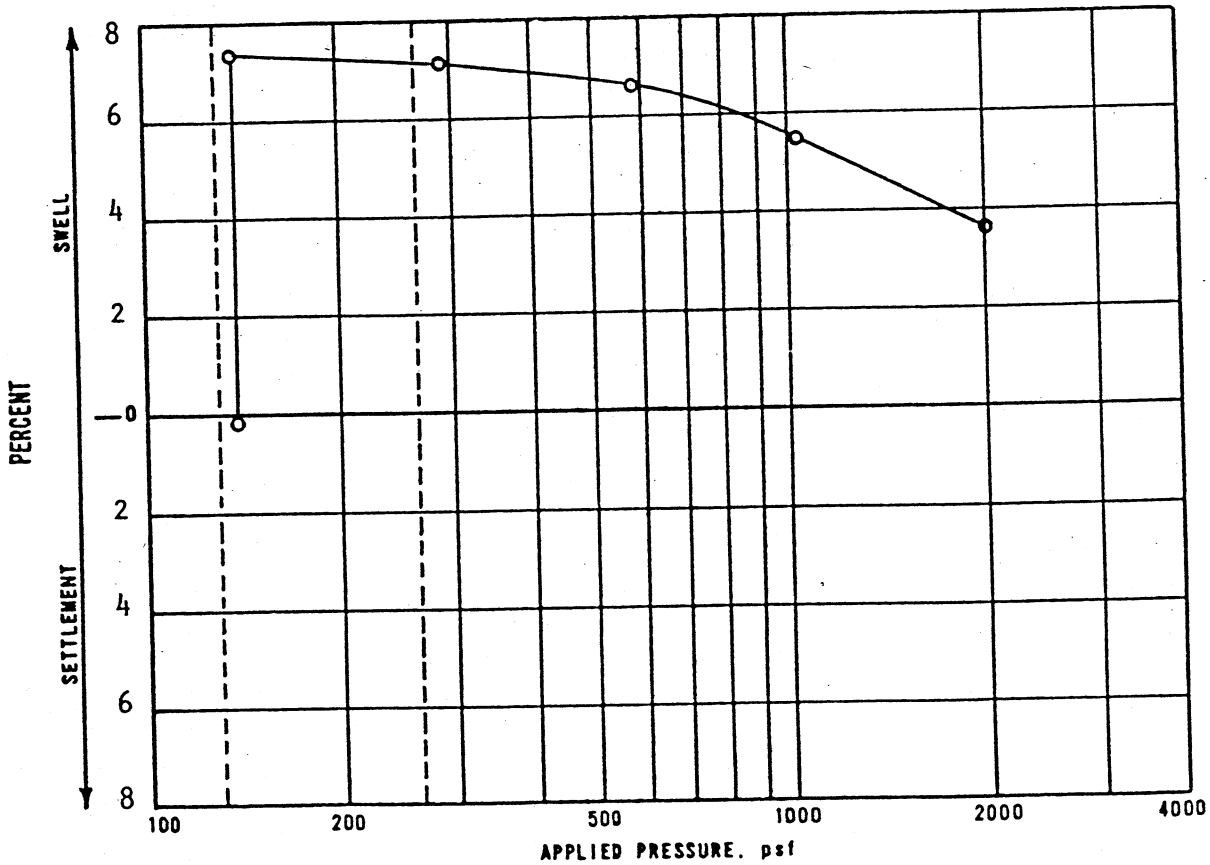
SAMPLE NO.	
SAMPLE DEPTH	
SAMPLE DESCRIPTION	
SPECIFIC GRAVITY	
TEST DESIGNATION	
MAXIMUM DRY DENSITY (pcf)	
OPTIMUM MOISTURE CONTENT, %	

PROJECT NO. 2317

SWELL-COMPRESSION TEST

HOLE NO. Bulk
DEPTH, FT. 2

SPEC. NO.	INITIAL SPECIMEN DATA			FINAL SPECIMEN DATA		
	DRY DENSITY (pcf)	WATER CONTENT (%)	DEGREE OF SATURATION (%)	DRY DENSITY (pcf)	WATER CONTENT (%)	DEGREE OF SATURATION (%)
1	104	18	79	100	24	100



Parcel Consolidation

32. Please provide additional information regarding the status of the application request before the City for the Property Acquisition Request to create three separate legal parcels.

Response: Silicon Valley Power completed and filed its application for the Property Acquisition Request (PAR) with the City of Santa Clara on September 9, 2002. As of December 13, 2002, the Pico Way PAR is in the hands of the City of Santa Clara Attorney's office for review. After review, the City Attorney's office will forward the PAR to the Engineering Department. The Engineering Department will then present the request to the Santa Clara City Council at their meeting on January 18, 2003. A final decision by the Santa Clara City Council on the abandonment of Pico Way is expected at that time.

Legal Description

33. Please provide the new legal description and revised parcel map describing the newly created parcels.

Response: The City of Santa Clara's Public Works Department is preparing a resolution for City Council approval regarding abandonment of Pico Way. Once this resolution is approved, SVP will move forward with the revised parcel map and new legal description. In order to complete the revised parcel map, a field survey must be completed. This survey will begin during the week of January 6, 2003, and will be completed in late January 2003.

Pico Way Abandonment

34. Please provide a copy of the City of Santa Clara Resolution approving the abandonment of Pico Way, which crosses the power plant site.

Response: The City of Santa Clara's Public Works Department is currently in the process of preparing a resolution for approval of abandonment by the City Council pursuant to Section 8334 of the Streets and Highways Code. We expect this resolution to be brought before the Santa Clara City Council for approval in January 2003.

Revised plot plan

35. Revise Figures 2.2-2a & 2b Plot Plan in the application to provide the following:

a) Location of all existing exterior lot lines with distances to existing and proposed structures.

b) Location of the centerlines of Duane Avenue, Lafayette Street and Comstock Street with distances to existing, exterior property lines.

c) Location of existing and proposed curbs and gutters with distances to exterior property lines.

d) Locations with distances for any areas of building setback that will be landscaped.

Response: See attached revised plot plans.

Sign Program

36. Provide a sign program that includes the following:

a) The location, size and number of all signs proposed.

b) The materials that will be used to construct the signs.

c) The lighting technique that will be used for the signs.

d) The height of all proposed signs.

e) The type of signs to be used (For example, a monument sign or a building mounted sign).

f) If signs will be located on buildings identify the distance from the surface of the sign to the surface of the structure to which it will be attached.

g) An architectural rendering of all signs proposed.

h) The content of each sign proposed.

Response: The Applicant has developed a preliminary sign program, which contains some conceptual proposals for the signage at the PPP. See attached sign program conceptual design plans. The final sign placement will be determined during the final design phase. All signage will be implemented in accordance with state and City of Santa Clara LORS.

Heavy Industrial District Coverage Standards

37. Provide calculations to show the project's consistency with the City of Santa Clara's Heavy Industrial District lot coverage standards with respect to:

a) The aerial extent of the project site (i.e., the entire ultimate legal parcels proposed for development) in square feet.

b) The aerial extent of proposed and existing structures with roofs in square feet.

Response: The project site will consist of two parcels: 1) a 2.86-acre parcel (124,581.6 square feet) where the power plant facility will be located, and 2) a smaller parcel (0.26 acres or 11,326 square feet) to be created at the corner of Comstock and Lafayette Streets where the gas compressor will be sited. Taken together, the two pieces of land total 135,907.6 square feet (3.12 acres). The gas compressor equipment will be housed in a roofed structure approximately 5,910 square feet in size. The maintenance building is the only roofed building on the power plant site and has 10,800 square feet of roofed area.

Parking Spaces

38. Provide the location, layout and numbers of parking spaces to be developed on the site. This information may be included in the revised Figures 2.2-2a and 2b Plot Plan, or in a separate, related exhibit.

Response: Eight parking spaces will be located within the Pico Way utility easement at the southeast corner of the project parcel. A single additional parking space will be located in front of the maintenance building, just outside the front door. This information, as well as the layout of the parking spaces, can be found on Figure 2.2-2a in the AFC Proposed Plot Plan.

Loading Dock

39. Delineate the location and dimensions of the loading dock in the revised Figures or the separate exhibit.

Response: The project has no loading dock.

Loading Space

40. Specify the minimum vertical clearance over the loading space.

Response: The project has no loading dock.

Metering Station Walkway

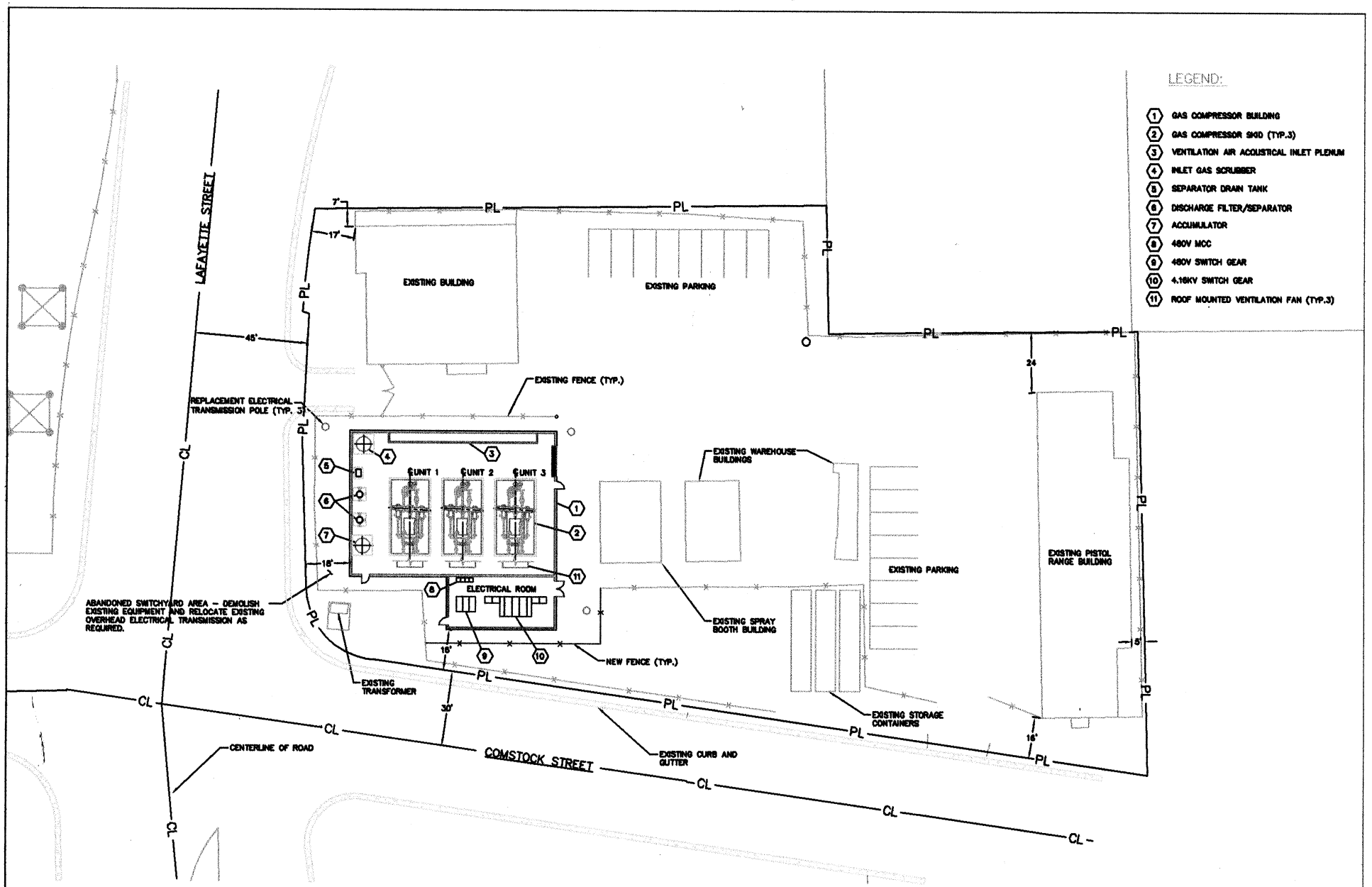
41. Please provide a copy of the recorded legal description and plot map depicting the realigned bicycle/pedestrian walkway in the area of the metering station.

Response: Attached is a parcel map from the Santa Clara County Assessor's Office, showing that the area of the proposed metering station and bicycle/pedestrian realignment. The passageway within which the metering station is located is an unpaved portion of the former Bassett Road (now Wilcox Avenue) and therefore has no recorded legal description. It is approximately 60 feet wide and extends between the back fencing of residences to the west and the barrier fencing to the Union Pacific railroad tracks to the east. Also attached is a plot map of the area and the proposed gas metering station showing the realigned bicycle/pedestrian path.

Data Request 35

REVISED PLOT PLANS

DR 35-19



GAS COMPRESSOR PLOT PLAN

GRAPHIC SCALE

0 10' 20' 40' 60'

PLANT N

Figure DR35-1b

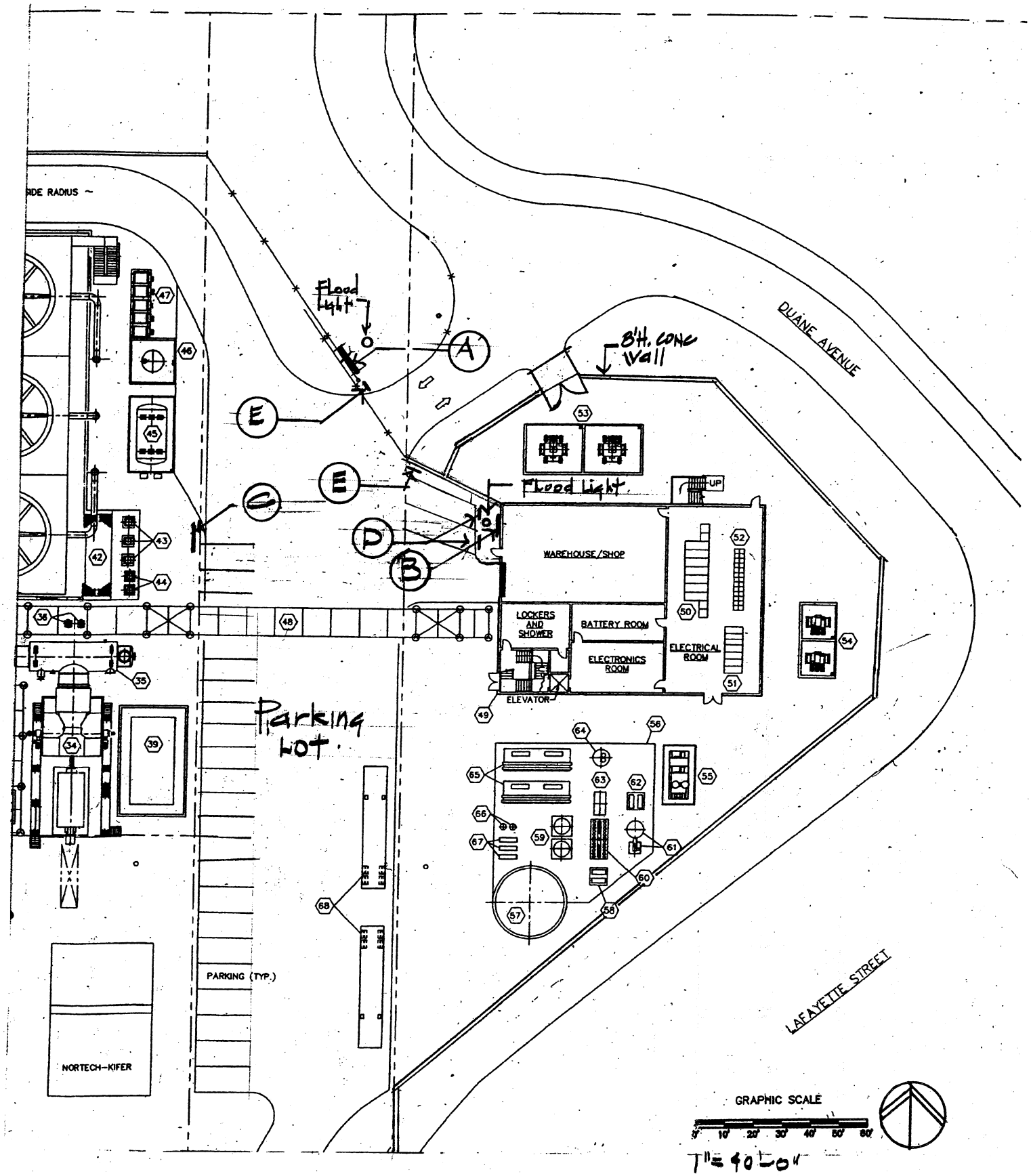
PB Power, Inc.
A Parsons Brinckerhoff Company
303 SECOND STREET, SUITE 700 NORTH, SAN FRANCISCO, CALIFORNIA 94107

PICO POWER PROJECT
PLOT PLAN

I:\Silicon_Valley_Power_Pico_Project\Engineering and PD Info\Response to CEC Data Request\figure 2.2-2b.dwg, 12/19/2002 02:46:16 PM, HP 2500C.pc3

Data Request 36

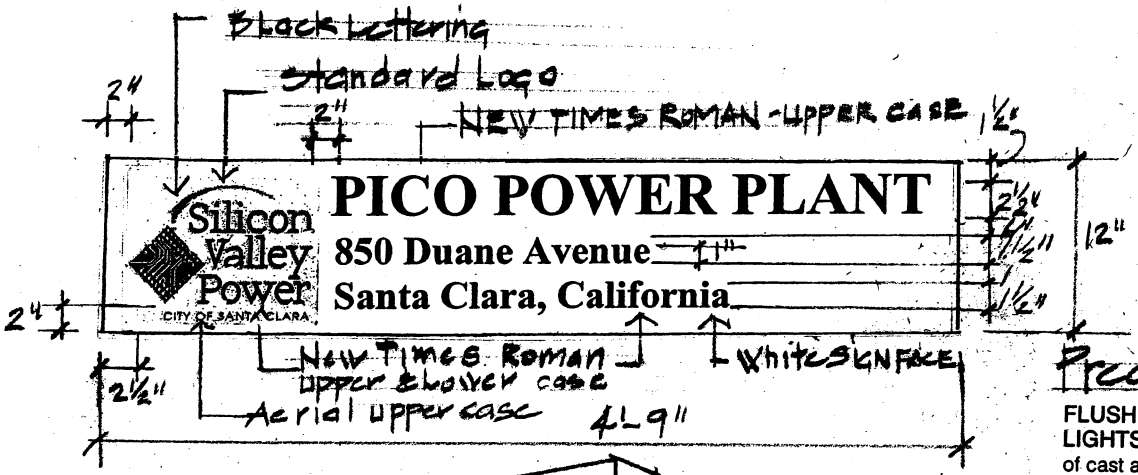
CONCEPTUAL SIGN PROGRAM

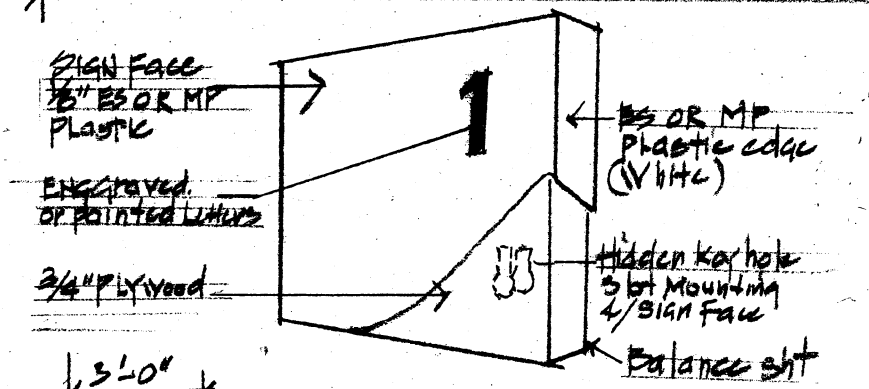


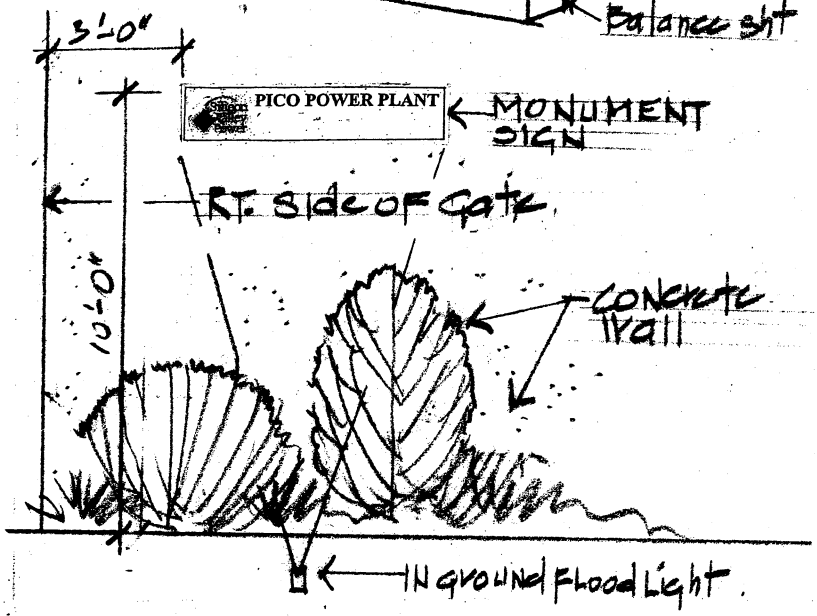
SIGN PLAN PICO POWER PLANT

scale 1" = 50'-0"

PICO POWER PLANT
850 Duane Avenue
Santa Clara, California

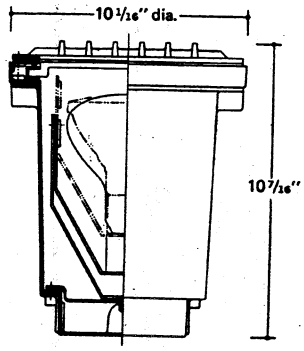






Precolite

FLUSH MOUNT GROUND LIGHTS. Weatherproof units of cast aluminum sealed for installation in concrete, earth, plaster, etc. These units are not classified as submersible; therefore, adequate drainage must be provided to avoid collection of water in fixture. Internal gimbal ring aiming of lamps permits light adjustment of 0°-30° in any direction. Integral splice box has two hubs located 180° apart, tapped for ½" conduit, side entry. One closure plug furnished. Other hub sizes and locations available when specified. Epoxy primed jade green baked enamel finish. Units should be coated with asphaltum before installation



5104 Same as 5100 except with tempered lens. PAR-38 lamp only.

SIGN A - MONUMENT SIGN (4.8 SQ. FT.)

PLANT OPERATIONS BUILDING
ENTRANCE

2"
1"
1/4"

White Sign face
2" emp
Black lettering

PLANT OPERATIONS BUILDING
ENTRANCE

2"
2"
1"
1"
9"

New Times Roman (UpperCase)
NEW TIMES Roman
3"
4 1/2 - 6"
3"
2 1/2"

Sign Face
6" ES or MP Plastic
Painted letters
3/4" Plywood

A

ES or MP Plastic edge (white)
Hidden key hole slot mounting 4/sign.
Fluorescent lt.

Prego Lite

OUTDOOR FLOOD, Rugged enclosed and gasketed unit of diecast aluminum construction —for high output lighting applications. 300W incandescent, PAR-56 or 500W quartz-halogen PAR-56 lamps. Tempered, molded clear glass. Textured gray finish.

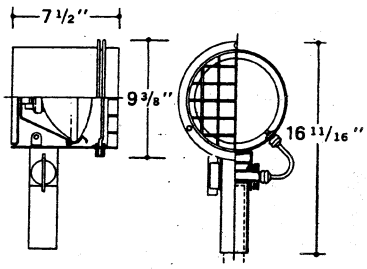
Windows
Approx Location

Bldg. Sign
3'-0"
1'-9"

Roll-up door

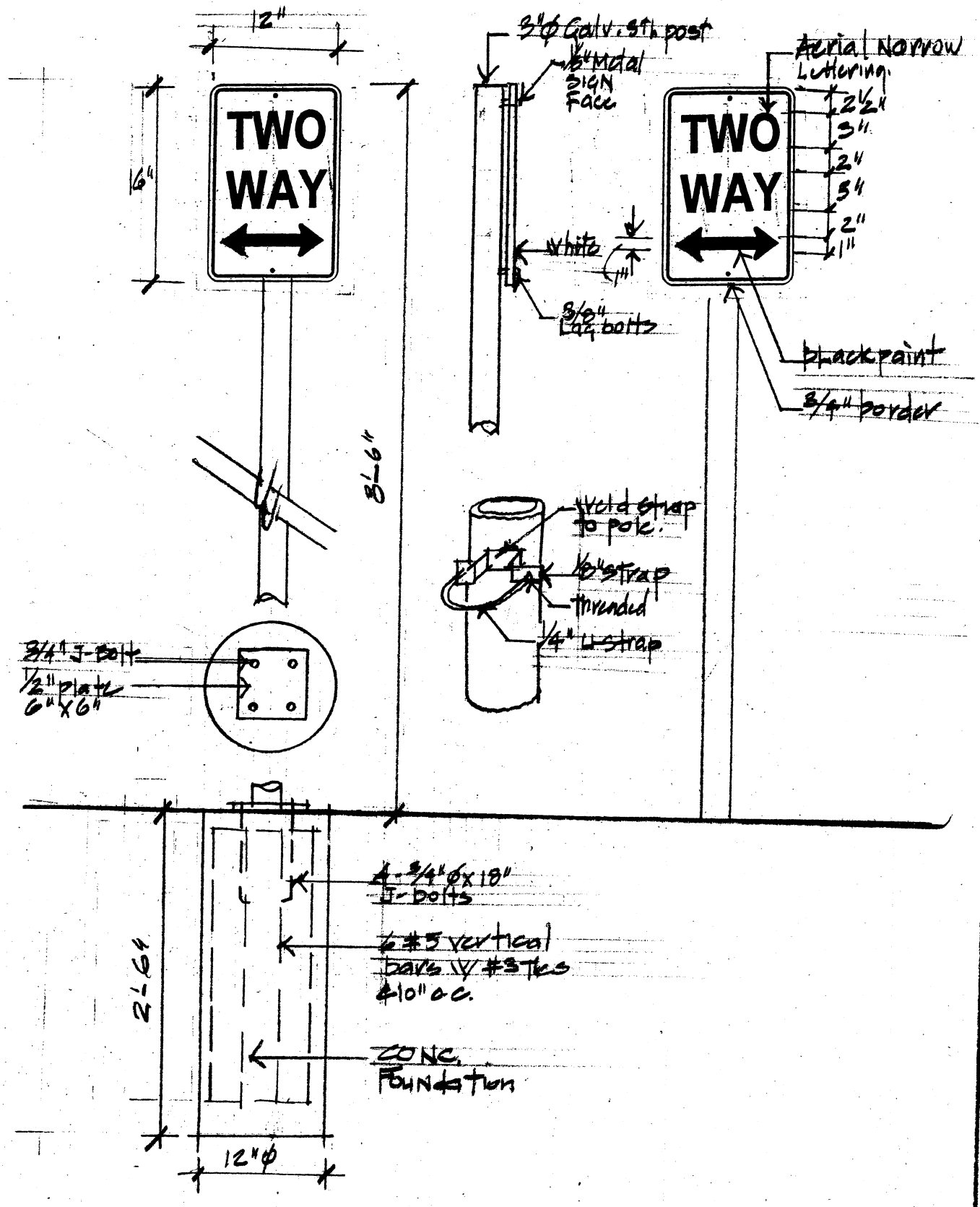
Above Ground Flood Light

Entry

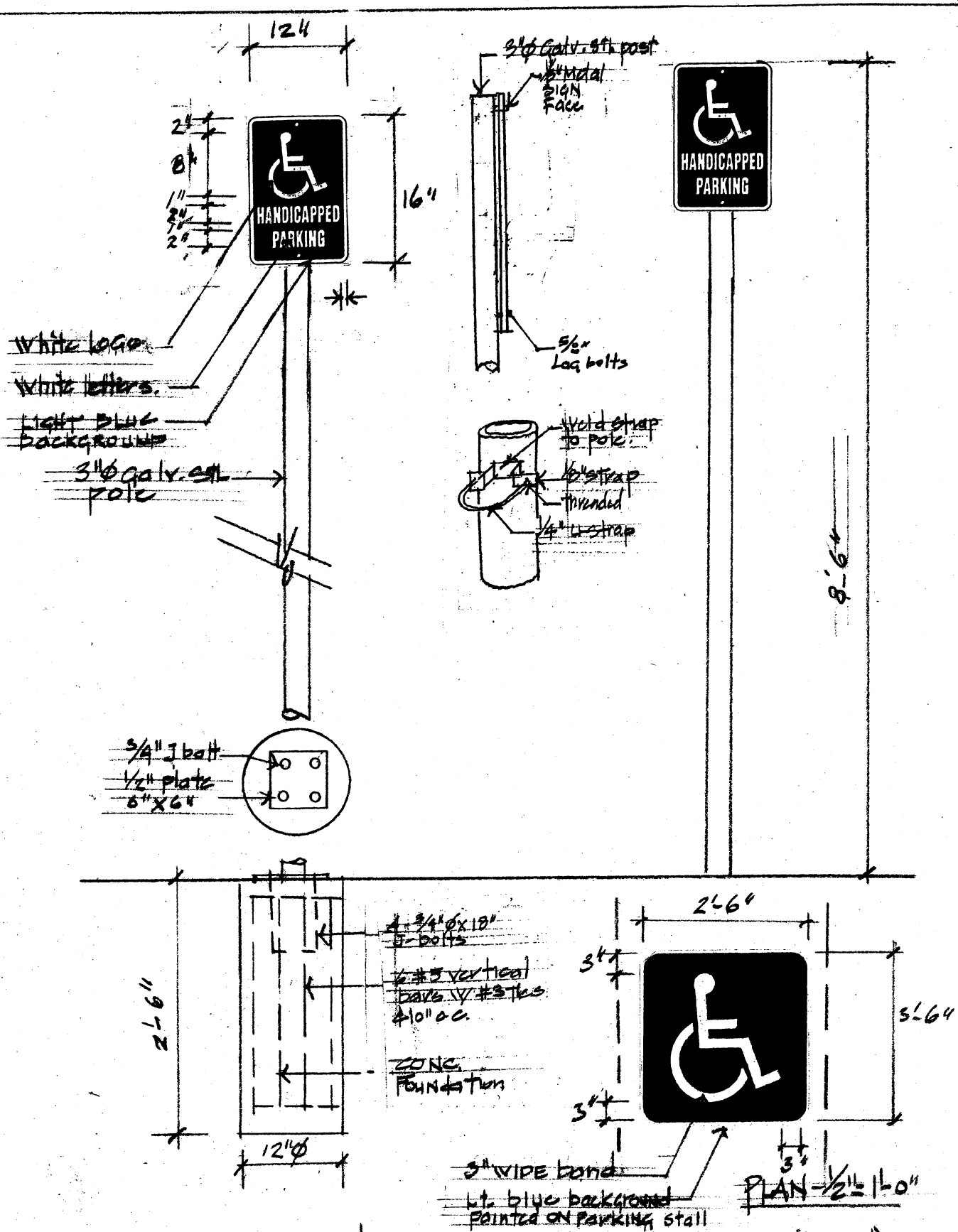


93002 Complete with louver.
300/500W, PAR-56
Fitter slip fits 1½" pipe (1⅞" O.D.)
Specify cat. no. 93028 for wall mount application.

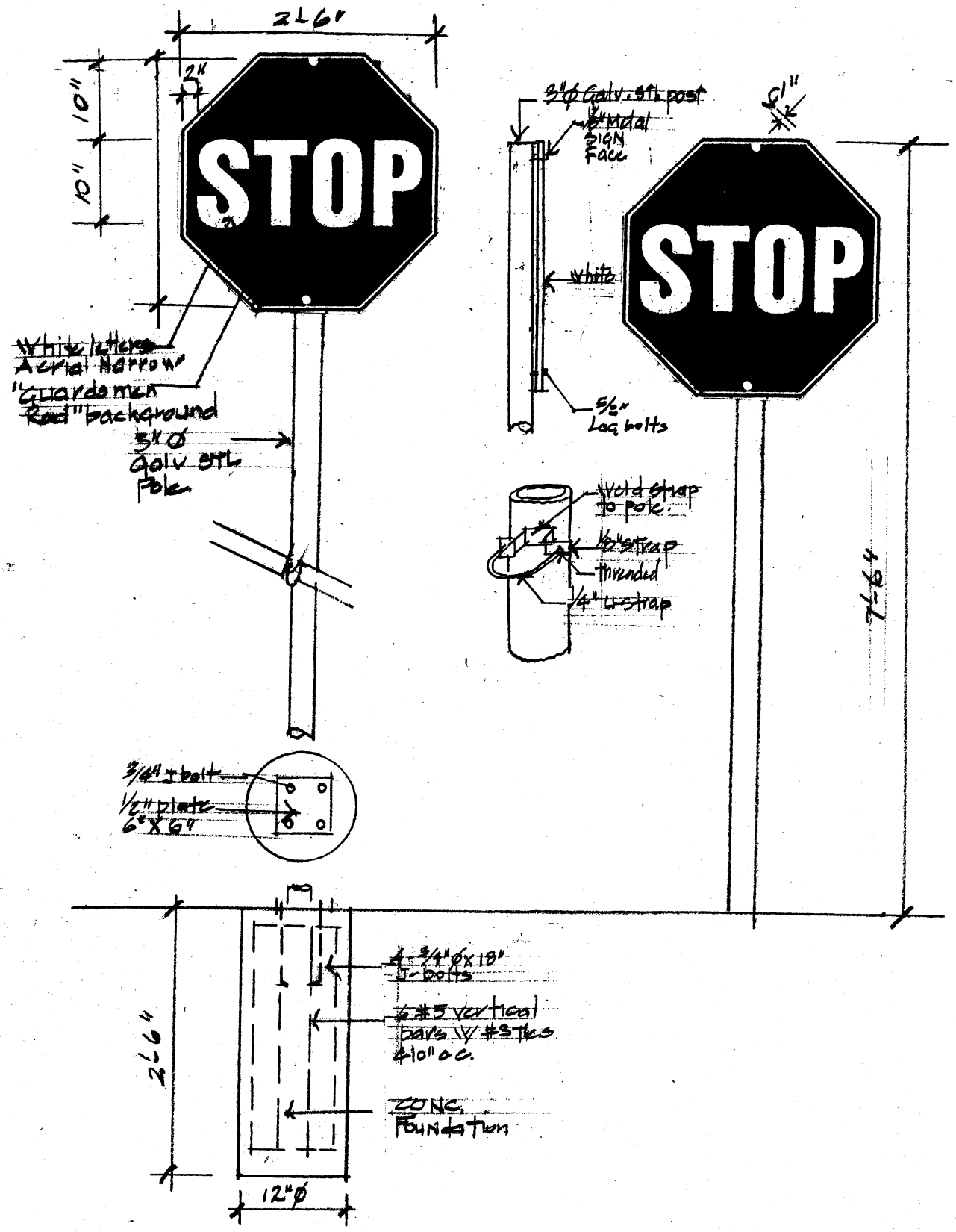
SIGN B - OPERATIONS BLDG. SIGN



SIGN C - DIRECTIONAL SIGN (1"=1'-0")



SIGN D - HANDICAPPED SIGNS (3/4" = 1')

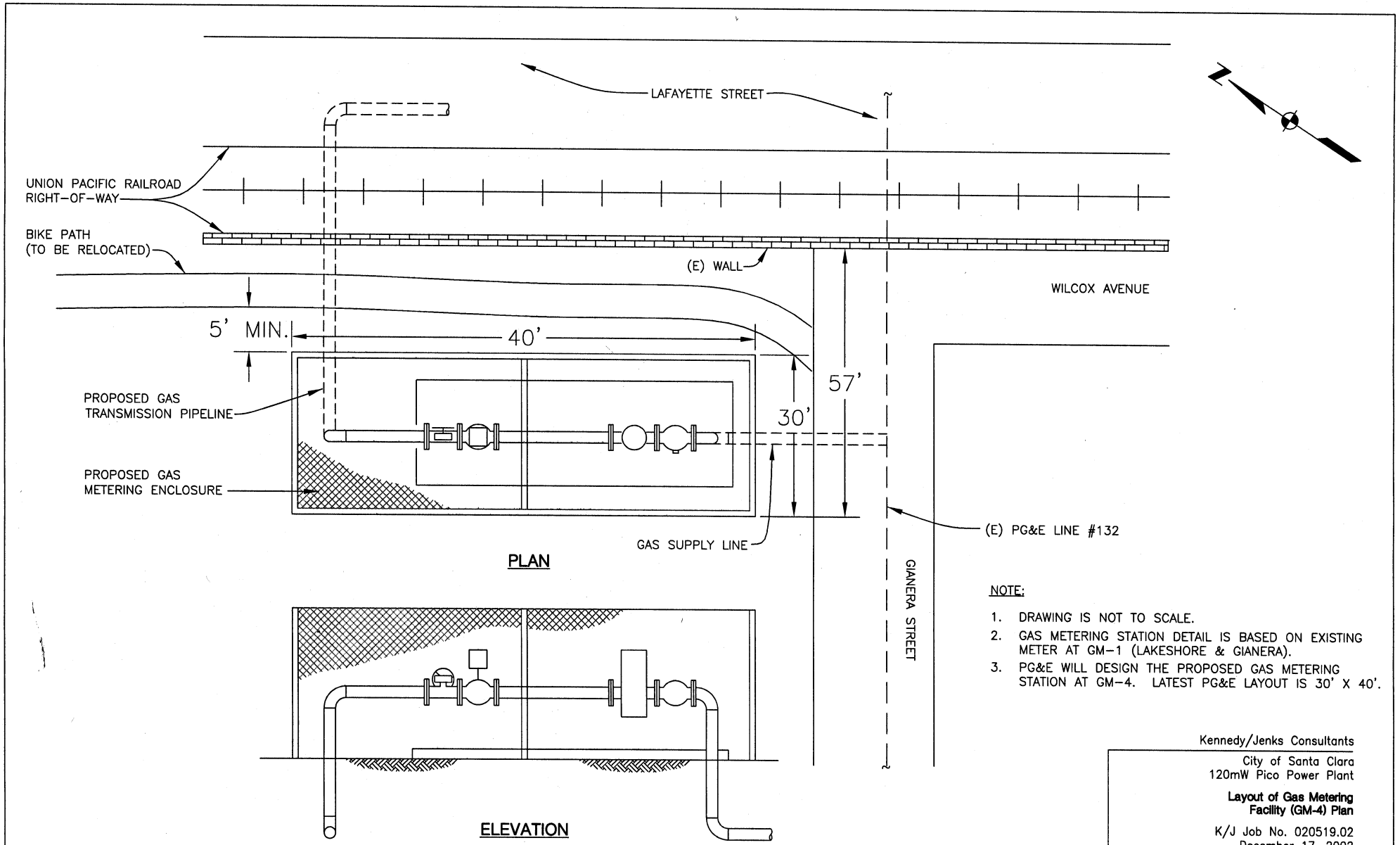


SIGN E - STOP SIGNS (3/4"=1'-0")

Data Request 41

GAS METERING STATION DIAGRAM

PARCEL MAP SHOWING THE GAS METERING STATION AREA



NOTE:

1. DRAWING IS NOT TO SCALE.
2. GAS METERING STATION DETAIL IS BASED ON EXISTING METER AT GM-1 (LAKESHORE & GIANERA).
3. PG&E WILL DESIGN THE PROPOSED GAS METERING STATION AT GM-4. LATEST PG&E LAYOUT IS 30' X 40'.

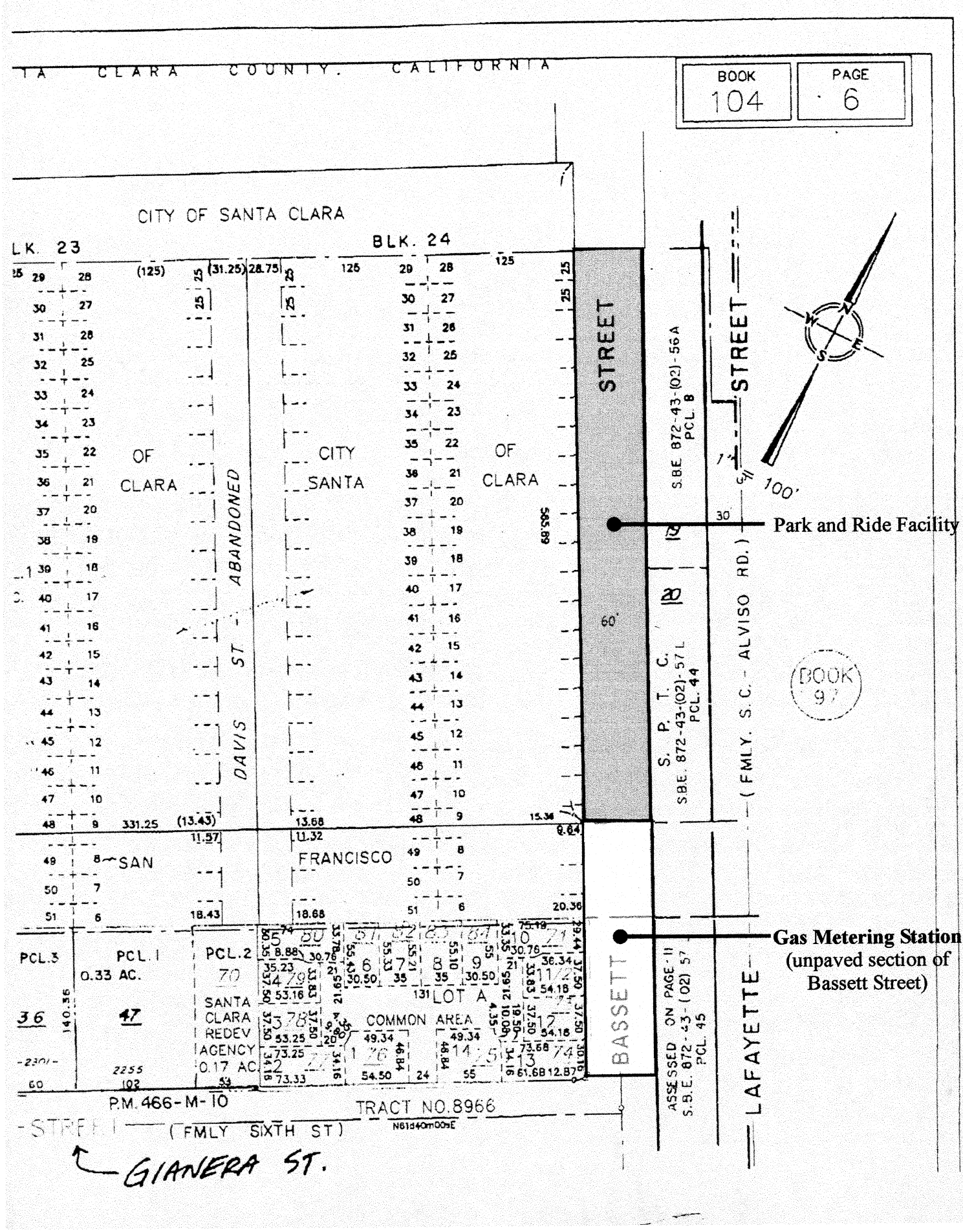
Kennedy/Jenks Consultants

City of Santa Clara
120mW Pico Power Plant

Layout of Gas Metering Facility (GM-4) Plan

K/J Job No. 020519.02
December 17, 2002

Figure 2


TA CLARA COUNTY, CALIFORNIA
BOOK 104
PAGE 6
CITY OF SANTA CLARA
BLK. 24
LK. 23
OF CLARA
CITY OF SANTA CLARA
ABANDONED
DAVIS ST
SAN FRANCISCO
STREET
STREET
S.B.E. 872-43-(02)-56A PCL. B
S. P. T. C. S.B.E. 872-43-(02)-57 L PCL. 44
(FMLY. S.C. - ALVISO RD.)
100'
60'
30'
Park and Ride Facility
Gas Metering Station
(unpaved section of
Bassett Street)
BOOK 97
BASSETT
LAFAYETTE
ASSESSED ON PAGE 11 S.B.E. 872-43-(02) 57 PCL. 45
PCL.3
PCL.1
0.33 AC.
PCL.2
SANTA CLARA REDEV AGENCY 0.17 AC.
COMMON AREA
LOT A
131
P.M. 466-M-10
TRACT NO. 8966
(FMLY SIXTH ST)
GIANERA ST.

Communications with Agencies

42. Please identify and describe any communications between the applicant's staff and consultants and Caltrans, the City of Santa Clara, or other applicable agencies.

Response: The Applicant, Silicon Valley Power, is the municipal electric utility of the City of Santa Clara. Since this is a City of Santa Clara project, internal communications between City planning and public works staff with the Applicant are ongoing. The Applicant's engineering consultant, Kenney/Jenks, has been in communication with Caltrans to determine what approvals are required for installation of the natural gas line. Once the final pipeline design is completed, the Applicant will complete and submit an application for approval from Caltrans for installation of the natural gas line.

43. Has any agency reviewed or commented, verbally or in writing, on the traffic impacts related to the construction or operation of the PPP? Have any potentially significant adverse impacts on any of the local roads or highways been identified?

Response: No agencies have commented on any potential traffic issues related to the construction or operation of the project. Additionally, no potentially significant adverse impacts on any of the local roads or highways were identified during the traffic study.

CD ROM

44. Please provide a CD containing high-resolution, electronic versions of Figure 1.1-1 (Architectural Rendering), and Figures 8.13-4a through 8.13-9b (the 11"x17" formatted existing view photographs and computer simulations), as revised by the following data requests.

Response: We have submitted a CD-ROM with the revised simulations as well as all of the figures for Visual Resources submitted previously with the AFC.

Landscaping/screening

45. Please discuss the feasibility of alternative screening options, such as offsite landscaping and architectural screens to conceal the industrial elements of the heat recovery steam generators (HRSGs), consistent with the City of Santa Clara Zoning Ordinance. The discussion should address the possibility of planting trees within the setback area between Lafayette Street and the Kifer Receiving Station and the use of onsite architectural screens to conceal views of the upper portions of the HRSGs from public rights of-way, including Lafayette Street (KOPs 1 and 6), Laurelwood Drive (KOP 3), and Highway 101 (KOP 4), and nearby properties (KOP 5). If it is feasible to plant trees offsite and/or use architectural screens, please revise the simulations accordingly. Please provide high quality 11" x 17" color images

Response: It is not feasible to plant trees or install architectural screens onsite or offsite, to screen the HRSGs from view from key observation points. The planting strip along the east side of the Kifer Receiving station is very narrow and transmission lines are overhead. Under the California Public Utility Commission's General Order 95 and because of the transmission lines overhead, trees will not be allowed to gain a height of more than 15 feet in this area. The view from KOP 1 (Central Expressway and Lafayette Street) currently consists of the Kifer Receiving Station and several large transmission lines in the middleground, and the tops of the PPP facilities in the background, screened by the Kifer Receiving Station. This is not a scenic or sensitive view that requires mitigative screening.

Similarly, views of the project area from Laurelwood Road (KOP-3), U.S. 101 (KOP-4) and Raymond Street (KOP-5) are not sensitive, scenic, or protected views that would require screening to avoid adverse impacts. Architectural screening, in any case, would not be feasible for this project due to space constraints. Offsite landscaping would not be feasible because the City of Santa Clara does not own or control parcels of land on which to install such landscaping.

From KOP-6 (Lafayette Street overpass to U.S. 101), the HRSGs are completely hidden from view by the project's cooling tower. Landscaping as proposed below (see response to Data Request 47) would provide further screening.

The Background introduction to this data request states that the City of Santa Clara zoning ordinance requires the screening of "mechanical equipment." This is not found in the zoning ordinance, however, but rather in the City's architectural guidelines that apply in a general way to all zoning districts. According to Mr. Geoffrey Goodfellow, Planning Director of the City of Santa Clara (personal communication with Scott Muller, December 3, 2002), this provision refers to the screening of mechanical appurtenances (such as air conditioners), not to an industrial structure, such as the power plant HRSGs.

46. Please discuss the feasibility of planting landscaping along the walls proposed on the north and west boundaries of the site to soften the appearance of these walls (which appears to be a requirement of the City of Santa Clara Zoning Ordinance) and to increase the screening of the project structures. If it is feasible to install landscaping along the north and west boundaries, please revise the simulation for KOP 3 to depict the plantings. Please provide a high quality 11" x 17" color image.

Response: It is not feasible to provide landscaping along the walls on the north and west sides of the site. Since the walls will be constructed along the property lines, there is no additional space for planting in this constrained project site. These walls, furthermore, do not face the street, but instead face the back sides of large buildings that have few windows on the wall side, and a parking lot.

The City's architectural guidelines, not the zoning ordinance, encourage landscaping around the foundations of the walls. This is a general guideline, not a binding regulation. According to the City of Santa Clara's Planning Department (personal communication between Geoffrey Goodfellow, Planning Director, and Scott Muller on December 3, 2002), the PPP would not be required to landscape the walls. In this case, landscaping such as climbing vines or other plants to cover the walls, would require additional space adjacent to the walls on what is a very constrained site and may not be feasible. The landscaping would largely be ineffectual at any rate, since there are few points from which these walls could be seen (that are not otherwise screened by the proposed landscaping or by buildings). Instead of landscaping, the City has requested that the project utilize a decorative wall treatment or design to relieve the solid mass that they otherwise create as seen from the parking lots of the neighboring buildings on Raymond Avenue. The project simulation from KOP 5 has been revised to show decorative design of the perimeter walls (see Figure DR46-1, attached).

47. Please discuss the feasibility of planting trees that would grow taller than those shown on the northeast and east sides of the site (depicted by the simulation of 10 year-old trees at KOP

2) to substantially screen the project from view within 5 years of planting. If there is a concern about the trees growing into the overhead 60 kV power line that would be relocated from the site to run along Lafayette Street and Duane Avenue, please discuss the possibility of placing this line underground in addition to the other lines being undergrounded. If it is feasible to plant taller-growing trees, please provide new simulations for KOP 2 showing the trees at 5 years of growth and at maturity. Please provide high quality 11" x 17" color images.

Response: It is feasible to plant taller trees in the landscaping strip along Duane Avenue and Lafayette Street on the northeastern, eastern, and southeastern sides of the project site. Larger trees, such as redwoods, are consistent with the City of Santa Clara's landscaping policies, and will substantially screen the project facilities within 5 to 10 years from views along Duane Avenue and Lafayette Street. These trees will be strategically placed to avoid the relocated 60 kV transmission line that will be installed near this same area. This transmission line parallels the proposed 8-foot-high perimeter wall to the project site and will have conductors installed vertically on the wooden poles. Visual simulations of the project from KOPs 2 and 6 have been revised to show these larger trees at 5 years of age and at maturity (Figures DR47-1 through -4).

Landscape Plan

48. Please provide a conceptual landscape plan (at a scale of 1" = 40') depicting the types and locations of trees, shrubs, and vines proposed to screen the power plant structures and walls consistent with the requirements of the Santa Clara Zoning Ordinance and to mitigate potentially significant visual impacts at KOP 2. The plan should describe the number of plants to be installed and their sizes at the time of planting. The plan should also describe the growth rate and times to maturity of the plant species selected, as well as their height at 5 years and at maturity.

Response: A Conceptual Landscape Plan is attached at the end of this section (and provided in larger format at a scale of 1" = 20' to CEC Staff). It depicts all plant species proposed to screen or soften the visual impact of the power plant consistent with the requirements of the City of Santa Clara's Architectural Guidelines and Zoning Ordinance. A plant matrix is also provided, along with the plan identifying the number of plants at all sizes, growth rates, characteristics, sizes at time of planting, after 5 years, 10 years, 20 years, and at maturity. Plants shown in the simulations for KOPs 1, 2, and 6 are shown at maturity.

Cooling Tower Plume Abatement

49. Please provide a brief description of the cooling tower plume abatement design; please confirm the "design point" for the plume abated cooling tower (noted in the Data Adequacy Supplement to be 35°F and 85% relative humidity) that describes the ambient condition limits at which visible plumes may start to form; and if available, please provide a plume

fogging frequency curve for the plume abated tower design (an example of a plume fogging frequency curve is attached).

Response: Cooling tower plume abatement is achieved by the reduction of the relative humidity in the air leaving the cooling tower stacks. Reduction of the relative humidity is accomplished by raising the exiting air temperature. This is typically achieved by adding an air mixing section above the normal wet cooling tower cells. In the walls of this mixing section there are water-to-air heat exchangers. Hot water returning to the cooling tower is first passed through these heat exchangers before being discharged into the wet cooling tower section. The cooling tower fans draw in ambient air that passes over these heat exchangers and is heated to temperatures above the existing ambient condition. This heated air is then mixed with the air from the wet cooling tower section (which is at 100% RH) such that the resulting air mixture exiting the stack is not saturated and the exiting temperature is above the ambient temperature of the surrounding air mass. With the cooling tower plume mass being at a temperature above the saturation temperature and above the ambient temperature, there is no vapor condensation resulting in a visible plume. The plume abatement system was designed to minimize plume formation for all temperatures at or above 35 degrees F and all humidity conditions up to 85 percent saturation.

Tabular frequency distribution of the visible plume for an unabated tower is provided on electronic files under separate cover. The SACTI computer output files for each year of analysis (1988-1993) contain cumulative frequency distributions of visible plume(s) for the cooling tower.

50. For staff to conduct a modeling analysis of the plume abated cooling tower exhaust, please at a minimum provide cooling tower operating data to fill the following table (Please note: this data request is not required to be answered if a plume fogging frequency curve is provided as part of the response for the proceeding data request). The values provided in the table must correspond to maximum heat rejection operating conditions at the specified ambient conditions.

Ambient Condition	*Exhaust Velocity (m/s)*	*Exhaust Flow Rate (lbs/hr/cell)*	*Moisture Content (% by weight)*	*Exhaust Temperature (°F)*
30°F, 80% RH				
30°F, 60% RH				
30°F, 40% RH				
40°F, 80% RH				
40°F, 60% RH				
40°F, 40% RH				
50°F, 80% RH				
50°F, 60% RH				
50°F, 40% RH				

Please note that staff intends to model the plume abated cooling tower using hourly estimated exhaust conditions based on the hourly ambient conditions of the meteorological file used to perform the modeling. The cooling tower exhaust conditions will be interpolated based on the exhaust values given. Therefore, additional combinations of temperature and relative humidity, if provided by the applicant, will be used to more accurately represent the cooling tower exhaust conditions.

Response: A cumulative frequency distribution was provided in electronic form in response to Data Request 50.

51. Please indicate if the applicant is willing to stipulate to a condition of certification that specifies the level of plume mitigation as described above, or has any comments regarding such a condition. Staff expects to write a condition of certification similar to that provided for the Russell City Energy Center plume abated cooling tower.

Response: The Applicant is willing to accept a condition of certification that the cooling tower plume abatement system will be installed and operated. However, there could be conditions of extremely low temperature and/or high relative humidity where a visible plume could form even with the abatement system fully operational. The Applicant would therefore object to a condition requiring that SVP prevent plumes from ever forming.

52. Please provide electronic copies of the Moffett NAS meteorological data, processed data and raw data, used by the applicant in conducting their plume modeling assessments. Please provide the following additional information: source of the meteorological data (i.e. National Climatic Data Center or other agency), anemometer height, and station location in latitude and longitude.

Response: The electronic files (unprocessed CD-144 format)) for Moffett Field are being provided under separate cover on CD-ROM. The anemometer height is 6.1 meters. The data was provided by NCDC on compact disk. The processed meteorological data, used in SACTI, is a binary format. The compiler used to generate the binary data was LAHEY EM-32 FORTRAN 77. The binary data is only readable through this compiler. Therefore, only the ASCII data in CD-144 format is provided. The latitude of Moffett Field is 37.3 degrees. The longitude is 121.9 degrees.

Data Request 46

REVISED PROJECT SIMULATION FROM KOP-5

Data Request 47

REVISED PROJECT SIMULATIONS FROM KOPs 2 AND 6

Data Request 48

CONCEPTUAL LANDSCAPE PLAN

WPCP Reliability

53. Please provide and estimate of the reliability of the WPCP, including, but not limited to:

a. Any reasons why the WPCP would be unable, even temporarily, to supply the project;

The reclaimed /recycled water which will be used as the primary water supply for the PPP will be provided by South Bay Water Recycling (SBWR). The SBWR Program was initiated in 1997 to reduce the discharge of treated water flowing from the WPCP into San Francisco Bay. The discharge of the WPCP's tertiary treated water into the Bay was believed to be endangering the salt marsh habitat by converting the saltwater marsh to fresh water and brackish water marsh. Rather than discharging all its treated water into the Bay, the WPCP now diverts water to the recycled water system thereby keeping discharges to the Bay under its permit discharge limit of 120 million gallons per day.

Table DR53-1 summarizes the influent and effluent flows from the WPCP for the first half of 2002 as reported in the July 2002, Clean Bay Strategy Report (City of San Jose, 2002). As can be seen from the flows presented in Table DR53-1, the WPCP has capacity to support the SBWR to meet average and peak PPP water supply requirements of 0.94 mgd (average flow) and 1.8 mgd (peak flow).

Table DR53-1. San Jose/Santa Clara WPCP Flows January through June 2002.

Month	Influent Flow (mgd)[1]	Diverted Flow[2] (mgd)	Effluent Flow[3] (mgd)
January	123.0	3.9	119.1
February	119.3	3.8	115.5
March	120.4	5.5	114.9
April	118.5	8.4	110.1
May	118.2	9.9	108.3
June	114.0	13.0	101.0
Average	118.9	7.4	111.5

[1]mgd = million gallons per day

[2]Diverted flow includes Recycled Water to SBWR distribution system, temporary on-site storage and WPCP irrigation

[3]Effluent flow is discharged by the WPCP into San Francisco Bay

As can be seen from the table, the WPCP has excess capacity as well as on-site storage capability for its tertiary treated water. The use of reclaimed water by the PPP will assist the WPCP in reducing its overall effluent discharge to San Francisco Bay.

b) How frequently such interruptions in service are likely to occur and the expected duration of such interruptions.

To evaluate reliability of the SBWR system, Mr. Eric Rosenbloom (Program Manager, SBWR) was contacted in August 2002. At that time, Mr. Rosenbloom reported that the reclaimed water system has had a limited number of outages due to 1) water quality variability (heavy rain can temporarily overload the WPCP treatment system), and 2) equipment failure (such as pipeline breaks in the distribution system).

According to Mr. Rosenbloom, in the past five years, there have been between 5 to 10 system outages (Personal Communication, August 9, 2002). One of the most recent system outages was in January 2000, when the WPCP treatment system was shut down for approximately 12 hours. However, according to Mr. Patrick Kwok (WPCP Division Manager, Operations and Engineering) while the WPCP treatment system has experienced outages such as those as described by Mr. Rosenbloom, with the exception of SBWR pipeline breaks, customer service has generally not been interrupted. Mr. Kwok stated that during those times when the WPCP treatment system has been shut-down, the use of recycled water stored by the WPCP has allowed service to SBWR customers to be maintained (Personal Communication, December 9, 2002).

Mr. Ron Garner (WPCP Plant Manager) also confirmed that the recycled water system was originally designed to allow for 72-hour outages and to operate in the dry season. However, Mr. Garner stated that upgrades to the system have been made and, in Mr. Garner's opinion, the system has improved in reliability over the past couple of years (Personal Communication, August 12, 2002).

In summary, the SBWR system is highly reliable. Historical operational information obtained from the individuals above suggests that the system may experience limited outages in the range of 12 to 72 hours once or twice a year at most. In addition, the July 2002 Clean Bay Strategy report states that an $82.5 million system expansion (approved by the San Jose City Council in June 2001) is currently underway. As a part of this expansion, the report notes that improvements will be implemented to further increase the reliability of the recycled water system (City of San Jose, 2002).

Backup Water Supply Well

54. Please provide additional information on the proposed back-up water supply well. Including, but not limited to:

a) Ownership of the well

Silicon Valley Power will own the backup water supply well. The well will be located on-site at the PPP property at 850 Duane Avenue in the City of Santa Clara. The well will be permitted as an industrial water supply well.

Please note that ownership of the backup supply well by SVP and its designation as an industrial supply well constitutes a change in the project design from that originally outlined in the PPP AFC filed October 7, 2002. In the AFC, it was stated that the City of Santa Clara had agreed to provide a new City water supply well in order to increase pressure in the City's existing water supply system (since an increase in the capacity of the City's potable water supply was not required to meet the PPP back-up water supply requirements).

However, based upon the reliability of the SBWR system and the estimated backup water supply requirements of the PPP (between 7.56 to 57 million gallons per year (mgy)), the installation of an on-site industrial supply was selected as the preferred back-up water supply option.

b) Specifications of the new well

SVP anticipates that the backup water supply well will be completed in the lower confined aquifer with a total depth of between 600 to 800 ft. below ground surface. The preliminary design for the well requires that the well be constructed using 30-inch diameter surface conductor casing, cemented in place. Telescoped inside the surface conductor casing will be 14 to 16-inch diameter production casing. In accordance with SCVWD well construction requirements, the well will be constructed with a sanitary seal that will be a minimum of 150 feet in depth. The seal will extend through the full length of the major regional aquitard (SCVWD 1989). Below the sanitary seal, the well screen and gravel pack will be sized to the aquifer formation to optimize well efficiency.

The anticipated yield for this backup water supply is consistent with other nearby City of Santa Clara extraction wells and is estimated to be between 800 and 1,500 gallons per minute (gpm), (City of Santa Clara 2002).

With respect to the actual construction of the backup water supply well, the SCVWD will require a well permit in compliance with Ordinance 90-1 (Personal communication, Ms. Seena Hoose, SCVWD, August 13, 2002). Ordinance 90-1 regulates the classification, construction, and destruction of wells and other deep excavations). As a part of the well permit process, a well construction application will be completed and submitted to the SCVWD for review and approval before well construction.

c) A list of all projects and users to which the well will supply water

The backup water supply well will supply water solely to the PPP project. The backup water supply well will only be used during those periods when the primary recycled water supply is temporarily unavailable.

d) Estimated average and maximum annual volume to be pumped from the well;

The backup water supply well will supply water solely to the PPP project. Since the PPP will be the sole user of the on-site backup water supply well, the responses to Data Requests 54d and 54e are identical. Average and maximum annual water volumes to be extracted from the backup water supply well are presented in the response to Data Request 54e.

e) Estimated average and maximum annual volume to be pumped from the well for the PPP

As discussed in response to Data Request 53, the SBWR system is highly reliable. Services outages of a short-term duration (less than 72-hours) once or twice a year comprise actual operating conditions. To assess the realistic average volume of water to be pumped from the backup supply well, the following assumptions were made:

1) Two 72-hour service interruptions would occur during the year (during which time no recycled water would be available)
2) All PPP water supply requirements would be obtained from the backup supply wells (i.e., there would be no contribution from the City of Santa Clara potable water supply system), and
3) All 72-hour outages would occur during hot summer days (the PPP would therefore require 1.26 mgd to operate).

Using the above conservative assumptions, the average annual volume required from the backup water supply well would be approximately 7.56 million gallons per year (mgy).

To accommodate an unusual service outage and calculate a maximum annual volume from the backup supply well, it was assumed that the backup water supply would be required for a maximum of 45 days per year (not including catastrophic events such as an earthquake). To calculate the maximum annual volume of water withdrawn from the backup water supply well, the plant water requirements for a hot summer day (1.26 mgd) were multiplied by the maximum number of days backup water would be required (45). Under this scenario, a maximum of 57 mgy of backup water would be consumed by the PPP.

f) Aquifer depth and water quality data for the aquifer from which the water will be withdrawn.

SVP anticipates that the backup water supply well will be completed in the lower confined aquifer with a total well depth of between 600 to 800 feet below ground surface. The City of

Santa Clara water supply Well Number 26 is located within one mile of the PPP site. Well 26 has a maximum yield of 1,032 gpm and is constructed with several screened intervals that range from 295 to 665 feet below ground surface (bgs) (City of Santa Clara, 2000).

Table DR54-1. Statistical Summary of Santa Clara Valley Groundwater Data as compared with Water Quality Objectives.

Constituent [1]	Median Concentration Lower Aquifer Zone	Drinking Water Standard [2,3]
Aluminum (ug/L[4])	6	1,000[2]
Arsenic (ug/L)	0.2	50[2]
Barium (ug/L)	159	1,000[2]
Boron (ug/L)	132	None
Cadmium (ug/L)	<1	5[2]
Chloride (mg/L)	43	500[3]
Chromium (ug/L)	1	50[2]
Copper (ug/L)	2.7	1,000[2]
Fluoride (mg/L [5])	0.12	2.0[2]
Iron (u/L)	11	300[3]
Lead (ug/L)	0.6	50[2]
Manganese (ug/L)	4	50[3]
Mercury (ug/L)	<1	2[2]
Nitrate (mg/L)	11	45[2]
Selenium (ug/L)	1.5	50[2]
Silver (ug/L)	<1	100[2]
Sulfate (mg/L)	46	500[3]
Total Dissolved Solids (mg/L)	420	1,000[3]
Zinc (ug/L)	5	5000[3]

1. For common inorganic water quality constituents
2. Maximum contaminant level as specified in Table 64431-A of Section 64431, Title 22, of the California Code of Regulations
3. Secondary maximum contaminant level as specified in Table 64449-A and Upper Recommended Contaminant Ranges as outlined in Table 64449-B of Section 64449, Title 22, of the California Code of Regulations
4. ug/L = micrograms per liter
5. mg/L = milligrams per liter

Reference: RWQCB 2001

Given the proximity of Well 26 to the PPP site and its comparable yield to that required by the PPP, it is likely that the screened intervals for the PPP backup supply well will be similar, though not identical, to those of Well 26. While the available well construction data from Well 26 provides a strong indication of aquifer conditions which may be encountered during the

construction of the backup supply well, final construction specifications for the backup well will depend upon the specific stratigraphy encountered at the PPP site.

Inorganic water quality data for lower aquifer is presented in Table DR54-1 (RWQCB, 2001). Volatile organic compounds (VOCs) are monitored by the Santa Clara Valley Water District as a part of its basinwide groundwater monitoring program or by public water suppliers as part of their Title 22 compliance monitoring (SCVWD, 2002). In 2001, VOCs were detected at concentrations below drinking water standards in 24 active water supply wells in the principal aquifer zone (also referred to as the lower confined aquifer) in the Santa Clara Valley Basin. The most commonly detected VOCs were 1,1,1-trichloroethene (detected in 15 wells) and trihalomethanes (THMs).

Groundwater Supply

55. Please provide additional information of the groundwater supply, including, but not limited to:

a) A groundwater balance;

b) Current and historic groundwater elevations for the basin;

c) Current, historic and projected groundwater recharge volumes;

d) Current and historic saltwater intrusion into the basin;

e) Estimated effects of pumping on saltwater intrusion, movement of saltwater or contaminated plumes, impacts to other wells and subsidence.

Response: Question 55 requests additional information on water balance and the effects of groundwater withdrawal on existing contamination, saltwater intrusion, and impacts to other wells. To answer this question completely and in a manner which addresses concerns associated with the impact of local groundwater withdrawal on long-standing basin-wide groundwater concerns (such as groundwater storage, saltwater intrusion and subsidence), the location and pumping information for wells within a 1/2 mile radius of the Pico Power Plant is required. The City of Santa Clara has requested the well search data. Once this well data is provided by the Santa Clara Valley Water District, then an analysis of both the local and basin-wide impacts of pumping of the backup supply well can be completed. If the well search data is received the week of December 23rd, we anticipate that the response to Question 55 will be submitted by January 3, 2003.

Master Plan

56. Please provide a copy of a long-range master plan for water.

Response: This City of Santa Clara 2002 Water Master Plan is attached.

Future Supply and Demand

57. Please provide information on the current and estimated future water supply and demand in the basin for the life of the project.

The life of the project is estimated to be 30 years. However, existing water supply projections are currently only available to 2020. Estimates of current and future water supply demand across the basin were obtained from the SCVWD Urban Water Management Plan (2001). These projections are summarized below in Table DR57-1.

Table DR57-1. Projected water demand (acre-feet per year).

	Year	2000	2005	2010	2015	2020
Total Demand	Lower Projection	406,290	404,252	406,600	410,942	415,920
	Most Likely	420,977	419,954	423,332	429,026	435,289
	Upper Projection	443,845	442,962	447,720	462,136	478,262

Landscaping Water

58. What will be the source and demand of landscaping water for the Project?

Recycled water will be used to meet landscaping water supply requirements for the PPP. Although plant lists have yet to be finalized, a preliminary estimate of landscaping water supply requirements (once plants are established after approximately 1 year) is on the order of 24,000 gallons per year.

Wastewater Disposal

59. Please provide additional information on the proposed wastewater disposal system:

Response: Wastewater disposal information, as provided by the City of Santa Clara (letter from Rajeev Batra, City Engineer, City of Santa Clara, to Mike Fox, Pico Power Project), is as follows:

a) Capacity and current volume of the existing 27-inch sewer line;

The peak operating capacity of the existing 27-inch sanitary sewer is 4.7 mgd. The current peak volume in the existing 27-inch sanitary sewer is 4.1 mgd, based on continuous monitoring of the 27-inch line for the week of July 12 through July 19, 2002.

b) Estimated maximum current volume of the existing 27-inch sewer line;

See response to Data Request 59a, above.

The existing 27-inch sanitary sewer line connects to an existing 48-inch line which, in turn, connects to two 33-inch parallel lines. The 33-inch lines connect to the City of San Jose trunk lines at the intersection of Trimble and Zanker Roads. The City of San Jose trunk lines convey the flow to the treatment plant.

The two 33-inch lines govern the capacity of the City of Santa Clara sewer system. The peak operating capacity of the two 33-inch lines is estimated at 14 mgd. The following are recent historical sewer flow data for these two existing 33-inch lines:

Maximum total flow	13 mgd
Average total flow	7.5 mgd
Minimum total flow	3.5 mgd

d) The policy regarding cost sharing of line upgrades.

The existing 27-inch sewer line was designed using the following minimum average design flows:

Residential	70 gallons per capita per day
Commercial	2,100 gallons per capita per day
Industrial	2,450 gallons per capita per day
Hospital	150 gallons per capita per day

Past practice has been to allow development to occur as long as there is adequate capacity in the sanitary sewer system. If in the future, the system is surcharged, the properties served by the system are asked to contribute towards supplementing (i.e., upsizing the line or constructing a new parallel line) the sanitary sewer system, as determined by the City. The amount to be contributed towards supplementing the system is a pro-rata share, based on site acreage, using the minimum average design flows (above).

Alternative Backup Water Supply

60. Because the project proposes to use fresh water for cooling water backup, Staff must examine whether options are available for this demand, such as use of degraded water in the upper aquifer as opposed to higher quality water in the deeper aquifer. Please provide a detailed feasibility and environmental impact analysis regarding alternative water supplies, cooling methods and waste disposal in comparison to the proposed options. The analysis should include, as a minimum:

a) Impacts on water use, other users and waste discharge in comparison to those currently proposed for the project;

b) All economic factors considered (such as capital and operating costs including water purchase and infrastructure price; efficiency losses and economic impacts; etc...) and all assumptions and or vendor data to support these estimates;

c) Changes in plant and linear facility infrastructure required to support each technology;

d) Plant efficiency and output calculations and assumptions for each alternative considered;

e) Analysis to support determinations on environmental impacts (particularly land use, biological and cultural resources, agriculture and soils, geologic hazards, traffic & transportation and water resources); and

f) All information sources and appropriate references.

Response: For efficient operation, the PPP requires a high quality, reliable influent water supply. For these reasons and to minimize the use of fresh water for the PPP, tertiary-treated recycled water provided by South Bay Water Recycling (SBWR) was chosen as the primary water supply for the project. To meet potential short-term supply outages in the recycled water supply (less than 72-hours in duration on average once or twice per year), a backup industrial well water supply, constructed in the lower confined aquifer zone, was selected as the preferred backup water supply alternative for the PPP. The only feasible alternatives for the backup water supply would be industrial well supply from: a) the upper aquifer (<150 feet) or the lower confined aquifer. Other cooling options would not be practicable for a backup supply. (For example, air cooling would not be practical for a backup supply because of the expense and site space needed). For this reason, the response to this question focuses on an alternatives analysis that compares the upper and lower aquifers as sources of backup cooling water. Since these alternatives do not require significantly different project design or operational configurations, we have not addressed these aspects of the Data Request (Items 60c, 60d, 60e) in any detail. However, an alternative cooling analysis is included in Section 9.6.5 of the AFC.

The lower confined aquifer (also referred to as the "principal aquifer zone" or the "pressure zone") is the most appropriate water supply aquifer for the PPP well due to its proven ability to deliver the volume of water required for the PPP (between 0.94 to 1.8 mgd), and because it can consistently provide the quality of influent water necessary for PPP operations. The regionally extensive aquitard, which confines the lower aquifer zone, has also protected the lower aquifer from contaminants that have degraded water quality in the upper aquifer zone. For these reasons, the lower confined aquifer zone represents the principal source of groundwater for potable and industrial use in Santa Clara Valley (SCVWD 2001).

The upper aquifer zone comprises those aquifers that occur within 150 feet of ground surface. Construction of the backup industrial well water supply within the upper aquifer zone is not considered feasible because: 1) water quality within one-quarter mile of the PPP site is degraded in this zone due to saltwater intrusion and organic contamination, and 2) the long-term reliability

of this source is uncertain because the quality is variable and because the upper aquifer is vulnerable to new contamination events.

There is significant and widespread pollution of the shallow unconfined aquifer zone from leaking fuel and solvent underground storage tanks and from landfills (Iwamura 1985; SCVWD 1989; RWQCB 2001; SCVWD 2002). Key chemical threats which have been identified with respect to water the upper aquifer zone are 1) saltwater intrusion, 2) methyl-tertiary-butyl-ether (MTBE), 3) chlorinated organic solvents, and 4) nitrates (RWQCB, 2001).

Saltwater intrusion—The water quality issues noted above and the highly variable contaminant concentrations detected within the upper aquifer make it particularly unsuited to provide a long-term water supply. Saltwater intrusion and organic contamination particularly affect the upper aquifer water quality in the vicinity of the PPP site.

Saltwater from San Francisco Bay and adjacent salt ponds has intruded into the upper unconfined aquifer within the Santa Clara Valley Basin. This is due to historical overpumping of water supply wells and associated subsidence (Iwamura 1980; RWQCB 2001). A zone of saltwater intrusion is present along San Francisco Bay, in the northern portion of the Santa Clara Valley Subbasin. The extent of intrusion is defined by the 100 milligram per liter (mg/L) chloride isoconcentration contour. The area within this isocontour encompasses approximately 18 square miles of the upper aquifer zone along San Francisco Bay and the salt evaporation ponds, from Highway 101 on the west to Highway 880 on the east. Intrusion extends as much as three miles inland from the salt evaporation ponds along the Guadelupe River (SCVWD, 2002).

The PPP site is situated within ¼-mile of the 100 mg/L isocontour which defines the zone of saltwater intrusion and within 1-mile of the Guadalupe River. The proximity of the site to zone of saltwater intrusion within the upper aquifer is a serious limitation on the use of the upper aquifer for water supply. A production well, such as the PPP backup water supply well, required to produce between 0.94 mgd (653 gpm) to 1.8 mgd (1250 gpm), may, over time, contribute to the further inland migration of the zone of saltwater intrusion. The proximity of the 100 mg/L isocontour to the site also suggests that influent chloride and total dissolved solids concentrations may vary substantially with pumping, resulting in the PPP requiring additional influent water treatment.

Contamination—In August 2002, BBL Environmental Information conducted an Environmental Records Search in support of a Phase I Environmental Site Assessment for the PPP. The search identified 18 Leaking Underground Storage Tank (LUST) facilities within a half-mile of the site. A subsequent review of solvent sites listed by the SCVWD resulted in the identification of 25 active solvent sites within the City of Santa Clara, with eight of these sites located upgradient, and within a 1-½ mile, distance of the PPP site.

Two key solvent sites are within ½ mile of the site with known plumes: 1) Camsi IV (Monsanto) Property (2710 Lafayette Street) and, 2) Fairchild Semiconductor (3080/3100 Alfred Street). The Camsi IV (Monsanto) property is located approximately 2,000 feet south of the site. A trichloroethene (TCE) groundwater plume in the upper aquifer extends northward from this site. The Calsites database references TCE concentrations of 30,000 parts per billion (ppb), compared with a maximum contaminant level for TCE of 5 ppb. Database records indicated that the TCE plume has extended has far north as the Owens Corning site (Phase I Site Assessment, 2002).

The Fairchild Semiconductor site is located approximately 2,600 feet west of the PPP site. TCE is also present in groundwater at the Fairchild Semiconductor site with maximum concentrations up to 2,300 ppb detected in the upper aquifer. The Fairchild Semiconductor site monitors 32 wells and operates three recovery wells as a part of their on-going remedial activities.

The proximity of the site to both inorganic and organic contamination present within the upper aquifer within a ½ mile of the site suggests that a water supply well completed within the upper aquifer would not provide consistent water quality to the PPP plant. Additionally, although the backup supply well would not be pumped frequently, it is likely that groundwater extraction rates of between 653 to 1250 gpm would temporarily influence groundwater flow patterns within the upper aquifer. Pumping of the backup supply well could also interfere with nearby groundwater recovery efforts by altering existing groundwater hydraulics.

Reliability of Supply—In addition to contamination already known to be present within the vicinity of the site, it is likely, given the industrial nature of the area surrounding the PPP site, that additional sources of subsurface contamination may affect water quality in the future. The vulnerability of the upper aquifer to additional contamination also makes the aquifer a poor choice for a long-term water supply.

Wastewater Disposal

61. Please provide information on the capacity of Santa Clara's storm water collection system that will receive drainage from the PPP in relation to the expected increase in peak flow for a 100-year storm event.

The 54-inch storm drain system is designed to convey the 10-year storm event. It is expected that the existing storm drain system will be surcharged (pressure flow) and that the public street prism (curb to curb) will convey part of the flow during the 100-year storm event and not allow "public" storm water to enter private properties.

The PPP would lead to a net increase of 0.24 cfs (10-year storm) and 0.35 cfs (100-year storm) to this storm drain system. This level of increase would not cause a significant adverse impact to the system.

Erosion Control Plan

62. Please provide a preliminary construction Erosion Control Plan with associated construction monitoring programs showing conceptual design and locations proposed for temporary BMPs for erosion control during construction.

Response: Erosion Control Plans are incorporated into the draft Storm Water Pollution Prevention Plans for construction and operation (see response to Data Requests 63).

Storm Water Pollution Prevention Plans

63. Please provide draft Stormwater Pollution Prevention plans for construction and operation of the PPP.

Response: Draft Storm Water Pollution Prevention Plans for construction and operation are attached. These preliminary documents will be modified and finalized as necessary in coordination with the construction contractor when detailed design and construction plans are developed.

Drainage Design

64. Please provide drainage plans with proposed contours showing existing and proposed watershed areas, drainage channels, peak discharge rates and volumes at key concentration points, and conceptual design and capacities of the proposed conveyance systems, erosion control features, and holding tanks. The contact and non-contact water drainage systems and design should be clearly differentiated in terms of location, watershed area, drainage conveyance design, storage system design, peak flow rates and runoff volumes. The plan should include post-development storm water discharge rates and volumes for contact and non-contact areas for the 5, 10, 25- and 100-year recurrence intervals. Provide a description of how frequently runoff volumes are expected to exceed the capacity of the drainage system or holding tanks, and how excess runoff will be accommodated and prevented from carrying contaminants off-site in the event of storms in excess of the drainage or storage capacity. Please provide a narrative description as well as conceptual plans and design details with all back-up hydrologic and hydraulic calculations used in developing the drainage concept design.

Response: The grading and drainage drawing, C1 (attached) shows the proposed grading and drainage plan after development of the essentially flat site. As shown in the drawing, the watershed area is the plant site area. Final site elevations and slopes will be developed during detailed design based upon the amount of excavation required for foundations, etc. Expected ridges, valleys, catch basins, pipeline routes, and storm water oil/water separators are shown on drawing C1. Refer to drawing C2 for the site contours of the existing site conditions noting that the site is essentially flat and that the watershed area is the plant boundary. Due to the sound

walls on the north and west plant boundaries, no stormwater runoff will enter or leave the plant along those sides. The southern plant grading plan will be designed so that no stormwater runoff will flow between the plant and the Kifer Receiving Station. The plant's eastern boundary borders Duane Avenue and Lafayette Street, and the grading plan will be developed to catch plant stormwater runoff and connect with the city stormwater drain system.

Peak discharge rates and runoff volumes for the 5, 10, 25, and 100-year events are presented in the attached Grading and Drainage concept description and calculation sheets. Based on preliminary calculations and drain line sizing for the small watershed area, it is expected that the plant stormwater collection system will easily handle a 100-year event and no holding tanks will be required. Preliminary line sizing indicates that a 100-year event peak discharge rate will be less than 50 percent of the capacity of a 15-inch RC drainpipe. There would, therefore, be no excess runoff in the event of a 100-year storm. The Grading and Drainage concept description addresses separation of oily water from areas within the plant site within which storm water may come into contact with oily or other residues.

Erosion control will be achieved through the use of paved areas and gravel covering. The only areas not paved or graveled will be landscaping around the plant perimeter on Duane Avenue and Lafayette Street on the street (landscaped) side of the plant perimeter wall. Additionally, the landscape coverage is a minimal percentage of the site.

As described in AFC Section 8.14,Waste Management, all on-site hazardous materials stored outdoors will be contained within dikes or berms that will catch any spills or rainwater. For the contact areas, if the rainwater gathered is not contaminated, then the water will be manually drained into the equipment drain system and into the industrial drain system oil/water separator. (This is not the same oil/water separator that is used for stormwater runoff.) Treated water is then sent to the city sanitary sewer system. If the rainwater gathered in the contact areas is contaminated then it will not be drained. Appropriate measures will then be taken to treat the contaminated water depending upon the contamination nature and quantity of water. Small quantities may be treated by plant personnel utilizing absorbents, etc. or for larger quantities; an outside hazardous material handling contractor may be utilized.

Off-site Drainage

65. Please describe the existing off-site drainage where storm water will be discharged, clearly indicating its location in a drainage plan, and characterizing its capacity to carry storm water in relation to pre and post-development flows. Include any sediment controls in the system as well as clean-outs and monitoring plans.

City of Santa Clara Storm Drain Block Book sheets show that the storm drain system in the vicinity of and downstream of the PPP. Most of the storm water from the project site would be discharged into the 54-inch storm drain located in the former Pico Way right-of-way. Storm water runoff from the eastern portion of the project site (location of the maintenance building) would discharge into the 12-inch lateral drain that is located on Duane Avenue. Storm water runoff would flow northward through the 54-inch drain and into a 4 x 10 box culvert and a 48-inch storm drain under U.S. 101. From the north side of U.S. 101, a 66-inch drain runs east and east-northeast in Laurelwood Road to 24-inch and 72-inch outlets to the Guadalupe River.

The project's sediment controls, clean-out provisions, and monitoring plans are included in the Storm Water Pollution Prevention Plans for construction and operation (see response to Data Request 63, above).

References

City of Santa Clara, 2002. City of Santa Clara, 2002 Water Master Plan. City of Santa Clara Water Department, Robin G. Saunders, Director, Santa Clara, CA 95050

City of San Jose, 2002. Clean Bay Strategy, South Bay Watershed Activities, Status Report, July 2002. City of San Jose Status Report, July 2002.

RWQCB, 2001. A Comprehensive Groundwater Protection Evaluation for South San Francisco Bay Basins, Draft for Stakeholder Review. Prepared by the Groundwater Committee of the California Regional Water Quality Control Board, San Francisco Bay Region. December 2001.

Santa Clara Valley Water District (SCVWD). 1989. Standards for the Construction and Destruction of Wells and Other Deep Excavations in Santa Clara County. Santa Clara Valley Water District Publication, Revised June 1989.

——2001. Santa Clara Valley Water District, Urban Water Management Plan. Developed by the Santa Clara Valley Water District, April 2001.

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