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June 7, 2002

Ms. Kristy Chew
Siting Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: Data Responses, Set 3D
Cosumnes Power Plant (01-AFC-19)

On behalf of the Sacramento Municipal Utility District, please find attached 12 copies and one original of the Data Responses, Set 3D, in response to Staff's Data Requests dated April 5, 2002.

As part of this data response set, three copies of the following documents are being submitted:

- Streambed Alteration Agreement Application (Attachment BR-201A)
- Wetland Delineation Report (Attachments BR-206C to 206E)

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Colin Taylor/SMUD
Kevin Hudson/SMUD
Steve Cohn/SMUD

# COSUMNES POWER PLANT (01-AFC-19)

# DATA RESPONSE, SET 3D

(Responses to Data Requests: 188, 191, 201, 202, 204, 206, 207, 229 and 235)

Submitted by

## SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

June 7, 2002


2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

# COSUMNES POWER PLANT (01-AFC-19)
# DATA RESPONSES, SET 3D

**Technical Area: Biological Resources**
**Authors:** Melinda Dorin and Rick York
**CPP Authors:** EJ Koford, Russel Huddleston, and Debra Crowe

## BACKGROUND

Table 8.14-8 in the AFC lists all of the potential wetland areas that will be crossed by the proposed gas pipeline. The table includes information on the type of wetland area, and how and when it will be crossed. Figures 6.1-1 through 6.1-6 from the AFC depict the proposed gas pipeline route and what methods will be used to lay the pipe. Staff needs more information on the crossings to analyze potential impacts to Biological Resources.

## DATA REQUESTS

188. Provide an updated table that includes all of the following: any changes to the methods used to cross wetland areas from that presented in the AFC, the amount of habitat disturbance (acreage) at each crossing, bore length where appropriate, and the anticipated distance from the water's edge to the bore site.

**Response:** A table that provides the acreage of the wetland areas is provided in Attachment BR-206C (see Data Response 206, below).

## BACKGROUND

The proposed gas pipeline will cross the Cosumnes River Preserve owned and managed by The Nature Conservancy and land owned by the California Department of Fish and Game (CDFG).

## DATA REQUEST

191. Provide a letter from the CDFG that states that they have been consulted about the alignment of the gas pipeline through CDFG property and outlines any potential outstanding biological issues on CDFG lands.

**Response:** When the project was first being developed, and the pipeline alignment being determined, SMUD contractors contacted CDFG to discuss the alignment of the pipeline across the Cosumnes River. CDFG indicated that this area is managed by the Nature Conservancy and that they would advise SMUD. SMUD contractors subsequently met and discussed the alignment with Nature Conservancy staff who made suggestions as the to alignment with least environmental impact. Later, the Nature Conservancy staff indicated a concern for vernal pools on the north side of Arno Road, and SMUD revised the pipeline alignment to avoid this area.

CDFG further advised that a streambed alteration agreement would be required to HDD under the Cosumnes River. SMUD submitted an application on June 3, 2002 (see Attachment BR-201A).

On May 24, 2002, SMUD sent a letter to Pat Perkins to obtain permission to perform remote sensing on a portion of their property. Permission from CDFG was granted on May 30, 2002.

Throughout this period, SMUD attempted to correspond or meet with Pat Perkins of CDFG. Subsequently, SMUD met with Dan Gifford (CDFG) at CEC workshops and the site visit. A letter was sent to Mr. Gifford on April 30, 2002, and May 23, 2002, requesting a letter in response to this data request. We understand that a letter from CDFG is in preparation.

## BACKGROUND

At the Data Response Workshop on February 24, 2002 there was a discussion between staff and EJ Koford about the response to Data Request 8 and the anticipated schedule for the federal lead agency to initiate consultation. Table BR-8 shows the anticipated consultation schedule as well as two potential lead agencies. It was stated during the Data Response Workshop that the U.S. Army Corps of Engineers (ACOE) will act as the federal lead agency for the project, but that has not been confirmed.

## DATA REQUESTS

201. Provide a new proposed schedule that identifies when the Biological Assessment will be submitted to the USFWS and NMFS, and when CDFG permits (2081 and 1601) and Regional Water Quality Control Board 401 certification applications will be submitted.

**Response:** Three copies of the Streambed Alteration Agreement Application that were submitted to CDFG on June 3, 2002, are provided as Attachment BR-201A. Three copies of the Preliminary Draft Biological Resource Assessment (BRA) are also provided as Attachment BR-201B.

## BACKGROUND

A wetland delineation is being completed for the project site and all associated facilities. There is a potential for several rare plants to be present at the site and along the gas pipeline route. The Special-Status Biological Resources Survey for the Twin Cities Power Plant Project, July 2001 submitted as Attachment BR-17 outlines rare plant surveys completed within the vicinity of the power plant site. Rare plant surveys should also be conducted along the gas pipeline in areas that are not heavily disturbed.

## DATA REQUEST

202. Provide rare plant survey results for areas along the gas pipeline in areas where there is potential for rare plants to be located. As an example, surveys are not necessary where the proposed gas pipeline may go through a vineyard.

**Response:** A rare plant survey has been completed for the gas pipeline. It is included as Attachment BR-202.

## BACKGROUND

Data Request 31 asked for burrowing owl surveys to be conducted for the project site and associated linears. The response provided March 19, 2002 states that burrowing owl surveys are being done along with the wetland delineation. The Burrowing Owl Consortium recommends that winter surveys (December 1 – January 31) and nesting season surveys (April 15 – July 15) for burrowing owls should be completed in order to assess potential impacts as accurately as possible (Burrowing Owl Survey Protocol and Mitigation Guidelines, 1993). Staff needs to confirm that nesting season surveys for burrowing owls will be completed so staff has sufficient information to complete its analysis.

## DATA REQUEST

204. Provide results for burrowing owl nesting season surveys (field survey dates, names and qualifications of biologists) and include the locations of occupied burrows on a figure with the scale 1"=500'.

**Response:** A memo addressing field surveys of Burrowing Owls and Swainson Hawks is included as Attachment BR-204B.

## BACKGROUND

Data Response 20 (Set 1H) provided figures depicting wetland areas located within 125 feet of the 26-mile natural gas alignment and a very general summary of the wetlands.

Data Requests 19 and 20 requested a figure (with a scale of 1″=100′) outlining the vernal pools and where jurisdictional wetlands occur within 250 feet of the linear facilities and a table that estimates the amount of wetland habitat that may be directly or indirectly impacted with a 250-foot buffer surrounding vernal pools, respectively.

## DATA REQUEST

206. Please provide the wetland delineation surveys that were completed for the alignment. Include a figure with the delineation points mapped, the wetland delineation sheets that were completed, a timeline for when the wetland delineation will be submitted to the Army Corps of Engineers for jurisdictional wetland classification, and a discussion of when consultation with the USFWS is expected.

**Response:** Wetland delineation surveys for the gas pipeline were submitted to the CEC on May 20, 2003 (Data Response 206, Set 3C). The wetland delineation for the CPP plant site and laydown area (Part II) is attached. The complete report is comprised of the following documents:

- Letter and Technical Memo to Fike Finan, USACOE, dated June 3, 2002 (Attachment BR-206C)
- Wetland Delineation Report for the Proposed South Sacramento Power Plant at Rancho Seco prepared by Davis Environmental Consulting (June 2000) (Attachment BR-206D)
- Preliminary Delineation of Waters of the United States, Including Wetlands, for the Rancho Seco Park Master Plan prepared by Jones & Stokes (July 15, 1993) (Attachment BR-206E)

207. Please provide a figure and table that satisfies the requests of Data Requests 19 and 20.

**Response:** The figures requested in Data Request #19, have been provided. The pipeline was provided as Attachment BR-206B (Set 3C) and the site is provided in Attachment BR-206C. The table requested in Data Request #20, is provided in Attachment BR-206C.

# Attachment BR-201A

# Streambed Alteration Agreement Application

Three copies were submitted to the CEC

*Attachment BR-202*

# Special-Status Plant Survey for the Cosumnes Power Plant Sacramento County, California

Prepared for

**Sacramento Municipal Utility District**

P.O. Box 15830
Sacramento, California 95852-1830

June 7, 2002

CH2MHILL

2485 Natomas Park Drive
Sacramento, California 95833

# 1.0 Introduction

## 1.1 Proposed Activity

The Sacramento Municipal Utility District (District) proposes to develop a natural gas-fired generating facility south of the Rancho Seco Plant in Sacramento County, 25 miles southeast of the City of Sacramento (see Figure 1.1-1, figures are at the end of the report). It will be a high-efficiency, combined cycle facility that will provide electricity to the District's Customers. The proposed project will be located on a 30-acre parcel that is part of 2,480 acres owned by the District. The site is in Sacramento County, approximately 4 miles north of the San Joaquin County line, and 5 miles west of Amador County. Approximately 9.2 acres located on District property to the south of the proposed plant site will be used for construction staging. Natural gas would be delivered to the project through a new 24-inch natural gas supply pipeline from the Carson Cogen Facility, approximately 20 miles northwest of the CPP.

## 1.2 Survey Objectives

The purpose of the botanical survey was to determine the effects of the proposed activities on rare, threatened and endangered plant species and plant communities within the project area. Special-status plants included all federal and state-listed species as well as taxa that are considered to be rare, threatened, or endangered that have not been listed, but have the potential to become listed in the near future, or any species of special conservation concern. Database searches of the California Natural Diversity Database (CNDDB, 2002) and California Native Plant Society's electronic inventory (CNPS, 2001) identified 16 special-status plants from the general region of the project area (Table 1, all tables are located at the end of the report).

# 2.0 Environmental Setting

## 2.1 Regional Context

The project area is located with the Great Valley Ecoregion, which is characterized by extensive Pleistocene alluvial plains of the Sacramento River. Much of the valley has been converted to irrigated agriculture and urban areas. Flood control and extensive drainage improvements have decreased the duration and extent of natural wetlands throughout the area (USDA 1997). The project is located within the Hardpan Terraces ecological subregion, which includes gently sloping terraces, floodplains, and alluvial fans on the east side of the Great Valley (USDA 1997).

## 2.2 Current Land Use

The project site and staging area are located in annual grassland habitat surrounding the decommissioned Ranch Seco facility. These areas are currently used for low-density, seasonal grazing. Most of the natural gas pipeline will be buried in existing public right-of-way (road easement), railroad right-of-way, and other utility easements. A portion of the line extending from Core Road to Arno Road will cross lands used for agricultural, public utility, and natural preservation purposes. The area where the pipeline will be placed outside of existing right-of-way is designated as Agricultural Cropland and Natural Preserve/Resource Conservation Area (Cosumnes River Preserve). Most of these areas are currently used for row crops, vineyards, and pastures.

## 2.3 Study Area Topography and Elevation

The topography of the project area is relatively flat, with some areas with gently sloping hills along the eastern end of the alignment. The elevation ranges from approximately 15 to 150 feet above sea level.

## 2.4 Climate

The region is characterized by a Mediterranean climate with hot, dry summers and cool, wet winters. Summer high temperatures frequently exceed 100 degrees Fahrenheit (°F), winter temperatures are generally mild, with fewer than 20 freezing days per year. Rainfall averages 17.6 inches per year, most of which falls between November and March. Precipitation measured at the California Department of Water Resources Lodi Weather Station during November and December 2001 was similar to the monthly average. Precipitation during January and February of 2002 was only 41% and 25% of the monthly average, respectively.

## 2.5 Soils

Numerous soil types have been mapped in the project area. The plant site, staging area and eastern portions of the natural gas pipeline alignment occur predominately on Redding gravelly loam and Corning Complex soils on high terraces formed from mixed rock sources. Slopes are generally between 0 and 8 percent. Most of the soils along the pipeline alignment are mapped as San Joaquin silt loam, and Galt clay. These soils have been leveled in most areas and have slopes between 0 and 1 percent. San Joaquin and Galt soils are moderately-well and well-drained soils found on low terraces formed from mixed alluvium. Clear Lake clay soils are found around the Cosumnes River. These derived from sandstone and shale parent material and are poorly drained. Areas around Laguna Creek are mapped as Columbia sandy loam. These soils have a clayey substratum, are occasionally flooded, but have been extensively drained. Slopes are between 0 to 2 percent.

## 2.6 Plant Communities

Descriptions of plant communities are based on the *List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database* (CDFG, 1999). The classification system is based on *A Manual of California Vegetation* (Sawyer and Keeler-Wolf, 1995). Community characteristics and distribution information from Holland (1986) have also been incorporated in the following descriptions.

### 2.6.1 California Annual Grassland

This plant community is characterized by introduced Mediterranean grasses such as soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), wild oat (*Avena fatua*), annual ryegrass (*Lolium multiflorum*), and barley (*Hordeum murinum)*. Many of the common forbs are also introduced species such as filaree (*Erodium cicutarium*), wild radish (*Raphanus sativus*), mustard (*Brassica nigra*), bristly ox-tongue (*Picris echioides*), bindweed (*Convolvulus arvensis*), yellow starthistle (*Centaurea solstitialis*), hairy vetch (*Vicia villosa*) and mallow (*Malva parviflora*). Common native forbs include brodiaea (*Brodiaea coronaria* and *B. elegans*) gold cups (*Calochortus luteus*), miniature lupine (*Lupinus bicolor*), and common spikeweed (*Hemizonia pungens*). This community is found throughout most of California's valleys and foothills at elevations less than 4,000 feet. Annual grassland was the dominant plant community on both the proposed plant site and staging area. This community was also common along the natural gas pipeline alignment in pastures, on the Cosumnes River Preserve, and along the edges of roadsides and cultivated fields.

### 2.6.2 Northern Hardpan Vernal Pools

This plant community is associated with soils underlain by a shallow, iron-silica cemented hardpan and hummocky microrelief made up of low mounds and shallow depressions. Winter rainfall perches above the hardpan and collects in the depressions, resulting in seasonal wetlands. The vegetation on the mounds is characterized by annual grassland species, but the seasonal inundation of the depressions results in a unique suite of species, often dominated by native annul grasses and forbs. Common species observed in vernal pools included popcorn flower (*Plagiobothrys stipitatus*), Freemont's goldfields (*Lasthenia fremontii*), smooth goldfields (*Lasthenia glaberrima*), coyote thistle (*Eryngium* sp.), showy

downingia (*Downingia ornatissima*), California semaphore grass (*Pleuropogon californicus*) and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*) are dominant species. This plant community is found on old alluvial terraces on the east side of the Central Valley from Tulare County north to Shasta County. Vernal pools were observed on the plant site, staging area, Cosumnes River Preserve. Constructed vernal pools as part of the Stonegate mitigation area, were observed along the natural gas pipeline alignment, south of Elk Grove Boulevard. Ephemeral ponds and drainage ditches that occur along roadsides and railroad berms can also exhibit some of the characteristics of vernal pools (seasonal hydrology, vegetation, and characteristic fauna). Drainage ditches and ephemeral ponds occur along both sides of the Western Pacific Railroad south of Carson Ice-Gen Project, near the north end of the gas pipeline.

### 2.6.3 Great Valley Mixed Riparian Forest

This habitat is characterized by a dense canopy of winter deciduous, broadleaf trees including sandbar willow (*Salix exigua*), Goodding's willow (*Salix gooddingii*) valley oak (*Quercus lobata*), California black walnut (*Juglans hindsii*), cottonwood (*Populus fremontii*), and box elder (*Acer negundo*). This habitat is associated with fine-textured alluvial soils of low gradient streams and rivers in the Sacramento and San Joaquin Valleys. Within the study area this habitat was observed along the Cosumnes River.

### 2.6.4 Valley Oak Woodland

Valley oak woodland is characterized by a generally open canopy in which valley oak is often the only tree species present. The understory is characterized by annual grassland. Valley oak woodland occurs on well-drained alluvial soils in the Sacramento and San Joaquin Valley and in the coastal valleys from Lake County to western Los Angles County. Within the study area, valley oak woodland was observed on the east side of Laguna Creek.

### 2.6.5 Bulrush-Cattail Wetland

This plant community is characterized by perennial, emergent monocots such as cattail (*Typha latifolia*) and tule (*Scirpus acutus*). This wetland type occurs in quiet water areas that are either permanently flooded, or inundated for extended periods of time. Natural bulrush-cattail wetlands occur along the upper reaches of the Sacramento-San Joaquin Delta, in river oxbows and other flood plain areas. This wetland community was observed along the natural gas pipeline alignment in an excavated irrigation pond, on the western side of the Cosumnes River. Additional areas with dense cattails were also observed at scattered locations along the natural gas pipeline alignment. These areas were generally associated with stock ponds or excavated linear features such as agricultural canals and drainages.

### 2.6.6 Agricultural Areas

Agricultural areas comprise the dominant habitat along natural gas pipeline corridor. Most areas are used for irrigated crops such as safflower, milo, clover, alfalfa, irrigated pasture and vineyards. Some areas are used for dry land crops such as wheat, oats, and barley.

## 2.6.7 Other Habitats

### Badger Creek

The natural gas line will cross a section of Badger Creek which is a seasonally-flowing tributary of the Cosumnes River. Tule and water-primrose (*Ludwigia peploides*) are present in portions of the stream channel. The riparian area is limited to a narrow band of small trees including sandbar willow, valley oak, and black locust (*Robinia pseduoacacia*).

### Laguna Creek

Laguna Creek is an seasonally flowing tributary of the Cosumnes River. Riparian vegetation in this area is limited to a few scattered valley oak trees, common rush (*Juncus effusus*), and annual grasses.

### Willow Creek

Willow Creek is a channelized, seasonal tributary of the Cosumnes River. The riparian vegetation is characterized by blackberry (*Rubus discolor*), ruderal forbs, and annual grasses. A few small patches of tules were observed in the channel. Agricultural areas are present on either side of the creek channel in this area.

### Unnamed Creek

An unnamed, channelized creek is located immediately east of Bruceville Road. Water from the creek is currently used for irrigation of the adjacent agricultural areas. The riparian area is characterized by an eucalyptus (*Eucalyptus globulus*) woodland with an understory of annual grasses and ruderal forbs. Emergent vegetation such as tules and cattails are intermittent along the sides of the creek.

### Open Water

A large, natural open water area was observed along the gas line alignment on Cosumnes River Preserve, east of Highway 99. Water primrose covered approximately 75% of the water surface. The margins of the open water, subject to seasonal inundation, were characterized by popcorn flower, coyote thistle, and spike rush (*Eleocharis macrostachya*).

### Swales

A swale is a linear, open depression that lacks a defined channel, but funnels overland or subsurface flow into a drainageway. The swales observed along the alignment were largely characterized by non-native annual grasses such as Italian ryegrass (*Lolium multiflorum*). Spike rush, coyote thistle and nutsedge (*Cyperus eragrostis*) were also present in these areas as subdominant species. Water flows in these areas in response to winter rains, with inundation greatly reduced or absent the remainder of the season. Swales were observed on both the plant site and staging area. Along the natural gas pipeline alignment, swales were observed south of Elk Grove Boulevard, on the Cosumnes River Preserve, and east of the Laguna Creek Crossing.

# 3.0 Methods

Prior to the field surveys a list of special status plants potentially occurring in the project area was compiled from the California Natural Diversity Base (CDFG, 2002) and the California Native Plant Society's Inventory of Rare, Threatened and Endangered Plants (CNPS, 2001).

Botanical surveys were conducted in accordance with CDFG (2000) plant survey guidelines. Surveys of the proposed Cosumnes Power Plant site and the laydown area were conducted on May 14, 2002. Surveys consisted of walking the proposed project and laydown areas. All plant species encountered within the project boundaries were identified to the taxonomic level necessary to determine the conservation status using Hickman (1993). Plant species observed during the field survey are listed in Table 2. Particular attention was given to seasonal wetland habitats, including vernal pools, intermittent creeks, and swales. Walking surveys of the proposed natural gas pipeline were conducted on May 15, 17, 29, and 31, 2002. Agricultural areas such as vineyards, alfalfa fields and grain crops were not included in the survey, but all areas adjacent to these fields were investigated. Early season botanical surveys in seasonal wetland areas were also conducted on April 15, 2002 as part of the wetland delineation.

# 4.0 Results and Conclusions

The California Natural Diversity Database and California Native Plant Society's electronic inventory search identified 16special-status plant species within the general vicinity of the Project (Table 1). No special-status plant species were identified in the project area during the wetland delineation or focused botanical surveys within the project boundary. In general, the majority of the vegetation was dominated by non-native annual grasses and forbs. Important natural habitats such as mixed riparian forest, oak woodlands and freshwater marsh habitats will be avoided and are not expected to be affected by the proposed project through the use of horizontal directional drill construction, reduced work areas, installation of silt fencing and other best management practices. Direct impacts to vernal pool habitat will be avoided to the maximum extent possible. Where impacts area unavoidable, loss of vernal pool habitat will be mitigated for at an approved vernal pool mitigation area.

# 5.0 References


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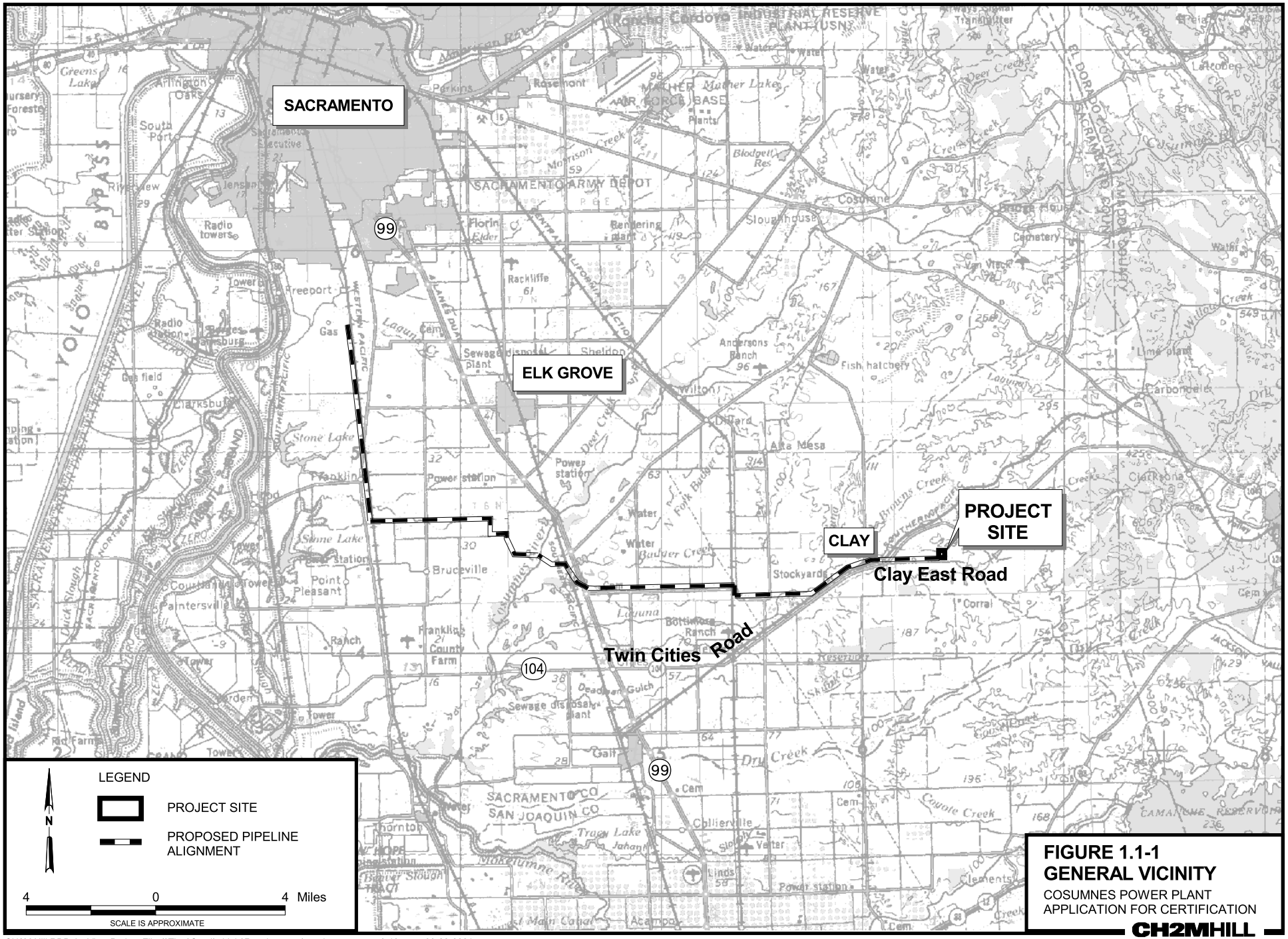


**FIGURE 1.1-1**
**GENERAL VICINITY**
COSUMNES POWER PLANT
APPLICATION FOR CERTIFICATION

CH2MHILL

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**TABLE 1.**
Special-Status Species Potentially Occurring in CPP Project Area

| Common Name | Scientific Name[1] | Status[2] (Fed/CA) | Season[3] | Primary Habitat[4] | Observed[5] | Comments |
|---|---|---|---|---|---|---|
| Legenere | *Legenere limosa* | --/1B | May-June | Vernal Pools | R | Known from 0.5 miles ESE of south end of Rancho Seco Dam. No reported occurrences in the project area. |
| Boggs Lake Hedge-Hyssop | *Gratiola heterosepala* | --/CE | April-June | Marshes, swamps, and vernal pools | R | Multiple occurrences in Forster Ranch, in San Joaquin County, no reported occurrences in the project area. |
| Sacramento Orcutt Grass | *Orcuttia viscida* | E/CE | May-June | Vernal Pools | R | Reported to occur southeast of Rancho Seco Dam, no reported occurrences in the project area. |
| Ione manzanita | *Arctostaphylos myrtifolia* | T/CT | January-February | Ione formation soils in chaparral, cismontane woodland from 120 to 1800 feet | U | No suitable habitat in the project area |
| Dwarf downingia | *Downingia pusilla* | | March-May | Vernal pools and swales in grasslands and foothills; blooms | S | Moderate potential, no reported occurrences in the project area. |
| Ione buckwheat | *Eriogonum apricum var. apricum* | E/CE | July-October | Ione soils in openings in chaparral from 180 to 450 feet | U | No suitable habitat in the project area |
| Irish Hill buckwheat | *Eriogonum apricum var. prostratum* | E/CE | June-July | Openings in chaparral on Ione soils from 270 to 390 feet | U | No suitable habitat in the project area |
| Tuolumne button-celery | *Eryngium pinnatisectum* | FSC | June-August | Vernal pools and mesic sites within cismontane woodland and lower montane coniferous forest from 210 to 2800 feet | U | No suitable habitat in the project area |
| Bisbee Peak rush-rose | *Helianthemum suffrutescens* | --/3 | April-June | Serpentinite, gabbroic, or Ione soils in chaparral from 120 to 2,500 feet | U | No suitable habitat in the project area |
| Rose-mallow | *Hibiscus lasiocarpus* | --/2 | June-September | Freshwater marshes and swamps | S | Limited potential, no reported occurrences in the project area. |
| Parry's horkelia | *Horkelia parryi* | FSC | April-June | Ione formation soils in chaparral or cismontane woodland from 240 to 3,000 feet | U | No suitable habitat in the project area |

**TABLE 1.**
Special-Status Species Potentially Occurring in CPP Project Area

| Common Name | Scientific Name[1] | Status[2] (Fed/CA) | Season[3] | Primary Habitat[4] | Observed[5] | Comments |
|---|---|---|---|---|---|---|
| Delta tule pea | *Lathyrus jepsonii var jepsonii* | FSC | May-September | Coastal freshwater marshes from 0 to 12 feet; blooms | S | Moderate potential for occurrence; known from the confluence of Badger Creek and the Cosumnes River. No reported occurrences in the project area |
| Mason's lilaeopsis | *Lilaeopsis masoniii* | FSC/CR | April-November | Brackish or freshwater marshes and riparian scrub from 0 to 30 feet | U | No suitable habitat; no reported occurrences in the project areas. |
| Pincushion navarretia | *Navarretia myersii ssp. Meyersii* | --/1B | May | Vernal pools from 20 to 270 feet | R | Known from the Badger Creek vicinity. No reports from the project areas |
| Slender Orcutt grass | *Orcuttia tenuis* | FT/CE | Blooms from May-October | Vernal pools from 90 to 5,000 feet | R | Known from Laguna Creek. Not reports from the project areas |
| Sanford's arrowhead | *Sagittaria sanfordii* | FSC | May-October | Shallow freshwater marshes and swamps | S | May occur in farm ponds or wetlands. No reported occurrences from the project area |

NOTES
[1]Scientific names are based Hickman (1993).
[2]Status of species relative to the Federal and California State Endangered Species Acts and Fish and Game Code.
[3]Season Blooming period
[4]Primary Habitat Most likely habitat association.
[5]Present on site: R = Reported occurrence, S = Suitable habitat present, U = unsuitable habitat present

KEY

Federal Status
E Federally listed as endangered
T Federally listed as threatened
FSC Federal species of Special Concern
E Species whose continued existence in California is jeopardized.

California Status
CE State listed endangered
CT State listed threatened
CR State listed rare

California Native Plant Society
IB Plants, rare, threatened, or endangered in California and elsewhere
2 Plants, rare, threatened, or endangered in California, but more common in other parts of their range
3 Plants for which more information is needed to determine conservation status (watch list)

SOURCE: California Department of Fish and Game, *California Natural Diversity Database*, 2002; California Native Plant Society, *Inventory of Rare and Endangered Vascular Plants Of California*, 2001.

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| • *Aceraceae* | | |
| *Acer negundo* var. *californicum* | Box elder | Native |
| • *Alismaceae* | | |
| *Alisma plantago-aquatica* | Water plantain | Native |
| • *Amaranthaceae* | | |
| *Amaranthus albus* | Tumbleweed | Non-Native |
| • *Anacardiaceae* | | |
| *Toxicodendron diversilobum* | Poison-oak | Native |
| • *Apiaceae* | | |
| *Conium maculatum* | Poison-hemlock | Non-Native |
| *Daucus carota* | Queen Anne's lace | Non-Native |
| *Eryngium aristulatum* var. *aristulatum* | Aristulate coyote-thistle | Native |
| *Eryngium vaseyi* | Vasey's coyote-thistle | Native |
| *Foeniculum vulgare* | Fennel | Non-Native |
| *Torilis arvensis* | Hedge parsley | Non-Native |
| • *Asclepiadaceae* | | |
| *Asclepias fascicularis* | Narrow-leaf milkweed | Native |
| *Asclepias speciosa* | Showy milkweed | Native |
| • *Asteraceae* | | |
| *Achillea millefolium* | Yarrow | Native |
| *Achyrachaena mollis* | Blow-wives | Native |
| *Anthemis cotula* | Mayweed | Non-Native |
| *Artemisia douglasiana* | Mugwort | Native |
| *Carduus pycnocephalus* | Italian thistle | Non-Native |
| *Centaurea solstitialis* | Yellow star-thistle | Non-Native |
| *Cichorium intybus* | Chicory | Non-Native |
| *Cirsium vulgare* | Bull thistle | Non-Native |
| *Conyza bonariensis* | South American horseweed | Non-Native |
| *Cotula coronopifolia* | Brass-buttons | Non-Native |
| *Filago gallica* | Mediterranean herba impia | Non-Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| *Gnaphalium luteo-album* | Everlasting | Non-Native |
| *Gnaphalium palustre* | Lowland cudweed | Native |
| *Grindelia hirsutula* | Gumweed | Native |
| *Hemizonia fitchii* | Fitch's tarweed | Native |
| *Hemizonia pungens* | Common spikeweed | Native |
| *Hypochaeris glabra* | Smooth cat's-ear | Non-Native |
| *Hypochaeris radicata* | Rough cat's-ear | Non-Native |
| *Lactuca serriola* | Prickly lettuce | Non-Native |
| *Lasthenia californica* | California goldfields | Native |
| *Lasthenia fremontii* | Fremont's goldfields | Native |
| *Lasthenia glaberrima* | Smooth goldfields | Native |
| *Picris echioides* | Bristly ox-tongue | Non-Native |
| *Psilocarphus brevissimus* | Dwarf woolly-heads | Native |
| *Psilocarphus tenellus* var. *globiferus* | Round woolly marbles | Native |
| *Senecio vulgaris* | Common groundsel | Non-Native |
| *Silybum marianum* | Milk thistle | Non-Native |
| *Sonchus asper* ssp. *asper* | Prickly sow thistle | Non-Native |
| *Sonchus oleraceus* | Common sow thistle | Non-Native |
| *Tragopogon dubius* | Goatsbeard | Non-Native |
| *Tragopogon porrifolius* | Salsify | Non-Native |
| *Wyethia angustifolia* | Narrow-leaf mule-ears | Native |
| *Xanthium strumarium* | Cocklebur | Native |
| • *Boraginaceae* | | |
| *Amsinckia menziesii* | Rancher's fireweed | Native |
| *Plagiobothrys stipitatus* | Stalked popcornflower | Native |
| • *Brassicaceae* | | |
| *Brassica nigra* | Black mustard | Non-Native |
| *Brassica rapa* | Field mustard | Non-Native |
| *Capsella bursa-pastoris* | Shepherd's purse | Non-Native |
| Cardaria draba | White-top | Non-Native |
| *Lepidium latifolium* | Perennial peppergrass | Non-Native |
| *Lepidium nitidum* var. *nitidum* | Shining peppergrass | Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| *Raphanus sativus* | Radish | Non-Native |
| *Rorippa curvisiliqua* | Western yellow-cress | Native |
| • *Callitrichaceae* | | |
| *Callitriche marginata* | Water-starwort | Native |
| • *Campanulaceae* | | |
| *Downingia concolor* | Spotted-throat downingia | Native |
| *Downingia ornatissima* | Showy horned Downingia | Native |
| *Downingia pulchella* | Flat-face downingia | Native |
| • *Caryophyllaceae* | | |
| *Spergula arvensis* ssp. *arvensis* | Stickwort | Non-Native |
| *Stellaria media* | Common chickweed | Non-Native |
| • *Chenopodiaceae* | | |
| *Chenopodium album* | Lamb's quarters | Non-Native |
| • *Convolvulaceae* | | |
| *Convolvulus arvensis* | Bindweed | Non-Native |
| • *Crassulaceae* | | |
| *Crassula aquatica* | Aquatic pigmy-weed | Native |
| • *Cuscutaceae* | | |
| *Cuscuta howelliana* | Dodder | Native |
| • *Cyperaceae* | | |
| *Carex barbarae* | Santa Barbara Sedge | Native |
| *Carex praegracilis* | Clustered field sedge | Native |
| *Cyperus eragrostis* | Tall flatsedge | Native |
| *Eleocharis macrostachya* | Creeping spikerush | Native |
| *Eleocharis acicularis* | Needle spikerush | Native |
| *Scirpus acutus* var. *occidentalis* | Tule | Native |
| • *Euphorbiaceae* | | |
| *Chamaesyce maculata* | Spurge | Non-Native |
| *Eremocarpus setigerus* | Turkey mullein | Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| • *Fabaceae* | | |
| *Lotus corniculatus* | Birdfoot trefoil | Non-Native |
| *Lotus purshianus* var. *purshianus* | Spanish lotus | Native |
| *Lupinus bicolor* | Miniature lupine | Native |
| *Medicago polymorpha* | California burclover | Non-Native |
| *Medicago sativa* | Alfalfa | Non-Native |
| *Melilotus indica* | Sourclover | Non-Native |
| *Trifolium depauperatum* | Bladder clover | Native |
| *Trifolium dubium* | Little hop clover | Non-Native |
| *Trifolium hirtum* | Rose clover | Non-Native |
| *Trifolium repens* | White clover | Non-Native |
| *Vicia villosa* | Hairy vetch | Non-Native |
| • *Fagaceae* | | |
| *Quercus lobata* | Valley oak | Native |
| • *Gentinaceae* | | |
| *Centaurium muehlenbergii* | Monterey centaurty | Native |
| • *Geraniaceae* | | |
| *Erodium botrys* | Broadleaf filaree | Non-Native |
| *Erodium cicutarium* | Red-stemmed filaree | Non-Native |
| *Geranium dissectum* | Cut-leaf geranium | Non-Native |
| *Geranium molle* | Dove's-foot geranium | Non-Native |
| • *Hypericeceae* | | |
| *Hypericum perforatum* | Klamathweed | Non-Native |
| • *Juglandaceae* | | |
| *Juglans californica* var. *hindsii* | California black walnut | Native |
| • *Juncaceae* | | |
| *Juncus acuminatus* | Sharp-fruited rush | |
| *Juncus bufonius* | Toad rush | Native |
| *Juncus effusus* | Common rush | Native |
| *Juncus mexicanus* | Mexican rush | Native |
| *Juncus oxymeris* | Pointed rush | Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| • *Lamiaceae* | | |
| *Marrubium vulgare* | Horehound | Non-Native |
| *Pogogyne zizyphoroides* | Pogogyne | Native |
| *Trichostema lanatum* | Woolly bluecurls | Native |
| • *Lemnaceae* | | |
| *Lemna* sp. | Duckweed | Native |
| • *Liliaceae* | | |
| *Brodiaea coronaria* | Harvest brodiaea | Native |
| *Brodiaea elegans* | Elegant brodiaea | Native |
| *Calochortus luteus* | Gold cups | Native |
| *Chlorogalum pomeridianum* | Wavy-leaf soap plant | Native |
| *Triteleia hyacinthina* | White hyacinth | Native |
| • *Lythraceae* | | |
| *Lythrum hyssopifolium* | Hyssop loosestrife | Non-Native |
| • *Malvaceae* | | |
| *Malva parviflora* | Cheeseweed | Non-Native |
| • *Myrtaceae* | | |
| • Eucalyptus globulus | Blue gum | Non-Native |
| • *Oleaceae* | | |
| *Fraxinus latifolia* | Oregon ash | Native |
| • *Onagraceae* | | |
| *Clarkia purpurea* | Winecup clarkia | Native |
| *Epilobium* sp. | Fireweed | - |
| *Epilobium torreyi* | Torry's willow herb | Native |
| *Ludwigia peploides* | Water-primrose | Native |
| • *Papaveraceae* | | |
| *Eschscholzia californica* | California poppy | Native |
| *Eschscholzia lobii* | Frying pans | Native |
| • *Plantaginaceae* | | |
| *Plantago coronopus* | Cutleaf plantain | Non-Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| *Plantago lanceolata* | English plantain | Non-Native |
| • *Poaceae* | | |
| *Aira caryophyllea* | Silver hairgrass | Non-Native |
| *Agrostis exarata* | Spike bentgrass | Native |
| *Alopecurus saccatus* | Pacific foxtail | Native |
| *Arundo donax* | Giant reed | Non-Native |
| *Avena fatua* | Wild oat | Non-Native |
| *Briza maxima* | Big quaking grass | Non-Native |
| *Briza minor* | Small quaking grass | Non-Native |
| *Bromus catharticus* | Rescue grass | Non-Native |
| *Bromus diandrus* | Ripgut grass | Non-Native |
| *Bromus hordeaceus* | Soft chess | Non-Native |
| *Bromus madritensis ssp. rubens* | Foxtail chess | Non-Native |
| *Bromus tectorum* | Cheat grass | Non-Native |
| *Cynodon dactylon* | Bermuda grass | Non-Native |
| *Cynosurus echinatus* | Hedgehog dogtail | Non-Native |
| *Deschampsia danthonioides* | Annual hairgrass | Native |
| *Digitaria sanguinalis* | Crabgrass | Non-Native |
| *Distichlis spicata* | Saltgrass | Native |
| *Elytrigia intermedia* | Intermediate wheatgrass | Non-Native |
| *Festuca pratensis* | Meadow feacue | Non-Native |
| *Hordeum brachyantherum* ssp. *brachyantherum* | Meadow barley | Native |
| *Hordeum marinum* ssp. *gussoneanum* | Mediterranean barley | Non-Native |
| *Hordeum murinum* ssp. *leporinum* | Farmer's foxtail | Non-Native |
| *Lolium multiflorum* | Italian ryegrass | Non-Native |
| *Lolium perenne* | Perennial ryegrass | Non-Native |
| *Paspalum dilatatum* | Dallisgrass | Non-Native |
| *Phalaris paradoxa* | Hood Canarygrass | Non-Native |
| *Phalaris lemmonii* | Lemmon's canarygrass | Native |
| *Phragmites australis* | Common reed | Native |
| *Pleuropogon californicus* | Semaphore grass | Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| *Poa annua* | Annual bluegrass | Non-Native |
| *Polypogon monspeliensis* | Annual beard grass | Non-Native |
| *Secale cereale* | Cereal rye | Non-Native |
| *Taeniatherum caput-medusae* | Medusa head | Non-Native |
| *Vulpia myuros* | Rattail fescue | Non-Native |
| • *Polemoniaceae* | | |
| *Navarretia intertexta* | Needle-leaved navarretia | Native |
| *Navarretia leucocephala* | White-headed navarretia | Native |
| *Navarretia pubescens* | Navarretia | Native |
| • *Polygonaceae* | | |
| *Polygonum arenastrum* | Common knotweed | Non-Native |
| *Polygonum lapathifolium* | Willow weed | Native |
| *Polygonum hydropiperoides* | Water Smartweed | Native |
| *Rumex acetosella* | Sheep sorrel | Non-Native |
| *Rumex crispus* | Curly dock | Non-Native |
| *Rumex salicifolius* | Willow dock | Native |
| • *Primulaceae* | | |
| *Anagallis arvensis* | Scarlet pimpernel | Non-Native |
| • *Ranunculaceae* | | |
| *Myosurus minimus* | Mouse-tail | Native |
| *Ranunculus aquatilus* | Water buttercup | Native |
| *Ranunculus bonariensis* var. *trisepalus* | Vernal pool buttercup | Native |
| *Ranunculus muricatus* | Spiny buttercup | Non-Native |
| • *Rosaceae* | | |
| *Malus sylvestris* | Apple | Non-Native |
| *Prunus* sp. | Prunus | - |
| *Rosa californica* | California rose | Native |
| *Rosa eglanteria* | Sweet-brier | Non-Native |
| *Rubus discolor* | Himalayan blackberry | Non-Native |

**TABLE 2.**
Plant Species Observed.

| Scientific Name | Common Name | Native / Non-Native |
|---|---|---|
| • *Rubiaceae* | | |
| *Galium aparine* | Common bedstraw | Native |
| *Galium parisiense* | Wall bedstraw | Non-Native |
| • *Salicaceae* | | |
| *Populus fremontii* ssp. *fremontii* | Fremont cottonwood | Native |
| *Salix exigua* | Narrow-leaved willow | Native |
| *Salix gooddingii* | Goodding's black willow | Native |
| *Salix laevigata* | Red willow | Native |
| *Salix lasiolepis* | Arroyo willow | Native |
| • *Scrophulariaceae* | | |
| *Castilleja attenuata* | Valley tassels | Native |
| *Gratiola ebracteata* | Hedge-hyssop | Native |
| *Mimulus guttatus* | Seep monkeyflower | Native |
| *Triphysaria eriantha* | Butter-and-eggs | Native |
| *Veronica arvensis* | Speedwell | Non-Native |
| *Veronica peregrina* ssp. *xalapensis* | Purslane speedwell | Native |
| • *Typhaceae* | | |
| *Typha latifolia* | Broad-leaved cattail | Native |
| • *Urticaceae* | | |
| *Urtica dioica* | Nettle | Native |
| • *Verbenaceae* | | |
| *Phyla nodiflora* var. *nodiflora* | Common lippia | Native |

**MEMORANDUM** CH2MHILL

# SWAINSON'S HAWK AND BURROWING OWL SURVEYS FOR CPP SITE AND GAS PIPELINE, SPRING 2002

**TO:** E.J. Koford

**COPIES:** K. Hudson
J. Carrier

**FROM:** Debra Crowe

**DATE:** June 7, 2002

## INTRODUCTION

The proposed Cosumnes Power Plant (CPP) project is located in southern Sacramento County, California (Figure 1). The 30-acre CPP site and temporary 20-acre laydown areas are located near the Sacramento Metropolitan Utility District (SMUD) Rancho Seco Plant. The site and laydown area consists of annual grassland with intermittent swales and seasonal wetlands. The site and laydown areas are currently grazed by cattle.

A 26-mile-long natural gas pipeline is proposed to connect the CPP to an existing Pacific Gas and Electric (PG&E) backbone pipeline at the Carson Cogeneration facility in the town of Elk Grove. The gas pipeline alignment extends from the CPP site along county and farm road rights-of-way and the Union Pacific railroad (UPRR) right-of-way (ROW). The primary habitats along the gas pipeline alignment are ruderal roadside vegetation, agricultural crop, annual grassland, and railroad access roads that lack vegetation. Seasonal ponding areas occur in many of these habitat types.

The purpose of this memorandum is to document the results of field surveys for western burrowing owl (*Athene cunicularia*) and Swainson's hawk (*Buteo swainsoni*) nesting locations in or adjacent to the proposed project impact areas. Also presented are descriptions of foraging habitat for Swainson's hawks and other special-status species that were observed during the surveys.

## FIELD METHODS

On May 1 and 3, 2002, CH2MHILL biologists Debra Crowe and Chris Green conducted nesting surveys for burrowing owl and Swainson's hawk. Follow up surveys were conducted during the rare plant surveys mid- and late May 2002, to verify sightings. The burrowing owl surveys were conducted per California Department of Fish and Game (CDFG) survey protocol guidelines (CDFG 1994) and included the CPP site, laydown area, and surrounding 500-foot

buffer. Transects covering the entire CPP site and laydown area were walked by the biologists. Burrows were inspected for burrowing owl sign such as feathers, pellets, and whitewash. Binoculars were used for observations and observations were recorded on data sheets. The burrowing owl survey also included a windshield and walking survey of the gas pipeline alignment from the CPP site to the junction of the UPRR tracks (Figure 1). When suitable habitat was observed along the roads, the biologists surveyed those areas on foot. Active crops were not walked, however, these areas were scanned with binoculars. The segment of pipeline that follows the UPRR is not accessible by vehicle so burrowing owl surveys along this portion of the gas pipeline were conducted on foot during the rare plant surveys in mid- and late May 2002.

Surveys for Swainson's hawk nests were conducted within 0.5 mile of the CPP site and laydown area, the gas pipeline alignment from the CPP site to the junction of UPRR, and at the Carson Co-Gen site. Surveys along the UPRR and follow up surveys to verify sightings were conducted during the rare plant surveys in mid- and late May 2002. Surveys were primarily conducted from a vehicle driving 1 to 5 miles per hour. Suitable areas included any location with potential nest trees and areas where hawks were observed flying. Once a Swainson's haws was observed flying, it was observed until it flew to a nest tree or forage location. Locations where a pair, group, and/or individuals were observed were recorded on maps including forage locations. In addition to the field surveys at the Carson Co-Gen site, results of surveys conducted by Sacramento Wastewater Treatment Plant Bufferlands biologists indicate Swainson's hawks are actively nesting there in 2002.

# SURVEY RESULTS

## Burrowing Owls

No burrowing owls or burrowing owls sign were observed on the CPP site or laydown area during the May 1 and 3, 2002 surveys. The annual grasses and forbes on the CPP site were 2 to 4 feet tall and dense. Vegetation on the laydown area was 1 to 2 feet tall and well grazed. Dominant grasses included Italian ryegrass (*Lolium multiflorum*), wild oats (*Avena* sp.), and vetch (*Vicia* sp.). Several black-tailed hare and California ground squirrel burrows were located primarily in the north-northwest portion of the CPP site. No burrowing owls were observed along the gas pipeline alignment from the CPP site to the junction of the UPRR. Several mammal burrows were observed along the dirt road west from the Cosumnes River to Eschinger Road that could be suitable for burrowing owls, although none was observed during the survey. The alignment along the UPRR was surveyed on foot during the rare plant surveys in May, 2002, and no active burrowing owl nest sites were observed, however, one burrowing owl was observed on May 31, 2002 on the shoulder of Sims Road at the Carson Co-Gen site. The Bufferlands biologist, Roger Jones, indicated there are 2 active nest burrows along the Sims Road access to the Carson Co-Gen site. Additional documentation of burrowing owl nest locations along the CPP pipeline alignment in this area is forthcoming from Mr. Jones.

# Attachment BR-204B

## Swainson's Hawks

No Swainson's hawks were observed at the CPP site during the surveys.

Five potential Swainson's hawk nest locations were observed along the gas pipeline route during the surveys. The first location is at the Laguna Creek riparian corridor between Valensin and Laguna roads, east of Alta Mesa Road at the Keneflick Ranch. On May 1, a dark morph Swainson's hawk was observed perched in a valley oak tree with bare branches approximately 0.2 mile north of the alignment. Several Swainson's hawks and red-tailed hawks were foraging in the area as a farmer was harvesting hay during the survey period. This location was checked again on May 3 and the dark morph Swainson's hawk was observed carrying nest material to the valley oak tree several times. A second hawk was not observed interacting with the first hawk during the survey, however, several hawks were foraging over a recently cut hay field immediately to the southwest. During a follow up survey on May 17, 2002, a female Swainson's hawk was observed sitting on the nest and a second hawk was observed foraging in the fields southwest of the nest tree. Habitats in the area include riparian, irrigated pasture, vineyards, and harvested hay fields. Two red-tailed hawks were also observed circling the riparian trees at the Laguna Creek crossing. Three Swainson's hawks were also observed circling the riparian habitat at the junction of Alta Mesa Road and Laguna Creek approximately 0.7 mile south of the pipeline alignment and several were observed foraging in fields at Valensin Road and Colony Road.

A second potential Swainson's hawk location was observed at Valensin Road and Arno Road approximately 0.5 mile north of the pipeline alignment. Several Swainson's hawks were observed foraging in a hay field at the intersection of Arno Road and Valensin Road, where Arno Road turns to the north. The landowner at 10576 Arno Road stopped and talked with the biologists indicating a Swainson's hawk nest was in a eucalyptus tree in the backyard. Because the hawks were foraging in the field, a positive identification of active nest use was not recorded during the survey. The landowner has been watching the Swainson's hawk for several years and indicated active nest use in 2000 and 2002. The landowner was knowledgeable about Swainson's hawks and had protested a proposed development in the area, siting the Swainson's hawk nesting and foraging areas would be disturbed. During follow up surveys on May 17, 2002, at least 5 Swainson's hawks were observed foraging in the fields east of this area and north of the alignment on Kerry Lane.

A third potential Swainson's hawk location was observed at Arno Road and Highway 99. Two light morph Swainson's hawks were observed circling the open field and riparian habitat in the Cosumnes Preserve south of Badger Creek and the Cosumnes River. Several Swainson's hawks were observed circling the fields west and east of Highway 99 in the Preserve. This area is known to support nesting Swainson's hawks. In a phone conference with CH2MHILL CDFG biologist, Dan Gifford, indicated active nests were recorded in 2002 west and northwest of Arno Road and Highway 99. Exact locations of active nests were not recorded during the survey as the hawks were circling over fields being harvested. Forage habitat in the area include pasture, wheat, hay, and alfalfa fields. Active nest sites are expected to occur every year in the Cosumnes Preserve. Additional preconstruction surveys should be conducted in this area prior to the start of construction.

A fourth potential Swainson's hawk location was observed along the alignment in an alfalfa field west of Bruceville Road under the existing transmission lines. A potential nest tree was located approximately 0.3 mile north of the pipeline alignment near a bus and truck storage area. One Swainson's hawk was observed perched in the tree near a nest, returning a few times to the tree after flying over the field. No nesting or courting behavior was observed, however, seven Swainson's hawks were observed circling the alfalfa field immediately to the south during the survey. Four red-tailed hawks were also observed foraging in the field during the survey. During a follow up survey on May 20, 2002, 12 to 20 Swainson's hawks, red-tailed hawks, and other raptors were observed foraging in the fields south of the bus storage area.

A fifth potential Swainson's hawk location was observed at the Carson Co-Gen site. Two light morph Swainson's hawk were observed circling a eucalyptus tree containing a stick nest on Bufferlands Road immediately south of the Carson Co-Gen facility. Verification of nesting was not observed during the survey as the hawks were circling and foraging over the hay fields adjacent to Bufferlands Road. Verification that the Swainson's hawk nest is currently active was received from the Bufferlands biologist, Roger Jones, May 15, 2002.

## Incidental Observations

Several flocks of tricolored blackbird (*Agelaius tricolor*) were observed foraging over the CPP site and laydown area. The flocks contained from 100 to 200 birds each with approximately 1,000 or more birds total. The tricolored blackbirds moved back and forth from the site to an area over the hill south of the laydown area. No tricolored blackbird nests were observed on the CPP site or laydown area. During the follow up survey on May 20, 2002, tricolored blackbirds and red-winged blackbirds were observed foraging in an alfalfa field north of Eschinger Rd. west of the Cosumnes River.

An active red-tailed hawk (*Buteo jamaicensis*) nest was observed in a transmission line tower on the west boundary of the laydown area. A pair of red-tailed hawks were perched on the tower near the nest during the survey.

Clay Creek held water approximately 6 to 18 inches deep in several locations. The ponding areas supported vernal pool plant species such as *Downingia* sp., coyote thistle (*Eryngium castrense*), wooly marbles ( *Psilocarphus* sp.), goldfields (*Lasthenia glabrata* and *Lasthenia fremontii*), popcorn flower (*Plagiobothrys* sp.), and spikerush (*Eleocharis* sp.). Some of the ponding areas within Clay Creek had the typical vernal pool rings of flowers. Mosquito fish were present in portions of Clay Creek and mallards and great egrets were observed foraging. The swales on the site also contained dense stands of vernal pool plants of the species listed above. The swales have a cobble substrate.

One great-horned owl was observed perched in a eucalyptus tree at the Carson Co-Gen site at the junction of Sims and Bufferlands roads. No nest was observed.

The following is a list of wildlife species observed during the burrowing owl and Swainson's hawk surveys.

## Attachment BR-204B

| Common Name | Scientific Name | Location Observed |
|---|---|---|
| American crow | *Corvus brachyrhynchos* | Pipeline |
| American kestrel | *Falco sparverius* | CPP site, reservoir |
| Audubon cottontail | *Sylvilagus audubonii* | Pipeline, Carson site |
| Barn swallow | *Hirundo rustica* | Pipeline |
| Black phoebe | *Sayornis nigricans* | Pipeline |
| Black-tailed hare | *Lepus californicus* | CPP site |
| California ground squirrel | *Spermophilus beecheyi* | CPP site, laydown |
| California quail | *Callipepla californica* | Pipeline, Carson site |
| California towhee | *Pipilo crissalis* | Pipeline |
| Cliff swallow | *Hirundo pyrrhonota* | Clay Creek |
| Coyote (scat) | *Canis latrans* | CPP site |
| Great egret | *Casmerodius albus* | Clay Creek, reservoir |
| Great-horned owl (possible nest) | *Bubo virginianus* | Pipeline, Carson site |
| House finch | *Carpodacus mexicanus* | Pipeline |
| House sparrow | *Passer domesticus* | Pipeline |
| Killdeer | *Charadrius vociferus* | CPP site, pipeline |
| Mallard | *Anas platyrhynchos* | Clay Creek |
| Mosquitofish | *Gambusia affinis* | Clay Creek |
| Mourning dove | *Zenaida macroura* | CPP site, laydown |
| Muskrat (den) | *Ondatra zibethicus* | Reservoir |
| Northern harrier | *Circus cyaneus* | Pipeline |
| Northern mockingbird | *Mimus polyglottos* | Pipeline |
| Nuttall's woodpecker | *Picoides nuttallii* | Reservoir tree |
| Pied-billed grebe | *Podilymbus podiceps* | Reservoir |
| Red-shouldered hawk | *Buteo lineatus* | Pipeline |
| Red-tailed hawk | *Buteo jamaicensis* | Laydown, pipeline |
| Red-winged blackbird | *Agelaius phoeniceus* | Reservoir, pipeline |

| | | |
|---|---|---|
| Ring-necked pheasant | *Phasianus colchicus* | Pipeline, Carson site |
| Rock dove | *Columba livia* | Pipeline |
| Swainson's hawk (nest and forage) | *Buteo swainsoni* | Pipeline, Carson site, Laguna Creek, Cosumnes Preserve |
| Tricolored blackbird (forage) | *Agelaius tricolor* | CPP site, laydown |
| Turkey vulture | *Cathartes aura* | CPP site, gas line |
| Western kingbird | *Tyrannus verticalis* | CPP site |
| Western meadowlark | *Sturnella neglecta* | CPP site, laydown, pipeline |
| Western scrub jay | *Aphelocoma coerulescens* | Pipeline |
| White pelican (6) | *Pelecanus erythrorhynchos* | Pipeline at Cosumnes Preserve |
| White-tailed kite (forage) | *Elanus caeruleus* | Pipeline |
| Yellow-headed blackbird | *Xanthocephalus xanthocephalus* | Laydown fence |

# REFERENCES

(CDFG) California Department of Fish and Game. Draft Staff Report on Burrowing Owl Mitigation. September 13, 1994.

## Attachments BR-206C to 206E

Three copies of the following documents were provided to the CEC:

- Letter and Technical Memo to Fike Finan, USACOE, dated June 3, 2002 (Attachment BR-206C)
- Wetland Delineation Report for the Proposed South Sacramento Power Plant at Rancho Seco prepared by Davis Environmental Consulting (June 2000) (Attachment BR-206D)
- Preliminary Delineation of Waters of the United States, Including Wetlands, for the Rancho Seco Park Master Plan prepared by Jones & Stokes (July 15, 1993) (Attachment BR-206E)

## Technical Area: Waste Management

**Author:** Alvin Greenberg, Ph.D.
**CPP Authors:** Karen Parker and John Carrier

## BACKGROUND

Recent correspondence (see attached letter from February 5, 2002) and conversations with the Department of Toxic Substances Control (DTSC) indicate a Phase I Environmental Site Assessment (ESA) for the entire length of the natural gas pipeline alignment is required.

## DATA REQUEST

229. Please provide a complete Phase I ESA for the 26-mile gas pipeline corridor and natural gas compressor stations according to ASTM 2000 guidelines.

**Response:** A workshop was held on May 15, 2002 to discuss this data request. At that meeting it was agreed that the material listed in Table WM-229 would be provided in response to this data request.

**TABLE WM-229**
Action Items from May 15, 2002 Workshop

| Responsible Party | | Item | Anticipated Completion Date |
|---|---|---|---|
| Applicant | a. | Aerial photos of the entire gas line to DTSC | 5/17/02 |
| Applicant | b. | Sanborn Maps of the gas line corridor (if available) | 5/24/02 |
| Applicant | c. | Historical Aerial photos covering the gas line alignment | 5/24/02 |
| Applicant | d. | Technical Memo on the properties of interest identified at the workshop and found on figures: 4, 5, 14, 17, 22, 37, and 45 | 5/31/02 |
| Applicant | e. | Invite CEC's representative for survey of RR corridor along Franklin Road | 5/23 or 5/24 |
| Applicant | f. | Tech Memo summarizing biologist's survey for suspected contamination along the gas line corridor | 5/28/02 |
| Applicant | g. | Email selected pages of photos to Alvin Greenberg (7 pages) | 5/15/02 |
| Applicant | h. | Provide NRC contact for radiological data | 5/21/02 |
| Applicant | i. | Provide information on Rancho Seco landfill and check with IWMB for records of landfill, including a record search of the trenches | 5/24/02 |
| Applicant | j. | Research existence of, and data from, RSP biological monitoring locations | 5/24/02 |
| CEC | k. | Provide list of contaminants and sampling protocol | 5/17/02 |

229a. Aerial photos of the entire gas line.

**Response:** Aerial photos of the entire gas line corridor showing the construction area and permanent easement, as well as the pits required for horizontal directional drilling (HDD) were provided to DTSC on May 16. A copy of the 12-page set was provided as Attachment WM-229a on May 20, 2002.

229b. Sanborne Maps of the gas line corridor (if available)

**Response:** A search for Sanborn maps of the plant site, laydown area, and entire gas line corridor was performed by Environmental Data Resources (EDR). No maps were identified. A letter from EDR documenting the results of their search is provided in Attachment WM-229b.

229d. Technical Memo on the properties of interest identified at the workshop and found on figures: 4, 5, 14, 17, 22, 37, and 45

**Response:** A technical memo providing more information about the facilities identified in the above-reference photos is provided as Attachment WM-229d.

229e. Invite CEC's representative for survey of RR corridor along Franklin Road

**Response:** An invitation to accompany the surveyors was extended to the CEC's representative on May 23, 2002.

229f. Tech Memo summarizing biologist's survey for suspected contamination along the gas line corridor

**Response:** A Tech Memo summarizing the biologists survey results is provided as Attachment WM-229f.

229g. Email the seven selected pages of the biological aerial photos to Alvin Greenberg.

**Response:** The seven tabbed pages (4, 5, 14, 17, 22, 37, and 45) from Attachment BR-206 (Data Set 3B) were emailed to Mr. Greenberg on May 15, 2002.

229h. Provide NRC contact for radiological data

**Response:** The NRC contact for Rancho Seco is:
Vince Everett, NRC Region IV
(817) 860-8198.

A copy of SMUD's Annual Radiological Environmental Operating Report for 2000 is provided as Attachment WM-229h.

229i. Provide information on Rancho Seco landfill and check with IWMB for records of landfill, including a record search of the trenches

Information from Rancho Seco as to the location and content of the landfill/trenches is provided as Attachment WM-229i. No information about the landfill/trenches was available from the Integrated Waste Management Board.

229j. Research existence of, and data from, RSP biological monitoring locations

**Response:** SMUD has historically maintained an environmental monitoring program sampling for radiological contamination at several areas surrounding Rancho Seco Plant. Attachment WM-229j provides information on the garden/ vineyard/pasture monitoring.

229k. The CEC is to provide a list of potential cooling tower contaminants and sampling protocol.

**Response:** At the workshop, concern was expressed by the CEC that chemicals used in Rancho Seco's cooling towers may have been dispersed in the air over a large portion of the site. At that time, SMUD was not sure what chemicals had been used to treat water in the cooling tower so the CEC said that they would look for guidance from similar plants.

Since the workshop, SMUD has been able to contact the Rancho Seco operators. A list of historical water treatment chemicals is provided in Attachment WM-229k. According to that data, the only chemicals used in the open system portion of the cooling process were sulfuric acid and chlorine. Neither of these chemicals would provide a health risk to workers at CPP.

**MEMORANDUM** CH2MHILL

# Sanborn Maps for CPP Proposed Gas Pipeline Alignment

**TO:** John Carrier

**COPIES:** Kevin Hudson/SMUD

**FROM:** Karen Parker

**DATE:** June 6, 2002

In response to a request of the Sacramento Municipal Utility District made by the California Department of Toxic Substances Control for more information regarding the historical uses of proposed property to be used for the construction of the Cosumnes Power Plant and its natural gas supply pipeline, an attempt was made by CH2MHILL to purchase Sanborn fire insurance maps. Environmental Data Resources, Inc. (EDR) was hired to do a search for any existing Sanborn maps using location data for the site and the 26-mile-long pipeline corridor provided electronically by CH2MHILL in GIS format. As shown by the attached report from EDR, there were no Sanborn maps identified by the search for the area in question.

"Linking Technology with Tradition"

# Sanborn® Map Report

**Ship to:** Karen Parker
CH2M Hill, Inc.
2485 Natomas Park Drive
Sacramento, CA 95833

1132163DEC 916-920-0300

**Order Date:** 5/24/2002 **Completion Date:** 05/28/2002
**Inquiry #:** 787221.1S
**P.O. #:** na
**Site Name:** Consumnes Power
**Address:** Consumnes Power
**City/State:** Elk Grove, CA 95758
**Cross Streets:**

This document reports that the largest and most complete collection of Sanborn fire insurance maps has been reviewed based on client-supplied information, and fire insurance maps depicting the target property at the specified address were not identified.

## NO COVERAGE

**TECHNICAL MEMORANDUM** CH2MHILL

# Property Uses Adjacent to Proposed CPP Natural Gas Line Corridor

**PREPARED FOR:** John Carrier

**PREPARED BY:** Karen Parker
CH2MHILL

**COPIES:** Kevin Hudson/SMUD

**DATE:** June 5, 2002

A brief survey of specific areas selected by the California Department of Toxic Substances Control (DTSC) was performed on May 17 and May 23, 2002. The areas were identified by DTSC at a workshop held by the California Energy Commission (CEC) on May 15, 2002. The areas were selected using a set of aerial photographs[1] of the proposed natural gas pipeline corridor for the Cosumnes Power Plant. Areas that appeared to contain possible sources of hazardous waste or environmental contamination were identified by DTSC by aerial photo figure number[2]. DTSC requested that more detail regarding the nature of activities in the areas in question be provided by the Applicant.

The results of the site survey performed by CH2M HILL are presented below by aerial photo figure number. For ease of reference, copies of the figures are attached. In addition, surface photographs of each area taken during the site survey are included in this Attachment.

## Figure 4 [and Photos 1 through 6]

This area is adjacent to the railroad tracks between Dwight Road and Santorini Drive in Elk Grove. The area is just south of the Sacramento Regional Waste Water Treatment Plant, north of Laguna Boulevard and west of Franklin Boulevard.

The housing development to the east of the railroad tracks is separated from the tracks by a concrete block sound wall. A portion of Dwight Road extending west from Franklin Boulevard north of the housing development crosses up and over the railroad tracks and terminates at Sims Road. A reference map of the area is attached.

On the western side of the railroad tracks, there is an unnamed dirt access road that runs southward from this portion of Dwight Road, and terminates at the Sacramento County Water Maintenance District WT-1 Facility. Immediately east of the access road (west of the tracks) is an

[1] A book of these 55 aerial photos was previously submitted to the CEC on May 6,2002, as Attachment BR-206 (Data Response Set 3B).

[2] The aerial photos identified by the CEC and DTSC for further investigation were 4, 5, 14, 17, 22, 37, and 45.

unlined drainage ditch. The railroad is raised several feet above grade in this area by a rock roadbed.

The Water Maintenance District facility is completely enclosed by a chain link fence. Based on a phone conversation with Mr. Craig Fetchner of the Sacramento County Water Maintenance Section on June 4, 2002, the two large tanks, visible on the aerial photograph (Figure 4), each hold 3.5 million gallons of water. A smaller tank of approximately 100,000 gallons in volume holds reclaim water (filter backwash) that contains mainly iron and manganese. An aboveground diesel storage tank is used for an emergency power generator. The aboveground tank replaced an underground diesel tank. The underground tank had leaked into its secondary containment but there was no release to the surrounding soil. Water treatment chemical storage (i.e., chlorine) is in 150-pound cylinders stored inside an onsite building. Mr. Fetchner was not aware of any historical releases from the site into the adjacent drainage ditch. He noted that a new sewer line was installed in the ditch last year. Photographs of the Water Maintenance Station are attached as Photos 1 through 3.

A large concrete-lined drainage ditch lies directly to the south of the Water Maintenance District facility (see Photo 4). With the exception of the Water Maintenance District facility, property to the north of the ditch appears to be owned by the Sacramento Regional Waste Water Treatment Plant. It is comprised mainly of undeveloped buffer land. The ditch runs east-west along the southern edge of the Sacramento Regional County Sanitation District's buffer land and the Water Maintenance Station. At the Water Maintenance Station, the ditch turns south and parallels the railroad tracks on the western side of the tracks. The ditch cuts off access from the Water Maintenance Station to the other facilities west of the railroad tracks that can be observed in Figure 4. To reach these other facilities, a second segment of Dwight Road must be accessed directly from Laguna Boulevard west of the railroad overcrossing.

This portion of Dwight Road parallels the railroad tracks. It contains about a half dozen commercial/industrial buildings. The road runs north from Laguna Boulevard and ends at the drainage ditch mentioned above.

Businesses along the east side of Dwight Road include, from north to south, Cardinal Distribution – A Cardinal Health Company (3238 Dwight), GNB Corporation (3200 Dwight), IXL Cabinets (3132 Dwight), and Laguna Self-Storage (3000 Dwight).

Behind the Cardinal Distribution site, accessed by a separate driveway that runs along the south side of the drainage ditch, is a small fenced area containing transformers.

The operator of the site is the Sacramento Municipal Utility District (SMUD). The site appeared to be well maintained and had no visible signs of leaks or spills. Photographs of the transformer area and the adjacent land between the transformer area and the railroad tracks are presented as Photos 5 and 6.

To the west of the transformer site is a small enclosed area containing an aboveground storage tank of approximately the same size as the Water Maintenance Station's reclaim tank, described above. The fenced area is not marked and does not appear to be in use at this time. According to

Sacramento County (Mr. Craig Fetchner), the tank does not belong to the Water Maintenance Station.

The Cardinal Distribution facility (3238 Dwight) consists of an office area near Dwight Road with a parking lot, and a fenced warehouse area with truck loading bays to the back of the site. None of these features are visible on Figure 4. Behind the facility is a road that runs to the small storage area and the transformer area mentioned above. The remainder of the site, as shown on Figure 4, is undeveloped. No visible signs of hazardous materials or waste storage were observed. No staining or stressed vegetation was visible from the parking area or the access road to the transformer area.

The large building shown at the bottom of Figure 4 is identified by a sign on the front of the building as GNB Corporation. However, there is a real estate sign in front of the building indicating there is space for lease, so GNB Corporation may not presently occupy the building. The sign identifies the realtor as Colliers International, Central Valley Industrial Group, (916) 563-3000. There were no visible signs of hazardous materials or wastes stored at the site and no signs of spills or contaminated asphalt or soils. The south side of the building contains several truck loading bays and a parking area. The building is visible in Photo 6.

### Figure 5 [and Photos 7 through 9]

The top of this aerial photo shows the south side of the GNB Corporation building described above. To the south is another large building located at 3132 Dwight Road. The sign on this building indicates that it is or was occupied by IXL Cabinets. However, this building also has a real estate sign in front of it. The real estate company information on the sign is the same as that on the sign described above for the GNB Corporation. This building appears to be a large warehouse, with an office area in the front. It is similar in design to the GNB Building. It contains several truck loading bays, and has a parking area to the south for employees. There was no visible hazardous materials or waste storage and no visible evidence of spills, distressed vegetation, or contaminated soils or asphalt at the time of the site survey.

Directly to the south of the IXL Cabinets building is a fence that separates the employee parking area from the Laguna Self-Storage facility. The self-storage facility is located at 3000 Dwight Road, on the northeast corner of the intersection of Dwight Road and Laguna Boulevard. The self-storage facility consists of a small sales office building and a number of storage buildings containing self-storage units. In addition, the facility has a large paved parking area for the storage of recreational vehicles and boats. The facility appears to be relatively new. Access is restricted by security gates and the entire site is either fenced or bounded by a concrete block wall. According to a sign on the electric gate, the phone number for Laguna Self-Storage is (916) 391-7000. A photograph of Laguna Self-Storage looking north from the Laguna Boulevard railroad overcrossing is included as Photo 7. In the photograph, the IXL Cabinet Building is visible beyond the RV and boat parking area. There were no visible signs of hazardous materials or wastes stored at the site and no signs of spills or contaminated asphalt or soils in this area.

## Attachment WM-229d

A small access road to the south of the self-storage facility and immediately north of the Laguna Boulevard railroad overpass is chained-off and has a sign denying access. The road leads to a pond located between the self-storage facility and the railroad tracks. While the pond could not be accessed during the site survey, it was readily observable from the Laguna Boulevard railroad overpass (see Photos 8 and 9). According to the manager of Laguna Self-Storage, the pond belongs to Sacramento County. At the time of the site visit, the pond was filled with water. The purpose of the pond was determined by contacting Mr. Dan Gewaltny of the County of Sacramento Storm Water Program on June 4, 2002. According to Mr. Gewaltny, the pond is a storm water detention basin maintained by Sacramento County.

There were no visible signs of hazardous materials or wastes stored at the site and no signs of spills or contaminated asphalt or soils in this area.

### Figure 14 [and Photos 10 through 11]

The subject of this aerial photo is located along the railroad alignment just to the east of Franklin Boulevard. The road that runs east-west in the photo is Bilby Road. On the west side of the railroad tracks, north of Bilby Road is a small residential area on Dennis Street. The four lots that back up to the railroad tracks contain residential homes and small storage buildings or garages. There is some old miscellaneous equipment stored behind the homes within the fenced backyards, as is typical of rural residences. A storage building appears to be associated with the residence located at 10338 Dennis. A picture is attached as Photo 10.

The eastern side of the railroad tracks contains native vegetation and a transmission line. Adjacent to this area is an old farmhouse on the north side of Bilby Road. The house has a circular driveway in front and several small outbuildings for livestock behind the house. Photo 11 shows the house, transmission line, and railroad tracks from Bilby Road.

As shown in Figure 14, the gas pipeline corridor lies east of the railroad tracks and transmission line, west of the farmhouse. The remainder of the area in Figure 14 consists of grazing and pasture land and farmland.

There were no visible signs of spills or contaminated asphalt or soils.

### Figure 17 [and Photos 12 through 13]

The buildings shown in this photograph appear to belong to Carmo Dairy, located at 10775 Franklin Road. Some of the large structures are actually open-walled sheds that provide shade for livestock. Others are barns, milking sheds, and residences. A large pond appears to have been excavated on the northwest corner of the site. There is a large pile of soil adjacent to the pond. Presumably the pond is used for watering cattle or providing irrigation water. There are numerous dairies in the area, including another at 10837 Franklin Road, the Alvara Machado Dairy, immediately south and east of the Carmo Dairy. A number of farms in the area grow grains, such as oats.

Access to the facility was not gained but photos were taken from Franklin Road. They are included as Photos 12 and 13.

Observations from Franklin Boulevard were too distant to determine hazardous materials use. However, closer observations made by the biologists along the railroad right-of-way indicated that were no visible signs of hazardous materials or wastes stored near the construction corridor and no signs of spills, distressed vegetation, or contaminated soils in this area (see Attachment WM-229f).

### Figure 22 [and Photos 14 through 15]

The precise address of this facility was not obtained. It is located on a dirt road along the transmission tower alignment, west of Bruceville Road, east of Core Road, and north of Eschinger Road. In the interest of not disturbing private property owners, photographs were taken from Bruceville Road, looking west (Photo 14), and from Eschinger Road, looking north (Photo 15). Several large vehicles, such as school buses, were visible on the property. There were no signs along the Bruceville Road access point indicating that the site was the home of an operating business.

During construction of the gas pipeline, soils in the vicinity of this property will be presumed to be contaminated with petroleum hydrocarbons, and possibly, metals as would be expected of used motor oil. Any excavated soils from this site will either be automatically managed as hazardous waste or, if time and storage availability allow, will be sampled and analyzed to determine whether they must be handled as hazardous waste.

However, closer observations made by the biologists indicated that, within the area of the stored vehicles, they did not observe any discolored soil or stressed vegetation (see Attachement WM-229f); both of which would be expected from soil contaminated by used motor oil.

The surrounding area appears to consist of farmland used for growing crops or for grazing livestock.

### Figure 37 [and Photos 16 through 19]

Figure 37 shows farms located at 10901 and 10920 Valensin Road. The property on the south side of Valensin Road contains a residence, barn, livestock pens and covered livestock sheds for dairy cows (Photos 16 and 17). The property on the north of the road has livestock pens near the road and farm buildings set back from the road (Photo 18). Fish farm ponds lie on the south side of the road to the east of the farms. Photographs taken from adjacent properties on Valensin Road show the structures immediately adjacent to the road (Photo 19). The proposed pipeline will be placed on the south side of Valensin Road.

Observations from along the road right-of-way indicated that were no visible signs of hazardous materials or wastes stored near the construction corridor and no signs of spills, distressed vegetation, or contaminated soils in this area.

# Attachment WM-229d

## Figure 45 [and Photos 20 through 21]

This aerial photo shows a ranch located at 12901 Twin Cities Road, a few miles to the west of Rancho Seco. The sign over the entry road giving the name of the ranch was too faded to read. The ranch contained farm equipment, buildings, livestock, and fenced paddock areas. The site also appeared to have a grain storage facility. Large transportation trailers for livestock were stored on site.

Pictures of the site taken from Twin Cities Road are included as Photos 20 and 21. As shown by the photos, the proposed pipeline corridor adjacent to the railroad tracks in this area is clean.

In this area, the pipeline would be located between the railroad tracks and Twin Cities Road. Observations from along the road and railroad right-of-way indicated that were no visible signs of hazardous materials or wastes stored near the construction corridor and no signs of spills, distressed vegetation, or contaminated soils in this area.

# COSUMNES POWER PLANT (01-AFC-19)
# DATA RESPONSES, SET 3D

## Attachment WM-229d

## INSERT

## Attach WM-229d.doc

**MEMORANDUM** CH2MHILL

# Cosumnes Power Plant – Potential Environmental Contaminants Observed During Botanical Field Surveys

**TO:** John Carrier / SAC

**COPIES:** Karen Parker / SAC
EJ Koford / SAC

**FROM:** Russell Huddleston / SAC

**DATE:** May 28, 2002

As per your request, any areas of potential concern as far as contaminated soils were noted during the botanical surveys for the Cosumnes Power Plant. The proposed plant site, laydown area, and 26-mile natural gas pipeline route were surveyed by walking transects. The primary focus of these surveys was rare, threatened and endangered plant species, as these surveys are focused on vegetation and ground cover. However, any visible indication of potential contamination such as stained soils, oil slicks, containers, stressed vegetation, etc. were noted. Trash and debris such as old furniture and paper products were observed in a few locations but were not specifically noted as being potentially hazardous sites. Results are summarized below. The exact locations are shown on the attached pipeline route photos.

1) Approximately 100 feet south of Dwight Road, at the northern edge of the 65-foot corridor. Observed an old, crushed 5-gallon gasoline canister. No stained soils or gasoline odors were evident.

2) Approximately 500 feet north of Elliot Ranch Road, in the 65-foot wide construction corridor. Observed a large pile of roofing materials (Tar -Shingles).

3) Under the Elk Grove Boulevard overpass, located just outside of the 65-foot-wide construction corridor, east side. Observed an empty plastic, 55-gallon container. No evidence of soil staining in the area. Concrete and other construction debris also observed in this area.

4) Approximately 4,600 feet north of the Franklin Boulevard crossing, south of Elk Grove Boulevard, observed an old refrigerator in the 65-foot-wide construction corridor.

5) Approximately 700 feet south of Bilby Road, on the east side of the railroad tracks, and 100 to 150 feet west of the proposed natural gas alignment. A few old buildings, discarded appliances and an old, rusted-out 50-gallon drum with numerous bullet holes were observed in this area. Some woody debris also observed in this area.

6) Approximately 4,000 feet south of Bilby Road, north of a dairy, east side of the railroad tracks, and approximately 25 feet west of the proposed construction area. Several plastic 2-

gallon motor oil containers adjacent to irrigation stand pipe and pump. An empty 55-gallon drum also observed in this location.

7) Approximately one mile south of Bilby Road, immediately east of a dairy, approximately 15 feet west of the proposed construction area. Old pick-up truck with engine removed observed in this area. Farm equipment also observed in this area.

8) Approximately 2,000 feet north of Core Road, east side of the railroad tracks, approximately 30 feet west of the proposed construction corridor. Very old, rusted-out 55-gallon drum observed near farm access road that crosses the railroad tracks.

9) North side of Core Road, approximately 1,800 feet east of the railroad tracks, just within green metal gate, approximately 50 feet south of the proposed construction corridor. Observed an old vehicle along the south side of an agricultural field, just inside of the gate.

10) Approximately 2,600 feet east of Ed Rau Road and 2,100 feet west of Bruceville Road. Junk yard area with several old busses, trucks, cars, campers and motor parts. No soil discoloration or stressed vegetation was observed in this area.

11) East side of Bruceville Road, approximately 50 feet south of proposed gas pipeline alignment. Several plastic 2-gallon motor oil containers were observed piled around pump next to irrigation stand pipe, located on the west side of the realigned creek.

12) Along Eschinger Road, approximately one mile west of where the road makes a 90-degree turn to the north. At the point where the natural gas pipeline runs north of Eschinger, just west of a vineyard. A television set was observed in a drainage ditch on the west side of a farm access road, approximately 100 feet north of Eschinger Road, and 25 feet west of the 65-foot-wide construction corridor.

13) Arno Road, approximately 200 feet east of McKinzie Road, located in the 65-foot-construction corridor. A car battery was observed in the roadside drainage ditch on the north side of Arno Road.

# INSERT PHOTOS

# Attach 229f.pdf

Attachment WM-229h

# ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

## JANUARY -- DECEMBER 2000

**Rancho Seco Nuclear Station**
**Herald, California**
**License Number DPR-54/ SNM-2510**

# 2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

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# 2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

## I. EXECUTIVE SUMMARY

This report contains results from the Radiological Environmental Monitoring Program (REMP) for the Rancho Seco Nuclear Station (RSNS) compiled for the period January 1, 2000 through December 31, 2000. This program is conducted by the Radiation Protection/ Chemistry Group at RSNS and is conducted in accordance with section D6.8.3.b of the RSNS Permanently Defueled Technical Specifications.

The results of the 2000 Radiological Environmental Monitoring Program showed that the operation of RSNS had no significant radiological impact on the environment.

Currently, the Plant is (1) permanently shutdown, (2) in a SAFSTOR condition, and (3) undergoing Decommissioning. Fuel off-loading into dry storage is currently scheduled to begin in 2001 to an Independent Spent Fuel Storage Installation (ISFSI).

During the reporting period, the atmospheric, terrestrial and aquatic environs adjacent to RSNS were monitored. The sample measurements showed that the levels of radioactivity in the sampled media were consistent with previous evaluations. All positively detected results were well below the reporting levels.

Doses resulting from ambient exposure to terrestrial and atmospheric direct radiation sources were measured through the placement and retrieval of Luxel monitoring badges. Direct radiation measurements attributable to Station operations, based on control and indicator locations, were indistinguishable above background levels. Two monitoring badge locations, placed in an area near the effluents discharge creek are being used to evaluate the higher than average soil activity. This activity is a result of historic monitored liquid effluent releases during Station operation. One monitoring badge location in this area is indicating dose higher than the indicator average. The dose at this location does not exceed regulatory limits.

Isotopic identifications were consistent with known releases of radioactive material from the Station to the atmospheric and aquatic environments. As expected, algae, fish, and sediment samples obtained from the aquatic environment of the No Name, Clay, Hadselville, and Laguna Creeks contributed the majority of positive isotopic identifications. Cesium -137, Cobalt-60, and Cesium-134 were the predominant nuclides identified in the aquatic environment. Tritium activity was detected during periods of liquid effluent releases.

## II. LAND USE CENSUS

The 2000 Land Use Census was conducted in accordance with the Rancho Seco Permanently Defueled Technical Specification (PDTS) section D.6.8.3.b.2 and Radiological Environmental Monitoring Program (REMP) manual section 4.0. The 2000 Land Use Census identified the continued transition to grape vineyards from pasture usage of the areas north, west, and south of the site. Evaluation of additional samples, because of this change, continued during 2000. Five well locations associated with the vineyards were sampled during 2000 and two grape samples were collected and analyzed during 2000.

This evaluation is in accordance with the requirements of 10CFR50, Appendix I, section IV.B.3. The land use census is performed on a biennial schedule and was performed during 2000 and completed in 2001. The next land use census is scheduled to be conducted in 2002 and completed in 2003.

## III. RADIOLOGICAL IMPACT EVALUATION

### PREDICTED POTENTIAL RADIOLOGICAL IMPACT

Gaseous Effluent Exposure Pathways

The maximum calculated annual organ dose commitment due to gaseous releases of tritium and particulate isotopes was 0.057 mRem (as calculated using the Rancho Seco Offsite Dose Calculation Manual (ODCM)). This calculated organ dose commitment was 0.38% of the associated PDTS limit (10CFR50, Appendix I guideline).

The maximum calculated annual dose commitment due to gaseous releases of noble gases was 0.00E+00 mrad, gamma air dose, and 0.00E+00 mrad, beta air dose, (as calculated using the Rancho Seco Offsite Dose Calculation Manual (ODCM)). The calculated air dose commitments were "NA" due to no calculated dose.

Liquid Effluent Exposure Pathways

During 2000, 1.83 E+07 liters of wastewater were released into "No Name" Creek from the two onsite Retention Basins. This volume of wastewater was dispersed into 1.64 E+10 liters of dilution water. The estimated error associated with determining these volumes was 5% and 20%, respectively.

The Liquid source term resulted in a calculated annual adult total body dose commitment of 0.139 mRem and a calculated child liver dose commitment of 0.276 mRem (as calculated using the ODCM). These calculated dose commitments were 4.64% and 2.76%, respectively, of the associated PDTS limits (10CFR50, Appendix I guidelines). The dose commitments reflect the age groups that could have received the highest annual dose commitment from the liquid source term. This information is summarized in Table 1.

## III. RADIOLOGICAL IMPACT EVALUATION (Continued)

### FUEL CYCLE DOSE EVALUATION

PDTS section D6.9.2.3 [NRC74] requires each Annual Radiological Environmental Operating Report (AREOR) to include information related to REMP manual section 5.0; Fuel Cycle Dose. The Fuel Cycle Dose Specification limits the dose or dose commitment to any real member of the public to 25 mrem to the total body or any organ, except the thyroid which is limited to 75 mrem. This specification implements requirements promulgated by the United States Environmental Protection Agency [CFRd].

Consistent with REMP manual section 5.0, no fuel cycle dose evaluation was required to be performed during 2000 since no REMP measurement exceeded the established reporting levels. Additionally, the Station effluent dose predictions did not exceed twice the dose guidelines of 10CFR50, Appendix I [CFRc]. The station operated within the Appendix I guidelines envelope for radioactive effluents (a condition supported by Program measurements); therefore, determination of an actual dose commitment delivered to a real member of the public was not required.

### OBSERVED POTENTIAL RADIOLOGICAL IMPACT

Gaseous Effluent Exposure Pathways

The calculated gaseous effluent dose commitment calculation activity, of 0.057 mRem [RS00] is based on tritium activity. No particulate isotopes of Station origin were released during 2000. The observed dose commitment dose calculation, if completed, using the gross beta data (which is primarily due to naturally occurring radioisotopes) would not provide an accurate correlation with the tritium activity dose calculations. Therefore, no dose comparison was completed.

This was also confirmed during 2000, as none of the REMP quarterly composite gamma isotopic analysis results for the airborne pathway indicated the presence of nuclides of Station origin.

Direct Radiation Exposure Pathway

Based on Luxel control and indicator locations measurement results obtained during 2000, the Station proper did not contribute an observable component to the recorded direct gamma radiation field. This Luxel data supports the Gaseous Effluent Exposure Pathway conclusions and supports the conclusion that the Plant has no direct radiation effect on the environment.

Luxel monitoring badges placed near the effluent stream were used to evaluate the dose from this area. Dose levels at these locations are higher than the mean of the control and indicator locations reported. This above average dose is due to elevated soil activity due to historic liquid effluent releases.

## III. RADIOLOGICAL IMPACT EVALUATION (Continued)

### OBSERVED POTENTIAL RADIOLOGICAL IMPACT

Liquid Effluent Exposure Pathways

To evaluate the impact on the environment from the liquid effluent pathway, dose calculations were performed and compared with the annual dose commitment calculations reported in the January -December 2000 Rancho Seco Annual Radioactive Effluent Release Report [RS00]. The observed results presented in Table 1 were obtained using the Cs-137 activity reported for the fish samples from 2000 (Appendix F, Table F-5), default consumption quantities for fish (ODCM), and nuclide-specific dose factors [NRC77].

As in past reports, the observed potential dose commitments listed in Table 1 are subject to uncertainty, principally due to the assumption that the observed radioactivity was due to 2000 Station operations only and was not affected by radioactivity introduced into the environment prior to 2000. A major portion of the activity identified by Program measurements in 2000 is attributable to historical releases documented in previous annual reports. Additionally, the observed dose commitment calculations are based on conservative default consumption factors for fish.

The 2000 Land Use Census indicates the potential for a liquid/ fish or liquid/ irrigated vegetation pathway. This potential will continue to be evaluated and updated in the 2002 Land Use Census. This potential is based on the possibility and not actual data supporting the use of the effluent streams for a source of fish. The irrigation of the vineyards will continue to be evaluated in the 2002 Land Use Census. Conservative consumption factors for fish were used for the observed dose commitment based on this potential.

## III. RADIOLOGICAL IMPACT EVALUATION (Continued)

### OBSERVED POTENTIAL RADIOLOGICAL IMPACT

**TABLE 1**

**2000 Liquid Effluent Pathway Potential Dose Comparison**

**POTENTIAL DOSE COMMITMENT**
(Based on the maximally exposed group)

| PREDICTED DOSE COMMITMENT (a) (mRem) | OBSERVED DOSE COMMITMENT (b) (c) (mRem) | PERCENT OF THE 10CFR50 APPENDIX I DOSE LIMITS |
|---|---|---|
| 0.139<br>(Adult Total Body) | 0.114<br>(Adult Total Body) | 3.8 %<br>Total Body<br>(3 mrem guideline) |
| 0.276<br>(Child-Liver) | 0.182<br>(Teen Liver) | 1.8 %<br>Organ<br>(10 mrem guideline) |

**Notes:**

(a) Reported in the 2000 Annual Radiological Effluents Release Report

(b) Calculated using Cs-137 activity for fish samples (Appendix F, Table F-5).

(c) The observed dose commitments for doses reflect the age group that could have received the highest annual dose commitment from the liquid source term

## IV. PROGRAM ANALYSIS RESULTS SUMMARY

This section compiles all Program data with corresponding evaluations. Each of the following five subsections presents information about each of the principal environmental exposure pathways monitored by the Program:

- ⇒ **Atmospheric** (Section IV-A)
- ⇒ **Direct Radiation** (Section IV-B)
- ⇒ **Terrestrial** (Section IV-C)
- ⇒ **Aquatic Life** (Section IV-D)
- ⇒ **Water** (Section IV-E)

Each of these sections contains a data evaluation subsection, which provides a summary of the data collected.

Table 2 is a comprehensive, all-media data summary presented in a format considered acceptable by the US Nuclear Regulatory Commission. Information contained in Table 2 was derived from data presented in Appendix F.

### IV-A. ATMOSPHERIC MONITORING

#### DATA EVALUATION

No radionuclides attributable to the operation of Rancho Seco were observed in gamma spectrometry analyses of the quarterly composites of the particulate filters. No table is presented for this data since all the data was reported as being below the associated minimum detectable activity for the nuclides of interest.

The data indicates that there was no measurable contribution to the airborne radioactivity inventory, which could reasonably be attributable to Station operations.

The summary data for 2000 air particulate monitoring is presented in Table 2. Comprehensive data tables are given in Appendix F, Table F-1.

## IV-B. DIRECT RADIATION MONITORING

### DATA EVALUATION

A comparison review of all Luxel badge data for the indicator and control locations during 2000 showed that there was no observable direct radiation component due to Station operations (i.e., storage or utilization of licensed radioactive material within the restricted area.)

Two Luxel badge locations are being used to evaluate the dose in areas next to the effluent stream. The data from these locations indicates doses are within regulatory limits.

The summary data for 2000 direct radiation monitoring is presented in Table 2. Comprehensive data tables are given in Appendix F, Table F-2.

## IV-C. TERRESTRIAL MONITORING

### DATA EVALUATION

**Garden Vegetation** -- Four garden vegetation samples and two grape samples were collected and analyzed for nuclides of interest during 2000. No gamma emitting isotopes were found in any of the samples analyzed. A site boundary irrigated garden has been evaluated to be a conservative method for evaluating the liquid effluent pathway. This method meets the requirement of the Land Use Census for monitoring gardens. This site boundary garden is used for the Land Use Census. The vineyard grape samples included a control location and an indicator location. These two samples were analyzed for gamma emitting isotopes and tritium activity.

**Soil (discharge canal)** -- Eight soil samples were collected and analyzed for nuclides of interest from the effluent discharge canal and downstream creeks during 2000. Cs-137 (7 samples, 61 to 1259 pCi/kg, 313 pCi/kg mean) and Co-60 (2 samples, 13 to 43 pCi/kg, 28 pCi/kg mean) was detected by the analyses. The remaining nuclide identifications were numerically below the required LLD-equivalent activity concentration. The presence of the identified nuclides is attributed to historical Station operations. Sampling at these locations is within an approximately 10 $m^2$ area. Random sampling in this area provides data to evaluate isotopic concentrations in the sample location. Due to the random nature of the samples, the data does not provide adequate statistical information to evaluate individual isotopic decay or overall migration information. Soil sampling at these locations is not required by the REMP (administratively controlled).

**Soil (storm drain outfall)** -- Thirty soil samples were collected from fifteen storm drain out-fall locations during 2000. These out-falls are located along the perimeter of the Industrial Area Boundary (Restricted Area) and the ISFSI. Gamma spectrometry analysis of these samples revealed the presence of Cs-137 (16 samples, 21 to 418 pCi/kg, 70 pCi/kg mean). Sampling at

these locations is in the area of the storm drain discharge. Soil sampling at these locations is not required by the REMP (administratively controlled).

## IV-C. TERRESTRIAL MONITORING (Continued)

### DATA EVALUATION

**Soil (depression area)** -- Fourteen (14) soil samples at seven locations were collected in 2000. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 (14 samples, 133 to 40700 pCi/kg, 9319 pCi/kg mean), Co-60 (8 samples, 30 to 1180 pCi/kg, 404 pCi/kg mean), and Cs-134 (6 samples, 38 to 147 pCi/kg, 79 pCi/kg mean. Sampling at these locations is within an approximately 3 $m^2$ area. As stated for the soil locations along the effluent discharge, random sampling in this area provides data to evaluate isotopic concentrations in the individual sample location(s). Due to the random nature of the samples, the data does not provide adequate statistical information to evaluate individual isotopic decay or overall migration information. Soil sampling at these locations is not required by the REMP (administratively controlled).

The summary data for 2000 terrestrial monitoring is presented in Table 2. Comprehensive data tables are given in the following Appendix F tables:

- ⇒ **F-3** (Garden Vegetables)
- ⇒ **F-4** (Soil and Sediment).

## IV-D. AQUATIC LIFE MONITORING

### DATA EVALUATION

**Fish** - Two fish samples were collected during 2000 and analyzed for nuclides of interest by gamma spectrometry. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 (2 samples, 59 to 94 pCi/kg, 76 pCi/kg mean).

**Sediment** - 23 samples of sediment were collected from the discharge canal and the Clay/ Hadselville/ Laguna Creeks during 2000. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 (21 samples, 11 to 9000 pCi/kg, 946 pCi/kg mean), Co-60 (4 samples, 6 to 176 pCi/kg, 95 pCi/kg mean), Cs-134 (2 samples, 30 to 41 pCi/kg, 36 pCi/kg mean), and Mn-54 (2 samples, 1 to 5 pCi/kg, 3 pCi/kg mean).

The presence of nuclides of interest in sediments is attributed to historical permitted liquid effluent discharges. The presence of Mn-54 is considered an anomaly due to the half-life of Mn-54. The analysis laboratory (Eberline Services) reanalyzed and confirmed the results for the Mn-54 data.

## IV-E. WATER MONITORING

### DATA EVALUATION

**Algae** - Eleven samples of algae were collected from the discharge canal and the Clay/ Hadselville/ Laguna creeks during 2000. Cs-137 (6 samples, 12 to 52 pCi/kg, 31 pCi/kg mean) and Co-60 (2 samples, 5 to 7 pCi/kg, 6 pCi/kg mean) was detected by gamma spectrometry analysis.

The identification of nuclides of interest in the algae samples is attributed to permitted historical liquid effluent discharges.

**Well Water** - 34 well water samples, from nine locations, were collected at indicator and control locations around the site during 2000. Tritium and gamma spectrometry analysis of the samples indicated results less than LLD. Gross beta activity levels for all samples were within regulatory limits. Three additional locations (total of four locations for the vineyards) were administratively added in 2000 for the observed transition to commercial grape vineyards around the site.

**Runoff Water** – 30 runoff water samples were collected at the site boundary during 2000. No nuclides of interest were identified by gamma spectrometry. One tritium analysis, during the third quarter, immediately after a liquid effluent release from the South Retention Basin, indicated a positive tritium result (5190 pCi/L).

**Surface Water** - Five locations (3 indicator and 2 control) were included in the surface water monitoring Program. Composite samplers located at the Plant intake (Folsom South Canal) and effluent discharge (Restricted Area/ Industrial Area Boundary) provide monthly composite samples. During 2000, 64 samples were collected and analyzed for nuclides of interest. No gamma-emitting nuclides were detected in any of the samples analyzed. Tritium activity was detected in samples collected during the third and fourth quarters of 2000 during planned liquid effluent releases from the South Retention Basin. Tritium activity was measured at 510 pCi/L from the composite sampler at the effluent discharge and 260 pCi/L from the grab sample taken at the Site Boundary.

**Drinking Water** - Water supplied from the site well is distributed in a potable water supply system for Station personnel consumption and use. On a monthly frequency, a sample of this water was collected and analyzed for nuclides of interest. A sample from the Rancho Seco Reservoir Well is collected as a control location. Cs-137 activity (45 pCi/L) was detected in the sample collected on January 25, 2000 from the Site sampling location. The Gross Beta analysis for this sample was 3.6 pCi/L. The location was re-sampled on March 13, 2000 and did not indicate Cs-137 activity. The next monthly sample did not detect Cs-137 activity at this location, as did all of the subsequent samples collected for 2000. The analysis vendor was contacted for reanalysis of the sample, but was unable to complete the analysis due to inadequate sample volume remaining. Gross Beta analysis for all samples showed activity within regulatory limits.

**Rainwater** - On a seasonal basis, rainwater is collected at an off site location. The sample is analyzed for gamma emitting isotopes and tritium. During 2000, 16 samples were collected at this location. No isotopes of interest were detected in these samples. Rainwater samples are not required to be collected by the REMP (administratively controlled).

## IV-E. WATER MONITORING

### DATA EVALUATION (continued)

The summary data for the water monitoring program is shown in Table 2. Comprehensive data tables are given in the following Appendix F Tables:

- ⇒ **F-4** Soil and Sediment
- ⇒ **F-6** Algae
- ⇒ **F-7** Well Water
- ⇒ **F-8** Runoff Water
- ⇒ **F-9** Surface Water
- ⇒ **F-10** Drinking Water
- ⇒ **F-11** Rain Water

TABLE 2

**ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY**

TABLE 2

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Name of Facility **Rancho Seco Nuclear Station** Docket No. **DPR-54/ SNM-2510**

Location of Facility **Sacramento, California** . Reporting Period **January - December 2000**
(County, State)

| Medium or Pathway Sampled (Unit of Measurement) | Type and Total Number of Analysis Performed | Lower Limit of Detection (LLD)[b] | All Indicator Locations Mean (f)[b] Range | Location with Highest Annual Mean Name Distance Direction Mean (f)[b] Range | Control locations Mean (f)[a] Range | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|
| Air Particulates (pCi/M$^3$) | Gross β (208) | 0.01 | 0.022 (104/104) (0.009- 0.069) | RAS0.1CO 0.1 miles 45° 0.023 (52/52) (0.010-0.065) | 0.022 (104/104) (0.009-0.063) | 0 |
| | γ-spec (4) | | | | | |
| | $^{137}$Cs | 0.01 | <LLD | <LLD | <LLD | |
| | $^{134}$Cs | 0.01 | <LLD | <LLD | <LLD | |
| | | | | | | |
| Direct Radiation (mRem/qtr.) | Luxel badge (139) | 1 mRem (badge sensitivity) | 18 (116-116) (13-46) | RTL0.4NO 0.4 miles 270° 37 (4/4) (29-46) | 17 (23/23) (13-21) | 0 |
| | | | | | | |
| Garden Vegetables (pCi/kg) | γ-spec (6) | | | | | |
| | $^{60}$Co | 60 | <LLD | <LLD | <LLD | 0 |
| | $^{137}$Cs | 60 | <LLD | <LLD | <LLD | 0 |
| | $^{134}$Cs | 60 | <LLD | <LLD | <LLD | 0 |
| | Tritium (2) | 1000 | <LLD | <LLD | <LLD | 0 |

[a] Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

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[b] LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

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|---|---|---|---|---|---|---|
| Soil Discharge Canal (pCi/kg) | γ-spec (8) | | | | | |
| | $^{60}$Co | 150 | 28 (2/8) (13-43) | RSL1.5NO 1.5 miles 270° 43 (1/2) (NA) | NA | 0 |
| | $^{137}$Cs | 150 | 313 (7/8) (61-1259) | RSL1.5NO 1.5 miles 270° 672 (2/2) (84-1259) | NA | 0 |
| | $^{134}$Cs | 150 | <LLD | <LLD | NA | 0 |
| | | | | | | |
| Soil Storm Drain (pCi/kg) | γ-spec (30) | | | | | |
| | $^{60}$Co | 150 | <LLD | <LLD | NA | 0 |
| | $^{137}$Cs | 150 | 70 (16/30) (21-418) | RSL0.2HO 0.2 miles 158° 231 (2/2) (44-418) | NA | 0 |
| | $^{134}$Cs | 150 | <LLD | <LLD | NA | 0 |

[a] Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

[b] LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

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(County, State)

| Medium or Pathway Sampled (Unit of Measurement) | Type and Total Number of Analysis Performed | Lower Limit of Detection (LLD) [b] | All Indicator Locations Mean (f)[b] Range | Location with Highest Annual Mean<br>Name<br>Distance Direction<br>Mean (f) [b]<br>Range & | Control locations Mean (f) [a] Range | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|
| Soil Depression Area (pCi/kg) | γ-spec (14) | | | | | |
| | $^{60}$Co | 150 | 404 (8/14)<br>(30-1180) | RSL0.4MP1<br>0.4 miles 248°<br>979 (2/2)<br>(778-1180) | NA | 0 |
| | $^{137}$Cs | 150 | 9319 (14/14)<br>(133-40700) | RSL0.4MP1<br>0.4 miles 248°<br>34825 (2/2)<br>(28950-40700) | NA | 0 |
| | $^{134}$Cs | 150 | 79 (6/14)<br>(38-147) | RSL0.4MP1<br>0.4 miles 248°<br>123 (2/2)<br>(99-147) | NA | 0 |
| | | | | | | |
| Sediment (pCi/kg) | γ-spec (23) | | | | | |
| | $^{60}$Co | 150 | 95 (4/23)<br>(6-176) | RMS0.7NO<br>0.7 miles 270°<br>173 (2/4)<br>(169-176) | NA | 0 |
| | $^{137}$Cs | 150 | 946 (21/23)<br>(11-9000) | RMS0.7NO<br>0.7 miles 270°<br>4419 (4/4)<br>(73-9000) | NA | 0 |
| | $^{134}$Cs | 150 | 36 (2/23)<br>(30-40) | RMS0.7NO<br>0.7 miles 270°<br>36 (2/4)<br>(30-41) | NA | 0 |
| | $^{54}$Mn | 150 | 3 (2/23)<br>(1-5) | RMS1.8NO<br>1.8 miles 270°<br>5 (1/4)<br>NA | | |

**a** Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

**b** LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

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|---|---|---|---|---|---|---|---|
| Fish (pCi/kg) | γ-spec (2) | | | | | | |
| | $^{54}$Mn | 130 | <LLD | <LLD | | NA | 0 |
| | $^{60}$Co | 130 | <LLD | <LLD | | NA | 0 |
| | $^{65}$Zn | 260 | <LLD | <LLD | | NA | 0 |
| | $^{137}$Cs | 130 | 76 (2/2) (59-94) | RFS0.6MO 0.6 miles 248° | 76 (2/2) (59-94) | NA | 0 |
| | $^{134}$Cs | 130 | <LLD | <LLD | | NA | 0 |
| | | | | | | | |
| Algae (pCi/kg) | γ-spec (11) | | | | | | |
| | $^{60}$Co | 150 | 6 (2-11) (5-7) | RAG1.8NO 1.8 miles 270° | 7 (1/11) ( NA ) | NA | 0 |
| | $^{137}$Cs | 150 | 31 (6-11) (12-52) | RAG1.8NO 1.8 miles 270° | 52 (1/11) ( NA ) | NA | 0 |
| | $^{134}$Cs | 150 | <LLD | <LLD | | NA | 0 |

[a] Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

[b] LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

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(County, State)

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|---|---|---|---|---|---|---|
| Well Water (pCi/L) | Gross β (34) | 4 | 3.9 (9/34) (2.4-6.9) | RWW0.3EO 0.3 miles 90° 6.9 (1/4) ( NA ) | <LLD | 0 |
| | Tritium (34) | 1000 | <LLD | <LLD | <LLD | 0 |
| | γ-spec (34) | | | | | |
| | $^{54}$Mn | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{60}$Co | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{65}$Zn | 30 | <LLD | <LLD | <LLD | 0 |
| | $^{137}$Cs | 10 | <LLD | <LLD | <LLD | 0 |
| | $^{134}$Cs | 10 | <LLD | <LLD | <LLD | 0 |
| | | | | | | |
| Runoff Water (pCi/L) | Tritium (30) | 2000 | 5190 (1/30) ( NA ) | RRW0.6MO 0.6 miles 248° 5190 (1/30) ( NA ) | NA | 0 |
| | γ-spec (30) | | | | | |
| | $^{54}$Mn | 15 | <LLD | <LLD | NA | 0 |
| | $^{60}$Co | 15 | <LLD | <LLD | NA | 0 |
| | $^{65}$Zn | 30 | <LLD | <LLD | NA | 0 |
| | $^{137}$Cs | 18 | <LLD | <LLD | NA | 0 |
| | $^{134}$Cs | 15 | <LLD | <LLD | NA | 0 |

**a** Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

**b** LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

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| Medium or Pathway Sampled (Unit of Measurement) | Type and Total Number of Analysis Performed | Lower Limit of Detection (LLD) [b] | All Indicator Locations Mean (f)[b] Range | Location with Highest Annual Mean Name Distance Direction Mean (f) [b] Range & | Control locations Mean (f) [a] Range | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|
| Surface Water (pCi/L) | Tritium (64) | 2000 | 385 (2/52) (260-510) | RSW0.3MO 0.3 miles 248° ( NA ) 510 (1/12) | <LLD | 0 |
| | γ-spec (64) | | | | | |
| | $^{54}$Mn | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{60}$Co | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{65}$Zn | 30 | <LLD | <LLD | <LLD | 0 |
| | $^{137}$Cs | 18 | <LLD | <LLD | <LLD | 0 |
| | $^{134}$Cs | 15 | <LLD | <LLD | <LLD | 0 |
| | | | | | | |
| Drinking Water (pCi/L) | Gross β (24) | 4 | 3.5 (8/13) (2.6-4.1) | RDW0.1GO 0.1 miles 135° 3.5 (8/13) (2.6-4.1) | 2.8 (8/12) (2-3.5) | 0 |
| | Tritium (24) | 1000 | | | <LLD | 0 |
| | γ-spec (24) | | | | | |
| | $^{54}$Mn | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{60}$Co | 15 | <LLD | <LLD | <LLD | 0 |
| | $^{65}$Zn | 30 | <LLD | <LLD | <LLD | 0 |
| | $^{137}$Cs | 10 | 45(1/13) ( NA ) | RDW0.1GO 0.1 miles 135° ( NA ) 45 (1/13) | <LLD | 0 |
| | $^{134}$Cs | 10 | <LLD | <LLD | <LLD | 0 |

[a] Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

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ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

Name of Facility **Rancho Seco Nuclear Station** Docket No. **DPR-54/ SNM-2510**

Location of Facility **Sacramento, California** . Reporting Period **January - December 2000**
(County, State)

| Medium or Pathway Sampled (Unit of Measurement) | Type and Total Number of Analysis Performed | Lower Limit of Detection (LLD) [b] | All Indicator Locations Mean (f)[b] Range | Location with Highest Annual Mean Name Distance Direction Mean (f) [b] Range & | Control locations Mean (f) [a] Range | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|
| Rain Water (pCi/L) | Tritium (16) | 2000 | <LLD | <LLD | NA | 0 |
| | γ-spec (16) | | | | | |
| | $^{54}$Mn | 15 | <LLD | <LLD | NA | 0 |
| | $^{60}$Co | 15 | <LLD | <LLD | NA | 0 |
| | $^{65}$Zn | 30 | <LLD | <LLD | NA | 0 |
| | $^{137}$Cs | 18 | <LLD | <LLD | NA | 0 |
| | $^{134}$Cs | 15 | <LLD | <LLD | NA | 0 |

[a] Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

[b] LLD values from Table E-2. See page E-8, "SENSITIVITY OF THE REMP MEASUREMENT PROCES", for information on determining LLD and Minimum Detectable Activity (MDA).

## V. REFERENCES


| | |
|---|---|
| CFRa | Code of Federal Regulations, 1999, "National Primary Drinking Water Regulations," Title 40, Part 141. |
| CFRb | Code of Federal Regulations, 1999, "Standards for Protection Against Radiation," Title 10, Part 20. |
| CFRc | Code of Federal Regulations, 1999, "Domestic Licensing of Production and Utilization Facilities," Title 10, Part 50. |
| CFRd | Code of Federal Regulations, 1999, "Environmental Radiation Protection Standards for Nuclear Power Operations," Title 40, Part 190. |
| NRC74 | United States Nuclear Regulatory Commission, 1974, "Permanently Defueled Technical Specifications for the Rancho Seco Nuclear Station," Appendix A to Facility License No. DPR-54 (as amended). |
| NRC77 | United States Nuclear Regulatory Commission, 1977, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I," Regulatory Guide 1.109, Revision 1. |
| NRC79a | United States Nuclear Regulatory Commission, 1979, "An Acceptable Radiological Environmental Monitoring Program," Branch Technical Position, Revision 1. |
| NRC79b | United States Nuclear Regulatory Commission, 1979, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment," Regulatory Guide 4.15, Revision 1. |
| NRC92 | United States Nuclear Regulatory Commission, "Air Sampling in the Workplace", Regulatory Guide 8.25, June 1992 |
| NUREG79 | United States Nuclear Regulatory Commission, 1979, "Radiological Effluent Technical Specifications for PWRs," NUREG-0472, Revision 2. |
| NUREG80a | United States Nuclear Regulatory Commission, 1980, "Methods for Demonstrating LWR Compliance with the EPA Uranium Fuel Cycle Standard (40CFR190)," NUREG-0543. |
| RS00 | Rancho Seco Nuclear Station, 2000, "Annual Radioactive Effluent Release Report, January -December 2000," Sacramento Municipal Utility District report. |

## VI. APPENDICES

## APPENDIX A

## 2000 LAND USE CENSUS RESULTS

In compliance with the Rancho Seco Permanently Defueled Technical Specifications, section D6.8.3.b.2 and the REMP Manual, section 4.0, "Land Use Census", a land use census was completed on February 27,2001. The primary method of conducting the survey was to use an aerial survey that was conducted during June 2000. Evaluating the aerial photographs continues to provide an effective method of determining locations and distances of the nearest residences. In conjunction with the aerial survey, a Global Positioning System (GPS) was used to verify distances and locations of residences. When the review of the survey photos indicated that an actual on-scene survey was needed to verify the use of identified structures; a visual observation was made. The aerial photos also provided a method to identify any changes in the agricultural, commercial, or industrial use of the land surrounding the site. The use of conservative dose factors for the purpose of projected dose calculations still requires that we evaluate the use of the area surrounding the site. The information that is presented is to verify this assumption and validate the process.

The land use census covered an area bounded by each of the sixteen meteorological sectors out to a two-mile radius from the Reactor Building.

The 2000 Land Use Census did not identify any changes in the use of the unrestricted areas that would require modifications in the Radiological Environmental Monitoring Program for evaluating doses to individuals from principal pathways of exposure. This evaluation and determination are in accordance with the requirements of 10CFR50, Appendix I, section IV.B.3.

The Land Use Census is completed on a biennial schedule. Aerial surveys will be conducted during 2002 and the Irrigation reports covering 2001 and 2002 will be requested during the last quarter of 2001 and 2002. This information will be used to complete the 2002 census scheduled to be completed in 2003.

## A. RESIDENT EXPOSURE PATHWAY SUMMARY

### Inhalation, Ground Plane and Water Consumption

The 2000 census determined that seven of the 16 radial sectors have residences that are within the 2-mile (3219 meters) Land Use Census radius. The closest residence in each of the seven sectors is identified below:

| Sector | Distance (meters) | Ranking (Nearest to Farthest) |
|---|---|---|
| A | >3219 | NA |
| B | >3219 | NA |
| C | 1432* | 3 |
| D | 1175* | 1 |
| E | >3219 | NA |
| F | >3219 | NA |
| G | 2381* | 6 |
| H | >3219 | NA |
| J | >3219 | NA |
| K | 2320* | 5 |
| L | 1207* | 2 |
| M | 2028* | 4 |
| N | 3181 | 7 |
| P | >3219 | NA |
| Q | >3219 | NA |
| R | >3219 | NA |

It is expected that all seven residences use well water for consumption and other domestic purposes.

*Distance updated using GPS.

## B. DEPOSITION EXPOSURE PATHWAY SUMMARY

### Beef Consumption

Based on conservative dose calculation parameters in use, the following is a summary for the 2000 land use census of the potential deposition exposure pathways at the locations listed below:

| Sector | Distance (meters) | Consumption Pathway | Comment |
|---|---|---|---|
| A | 433 | Beef | Unrestricted Area Boundary |
| B | 430 | Beef | Unrestricted Area Boundary |
| C | 531* | Beef | Unrestricted Area Boundary |
| D | 451* | Beef | Unrestricted Area Boundary |
| E | 483* | Beef | Unrestricted Area Boundary |
| F | 499* | Beef | Unrestricted Area Boundary |
| G | 579* | Beef | Unrestricted Area Boundary |
| H | 198 | Beef | Unrestricted Area Boundary |
| J | 195 | Beef | Unrestricted Area Boundary |
| K | 195 | Beef | Unrestricted Area Boundary |
| L | 286 | Beef | Unrestricted Area Boundary |
| M | 404 | Beef | Unrestricted Area Boundary |
| N | 514* | Beef | Unrestricted Area Boundary |
| P | 708* | Beef | Unrestricted Area Boundary |
| Q | 579* | Beef | Unrestricted Area Boundary |
| R | 448 | Beef | Unrestricted Area Boundary |

Because of the extremely small amount of radioactive gaseous effluent released from the site, Deposition Exposure Pathway changes were considered inconsequential. The changes indicated in the beef consumption table do not necessitate modification of ODCM or REMP practices.

*Distance updated using GPS

## C. IRRIGATED CROP EXPOSURE PATHWAY SUMMARY

**Laguna Creek**

The 2000 Land Use Census determined that irrigation water is used by three organizations. Rancho Seco Nuclear Station, through a contract with Rossini Farming Co. monitors water usage from the Site Boundary for irrigation purposes. Clay Irrigation District is the next user downstream that provides irrigation water. Galt Irrigation District provides irrigation water downstream of the Clay Irrigation District. The following is a summary of the Irrigation Reports collected during the 2000 Land Use Census.

### Rossini Farming Co. Usage

| Date | Meter Reading | Comment |
|---|---|---|
| January 14, 1999 to August 25, 1999 | 1.787 | Initial reading at start of contract |
| December 2, 1999 | 67.002 | |
| December 30, 1999 | 101.571 | |
| March 6, 2000 to December 7, 2000 | 124.682 | |

Total usage: 122.895 Acre-feet (40,057,010.78 gallons)

### Clay Irrigation District

| Resident | Year | Acre-feet | Usage |
|---|---|---|---|
| Gary Silva | 1999 | 4513 | Pasturage |
| Gary Silva | 2000 | 4390 | Pasturage |

The amount of water used is based on discussions with the resident (Gary Silva) that he uses 1/3 of the discharge from Rancho Seco and Galt Irrigation District uses the remaining 2/3 of the total discharge.

## C. IRRIGATED CROP EXPOSURE PATHWAY SUMMARY (Continued)

**Laguna Creek**

Galt Irrigation District

1999/ 2000 Irrigation Report

| Meter No. | Acre Feet Water 1999 | Acreage Irrigated 1999 | Crop 1999 | Acre Feet Water 2000 | Acreage Irrigated 2000 | Crop 2000 |
|---|---|---|---|---|---|---|
| Creek meter | 165 | 55 | Pasture | 165 | 55 | Pasture |
| 251 | 470.544 | 156 | Sudan | 0 | | |
| 588 | 176.112 | 20 | Clover | 24.933 | 20 | Clover |
| 494 | 194.931 | 60 | Corn | 16.919 | 60 | Corn |
| 500 | 254.55 | 50 | Sudan | 224.282 | 100 | Sudan |
| 254 | 368.499 | 50 | Sudan | 412.553 | 110 | Clover |
| 255 | 402.045 | 135 | Sudan | 413.433 | 140 | Pasture |
| 253 | 383.545 | 130 | Pasture | 384.175 | 140 | Pasture |
| 250 | 27.24 | 90 | Clover | 92.37 | 170 | Sudan |
| 247 | 0 | 0 | | | | |
| 256 | 332.055 | 100 | Sudan | 275 | 100 | Sudan |
| 136 | 177.883 | 60 | Corn | 175.437 | 60 | Corn |
| 461 | 48.406 | 30 | Alfalfa | 48.406 | 40 | Corn |
| 315 | 210.432 | 50 | Sudan | 63.862 | 50 | Sudan |
| | | | | | | |
| Total | 3211.242 | 986 | | 2296.37 | 1201 | |

Based on direct observation cattle consume water from the Clay, Hadselville, and Laguna Creeks.

## D. OTHER EXPOSURE PATHWAYS

The 2000 Land Use Census confirmed previous knowledge that the Clay/Laguna Creeks are utilized by the general public for aquatic life consumption purposes. Past census evaluations have been unsuccessful in determining the usage/ occupancy factors for their consumption. Therefore, insufficient data existed to justify ODCM usage factor modification.

## E. REMP EVALUATION

An objective of the 2000 Land Use Census was to compare census and current REMP Manual locations to ensure consistency exists between monitoring activities and actual land utilization. The following discussion is a summary of the comparison evaluation for each of the four exposure pathways.

Resident Exposure Pathway

The inhalation and ground plane exposure pathways, the principal components of the Resident Exposure Pathway, are monitored directly and indirectly by Luxel dosimetry, air, and soil sampling and analysis. Well water was monitored at nine locations.

Since the existing REMP was more conservative with respect to Resident Exposure Pathway monitoring, no changes were required.

Deposition Exposure Pathway

The Deposition Exposure Pathway (Section B) is monitored directly within the Station Site Boundary through garden vegetation sampling and analysis. The potential for a deposition pathway has been evaluated by the ODCM and REMP programs and found to have little potential for the current plant status. Since the current REMP was representative and conservative with respect to Deposition Exposure Pathway monitoring, no changes were required.

Irrigated Crop Exposure Pathway

The REMP was effective in monitoring the identified irrigated crop exposure pathways. This conclusion was because the REMP included irrigated vegetation sampling. The commercial grape vineyards use well water for the primary source of irrigation and the Clay/ Laguna Creeks for a supplemental source as needed.

REMP surface water surveillance activities monitor irrigation water radiological quality. Current ODCM calculations are conservative since dilution effects are not included when predicting potential dose delivered through downstream pathways.

No REMP changes were required to monitor the irrigated crop exposure pathway.

## E. REMP EVALUATION (continued)

Other Exposure Pathways

Existing aquatic life, surface water and sediment sampling and analysis practices are effective in monitoring potential observable effects associated with recreational activities occurring at the Clay Creek, Hadselville Creek, Laguna Creek, Folsom South Canal and Rancho Seco Lake. With respect to availability and quantity of food sources, the other identified consumption activities were considered inconsequential for pathway monitoring purposes.

No REMP changes were required to monitor other exposure pathways.

## F. ODCM EVALUATION

Based on 2000 Land Use Census findings, the following potential exposure pathways exist at the indicated locations:

**GASEOUS EFFLUENT**

| Exposure Pathway | Location | Comment |
|---|---|---|
| Inhalation | 1175 meters ENE | Resident location having the highest dispersion parameter |
| Ground Plane | 1175 meters ENE | Resident location having the highest deposition parameter |

**LIQUID EFFLUENT**

| Exposure Pathway | Location | Comment |
|---|---|---|
| Freshwater Fish | Clay Creek | Recreation beyond the Site Boundary |
| Swimming | Clay Creek | Recreation beyond the Site Boundary |
| Shoreline Deposits | Clay Creek | Recreation beyond the Site Boundary |
| Irrigated vegetation | Clay Creek | Potential for residences beyond the site boundary |
| Irrigated forage | Clay Creek | Cattle grazing beyond the Site Boundary |
| Drinking Water | Clay Creek | Cattle drinking water beyond the Site Boundary |

## F. ODCM EVALUATION (continued)

The GASEOUS EFFLUENT locations for inhalation and ground plane used by the ODCM are conservative since they are located at the Station Site Boundary.

Specifying the Laguna Creek location also provides additional conservatism since the beneficial effects of downstream dilution are not considered when specifying effluent release restrictions.

As required by the 2000 Land Use Census the above information for exposure pathways and locations was submitted for incorporation in the ODCM for use during 2001.

## APPENDIX B

## SAMPLE SITE DESCRIPTIONS AND MAPS

This appendix provides descriptive information about the sampling locations and maps of all the locations for the Radiological Environmental Monitoring Program sites.

Table B-1 provides information on sample type, identification codes, and map location references. The sample identification code is an alphanumeric string beginning with the prefix "R" (for Rancho Seco Nuclear Station) followed by two letters to identify the sample media:

| | | | |
|---|---|---|---|
| AS | Air | SL | Soil |
| RW | Runoff Water | FS | Fish |
| SW | Surface Water | LV | Garden Vegetable |
| DW | Drinking Water | AG | Algae |
| WW | Well Water | TL | Direct Gamma Radiation (Luxel) |
| MS | Mud and Silt | RN | Rainwater |

The numeric designations, which follow the letter designations, indicate the straight-line distance (in miles) from the center of the Reactor Building to the monitoring site.

The next letter designates the sector in which the monitoring location is located. The letters A through R are used for sector designators. The letters I and O are not used to prevent confusion with the numbers one and zero in the ID codes.

| Sector Letter | Degrees Azimuth | Compass Point |
|---|---|---|
| A | 348.75 to 11.25 | N |
| B | 11.25 to 33.75 | NNE |
| C | 33.75 to 56.25 | NE |
| D | 56.25 to 78.75 | ENE |
| E | 78.75 to 101.25 | E |
| F | 101.25 to 123.75 | ESE |
| G | 123.75 to 146.25 | SE |
| H | 146.25 to 168.75 | SSE |
| J | 168.75 to 191.25 | S |
| K | 191.25 to 213.75 | SSW |
| L | 213.75 to 236.25 | SW |
| M | 236.25 to 258.75 | WSW |
| N | 258.75 to 281.25 | W |
| P | 281.25 to 303.75 | WNW |
| Q | 303.75 to 326.25 | NW |
| R | 326.25 to 348.75 | NNW |

**SAMPLE SITE DESCRIPTIONS AND MAPS**
**(continued)**

The final letter designation indicates if the location is part of the operational REMP program ("O") or post-operational REMP program ("P").

**Table B-1** Lists each location referencing the sample type and the location ID code to the map site number on one of the four Radiological Environmental Monitoring Site Maps included in this Appendix.

**Figure B-1** **Site Location Map**: Shows the locations of the sample locations on and/or near the Site (including Storm Drain locations).

**Figure B-2** **1 Mile Radius map**: Sampling locations within one mile of the Reactor Building centerline are shown on this map.

**Figure B-3** **5 Mile Radius map**: Sampling locations between one and five miles from the Reactor Building centerline are shown on this map.

**Figure B-4** **25 Mile Radius map**: Sampling locations between five to 25 miles from the Reactor Building centerline are shown on this map.

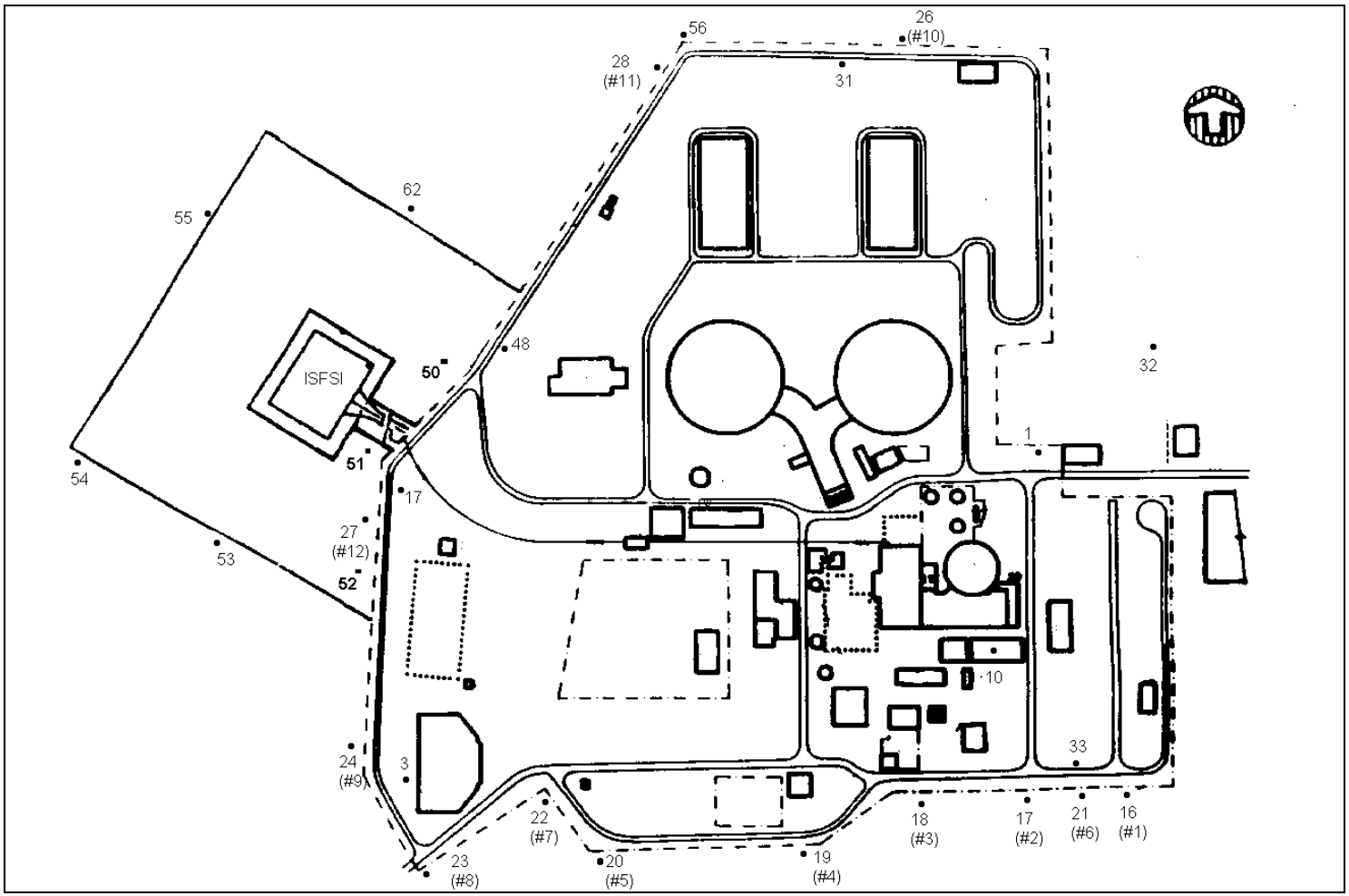


**Figure B-1** **Radiological Environmental Sampling Locations on and near the Site**
(Storm Drain location numbers are in parenthesis)

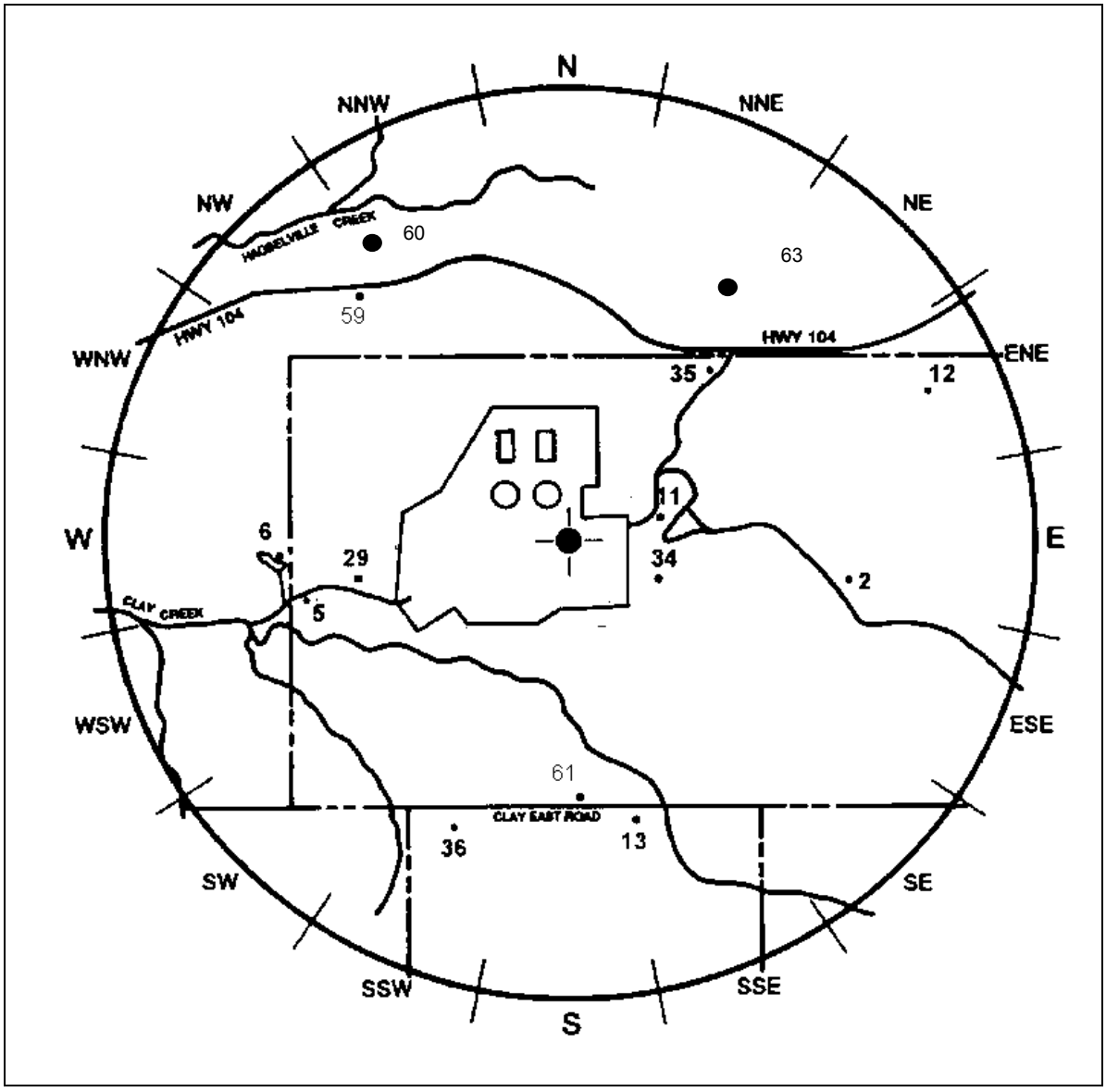


**Figure B-2 Radiological Environmental Sampling Locations within 1 mile from the Reactor Building**

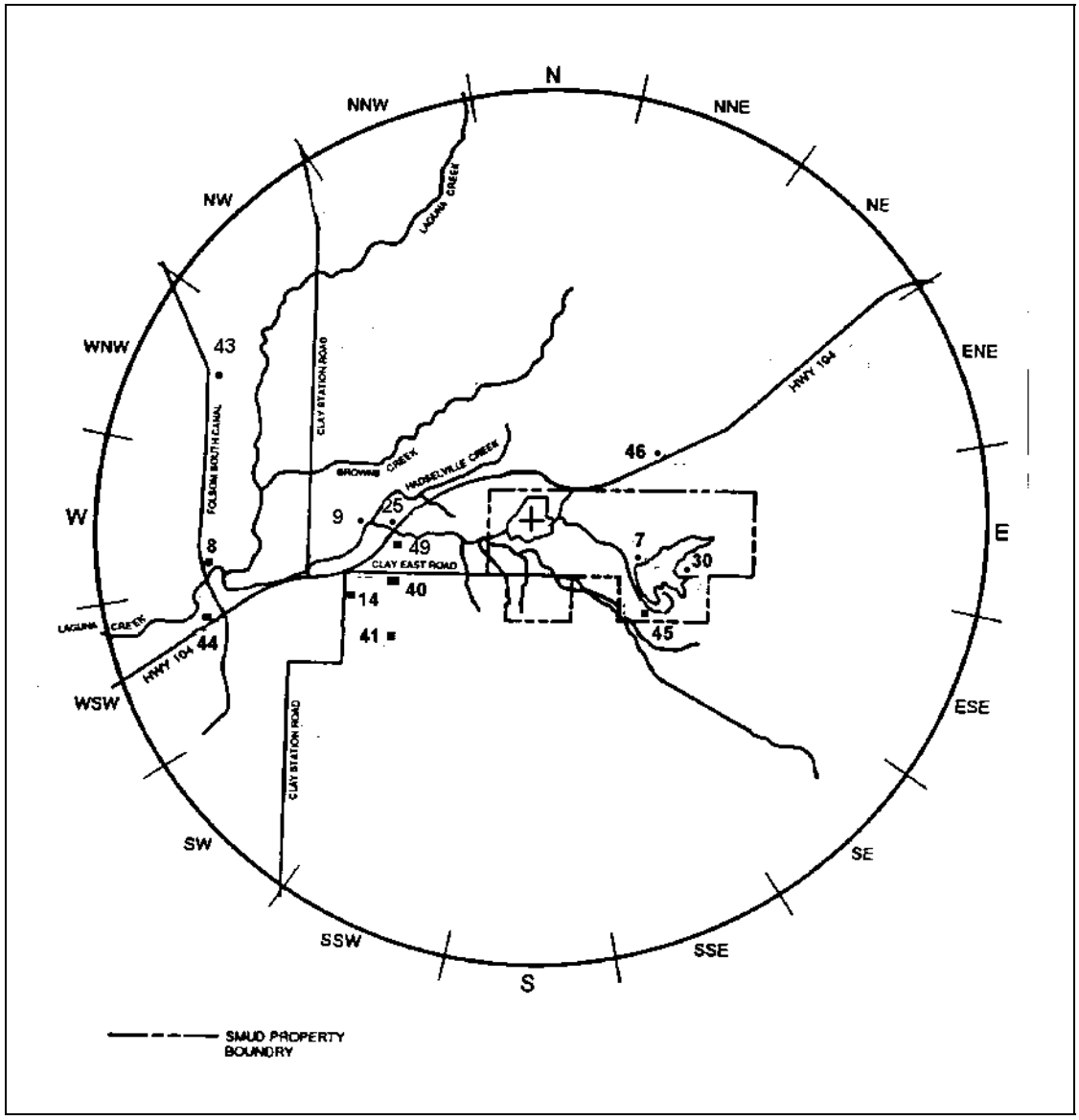


**Figure B-3 Radiological Environmental Sampling Locations from 1 to 5 miles from the Reactor Building**

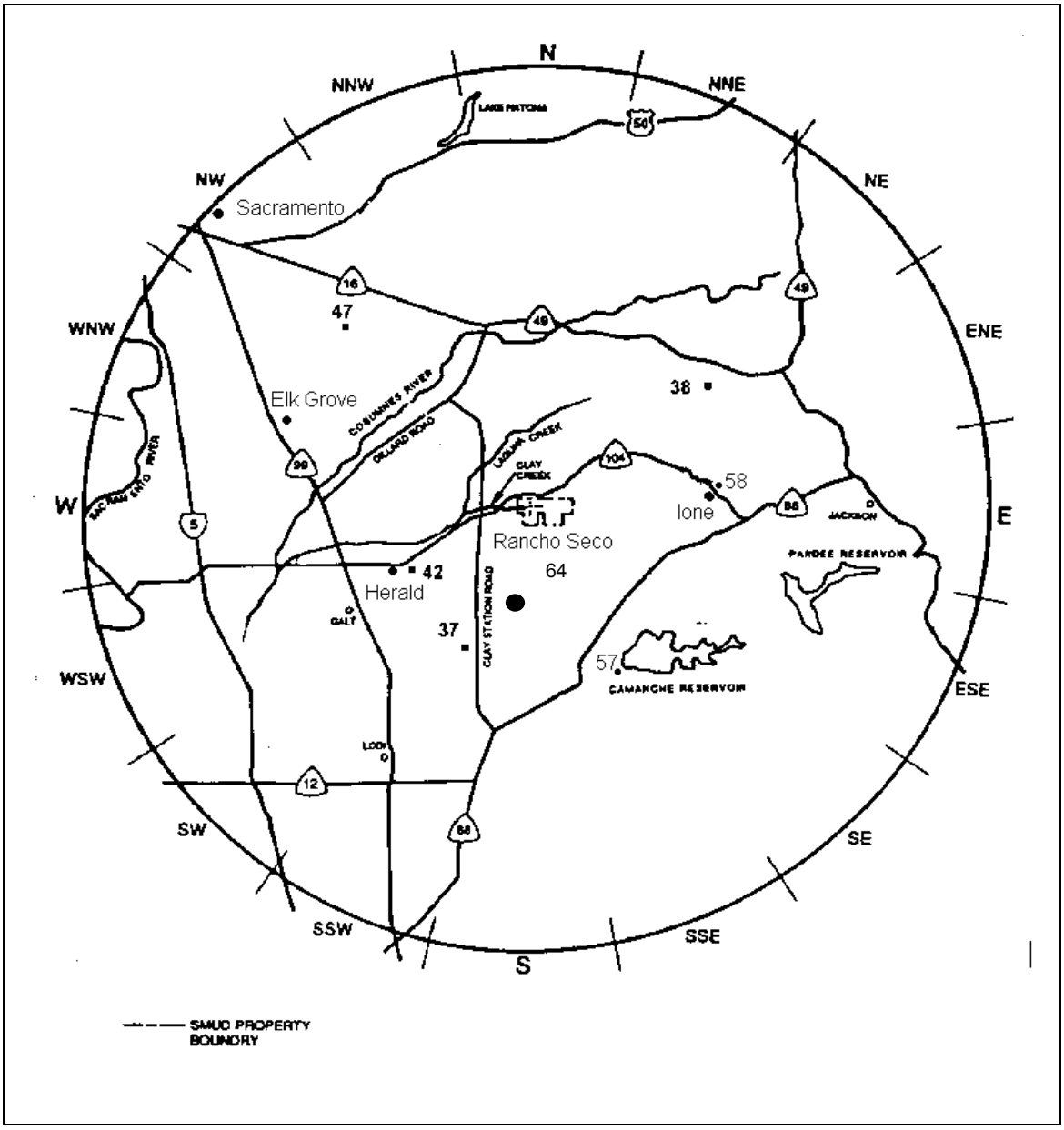


**Figure B-4 Radiological Environmental Sampling Locations 5 to 25 miles from the Reactor Building**

## Table B-1
## Radiological Environmental Monitoring Sites and Map Locations

| Sample Type | ID Code | Class | Map Location No. | Collection Frequency | Description. of Location | Miles | Sector |
|---|---|---|---|---|---|---|---|
| AIR | RAS0.1CO | IND. | 1 | Weekly | On Site-PAP BLDG. | 0.1 | C |
| AIR | RAS0.7EO | IND. | 2 | Weekly | Meteorological Tower | 0.7 | E |
| AIR | RAS0.3MO | IND. | 3 | Weekly | Effluent Discharge | 0.3 | M |
| AIR | RAS1.8FP | CON | 30 | Weekly | Rancho Seco Reservoir Well Enclosure | 1.8 | F |
| | | | | | | | |
| RUNOFF WATER | RRW0.6MO | IND. | 5 | Biweekly | Site Boundary | 0.6 | M |
| | | | | | | | |
| SURFACE WATER | RSW0.7NO | IND. | 6 | Monthly | Water Sump | 0.7 | N |
| SURFACE WATER | RSW1.3FO | CON | 7 | Monthly | Rancho Seco Reservoir | 1.3 | F |
| SURFACE WATER | RSW3.7NO | CON | 8 | Monthly Composite | ISCO Composite Sampler at Folsom South Canal | 3.7 | N |
| SURFACE WATER | RSW0.3MO | IND. | 3 | Monthly Composite | ISCO Composite Sampler at Effluent Discharge | 0.3 | M |
| SURFACE WATER | RSW1.8NO | IND. | 9 | Monthly | Confluence of Clay and Hadselville Creeks | 1.8 | N |
| | | | | | | | |
| DRINKING WATER | RDW0.1GO | IND. | 10 | Monthly | Rancho Seco Site | 0.1 | G |
| DRINKING WATER | RDW1.8FP | CON | 30 | Monthly | Rancho Seco Lake Well | 1.8 | F |
| | | | | | | | |
| WELL WATER | RWW0.3EO | IND. | 11 | Quarterly | Site Well | 0.3 | E |
| WELL WATER | RWW0.8DO | CON | 12 | Quarterly | Marciel Ranch | 0.8 | D |
| WELL WATER | RWW0.8LO | IND. | 13 | Quarterly | Clay Cattle Feedlot | 0.8 | L |
| WELL WATER | RWW3.7MO | IND. | 8 | Quarterly | Silva Feed Lot Well | 3.7 | M |
| WELL WATER | RWW2.1M0 | IND. | 14 | Quarterly | Clay Area Well (Tipling's) | 2.2 | M |
| WELL WATER | RWW1.5MP | IND. | 49 | Quarterly | Vineyard Well (west) | 1.5 | M |
| WELL WATER | RWW0.6RP | IND | 59 | Quarterly | Vineyard Well (south of Hwy 104) | 0.6 | R |
| WELL WATER | RWW0.7RP | IND | 60 | Quarterly | Vineyard Well North west of Site | 0.7 | R |
| WELL WATER | RWW0.9CP | IND | 63 | Quarterly | Vineyard Well Sample North East of Site | 0.9 | C |
| | | | | | | | |
| RAIN WATER | RRN0.8DO | IND. | 2 | Seasonal | Meteorological Tower | 0.8 | D |
| | | | | | | | |

## Table B-1
## (Continued)

### Radiological Environmental Monitoring Sites and Map Locations

| Sample Type | ID Code | Class | Map location No. | Collection Frequency | Description. of Location | Miles | Sector |
|---|---|---|---|---|---|---|---|
| MUD AND SILT | RMS0.3MO | IND. | 3 | Quarterly | Effluent Discharge | 0.3 | M |
| MUD AND SILT | RMS0.6MO | IND. | 5 | Quarterly | Site Boundary | 0.6 | M |
| MUD AND SILT | RMS0.7NO | IND. | 6 | Quarterly | Water Sump | 0.7 | N |
| MUD AND SILT | RMS1.8NO | IND. | 9 | Quarterly | Confluence of Clay and Hadselville Creeks | 1.8 | N |
| MUD AND SILT | RMS3.7NO | IND. | 8 | Quarterly | Laguna Creek at Folsom South Canal | 3.7 | N |
| | | | | | | | |
| FISH | RFS0.3MO | IND. | 3 | Semi-Annual | Effluent Discharge | 0.3 | M |
| FISH | RFS0.6MO | IND. | 5 | Semi-Annual | Site Boundary | 0.6 | M |
| FISH | RFS0.7NO | IND. | 6 | Semi-Annual | Water Sump | 0.7 | N |
| FISH | RFS1.5FO | CON | 7 | Semi-Annual | Rancho Seco Reservoir | 1.5 | F |
| FISH | RFS1.8NO | IND. | 9 | Semi-Annual | Confluence of Clay and Hadselville Creeks | 1.8 | N |
| | | | | | | | |
| ALGAE | RAG0.3MO | IND. | 3 | Semi-Annual | Effluent Discharge | 0.3 | M |
| ALGAE | RAG0.6MO | IND. | 5 | Semi-Annual | Site Boundary | 0.6 | M |
| ALGAE | RAG0.7NO | IND. | 6 | Semi-Annual | Water Sump | 0.7 | N |
| ALGAE | RAG1.8NO | IND. | 9 | Semi-Annual | Confluence of Clay and Hadselville Creek | 1.8 | N |
| ALGAE | RAG3.7NO | IND. | 8 | Semi-Annual | Hadselville Creek at Folsom South Canal | 3.7 | N |
| ALGAE | RAG1.3FO | IND | 7 | Semi-Annual | Reservoir north | 1.3 | F |
| ALGAE | RAG2.2NO | IND | 9 | Semi-Annual | Hadselville/ Clay Creeks | 2.2 | N |
| | | | | | | | |
| SOIL | RSL0.2HO1 | IND. | 16 | Semi-Annual | Storm Drain No. 1 | 0.2 | H |
| SOIL | RSL0.2HO2 | IND. | 17 | Semi-Annual | Storm Drain No. 2 | 0.2 | H |
| SOIL | RSL0.2JO | IND. | 18 | Semi-Annual | Storm Drain No. 3 | 0.2 | J |
| SOIL | RSL0.2KO | IND. | 19 | Semi-Annual | Storm Drain No. 4 | 0.2 | K |
| SOIL | RSL0.3LO | IND. | 20 | Semi-Annual | Storm Drain No. 5 | 0.3 | L |
| SOIL | RSL0.2HO | IND. | 21 | Semi-Annual | Storm Drain No. 6 | 0.2 | H |
| SOIL | RSL0.3MO7 | IND. | 22 | Semi-Annual | Storm Drain No. 7 | 0.3 | M |
| SOIL | RSL0.3MO8 | IND. | 23 | Semi-Annual | Storm Drain No. 8 | 0.3 | M |
| SOIL | RSL0.3MO9 | IND. | 24 | Semi-Annual | Storm Drain No. 9 | 0.3 | M |
| SOIL | RSL0.3A0 | IND. | 26 | Semi-Annual | Storm Drain No. 10 | 0.3 | B |
| SOIL | RSL0.3NO | IND. | 27 | Semi-Annual | Storm Drain No. 12 | 0.3 | N |
| SOIL | RSL0.3Q0 | IND. | 28 | Semi-Annual | Storm Drain No. 11 | 0.3 | Q |

**Table B-1**
**(Continued)**

**Radiological Environmental Monitoring Sites and Map Locations**

| Sample Type | ID Code | Class | Map Location No. | Collection Frequency | Description of Location | Miles | Sector |
|---|---|---|---|---|---|---|---|
| SOIL | RSL0.6MO | IND. | 5 | Semi-Annual | Site Boundary | 0.6 | M |
| SOIL | RSL0.7NO | IND. | 6 | Semi-Annual | Water Sump | 0.7 | N |
| SOIL | RSL1.5NO | IND. | 25 | Semi-Annual | Silva Property | 1.5 | N |
| SOIL | RSL1.8NO | IND. | 9 | Semi-Annual | Confluence of Clay and Hadselville Creek | 1.8 | N |
| SOIL | RSL0.4MP1 | IND. | 29 | Semi-Annual | Depression Area | 0.4 | M |
| SOIL | RSL0.4MP2 | IND. | 29 | Semi-Annual | Depression Area | 0.4 | M |
| SOIL | RSL0.4MP3 | IND. | 29 | Semi-Annual | Depression Area | 0.4 | M |
| SOIL | RSL0.3NP1 | IND. | 50 | Semi-Annual | ISFSI north drainage | 0.3 | N |
| SOIL | RSL0.3NP2 | IND. | 51 | Semi-Annual | ISFSI south drainage | | |
| SOIL | RSL0.3NP3 | IND. | 52 | Semi-Annual | ISFSI combined drainage | | |
| SOIL | RSL0.5MPAK | IND. | 5 | Semi-Annual | Site Boundary | 0.5 | M |
| SOIL | RSL0.5MPAL | IND. | 5 | Semi-Annual | Site Boundary | 0.5 | M |
| SOIL | RSL0.5MPAM | IND. | 5 | Semi-Annual | Site Boundary | 0.5 | M |
| SOIL | RSL0.5MPAN | IND. | 5 | Semi-Annual | Site Boundary | 0.5 | M |
| | | | | | | | |
| GARDEN VEGETABLES | RLV0.6MO | IND. | 5 | Semi-Annual | Site Boundary Garden irrigated with No-Name Creek water | 0.6 | M |
| GARDEN VEGETABLES | RLVXX.XX | CON | NA | Semi-Annual | Truck Garden which provides local produce from the local area | NA | NA |
| VINEYARD | RLV0.7NO | IND | 6 | Seasonal | Vineyard Sample West of Site | 0.6 | N |
| VINEYARD | RLV6.6KP | CON | 64 | Seasonal | Vineyard Sample Southwest of Site | 6.6 | K |
| | | | | | | | |

**Table B-1**
**(Continued)**

## Radiological Environmental Monitoring Sites and Map Locations

| Sample Type | ID Code | Class | Map Location No. | Collection Frequency | Description of Location | Miles | Sector |
|---|---|---|---|---|---|---|---|
| Luxel | RTL0.3RO | IND. | 31 | Quarterly | NNW @ Perimeter Fence N/O Spray Ponds; #1 | 0.3 | R |
| Luxel | RTL0.3C0 | IND. | 32 | Quarterly | NE Perimeter Fence/ parking lot NE corner; #2 | 0.3 | C |
| Luxel | RTL0.3NO | IND. | 17 | Quarterly | W Perimeter Fence road/ pole/ top of hill; #3 | 0.3 | N |
| Luxel | RTL0.3LO | IND. | 20 | Quarterly | SW Perimeter Fence road near RS lake filters; #4 | 0.3 | L |
| Luxel | RTL0.3HO | IND. | 33 | Quarterly | Perimeter Fence/ S/O of Admin. Bldg.; #5 | 0.3 | H |
| Luxel | RTL0.4F0 | IND. | 34 | Quarterly | Photovoltaic Facility/ North Fence (NRC); #6 | 0.4 | F |
| Luxel | RTL0.5CO | IND. | 35 | Quarterly | Rt. 104 entrance to Rancho Seco; #7 | 0.5 | C |
| Luxel | RTL0.6KO | IND. | 36 | Quarterly | Tokay Substation; #11 | 0.8 | K |
| Luxel | RTL10.0HP | CON | 57 | Quarterly | Fish Hatchery at Comanche Lake, #15 | 10.0 | H |
| Luxel | RTL2.7MO | IND. | 14 | Quarterly | In Clay at Tipling's Residence 11633 Clay Station Rd; #16 | 2.1 | M |
| Luxel | RTL8.2KO | IND. | 37 | Quarterly | Elliott Cemetery Near Angelo Dairy; #17 | 8.2 | K |
| Luxel | RTL7.8CO | IND. | 38 | Quarterly | Sam Jaber Residence/ 601 Carbondale Rd/ Ione; #18 | 7.8 | C |
| Luxel | RTL0.7GO | IND. | 30 | Quarterly | Well pump fence @ reservoir; #43 | 1.7 | G |
| Luxel | RTL1.5MO | IND. | 40 | Quarterly | Clay East & Kirkwood (NRC); #20 | 1.5 | M |
| Luxel | RTL3.9KO | IND. | 41 | Quarterly | SSW of Site on Borden Rd; #26 | 3.9 | K |
| Luxel | RTL7.4MO | IND. | 42 | Quarterly | Herald Fire Station #87/ 12746 Ivie Rd; #30 | 7.4 | M |
| Luxel | RTL3.7NO | IND. | 43 | Quarterly | Folsom South Canal near Hobday Rd; #31 | 3.7 | N |
| Luxel | RTL3.8MO | IND. | 44 | Quarterly | BLM entrance to Folsom South Canal Pumping Station; #33 | 3.8 | M |
| Luxel | RTL1.9NO | IND. | 9 | Quarterly | Hadselville Cr. & Clay Cr.; #35 | 1.9 | N |
| Luxel | RTL1.8F0 | IND. | 45 | Quarterly | Rancho Seco Lake Maintenance Building, #19 | 1.8 | F |
| Luxel | RTL1.4DO | IND. | 46 | Quarterly | 0.9 Miles E/O Site on Twin Cities Road/ Rt. 104; #46 | 1.4 | D |
| Luxel | RTL10.0EP | CON | 58 | Quarterly | Preston School entrance on pole, #51 | 10.0 | E |
| Luxel | RTL8.0PO | IND. | 47 | Quarterly | Dillard School; #55 | 8.0 | P |
| Luxel | RTL0.8DO | IND. | 12 | Quarterly | Marciel Ranch; 14626 Twin Cities Rd; #63 | 0.8 | D |
| Luxel | RTL0.6MO | IND. | 5 | Quarterly | Site Boundary Irrigated Garden; #65 | 0.6 | M |
| Luxel | RTL0.4NO | IND. | 29 | Quarterly | Depression @ Clay Creek; #66 | 0.4 | N |

**Table B-1**
**(Continued)**

## Radiological Environmental Monitoring Sites and Map Locations

| Sample Type | ID Code | Class | Map Location No. | Collection Frequency | Description of Location | Miles | Sector |
|---|---|---|---|---|---|---|---|
| Luxel | RTL0.4NO1 | IND. | 29 | Quarterly | Soil Pile @ Clay Creek; #67 | 0.4 | N |
| Luxel | RTL0.3PO | IND. | 48 | Quarterly | West Fence; #68 | 0.3 | P |
| Luxel | RTL0.3NP | IND. | 53 | Quarterly | West Garden, #88 | 0.3 | N |
| Luxel | RTL0.4NP | IND. | 54 | Quarterly | Southwest ISFSI, #89 | 0.4 | N |
| Luxel | RTL0.5PP | IND. | 55 | Quarterly | Northwest ISFSI, #90 | 0.5 | P |
| Luxel | RTL0.3QP | IND. | 56 | Quarterly | Northeast ISFSI, #91 | 0.3 | Q |
| Luxel | RTL0.7QP | IND. | 59 | Quarterly | Highway 104 at the rail spur on pole, #92 | 0.7 | Q |
| Luxel | RTL0.7JP | IND. | 61 | Quarterly | Clay East Road on pole south of site boundary, #93 | 0.7 | J |
| Luxel | RTL0.4PP | IND. | 62 | Quarterly | ISFSI ALARA fence north side, #94 | 0.4 | P |

# APPENDIX C

# QUALITY CONTROL SAMPLE ANALYSIS RESULTS

## QUALITY ASSURANCE AND CONTROL

Implementation of the Radiological Environmental Monitoring Program (REMP) consists of a number of discrete steps including:

- ⇒ Sample collection,
- ⇒ Packaging,
- ⇒ Shipment and receipt,
- ⇒ Measurements of radioactivity,
- ⇒ Data evaluation, and
- ⇒ Reporting.

These program elements are performed according to approved, written procedures to assure the validity of REMP results. This section discusses the internal quality control measurements made by the analysis laboratory, Eberline Services (formerly Thermo Nutech), and the results of their participation in the Interlaboratory Comparison Program implemented by the National Institute of Standards Testing (NIST). The Interlaboratory Comparison Program and the analysis laboratories Quality Assurance Programs provide information on the validity (accuracy and precision) of the REMP implementation steps listed above.

Because REMP measurement validity is important for evaluating protection of the health and safety of the public, RSNS has established an Environmental Quality Assurance Program (EQAP) for radiological environmental measurements. The Environmental QA Program implements the guidance provided in Regulatory Guide 4.15, (NRC79a).

## INTERLABORATORY COMPARISON PROGRAM

Eberline Services participates in the Interlaboratory Comparison Program (ICP). The ICP is a radiological analysis quality control program implemented by NIST and provided by vendor laboratories. Eberline Services participates in an ICP provided by the Department of Energy (DOE). Participation in an ICP is a requirement of the Permanently Defueled Technical Specification (section D6.8.3.b.3). It provides for an independent check of the proficiency of the laboratory. It also provides information on the precision and accuracy of measurements of radioactive material in REMP samples by Eberline Services. The extent of Eberline Services participation in this program includes all of the environmental radioactivity determinations that are related to the analyses required by the REMP manual.

**INTERLABORATORY COMPARISON PROGRAM**
**(continued)**

The Intercomparison Program consists of a variety of sample media spiked with known quantities of specific radioactive materials at levels normally found in environmental samples. These levels are generally quite low. Most samples require long counting times to determine if any activity is present, and the results may have large deviations from the mean. When the samples are distributed, there is an implied precision requirement given in terms of the analysis requested to be performed. After the labs provide the results of their analyses, the laboratories provide a statistical summary of all the results by the participating laboratory. This report includes the acceptance control limits, the mean of all laboratories and the standard deviation of the results by all labs, among other statistics.

If the results of a determination by Eberline Services in the ICP is outside the specified control limits or do not pass the outliers test, Eberline Services must investigate and, if a problem is identified, take corrective action to prevent problem recurrence.

During 2000, Eberline Services analyzed 12 ICP samples related to the current REMP program. All sample results reported by Eberline Services were within the control limits.

The Eberline Services measurement results are presented in Table C-1 along with the acceptable values for each test.

**INTRALABORATORY QUALITY ASSURANCE PROGRAM**

Eberline Services by contract also operate an Intralaboratory Comparison Program (Quality Assurance Program) to maintain an acceptable quality level on a routine basis.

As part of their Quality Assurance Program, the laboratory performs background counts, an analysis of spiked samples, and duplicate sample counts for every ten Rancho Seco REMP samples analyzed. These quality control procedures are performed for all analyses except gamma spectrometry, for which weekly energy and efficiency checks are performed. Personnel not directly involved with the analysis prepare the spiked and duplicate samples. Spiked samples, as well as the radioactive sources used for the gamma spectrometer checks, are traceable to the National Institute for Standards and Technology (NIST).

## RANCHO SECO AUDIT AND SURVEILLANCE RESULTS

The Rancho Seco Quality Program requires periodic audits of REMP activities, including Eberline Services. Contract laboratory performance is evaluated by the Rancho Seco QA Department.

## CONCLUSIONS

The Intralaboratory and Interlaboratory results provided Eberline Services indicate that Eberline Services performance was acceptable.

## DIRECT RADIATION (Luxel) COMPARISON PROGRAM

The monitoring badge vendor Landauer (Luxel) participated in a blind spike comparison-testing program. Landauer participated in a biennial program provided by the Idaho National Environmental Laboratory (INEL). A review of Landauer's results of the participation in this testing program indicates that Landauer has satisfactorily completed all of the required tests for the types of environmental radiation monitored at RSNS.

This comparison program satisfies the requirement of the REMP manual section 6.0.

**TABLE C-1**

**2000 INTERLABORATORY COMPARISON PROGRAM**
Statistical Report Summary Data for Responding Lab

| Sample Type | Sample Date | Assay Type | DOE Result | Eberline Services Result | Control Limits Reported/ Range |
|---|---|---|---|---|---|
| Air Filter | 6/00 | Co-60 | 5.320±0.260 | 5.084 ± 0.206 | 0.75-1.32 |
| Air Filter | 6/00 | Cs-137 | 6.100 ± 0.300 | 5.878 ± 0.211 | 0.73-1.37 |
| Air Filter | 6/00 | Gross Beta | 2.420 ±0.200 | 2.285 ±0.114 | 0.72-1.67 |
| Air Filter | 6/00 | Mn-54 | 27.200±0.800 | 25.910±0.340 | None reported |
| Soil | 6/00 | Cs-137 | 339.000 ±9.300 | 298.400 ±3.700 | 0.83-1.32 |
| Vegetation | 6/00 | Co-60 | 52.800 ±1.000 | 49.500 ±.3.200 | 0.69-1.46 |
| Vegetation | 6/00 | Cs-137 | 1380.000 ±20.000 | 1225.000 ±8.000 | 0.80-1.40 |
| Water | 6/00 | Co-60 | 48.900 ±1.800 | 53.180 ±1.150 | 0.80-1.20 |
| Water | 6/00 | Cs-137 | 103.000 ±4.000 | 112.800 ±1.400 | 0.80-1.26 |
| Water | 6/00 | Gross Beta | 690.000 ±70.000 | 727.000 ±20.000 | 0.55-1.54 |
| Water | 6/00 | Tritium | 79.400 ±2.500 | 83.479 ±8.559 | 0.71-1.79 |

**TABLE C-1**
**(cont.)**
**2000 INTERLABORATORY COMPARISON PROGRAM**
Statistical Report Summary Data for Responding Lab
(Thermo NUtech.)

| Sample Type | Sample Date | Assay Type | DOE Result | Eberline Services Result | Control Limits Reported/ Range |
|---|---|---|---|---|---|
| Mixed Analyte | 11/00 | Cs-134 | 1047 | 1096 | 732.90-1361.10 |
| | 11/00 | Cs-137 | 930 | 897.5 | 651.00-1209.00 |
| | 11/00 | Co-60 | 1180 | 1180 | 826.00-1534.00 |
| | 11/00 | Mn-54 | 1023 | 1044 | 716.10-1329.90 |
| | | | | | |
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## APPENDIX D

## SAMPLE COLLECTION AND ANALYSIS METHODS

For each of the sample media collected, the method of collection is documented in Rancho Seco Nuclear Station procedures. Detailed analysis methods are documented in procedures controlled by the contract laboratory, Thermo NUtech. A brief description of these collection and analysis methods is included in this Appendix.

| Sample Media | Collection/Analysis Method |
|---|---|
| **AIR** | An air sampler continuously moves air through a filter paper designed to capture particulates by filter paper impaction. The air samplers are equipped with a flow device and elapsed time meter, which, together are used to calculate the volume of air that has passed through the filter paper.<br><br>The filter paper is exchanged weekly. At least one day is allowed to elapse between sample collection and counting to reduce the interference of naturally occurring radon and thorium daughters on the sample analysis. The filter paper is assayed for gross beta radioactivity by placing the filter on a stainless steel planchet and counted with an internal gas flow proportional counter.<br><br>The individual particulate filter papers are saved over a calendar quarter and the composite collection is assayed for gamma isotopic radioactivity by gamma spectroscopy. |
| **DIRECT RADIATION** | Monitoring badges (Luxels), are located within a ten (10) mile radius of the site. The badges within a five (5) mile radius are considered indicator badges. Two (2) badges are placed at each monitoring location to assure adequate data recovery and to improve measurement statistics. The badge field exposure cycle is approximately ninety (90) days. At the end of the field exposure cycle, the badges are exchanged and returned to the contract laboratory for processing. |

| Sample Media | Collection/Analysis Method |
|---|---|
| | **SOIL &** |
| **SEDIMENT** | Samples of sediment and soil are collected from the top three inches (approx 15 cm) of the sampled material. Sediment samples are obtained approximately two feet from the shoreline. Each sample is assayed directly for gamma isotopic radioactivity by gamma spectroscopy. |
| | **GARDEN** |
| **PRODUCE** | Samples of vegetables are collected semi-annually from a garden, which is maintained at the Station Site Boundary. Control location samples are collected from a local commercial vendor. The vegetables are assayed directly for gamma isotopic radioactivity by gamma spectroscopy. During 2000 samples were also collected from the vineyards near the site and at a vineyard control location (seasonal). |
| **FISH** | Fish are collected semi-annually from the Clay Creek system. The dissected (edible) portion of each sample is assayed directly for gamma isotopic radioactivity by gamma spectroscopy. |
| **ALGAE** | Samples of algae in the Clay Creek system are collected semi-annually and assayed directly for gamma isotopic radioactivity by gamma spectroscopy. |
| **WATER** | 1 liter grab samples of water from locations in the liquid effluent pathway and groundwater are collected as follows:<br>• Surface water and Drinking water are collected monthly<br>• Runoff water is collected biweekly<br>• Well water is collected quarterly.<br><br>At two locations, samples are obtained to provide a monthly composite sample. All samples are assayed for tritium by liquid scintillation counting and for gamma isotopic radioactivity by gamma spectroscopy. Drinking and Well water samples are analyzed for Gross Beta activity. |
| **RAIN WATER** | Samples of rainwater are collected on a seasonal basis. All samples are assayed for tritium by liquid scintillation and for gamma isotopic radioactivity by gamma spectroscopy. |

## APPENDIX E

## ENVIRONMENTAL MONITORING PROGRAM DESIGN

### PROGRAM BASIS

The Sacramento Municipal Utility District conducts a continuous Radiological Environmental Monitoring Program (REMP) at the Rancho Seco Nuclear Station to assess the impact of Station operation on the surrounding environment. The current Post-Operation REMP is a continuation of a similar program initiated prior to and during operation of the Station. Samples of the surrounding environment are collected on a routine basis and analyzed to determine the amount of radiation and radioactive materials present in the exposure pathways.

During 2000 the program was directed and executed by the Radiation Protection/ Chemistry Superintendent. The Technical Staff and the Chem./Rad Decommissioning Technicians perform sample collection. The Radiological Health Supervisor performs data review and Program maintenance. The Program is operated with primary accountability and cognizance of the Manager, Plant Closure and Decommissioning.

The Program is designed consistent with Title 10, Code of Federal Regulations, Part 50, Appendix I - Section IV, B.2, B.3 and C, and Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 64. The program also complies with Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation," Section 1302. These federal requirements are cited in the Rancho Seco Permanently Defueled Technical Specifications and the REMP manual. REMP requirements are implemented through the review, approval and routine use of several documents, namely the REMP Manual, Offsite Dose Calculation Manual, Surveillance Procedures and Health Physics Implementing Procedures.

The programmatic elements of the REMP are based on regulatory requirements and associated guidelines. The objectives of the Program are to:

1. Provide the technological basis and the instruction for monitoring the environs for radioactivity sources. The radioactive sources, which contribute to detectable radioactivity in the local environs, are comprised of:

   ⇒ Naturally occurring background,
   ⇒ Releases during normal operations,
   ⇒ World-wide weapons testing, and
   ⇒ Major global nuclear accidents

**PROGRAM BASIS**
(Continued)

2. Provide the means to verify the effectiveness of the Rancho Seco Nuclear Station Radiological Effluents Control Program.
3. Meet the minimum detectable limits for radioisotopes in environmental samples.
4. Provide quantitative measurements in the gaseous, liquid and direct radiation exposure pathways for radionuclides.
5. Provide indications of the largest potential radiation exposure for individuals as a result of radionuclides in the principal exposure pathways.

The Program is developed and conducted using recognized standards and practices NRC79a, NRC79b, NUREG79, and NUREG80a.

**REMP CHANGES**

The Permanently Defueled Technical Specifications administrative requirements for the REMP program were not revised during 2000. The REMP manual was revised during 2000:

1. Include in Section 1, ISFSI Technical Specification bases for dose limits, administrative controls, and pathway analysis.
2. Editorial change to revise reference to "thermoluminesence dosimeter" to "monitoring device". This was overlooked in the last revision as a generic change.
3. Added ISFSI Technical Specification to Section 9 as a reference.
4. Increased number of monitoring badges from 24 to 25, in Table 1, Item 2, Direct Radiation, to reflect addition of ISFSI monitoring badges added in an earlier revision.

**EXPOSURE PATHWAYS**

The fundamental parameters, which have been defined prior to monitoring the environs, are:

1. Identification of the effluent release pathways
2. Identification of the human exposure pathways
3. Identification of the land use parameters by the population within a two-mile radius of the plant site.

Each of these three parameters is discussed below.

## EXPOSURE PATHWAYS

### Effluent Release Pathways

There are three principal pathways, which may result in human exposure to radiation and radioactive material originating from Station operation:

1. Gaseous effluents

2. Liquid effluents and

3. Direct radiation from these effluents and onsite sources.

Gaseous Effluents

Gaseous ventilation and process effluents are released, through particulate filtration units to the environment from the Reactor Building and Auxiliary Building stacks.

In the gaseous pathway, airborne radioactive materials can be inhaled or ingested by humans. Animals can inhale or ingest radioactive material present in the atmosphere, which are retained in animal food products (meat or milk). Radioactive materials, which are carried by air currents, can also be deposited on vegetation or water sources, which are in turn directly consumed by humans or animals.

Liquid Effluents

In the liquid exposure pathway, humans can ingest radioactive materials in surface waters directly or indirectly through the consumption of aquatic foods such as fish and shellfish. Humans can consume vegetation, which is irrigated with Clay Creek water, which may contain radioactive material. Another exposure pathway from liquid effluents results from the consumption of animal products such as meat and milk from animals, which have fed upon irrigated vegetation and/ or consumed Clay Creek water.

Direct Radiation

In the direct radiation pathway, potential radiation exposure may occur from radioactive material storage vessels, which are contained within the site boundary such as the Borated Water Storage Tank. People can potentially be exposed to direct radiation from gaseous effluents or from ground deposition of particulates deposited on the ground from gaseous or liquid effluents. When the fuel off-load is completed, the ISFSI will become part of the direct radiation pathway.

## LAND USE CENSUS

On a biennial basis, a land use census is conducted within a two-mile radius to identify any changes in the human exposure pathways. The Land Use Census is used to determine the changes needed for REMP monitoring activities. The results of the land use census conducted during 2000 are presented in Appendix A of this Report. The next scheduled land use census will be conducted in 2002 and reported in the 2002 AREOR. From data obtained from the Land Use Census, exposure pathways are analyzed through a systematic process, which identifies a sample medium, or organism that is found to potentially contribute to an individual's radiation exposure. Usage and bioaccumulation factors (NRC77) are then specified which represent the magnitude of radioactive material transfer through the food chain to a receptor. The analysis of the effluent and exposure pathways enables monitoring sites to be identified as "indicator" (for sites at which the potential effects of Station effluents would be readily detected) or "control" (for those sites which are not expected to be influenced by Station operation). The analysis results of samples obtained at indicator and control sites are routinely compared to identify potential exposures above background levels.

## MONITORING LOCATION SELECTION

The REMP maintains the monitoring sites required by the REMP manual, Table 6. This program is supplemented with additional samples to compensate for changes in the radiological environment surrounding Rancho Seco. The United States Nuclear Regulatory Commission and the California Department of Health Services also selected some of the monitoring sites as part of their monitoring programs. Indicator sites are placed in areas, which would be most sensitive to the effects of Station effluents such as downwind, or downstream areas near the Station. If radioactive material is detected above background at any of these indicator sites, observed potential exposure and dose to humans can be estimated to verify the effectiveness of the Offsite Dose Calculation Manual in predicting potential exposures or doses. It is important to note that the detection of radioactive material in indicator samples does not necessarily mean that its presence can be attributed to Rancho Seco operations. Moreover, especially with liquid effluent pathway samples, the detection of radioactive material is difficult to interpret since it is unknown when the material was deposited. In many instances, the observed radioactive material could correctly be ascribed to historical (pre-2000) depositions.

Control locations provide data that should not be influenced by the operation of Rancho Seco. These locations are selected based upon distance from the Station in the upwind or upstream direction of the effluent release pathways. Samples obtained from control locations should, upon analysis, reveal information about the presence and distribution of naturally occurring and man-made radioactive materials. Data from these locations are used to aid in the discrimination between the effects of Rancho Seco releases and other natural phenomena or accidental releases, which may result in human exposure.

**MONITORING LOCATION SELECTION**
(continued)

Gaseous effluent indicator monitoring sites are generally placed in areas, which receive prevailing winds crossing the Rancho Seco site. Liquid radioactive effluents are discharged in batches from two onsite Retention Basins into "No Name" Creek located southwest of the Station. Dilution water, obtained from the Folsom South Canal, is discharged into "No Name" Creek to give reasonable assurance of compliance with the 10CFR50, Appendix I dose guidelines. "No Name" Creek flows southerly into the Clay Creek. Without this dilution water flow, the Clay Creek would be in a dry state for most of the year.

Beyond the Site Boundary at a point north of Highway 104, the Clay Creek empties into the Hadselville Creek. Hadselville Creek then empties into the Laguna Creek at a point west of North Clay Station Road near the Folsom South Canal. Finally, Laguna Creek flows into the Cosumnes River at a point located approximately 20 straight-line miles west of Rancho Seco. Since this stream system is the only routine release pathway for liquid radioactive and non-radioactive effluents from the Station, the liquid exposure pathway indicator sites are located along these creeks and nearby land.

The direct radiation pathway is monitored principally through a network of monitoring badges at sites distributed in sectors centered on the Station. The badges are located primarily at the site, residential, and recreational areas around the Rancho Seco location. This design provides the capability to easily detect Station-induced direct radiation contributions to the observed terrestrial and cosmic direct radiation background.

Some badges have been sited in special locations to record direct radiation resulting from known depositions of radioactive material and to provide pre-operational data for the Interim Spent Fuel Storage Installation (ISFSI).

Appendix B contains a detailed description and illustration of the REMP sample and monitoring locations.

**SAMPLE MEDIA**

Samples are collected from predetermined monitoring sites at a specified frequency. The sample media chosen is a function of the type of monitoring desired and coincides with one of the following exposure pathways:

- o Atmospheric
- o Direct radiation
- o Terrestrial
- o Aquatic life
- o Water

**Atmospheric monitoring** is accomplished by filtering a volume of air using a mechanical air pump to collect particulates with a particulate filter paper. Four air sampler locations are used to collect weekly air samples. Two locations (Meteorological Tower and Rancho Seco Reservoir) are control locations and the remaining two locations are indicator locations on the plant site.

**Direct radiation monitoring** is achieved by placing monitoring badges at aboveground sites. The monitoring badges respond to, and record the amount of, gamma radiation exposure. The source of this gamma radiation exposure is varied and includes potential Station effluents, naturally occurring terrestrial, and cosmogonic radionuclides. The monitoring badges are also influenced by seasonal and global (fallout) radiation sources.

There are 35 sites, which are monitored within a 10-mile radius of the Station. The monitoring badges are placed at the Station Industrial Area Boundary, near the property boundary, locations of interest such as nearby residences, and at control locations located beyond five miles of the Station.

**Terrestrial monitoring** is accomplished by obtaining samples of sediment, soil, and garden vegetation to measure the quantity of radioactive material deposited from gaseous and liquid effluents. There are five mud and silt, 27 soil, and 4 garden vegetation locations. Two vineyard sample locations were administrated added during 1999.

**Aquatic monitoring** includes the sampling of fish and algae. Algae is an excellent concentrator of radioactivity contained in water and is sampled to provide an early indication of increased liquid radioactive material concentration. There are four fish and five algae sample locations.

**SAMPLE MEDIA**
(continued)

**Water monitoring** includes samples of surface, runoff, drinking, and well sources from locations in the liquid effluent pathway and from area wells. The six surface water sampling locations monitor site supply water (Folsom South Canal), runoff water and water discharged from the Station. Drinking water is sampled from six groundwater wells and two drinking water taps. Two new well locations were administrated added in 2000 to monitor the vineyard wells. These locations were added to reflect the change in agricultural use of the surrounding area. Rainwater is also collected at one location on a seasonal basis.

**SAMPLE ANALYSIS & DATA HANDLING**

The laboratory, which provides radio-analytical services for the Program, is Eberline Services located in Richmond, California. Sample analysis results submitted by Eberline Services are reviewed for accuracy and completeness and then entered into a computerized database for evaluation and trending.

Data comparisons are made between individual control and indicator sample sites to isolate potential Station influences on the measurement results.

The summarized results of the 2000 Radiological Environmental Monitoring Program are presented in Table 2.

Individual (raw data) results are presented in Appendix F, Tables F-1 through F-11.

**REGULATORY REPORTING LEVELS**

Sample analysis data is reviewed and evaluated by the Radiological Health Supervisor as the results are received. All sample analysis results are reviewed for correct sensitivity and anomalies.

The activity concentration values listed in Table E-1 are the environmental Fuel Cycle Dose quantities that, if exceeded, require a Special Report to be submitted to the USNRC. In accordance with the REMP Manual (Section 5, Fuel Cycle Dose), the Special Report must include an evaluation of any release conditions, environmental factors or other aspects, which caused the reporting limits to be exceeded.

**REGULATORY REPORTING LEVELS**
(continued)

In addition to the Fuel Cycle Dose reporting requirements, a Special Report is required to be submitted to the USNRC when more than one of the radionuclides in Table E-1 are detected in the sampling medium and the summed ratio of detected activity concentration to the respective Reporting Level concentration is greater than, or equal to, unity (1). When radionuclides other than those listed in Table E-1 are detected which are a result of Station effluents, a Special Report is required to be submitted if the potential annual dose commitment exceeds the 10 CFR 50, Appendix I guidelines.

No reports of the types described above were required to be submitted during 2000.

**SENSITIVITY OF THE REMP MEASUREMENT PROCESS**

All Program measurements must be performed at a sensitivity, which meets USNRC requirements. This sensitivity is determined "before the fact" (*a priori*) for each radionuclide of interest and sample analysis type. Typical controllable sensitivity parameters include:

⇒ Sample volume or mass

⇒ Sampling efficiency

⇒ Time from sample collection to measurement

⇒ Instrument detection efficiency for the nuclides (energies) of interest

⇒ Background radiation levels

⇒ Chemical recovery factors

By adjusting and controlling each of these parameters to maximize measurement process efficiency, a maximum sensitivity level (activity concentration) can be specified for each nuclide of interest and analysis type while maintaining an economic measurement process. The maximum sensitivities in the REMP are specified by the USNRC in the REMP Manual approved for Rancho Seco. These sensitivities are referred to as "LLD's", an acronym for "Lower Limit of Detection". LLD's are specified on an "*a priori*" basis and apply to routine measurement process capabilities when no other interfering radioactivity is present. The word "routine" is emphasized since occasional circumstances, such as limited sample mass, elevated levels of background radiation and interfering nuclides can contribute to sensitivity degradation.

Such occurrences are normally noted and reported during the conduct of REMP activities.

**SENSITIVITY OF THE REMP MEASUREMENT PROCESS**
(continued)

Meeting the LLD requirements is a quality control function shared by both REMP and the analytical laboratory personnel. Once the laboratory establishes values for the controllable parameters for each analysis type, sample chain of custody controls ensure that these parameters are upheld. If all parameters are upheld, then compliance with the LLD requirements has been demonstrated. The specific LLD values for Program measurements are included in Table E-2.

Since most of the samples analyzed result in the detection decision "activity not identified", a Minimum Detectable Activity (MDA) concentration value is calculated and reported. This value can be thought of as the LLD-at-the-time-of-counting since it is calculated using an equation, which is similar to the one, used to establish LLD parameters. The biggest difference is that actual (not "*a priori*") parameters are used, including interference from natural radioactive material in the sample. It is important to note that MDA's are reported only for those measurements where the "activity not identified" decision has already been made.

MDA values are used primarily to identify changes in the measurement process and to convey more information about the measurement itself. Without the use of the MDA concept, most Program measurements would be reported simply as "<LLD". With MDA used, Program measurements are reported as "< xxx " where "xxx" is the calculated MDA concentration.

**TABLE E-1**

**REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES**

| Analysis | Water (pCi/L) | Airborne Particulate or Gases (pCi/m³) | Fish (pCi/kg, wet) | Food Products (pCi/kg, wet) |
|---|---|---|---|---|
| H-3 | 20000[a] | | | |
| Mn-54 | 1000 | | 30000 | |
| Co-60 | 300 | | 10000 | |
| Zn-65 | 300 | | 20000 | |
| Cs-134 | 30 | 10 | 1000 | 1000 |
| Cs-137 | 50 | 20 | 2000 | 2000 |
| Gross Beta | 40 [b] | 2 [c] | | |

Notes:

[a] For drinking water samples, this is a 40 CFR Part 141 value

[b] Gross Beta activity in water of ten times the yearly mean of the control samples is indicated as the level that gamma isotopic analysis should be performed on the individual sample (NRC79a). Gamma isotopic analysis on each water sample is required by the REMP and therefore this requirement does not apply.

[c] Gross Beta activity is air of ten times the yearly mean of the control samples is indicated as the level that gamma isotopic analysis should be performed on the individual sample. The value indicated is Site specific.

**TABLE E-2**

**MAXIMUM (REQUIRED) LLD VALUES FOR ENVIRONMENTAL SAMPLES[ac] (NRC79A)**

| Analysis (d) | Water (pCi/L) | Airborne Particulate or Gases (pCi/m³) | Fish (pCi/kg, wet) | Food Products (pCi/kg, dry) | Sediment (pCi/kg, dry) |
|---|---|---|---|---|---|
| Gross Beta | 4[b] | 0.01 | | | |
| H-3 | 2000 (1000, [b]) | | | | |
| Mn-54 | 15 | | 130 | | |
| Co-60 | 15 | | 130 | | 150[e] |
| Zn-65 | 30 | | 260 | | |
| Cs-134 | 15 (10[b]) | 0.01[d] | 130 | 60 | 150 |
| Cs-137 | 18 (10[b]) | 0.01[d] | 130 | 60 | 150 |

Notes:

(a) Analysis requirements are those recommended in the BTP [NRC79A] and RETS [NUREG79].

(b) LLD for water samples utilized for human consumption only [NUREG79].

(c) Other peaks, which are measurable and identifiable, together with the nuclides in Table E-2, shall be identified and reported.

(d) Composite analysis LLD is shown; individual sample LLD is 0.05 pCi/m³ (Site-specific value).

(e) LLD for Mud and Silt Co-60 is not required by RETS [NUREG79]. This value is consistent with the RETS required value for Cs-134 and Cs-137.

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**APPENDIX F**

**2000 SAMPLE ANALYSIS RAW DATA TABLES**

**TABLE F-1**
**2000 WEEKLY AIR SAMPLE SUMMARY**

Gross Beta Activity in Air Particulates
($pCi/m^3$)

| Collected Date | RAS01CO | 2 sigma | RAS03MO | 2 sigma | RAS07EO | 2 sigma | RAS18FP | 2 sigma |
|---|---|---|---|---|---|---|---|---|
| 1/3/2000 | 0.065 | 0.002 | 0.069 | 0.003 | 0.059 | 0.002 | 0.063 | 0.002 |
| 1/11/2000 | 0.044 | 0.002 | 0.042 | 0.002 | 0.042 | 0.002 | 0.043 | 0.002 |
| 1/18/2000 | 0.023 | 0.001 | 0.025 | 0.001 | 0.023 | 0.002 | 0.024 | 0.002 |
| 1/25/2000 | 0.012 | 0.001 | 0.011 | 0.001 | 0.012 | 0.001 | 0.012 | 0.001 |
| 2/1/2000 | 0.019 | 0.001 | 0.019 | 0.001 | 0.033 | 0.002 | 0.018 | 0.001 |
| 2/8/2000 | 0.019 | 0.001 | 0.018 | 0.001 | 0.019 | 0.001 | 0.019 | 0.001 |
| 2/15/2000 | 0.014 | 0.001 | 0.013 | 0.001 | 0.014 | 0.001 | 0.014 | 0.001 |
| 2/22/2000 | 0.012 | 0.001 | 0.013 | 0.001 | 0.012 | 0.001 | 0.011 | 0.001 |
| 2/29/2000 | 0.010 | 0.001 | 0.010 | 0.001 | 0.010 | 0.001 | 0.010 | 0.001 |
| 3/6/2000 | 0.014 | 0.001 | 0.013 | 0.001 | 0.013 | 0.001 | 0.013 | 0.001 |
| 3/14/2000 | 0.013 | 0.001 | 0.012 | 0.001 | 0.013 | 0.001 | 0.011 | 0.001 |
| 3/21/2000 | 0.014 | 0.001 | 0.013 | 0.001 | 0.012 | 0.001 | 0.013 | 0.001 |
| 3/28/2000 | 0.016 | 0.001 | 0.015 | 0.001 | 0.015 | 0.001 | 0.015 | 0.001 |
| 4/4/2000 | 0.021 | 0.001 | 0.022 | 0.001 | 0.022 | 0.001 | 0.021 | 0.001 |
| 4/11/2000 | 0.017 | 0.001 | 0.018 | 0.001 | 0.018 | 0.001 | 0.017 | 0.001 |
| 4/18/2000 | 0.014 | 0.001 | 0.013 | 0.001 | 0.011 | 0.001 | 0.012 | 0.001 |
| 4/25/2000 | 0.014 | 0.001 | 0.013 | 0.001 | 0.012 | 0.001 | 0.012 | 0.001 |
| 5/2/2000 | 0.017 | 0.001 | 0.014 | 0.001 | 0.014 | 0.001 | 0.013 | 0.001 |
| 5/8/2000 | 0.013 | 0.001 | 0.011 | 0.001 | 0.011 | 0.001 | 0.011 | 0.001 |
| 5/16/2000 | 0.011 | 0.001 | 0.009 | 0.001 | 0.009 | 0.001 | 0.010 | 0.001 |
| 5/23/2000 | 0.025 | 0.002 | 0.028 | 0.002 | 0.027 | 0.003 | 0.026 | 0.002 |
| 5/30/2000 | 0.015 | 0.001 | 0.012 | 0.001 | 0.012 | 0.001 | 0.013 | 0.001 |
| 6/6/2000 | 0.022 | 0.001 | 0.019 | 0.001 | 0.018 | 0.001 | 0.018 | 0.001 |
| 6/12/2000 | 0.012 | 0.001 | 0.010 | 0.001 | 0.010 | 0.001 | 0.010 | 0.001 |
| 6/20/2000 | 0.017 | 0.001 | 0.015 | 0.001 | 0.015 | 0.001 | 0.015 | 0.001 |
| 6/26/2000 | 0.019 | 0.002 | 0.017 | 0.001 | 0.016 | 0.001 | 0.016 | 0.001 |

**TABLE F-1**
**2000 WEEKLY AIR SAMPLE SUMMARY**
**(continued)**

Gross Beta Activity in Air Particulates
($pCi/m^3$)

| Collected Date | RAS01CO | 2 sigma | RAS03MO | 2 sigma | RAS07EO | 2 sigma | RAS18FP | 2 sigma |
|---|---|---|---|---|---|---|---|---|
| 7/5/2000 | 0.017 | 0.001 | 0.014 | 0.001 | 0.013 | 0.001 | 0.013 | 0.001 |
| 7/10/2000 | 0.013 | 0.001 | 0.015 | 0.001 | 0.013 | 0.001 | 0.011 | 0.001 |
| 7/18/2000 | 0.013 | 0.001 | 0.013 | 0.001 | 0.014 | 0.001 | 0.015 | 0.001 |
| 7/24/2000 | 0.017 | 0.002 | 0.017 | 0.001 | 0.701 | 0.100 | 0.018 | 0.001 |
| 8/1/2000 | 0.017 | 0.001 | 0.016 | 0.001 | 0.392 | 0.065 | 0.016 | 0.001 |
| 8/8/2000 | 0.020 | 0.002 | 0.020 | 0.001 | 0.018 | 0.001 | 0.019 | 0.001 |
| 8/15/2000 | 0.016 | 0.001 | 0.018 | 0.001 | 0.015 | 0.001 | 0.018 | 0.001 |
| 8/21/2000 | 0.021 | 0.003 | 0.018 | 0.001 | 0.018 | 0.002 | 0.018 | 0.001 |
| 8/29/2000 | 0.017 | 0.001 | 0.016 | 0.001 | 0.018 | 0.001 | 0.016 | 0.001 |
| 9/5/2000 | 0.016 | 0.001 | 0.015 | 0.001 | 0.016 | 0.001 | 0.016 | 0.001 |
| 9/12/2000 | 0.029 | 0.001 | 0.026 | 0.001 | 0.030 | 0.002 | 0.026 | 0.001 |
| 9/19/2000 | 0.027 | 0.001 | 0.024 | 0.001 | 0.026 | 0.001 | 0.026 | 0.001 |
| 9/26/2000 | 0.025 | 0.001 | 0.023 | 0.001 | 0.025 | 0.001 | 0.024 | 0.001 |
| 10/2/2000 | 0.038 | 0.001 | 0.037 | 0.001 | 0.040 | 0.001 | 0.038 | 0.001 |
| 10/10/2000 | 0.022 | 0.002 | 0.023 | 0.001 | 0.025 | 0.002 | 0.022 | 0.001 |
| 10/17/2000 | 0.024 | 0.001 | 0.024 | 0.003 | 0.025 | 0.001 | 0.025 | 0.001 |
| 10/24/2000 | 0.030 | 0.002 | 0.029 | 0.003 | 0.033 | 0.001 | 0.029 | 0.001 |
| 10/31/2000 | 0.015 | 0.001 | 0.013 | 0.001 | 0.015 | 0.001 | 0.013 | 0.001 |
| 11/7/2000 | 0.026 | 0.002 | 0.029 | 0.004 | 0.026 | 0.002 | 0.021 | 0.001 |
| 11/14/2000 | 0.019 | 0.001 | 0.018 | 0.001 | 0.021 | 0.001 | 0.018 | 0.002 |
| 11/20/2000 | 0.045 | 0.010 | 0.035 | 0.004 | 0.037 | 0.001 | 0.033 | 0.002 |
| 11/27/2000 | 0.064 | 0.002 | 0.058 | 0.002 | 0.061 | 0.002 | 0.056 | 0.002 |
| 12/5/2000 | 0.049 | 0.002 | 0.046 | 0.002 | 0.045 | 0.002 | 0.043 | 0.002 |
| 12/12/2000 | 0.060 | 0.004 | 0.057 | 0.002 | 0.061 | 0.002 | 0.056 | 0.002 |
| 12/19/2000 | 0.021 | 0.001 | 0.019 | 0.001 | 0.020 | 0.001 | 0.019 | 0.001 |
| 12/26/2000 | 0.040 | 0.002 | 0.037 | 0.002 | 0.042 | 0.002 | 0.037 | 0.002 |

**Table F-2**

**2000 Luxel Summary (Direct Radiation)**
Quarterly
(mRem)

| ID | Type | 2000-1 | 2000-2 | 2000-3 | 2000-4 |
|---|---|---|---|---|---|
| RTL0.3RO | INDICATOR | 16.0 | 18.0 | 19.0 | 20.0 |
| RTL0.3CO | INDICATOR | 17.0 | 16.0 | 16.0 | 23.0 |
| RTL0.3NO | INDICATOR | 16.0 | 20.0 | 17.0 | 23.0 |
| RTL0.3LO | INDICATOR | 17.0 | 17.0 | 17.0 | 19.0 |
| RTL0.3HO | INDICATOR | 16.0 | 18.0 | 18.0 | 21.0 |
| RTL0.4FO | INDICATOR | 14.0 | 17.0 | 15.0 | 18.0 |
| RTL0.5CO | INDICATOR | 16.0 | 17.0 | 19.0 | 23.0 |
| RTL0.6KO | INDICATOR | 15.0 | 17.0 | 15.0 | 20.0 |
| RTL10.0HP | CONTROL | 17.0 | 17.0 | 14.0 | 21.0 |
| RTL2.7MO | INDICATOR | 15.0 | 15.0 | 17.0 | 15.0 |
| RTL8.2KO | CONTROL | 18.0 | 23.0 | 19.0 | 22.0 |
| RTL7.8CO | CONTROL | 13.0 | 14.0 | 13.0 | 16.0 |
| RTL1.8FO | INDICATOR | 13.0 | 14.0 | 13.0 | 14.0 |
| RTL1.5MO | INDICATOR | 16.0 | 17.0 | 15.0 | 20.0 |
| RTL3.9KO | INDICATOR | 13.0 | 16.0 | 16.0 | 19.0 |
| RTL7.4MO | CONTROL | 0.0 | 19.0 | 14.0 | 20.0 |
| RTL3.7NO | INDICATOR | 16.0 | 18.0 | 18.0 | 16.0 |
| RTL3.8MO | INDICATOR | 16.0 | 17.0 | 17.0 | 16.0 |
| RTL1.9NO | INDICATOR | 15.0 | 22.0 | 17.0 | 21.0 |
| RTL1.7FO | INDICATOR | 15.0 | 17.0 | 16.0 | 17.0 |
| RTL1.4DO | INDICATOR | 18.0 | 19.0 | 19.0 | 19.0 |
| RTL10.0EP | CONTROL | 13.0 | 15.0 | 18.0 | 17.0 |
| RTL8.0PO | CONTROL | 16.0 | 16.0 | 18.0 | 18.0 |
| RTL0.8DO | INDICATOR | 17.0 | 18.0 | 18.0 | 19.0 |
| RTL0.6MO | INDICATOR | 14.0 | 15.0 | 17.0 | 16.0 |
| RTL0.4NO | INDICATOR | 29.0 | 35.0 | 46.0 | 36.0 |
| RTL0.4NO1 | INDICATOR | 17.0 | 18.0 | 21.0 | 19.0 |
| RTL0.3PO | INDICATOR | 17.0 | 19.0 | 14.0 | 20.0 |
| RTL0.3NP | INDICATOR | 16.0 | 19.0 | 15.0 | 16.0 |
| RTL0.4NP | INDICATOR | 14.0 | 18.0 | 16.0 | 20.0 |
| RTL0.5NP | INDICATOR | 17.0 | 20.0 | 15.0 | 21.0 |
| RTL0.3QP | INDICATOR | 14.0 | 17.0 | 17.0 | 17.0 |
| RTL0.7QP | INDICATOR | 15.0 | 17.0 | 14.0 | 17.0 |
| RTL0.7JO | INDICATOR | 14.0 | 17.0 | 14.0 | 17.0 |
| RTL0.4PP | INDICATOR | 15.0 | 21.0 | 19.0 | 21.0 |

**Table F-3**

**2000 Garden Vegetables**
Semi-annual
(pCi/kg, wet)

| Sample ID | Collect date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 | Tritium |
|---|---|---|---|---|---|---|---|
| RLV0.6MO | 3/23/2000 | <26 | <18 | <47 | <25 | <16 | |
| RLV18.0KO | 3/23/2000 | <16 | <18 | <34 | <18 | <16 | |
| RLV0.6MO | 7/10/2000 | <6.1 | <7.0 | <15 | <16 | <6.3 | |
| RLV18.0KO | 7/10/2000 | <28 | <29 | <70 | <28 | <24 | |
| RLV6.6KP | 8/29/2000 | <8.90 | <9.21 | <20.5 | <17.8 | <9.77 | <93 |
| RLV0.7NO | 8/29/2000 | <11.3 | <13.0 | <30.4 | <13.7 | <11.9 | <98 |

## Table F-4

**2000 SEDIMENT**
Quarterly
(pCi/kg)

| Sample ID | Collect Date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|
| RMS1.8NO | 2/8/2000 | <7.0 | <8.0 | <21 | <10 | 62.0 |
| RMS3.7NO | 2/8/2000 | <15 | <15 | <38 | <19 | <14 |
| RMS0.6MO | 2/8/2000 | <10 | <10 | <28 | <13 | 126 |
| RMS0.7NO | 2/8/2000 | <20 | 169 | <50 | 30.0 | 9000 |
| RMS0.6MOQ | 2/8/2000 | <9.0 | <9.0 | <22 | <11 | 275 |
| RMS0.3MO | 2/15/2000 | <25 | 29.0 | <62 | <35 | 517 |
| RMS0.7NO | 5/23/2000 | <27 | 176 | <64 | 41.0 | 8380 |
| RMS1.8NO | 5/23/2000 | 5.00 | <7.0 | <14 | <7.0 | 179 |
| RMS3.7NO | 5/23/2000 | <8.0 | <5.0 | <23 | <10 | 53 |
| RMS0.6MOQ | 5/23/2000 | <4.0 | <5.0 | <12 | <8.0 | 49.0 |
| RMS0.3MO | 5/23/2000 | <5.0 | <7.0 | <15 | <10 | 115 |
| RMS0.6MO | 5/23/2000 | <4.0 | <5.0 | <12 | <6.0 | 38.0 |
| RMS0.6MOQ | 8/21/2000 | | <17 | <42 | <21 | 176 |
| RMS0.3MO | 8/21/2000 | | <29 | <75 | <33 | 145 |
| RMS0.7NO | 8/21/2000 | | <34 | <81 | <49 | 221 |
| RMS0.6MO | 8/21/2000 | | <29 | <59 | <32 | 158 |
| RMS1.8NO | 8/21/2000 | | <22 | <49 | <30 | 92.8 |
| RMS3.7NO | 8/21/2000 | | <33 | <67 | <39 | <30 |
| RMS0.6MO | 11/7/2000 | 1.12 | <2.3 | <2.3 | <1.8 | 26.2 |
| RMS0.7NO | 11/7/2000 | <1.9 | <2.1 | <4.5 | <2.8 | 72.9 |
| RMS0.3MO | 11/7/2000 | <2.6 | 5.47 | <8.0 | <3.4 | 172 |
| RMS1.8NO | 11/7/2000 | <1.7 | <1.9 | <4.9 | <2.5 | 45.6 |
| RMS3.7NO | 11/7/2000 | <2.8 | <3.1 | <7.8 | <3.5 | 10.9 |

**TABLE F-4**
(continued)

**2000 SOIL AND SEDIMENT**

Effluent Creek Soil
Semi-Annual
(pCi/kg)

| Sample ID | Description | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RSL0.6MO | Site Boundary | 4/26/2000 | <7 | 13 | <15 | <6 | 276 |
| RSL0.6MO | Site Boundary | 11/1/2000 | <10 | <7 | <23 | <8 | 198 |
| RSL0.7NO | Water Sump | 4/26/2000 | <9 | <7 | <21 | <7 | 150 |
| RSL0.7NO | Water Sump | 11/1/2000 | <10 | <9 | <20 | <7 | 61 |
| RSL1.5NO | Silva Property | 4/26/2000 | <9 | 43 | <26 | <10 | 1259 |
| RSL1.5NO | Silva Property | 11/1/2000 | <18 | <17 | <39 | <12 | 84 |
| RSL1.8NO | Hadselville/ Clay Creeks | 4/26/2000 | <10 | <9 | <21 | <8 | <9 |
| RSL1.8NO | Hadselville/ Clay Creeks | 11/1/2000 | <14 | <13 | <38 | <12 | 164 |

**TABLE F-4**
(continued)
**2000 SOIL AND SEDIMENT**

Site Boundary Soil/ Depression Areas Soil
Semi-Annual
(pCi/kg)

| Sample ID | Description | Collection Date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RSL0.5MPAK | Site Boundary | 4/26/2000 | <12 | <15 | <26 | <13 | 339 |
| RSL0.5MPAK | Site Boundary | 11/7/2000 | <7 | <7 | <17 | <6 | 133 |
| RSL0.5MPAL | Site Boundary | 11/7/2000 | <8 | <7 | <19 | <8 | 243 |
| RSL0.5MPAL | Site Boundary | 4/26/2000 | <10 | <11 | <23 | <9 | 198 |
| RSL0.5MPAM | Site Boundary | 11/7/2000 | <11 | 171 | <23 | <11 | 1574 |
| RSL0.5MPAM | Site Boundary | 4/26/2000 | <12 | 181 | <25 | <13 | 3248 |
| RSL0.5MPAN | Site Boundary | 4/26/2000 | <8 | <7 | <17 | <6 | 138 |
| RSL0.5MPAN | Site Boundary | 11/7/2000 | <11 | <12 | <21 | <8 | 171 |
| RSL0.4MP1 | Depression | 4/26/2000 | <19 | 1180 | <54 | 147 | 40700 |
| RSL0.4MP1 | Depression | 11/6/2000 | <19 | 778 | <46 | 99 | 28950 |
| RSL0.4MP2 | Depression | 4/26/2000 | <23 | 494 | <58 | 76 | 24690 |
| RSL0.4MP2 | Depression | 11/6/2000 | <14 | 364 | <38 | 62 | 17820 |
| RSL0.4MP3 | Depression | 11/7/2000 | <11 | 37 | <21 | 38 | 7421 |
| RSL0.4MP3 | Depression | 4/26/2000 | <8 | 30 | <17 | 53 | 4838 |

**TABLE F-4**
(continued)

**2000 SOIL AND SEDIMENT**
Storm Drain Soil
Semi-Annual
(pCi/kg)

| Sample ID | Description | Collection Date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RSL0.3NP1 | ISFSI #1 | 4/26/2000 | <9 | <9 | <22 | <7 | <9 |
| RSL0.3NP1 | ISFSI #1 | 11/6/2000 | <9 | <8 | <19 | <8 | <10 |
| RSL0.3NP2 | ISFSI #2 | 4/26/2000 | <8 | <7 | <19 | <7 | <8 |
| RSL0.3NP2 | ISFSI #2 | 11/6/2000 | <9 | <8 | <19 | <7 | <10 |
| RSL0.3NP3 | ISFSI #3 | 11/6/2000 | <7 | <6 | <18 | <5 | <8 |
| RSL0.3NP3 | ISFSI #3 | 4/26/2000 | <9 | <9 | <19 | <6 | <8 |
| RSL0.2HO1 | Storm Drain #1 | 11/2/2000 | <17 | <17 | <35 | <13 | 47 |
| RSL0.2HO1 | Storm Drain #1 | 4/26/2000 | <8 | <7 | <14 | <6 | <8 |
| RSL0.2HO2 | Storm Drain #2 | 11/2/2000 | <13 | <17 | <28 | <10 | 104 |
| RSL0.2HO2 | Storm Drain #2 | 4/26/2000 | <8 | <13 | <20 | <7 | 78 |
| RSL0.2JO | Storm Drain #3 | 4/26/2000 | <8 | <9 | <21 | <7 | <10 |
| RSL0.2JO | Storm Drain #3 | 11/1/2000 | <9 | <9 | <18 | <6 | 21 |
| RSL0.2KO | Storm Drain #4 | 11/2/2000 | <8 | <8 | <18 | <6 | 43 |
| RSL0.2KO | Storm Drain #4 | 4/26/2000 | <8 | <10 | <21 | <7 | 60 |
| RSL0.3LO | Storm Drain #5 | 4/26/2000 | <7 | <6 | <16 | <6 | <9 |
| RSL0.3LO | Storm Drain #5 | 11/2/2000 | <8 | <7 | <20 | <6 | 26 |
| RSL0.2HO | Storm Drain #6 | 4/26/2000 | <10 | <8 | <21 | <8 | 44 |
| RSL0.2HO | Storm Drain #6 | 11/1/2000 | <11 | <14 | <27 | <10 | 418 |
| RSL0.3MO7 | Storm Drain #7 | 4/26/2000 | <8 | <7 | <20 | <6 | 23 |
| RSL0.3MO7 | Storm Drain #7 | 11/2/2000 | <9 | <10 | <22 | <7 | 35 |
| RSL0.3MO8 | Storm Drain #8 | 4/26/2000 | <10 | <8 | <20 | <8 | 59 |
| RSL0.3MO8 | Storm Drain #8 | 11/2/2000 | <8 | <8 | <19 | <7 | <9 |
| RSL0.3MO9 | Storm Drain #9 | 4/26/2000 | <9 | <8 | <19 | <7 | 27 |
| RSL0.3MO9 | Storm Drain #9 | 11/6/2000 | <10 | <11 | <21 | <8 | 45 |
| RSL0.3AO | Storm Drain #10 | 11/2/2000 | <8 | <7 | <21 | <6 | 25 |
| RSL0.3AO | Storm Drain #10 | 4/26/2000 | <7 | <7 | <19 | <5 | <8 |
| RSL0.3QO | Storm Drain #11 | 4/26/2000 | <8 | <8 | <21 | <6 | <9 |
| RSL0.3QO | Storm Drain #11 | 11/6/2000 | <11 | <10 | <24 | <8 | 59 |
| RSL0.3NO | Storm Drain #12 | 11/2/2000 | <7 | <8 | <19 | <7 | <9 |
| RSL0.3NO | Storm Drain #12 | 4/26/2000 | <9 | <8 | <22 | <8 | <9 |

**TABLE F-5**

**2000 FISH**
Semi-Annual
(pCi/kg, wet)

| Sample ID | Collect Date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|
| RFS0.6MO (1) | 6/6/2000 | <12 | <16 | <40 | <15 | 94 |
| RFS0.6MO (1) | 11/16/2000 | <11 | <10 | <22 | <14 | 58.5 |

Note: (1)=Predator Species

**TABLE F-6**

**2000 ALGAE**
Semi-annual
(pCi/kg, wet)

| Sample ID | Collect Date | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|
| RAG1.3FO | 7/18/2000 | <4.7 | <5.0 | <11 | <6.3 | <9.2 |
| RAG0.3MO | 7/18/2000 | <5.4 | <6.0 | <13 | <12 | 19.1 |
| RAG2.2NO | 7/18/2000 | <7.1 | <8.5 | <18 | <9.3 | <13 |
| RAG1.8NO | 7/18/2000 | <4.6 | <6.2 | <11 | <6.0 | <19.5 |
| RAG3.7NO | 7/18/2000 | <9.6 | <11 | <25 | <21 | 11.6 |
| RAG0.6MO | 7/18/2000 | <8.7 | <10 | <21 | <11 | 29.8 |
| RAG0.7NO | 7/18/2000 | <5.7 | 5.20 | <7.8 | <4.0 | 29.5 |
| RAG1.3FO | 8/29/2000 | <5.66 | <6.52 | <12.7 | <11.0 | <8.93 |
| RAG3.7NO | 8/29/2000 | <5.54 | <5.18 | <12.1 | <8.65 | <5.81 |
| RAG1.8NO | 8/29/2000 | <2.71 | 6.56 | <6.23 | <3.67 | 52.2 |
| RAG0.7NO | 8/29/2000 | <5.33 | <6.19 | <11.6 | <6.31 | 45.5 |

**TABLE F-7**

**2000 WELL WATER**
Quarterly
(pCi/L)

| Sample ID | Collect Date | Gross beta | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|---|
| RWW1.5RP | 1/25/2000 | <2.8 | <201 | <3.69 | <4.61 | <9.05 | <4.97 | <3.99 |
| RWW0.6RP | 1/25/2000 | 3.5 | <201 | <8.34 | <10.7 | <20.3 | <10.3 | <8.42 |
| RWW0.6RP | 3/1/2000 | <3.71 | <202 | <6.42 | <7.38 | <12.4 | <7.40 | <6.44 |
| RWW1.5RP | 3/1/2000 | <3.17 | <201 | <5.45 | <7.06 | <15.6 | <7.35 | <5.53 |
| RWW3.7MO | 3/7/2000 | <2.80 | <208 | <11.8 | <14.2 | <26.4 | <12.8 | <11.5 |
| RWW2.1MO | 3/7/2000 | <3.18 | <207 | <43.8 | <39.8 | <97.8 | <52.5 | <43.0 |
| RWW0.8LO | 3/7/2000 | <3.51 | <212 | <5.03 | <6.19 | <14.6 | <6.80 | <5.07 |
| RWW0.8DO | 3/7/2000 | <3.06 | <200 | <3.99 | <4.64 | <8.52 | <5.06 | <4.14 |
| RWW0.3EO | 3/7/2000 | <3.72 | <199 | <9.13 | <10.9 | <19.4 | <10.1 | <9.66 |
| RWW1.5RP | 3/28/2000 | <2.4 | <210 | <7.2 | <7.9 | <15 | <9.6 | <7.5 |
| RWW0.6RP | 3/28/2000 | 2.38 | <210 | <3.3 | <4.1 | <7.2 | <4.3 | <3.5 |
| RWW1.5MP | 6/6/2000 | <3.1 | <190 | <3.9 | <5.2 | <11 | <13 | <4.1 |
| RWW0.3EO | 6/6/2000 | 6.85 | <190 | <4.2 | <5.1 | <12 | <9.3 | <4.5 |
| RWW0.6RP | 6/6/2000 | 3.29 | <190 | <8.5 | <8.2 | <19 | <11 | <8.4 |
| RWW2.1MO | 6/6/2000 | <3.0 | <190 | <9.2 | <11 | <21 | <10 | <7.4 |
| RWW0.8LO | 6/6/2000 | <1.8 | <190 | <8.8 | <11 | <20 | <10 | <9.3 |
| RWW0.8DO | 6/6/2000 | 3.3 | <190 | <4.0 | <4.4 | <9.4 | <5.3 | <4.4 |
| RWW3.7MO | 6/6/2000 | <3.2 | <190 | <7.6 | <9.1 | <17 | <8.3 | <7.7 |
| RWW1.5MP | 9/5/2000 | <1.8 | <430 | <14 | <15 | <31 | <18 | <14 |
| RWW0.6RP | 9/5/2000 | 2.35 | <440 | <6.9 | <6.9 | <14 | <7.5 | <7.2 |
| RWW2.1MO | 9/5/2000 | <2.4 | <430 | <14 | <15 | <28 | <19 | <14 |
| RWW0.8LO | 9/5/2000 | <1.8 | <440 | <9.7 | <11 | <22 | <14 | <11 |
| RWW0.8DO | 9/5/2000 | <2.1 | <430 | <4.6 | <4.5 | <8.6 | <5.5 | <4.1 |
| RWW3.7MO | 9/5/2000 | <1.8 | <440 | <6.0 | <5.6 | <12 | <6.0 | <5.7 |
| RWW0.3EO | 9/5/2000 | <2.3 | <440 | <14 | <14 | <28 | <18 | <14 |
| RWW1.5MP | 11/27/2000 | <2.6 | <190 | <7.9 | <9.9 | <20 | <10 | <8.4 |
| RWW2.1MO | 11/27/2000 | <2.0 | <190 | <6.7 | <16 | <17 | <9.2 | <7.6 |
| RWW0.7RP | 11/28/2000 | 2.84 | <190 | <5.5 | <5.3 | <11 | <6.9 | <6.1 |
| RWW0.6RP | 11/28/2000 | 4.23 | <190 | <6.1 | <6.6 | <12 | <6.7 | <11 |
| RWW0.8LO | 11/28/2000 | 2.76 | <190 | <8.1 | <11 | <22 | <9.9 | <9.6 |
| RWW0.8DO | 11/28/2000 | <3.8 | <190 | <3.2 | <3.7 | <7.4 | <4.5 | <3.7 |
| RWW0.3EO | 11/28/2000 | 6.59 | <190 | <6.7 | <7.5 | <17 | <8.9 | <7.7 |
| RWW3.7MO | 11/28/2000 | <1.8 | <190 | <8.1 | <11 | <22 | <9.9 | <9.6 |
| RWW0.9CP | 11/29/2000 | <2.9 | <190 | <6.1 | <7.3 | <15 | <7.5 | <7.1 |

**TABLE F-8**

**2000 RUNOFF WATER**
Biweekly
(pCi/L)

| Sample ID | Collect Date | Tritium | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RRW0.6MO | 1/11/2000 | <218 | <7.84 | <7.61 | <15.5 | <8.28 | <7.53 |
| RRW0.6MO | 1/25/2000 | <189 | <7.65 | <8.45 | <18.2 | <10.5 | <8.56 |
| RRW0.6MO | 2/9/2000 | <231 | <6.9 | <7.2 | <20 | <8.0 | <5.5 |
| RRW0.6MO | 2/23/2000 | <164 | <4.73 | <6.76 | <15.0 | <6.35 | <5.32 |
| RRW0.6MO | 3/7/2000 | <190 | <9.22 | <11.0 | <19.5 | <11.0 | <8.26 |
| RRW0.6MO | 3/21/2000 | <210 | <10 | <8.4 | <23 | <12 | <8.4 |
| RRW0.6MOQ | 3/21/2000 | <200 | <6.2 | <6.6 | <17 | <13 | <5.4 |
| RRW0.6MO | 4/4/2000 | <180 | <7.7 | <10 | <23 | <9.9 | <8.4 |
| RRW0.6MO | 4/18/2000 | <190 | <5.7 | <7.1 | <13 | <7.4 | <6.6 |
| RRW0.6MO | 5/2/2000 | <210 | <4.2 | <6.1 | <13 | <12 | <4.9 |
| RRW0.6MO | 5/16/2000 | <200 | <4.5 | <6.3 | <14 | <7.0 | <5.3 |
| RRW0.6MO | 5/30/2000 | <170 | <8.1 | <8.9 | <17 | <9.0 | <7.4 |
| RRW0.6MO | 6/12/2000 | <160 | <4.9 | <6.4 | <16 | <6.9 | <5.1 |
| RRW0.6MOQ | 6/12/2000 | <160 | <8.8 | <9.1 | <21 | <28 | <8.2 |
| RRW0.6MO | 6/27/2000 | <160 | <4.9 | <6.3 | <14 | <6.7 | <4.8 |
| RRW0.6MO | 7/10/2000 | <160 | <9.6 | <11 | <23 | <13 | <11 |
| RRW0.6MO | 7/24/2000 | <160 | <4.6 | <6.3 | <14 | <6.4 | <4.9 |
| RRW0.6MO | 8/8/2000 | <200 | <8.0 | <9.5 | <18 | <9.4 | <8.9 |
| RRW0.6MO | 8/21/2000 | <190 | <6.0 | <6.8 | <13 | <8.7 | <12 |
| RRW0.6MO | 9/5/2000 | <460 | <8.4 | <9.7 | <19 | <12 | <10 |
| RRW0.6MOQ | 9/5/2000 | <460 | <11 | <12 | <23 | <11 | <10 |
| RRW0.6MO | 9/19/2000 | 5060/ 5190 | <5.1 | <5.4 | <10 | <7.1 | <5.9 |
| RRW0.6MO | 10/3/2000 | <160 | <7.6 | <8.7 | <16 | <9.2 | <7.9 |
| RRW0.6MO | 10/17/2000 | <230 | <5.3 | <5.5 | <10 | <7.4 | <5.6 |
| RRW0.6MO | 10/31/2000 | <190 | <8.4 | <9.1 | <19 | <12 | <8.9 |
| RRW0.6MO | 11/14/2000 | <110 | <6.9 | <6.9 | <12 | <7.2 | <7.7 |
| RRW0.6MO | 11/28/2000 | <190 | <8.5 | <9.4 | <19 | <9.4 | <8.1 |
| RRW0.6MOQ | 11/28/2000 | <190 | <7.9 | <7.5 | <14 | <8.6 | <7.5 |
| RRW0.6MO | 12/12/2000 | <160 | <8.9 | <9.1 | <19 | <10 | <9.8 |
| RRW0.6MO | 12/26/2000 | <200 | <6.0 | <6.3 | <12 | <7.0 | <6.0 |

**TABLE F-9**
**2000 SURFACE WATER**
Monthly Grab / Monthly Composite
(pCi/L)

| Sample ID | Collect Date | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RSW0.3MO | 1/25/2000 | <194 | <3.76 | <4.62 | <7.89 | <4.67 | <4.00 |
| RSW0.7NO | 1/25/2000 | <187 | <7.06 | <8.22 | <15.9 | <9.25 | <7.86 |
| RSW1.3FO | 1/25/2000 | <192 | <6.13 | <6.72 | <13.4 | <7.47 | <6.36 |
| RSW1.8NOQ | 1/25/2000 | <197 | <4.24 | <5.31 | <12.2 | <5.98 | <4.75 |
| RSW1.8NO | 1/25/2000 | <188 | <3.95 | <4.46 | <7.58 | <5.00 | <4.00 |
| RSW3.7NO | 1/25/2000 | <192 | <8.27 | <8.33 | <16.1 | <9.27 | <8.44 |
| RSW1.3FO | 2/29/2000 | <198 | <7.64 | <8.76 | <15.6 | <8.41 | <7.52 |
| RSW0.7NO | 2/29/2000 | <199 | <8.12 | <9.20 | <19.7 | <10.4 | <9.03 |
| RSW0.3MO | 2/29/2000 | <196 | <4.36 | <4.51 | <9.28 | <5.38 | <4.33 |
| RSW3.7NO | 2/29/2000 | <199 | <9.50 | <9.72 | <17.5 | <9.93 | <9.62 |
| RSW1.8NO | 2/29/2000 | <196 | <9.53 | <9.98 | <20.8 | <11.2 | <8.72 |
| RSW3.7NO | 3/28/2000 | <207 | <8.90 | <12.0 | <21.0 | <9.90 | <9.00 |
| RSW0.3MO | 3/28/2000 | <214 | <8.00 | <9.50 | <16.0 | <10.0 | <9.20 |
| RSW0.7NO | 3/28/2000 | <214 | <4.30 | <4.40 | <8.30 | <5.40 | <4.10 |
| RSW1.8NO | 3/28/2000 | <204 | <5.70 | <6.50 | <17.0 | <12.0 | <5.30 |
| RSW1.3FO | 3/28/2000 | <203 | <6.70 | <7.30 | <16.0 | <8.80 | <5.30 |
| RSW1.8NO | 4/25/2000 | <190 | <6.9 | <8.5 | <15 | <8.0 | <7.0 |
| RSW3.7NO | 4/25/2000 | <190 | <4.3 | <5.4 | <12 | <7.8 | <4.3 |
| RSW0.3MO | 4/25/2000 | <180 | <6.4 | <6.9 | <13 | <7.0 | <6.7 |
| RSW1.8NOQ | 4/25/2000 | <190 | <7.7 | <8.7 | <18 | <10 | <8.6 |
| RSW0.7NO | 4/25/2000 | <190 | <5.0 | <5.6 | <15 | <6.6 | <5.0 |
| RSW1.3FO | 4/25/2000 | <190 | <3.8 | <5.4 | <12 | <5.2 | <4.4 |
| RSW0.7NO | 5/30/2000 | <170 | <9.0 | <11 | <21 | <10 | <9.0 |
| RSW0.3MO | 5/30/2000 | <170 | <7.5 | <8.5 | <17 | <8.6 | <7.3 |
| RSW3.7NO | 5/30/2000 | <170 | <8.7 | <8.4 | <20 | <12 | <8.9 |
| RSW1.8NO | 5/30/2000 | <170 | <4.0 | <4.5 | <9.4 | <5.4 | <4.2 |
| RSW1.3FO | 5/30/2000 | <170 | <4.0 | <5.0 | <12 | <5.5 | <4.3 |
| RSW0.3MO | 6/26/2000 | <160 | <5.0 | <6.9 | <15 | <6.9 | <4.9 |
| RSW1.8NO | 6/27/2000 | <160 | <4.6 | <6.1 | <14 | <11 | <4.6 |
| RSW0.7NO | 6/27/2000 | <150 | <4.2 | <5.5 | <12 | <7.3 | <4.2 |
| RSW1.3FO | 6/27/2000 | <160 | <4.2 | <5.7 | <13 | <11 | <4.1 |
| RSW3.7NO | 6/27/2000 | <160 | <7.2 | <7.9 | <15 | <8.5 | <7.4 |

**TABLE F-9**
(continued)

**2000 SURFACE WATER**
Monthly Grab/ Monthly Composite
(pCi/L)

| Sample ID | Collect Date | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RSW1.8NO | 7/24/2000 | <160 | <5.5 | <5.6 | <12 | <7.2 | <6.0 |
| RSW0.3MO | 7/24/2000 | <160 | <4.6 | <6.7 | <14 | <8.0 | <5.2 |
| RSW1.8NOQ | 7/24/2000 | <160 | <8.1 | <1.0 | <19 | <10 | <8.5 |
| RSW1.3FO | 7/24/2000 | <160 | <5.2 | <5.3 | <12 | <6.9 | <5.8 |
| RSW0.7NO | 7/24/2000 | <160 | <6.4 | <7.4 | <14 | <7.9 | <6.8 |
| RSW3.7NO | 7/24/2000 | <160 | <5.6 | <6.3 | <13 | <8.2 | <6.7 |
| RSW0.3MO | 8/29/2000 | <450 | <10 | <11 | <22 | <14 | <11 |
| RSW3.7NO | 8/29/2000 | <450 | <13 | <15 | <26 | <16 | <15 |
| RSW0.7NO | 8/29/2000 | <460 | <6.4 | <6.8 | <13 | <8.3 | <6.0 |
| RSW1.8NO | 8/29/2000 | <450 | <13 | <23 | <3 | <16 | <14 |
| RSW1.3FO | 8/29/2000 | <460 | <9.8 | <10 | <22 | <17 | <11 |
| RSW1.8NO | 9/26/2000 | <160 | <7.6 | <8.1 | <15 | <8.0 | <6.7 |
| RSW1.3FO | 9/26/2000 | <196 | <6.0 | <6.1 | <13 | <8.4 | <6.8 |
| RSW0.7NO | 9/26/2000 | <160 | <8.0 | <8.5 | <17 | <12 | <9.0 |
| RSW3.7NO | 9/26/2000 | <160 | <6.6 | <6.9 | <14 | <9.5 | <7.5 |
| RSW0.3MO | 9/26/2000 | 510 | <7.0 | <8.5 | <14 | <7.8 | <6.4 |
| RSW0.7NO | 10/31/2000 | 260 | <6.4 | <8.6 | <15 | <7.7 | <6.7 |
| RSW1.3FO | 10/31/2000 | <190 | <3.6 | <4.0 | <7.6 | <4.5 | <4.0 |
| RSW3.7NO | 10/31/2000 | <190 | <3.2 | <3.9 | <7.7 | <4.3 | <3.8 |
| RSW0.3MO | 10/31/2000 | <190 | <8.9 | <9.7 | <19 | <10 | <8.6 |
| RSW1.8NO | 10/31/2000 | <190 | <7.8 | <8.4 | <18 | <10 | <8.5 |
| RSW1.8NOQ | 10/31/2000 | <190 | <5.3 | <5.5 | <10 | <7.5 | <3.9 |
| RSW1.3FO | 11/27/2000 | <180 | <5.0 | <5.1 | <11 | <13 | <5.7 |
| RSW0.3MO | 11/27/2000 | <190 | <5.5 | <5.6 | <11 | <11 | <5.5 |
| RSW3.7NO | 11/27/2000 | <190 | <6.8 | <6.7 | <14 | <14 | <6.9 |
| RSW0.7NO | 11/27/2000 | <380 | <7.2 | <7.5 | <16 | <9.1 | <7.5 |
| RSW1.8NO | 11/27/2000 | <190 | <6.1 | <7.1 | <15 | <8.1 | <6.7 |
| RSW1.8NO | 12/26/2000 | <200 | <5.9 | <6.4 | <14 | <15 | <6.9 |
| RSW0.3MO | 12/26/2000 | <200 | <9.1 | <9.0 | <17 | <10 | <8.6 |
| RSW3.7NO | 12/26/2000 | <200 | <5.1 | <5.5 | <12 | <11 | <5.7 |
| RSW0.7NO | 12/26/2000 | <200 | <7.4 | <7.3 | <16 | <20 | <7.5 |
| RSW1.3FO | 12/26/2000 | <200 | <8.2 | <8.9 | <19 | <11 | <9.0 |

**TABLE F-10**

**2000 Drinking Water**
Monthly
(pCi/L)

| Sample ID | Collect Date | Gross beta | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|---|
| RDW0.1GO | 1/25/2000 | 3.6 | <197 | <4.48 | <5.91 | <12.9 | <7.64 | 45+-5.4 |
| RDW1.8FP | 1/25/2000 | <3.82 | <205 | <3.82 | <8.88 | <10.4 | <20.2 | <8.66 |
| RDW1.8FP | 2/29/2000 | <4.95 | <203 | <7.12 | <8.78 | <13.7 | <7.90 | <7.20 |
| RDW0.1GO | 2/29/2000 | <4.05 | <198 | <5.23 | <6.64 | <15.1 | <7.14 | <5.44 |
| RDW0.1GO | 3/13/2000 | <3.71 | <210 | <9.48 | <10.3 | <17.9 | <11.3 | <11.4 |
| RDW0.1GO | 3/28/2000 | <2.5 | <210 | <4.0 | <4.9 | <7.8 | <4.9 | <4.3 |
| RDW1.8FP | 3/28/2000 | 3.24 | <200 | <6.7 | <9.0 | <15 | <8.3 | <7.7 |
| RDW1.8FP | 4/25/2000 | <3.78 | <207 | <4.13 | <5.58 | <13.0 | <5.86 | <4.90 |
| RDW0.1GO | 4/25/2000 | 4.3 | <210 | <4.81 | <6.28 | <15.7 | <6.64 | <5.53 |
| RDW0.1GO | 5/30/2000 | <3.7 | <200 | <9.0 | <9.0 | <20 | <16 | <9.2 |
| RDW1.8FP | 5/30/2000 | <3.2 | <200 | <4.0 | <5.4 | <12 | <5.7 | <4.4 |
| RDW0.1GO | 6/27/2000 | 3.25 | <200 | <6.5 | <7.4 | <13 | <7.8 | <6.2 |
| RDW1.8FP | 6/27/2000 | 3.01 | <200 | <4.1 | <5.9 | <12 | <5.7 | <4.3 |
| RDW1.8FP | 7/24/2000 | 2.74 | <160 | <7.8 | <8.5 | <19 | <13 | <8.4 |
| RDW0.1GO | 7/24/2000 | 2.63 | <160 | <3.8 | <5.3 | <13 | <5.4 | <4.1 |
| RDW0.1GO | 8/29/2000 | 2.93 | <217 | <1.05 | <1.56 | <2.71 | <1.23 | <0.961 |
| RDW1.8FP | 8/29/2000 | 2.32 | <217 | <9.51 | <9.66 | <21.6 | <12.8 | <11.0 |
| RDW0.1GO | 9/26/2000 | <4.8 | <190 | <6.7 | <8.2 | <15 | <8.4 | <7.0 |
| RDW1.8FP | 9/26/2000 | 2.02 | <190 | <5.6 | <5.8 | <11 | <10 | <6.2 |
| RDW1.8FP | 10/31/2000 | 2.98 | <190 | <7.5 | <8.9 | <18 | <9.5 | <8.1 |
| RDW0.1GO | 10/31/2000 | 4.10 | <180 | <5.2 | <5.9 | <10 | <7.5 | <6.1 |
| RDW0.1GO | 11/27/2000 | 3.36 | <190 | <3.4 | <4.1 | <7.0 | <4.2 | <3.8 |
| RDW1.8FP | 11/27/2000 | 2.82 | <180 | <6.0 | <6.7 | <13 | <7.2 | <6.6 |
| RDW0.1GO | 12/26/2000 | 3.64 | <200 | <8.2 | <8.3 | <15 | <9.9 | <7.9 |
| RDW1.8FP | 12/26/2000 | 3.46 | <200 | <5.7 | <6.3 | <13 | <7.0 | <6.2 |

**TABLE F-11**

**2000 Rain Water**
Seasonal
(pCi/L)

| Sample id | Collect date | | Mn-54 | Co-60 | Zn-65 | Cs-134 | Cs-137 |
|---|---|---|---|---|---|---|---|
| RRN0.8DO | 1/18/2000 | <191 | <7.18 | <7.94 | <15.5 | <9.74 | <8.52 |
| RRN0.8DO | 1/25/2000 | <191 | <6.43 | <6.44 | <13.2 | <6.79 | <6.58 |
| RRN0.8DO | 2/8/2000 | <230 | <7.96 | <12.8 | <17.3 | <9.81 | <7.88 |
| RRN0.8DO | 2/22/2000 | <168 | <8.09 | <9.55 | <19.1 | <11.2 | <9.78 |
| RRN0.8DO | 2/29/2000 | <198 | <4.28 | <5.62 | <12.4 | <5.76 | <4.14 |
| RRN0.8DO | 3/21/2000 | <200 | <4.2 | <6.2 | <14 | <5.9 | <4.8 |
| RRN0.8DO | 4/25/2000 | <200 | <7.2 | <8.7 | <17 | <9.4 | <7.4 |
| RRN0.8DO | 5/8/2000 | <200 | <4.6 | <5.5 | <13 | <9.5 | <4.6 |
| RRN0.8DO | 5/23/2000 | <170 | <4.5 | <5.9 | <13 | <12 | <4.7 |
| RRN0.8DO | 6/12/2000 | <160 | <8.4 | <13 | <20 | <10 | <8.9 |
| RRN0.8DO | 9/5/2000 | <450 | <11 | <13 | <23 | <14 | <12 |
| RRN0.8DO | 10/10/2000 | <160 | <6.0 | <6.9 | <15 | <8.4 | <7.2 |
| RRN0.8DO | 10/31/2000 | <190 | <6.9 | <8.4 | <15 | <8.2 | <7.7 |
| RRN0.8DO | 11/27/2000 | <190 | <5.4 | <5.4 | <11 | <12 | <5.5 |
| RRN0.8DO | 12/12/2000 | <150 | <6.5 | <6.4 | <13 | <8.8 | <6.6 |
| RRN0.8DO | 12/26/2000 | <200 | <9.7 | <12 | <20 | <11 | <9.1 |

**APPENDIX G**
**2000 MISSED SAMPLE REPORT**

In accordance with the requirements REMP manual section 3.1, the following samples are being reported as not being collected for the reasons indicated during 2000. Corrective action as required by the REMP manual is as indicated.

**Luxel Monitoring Badges (Direct radiation pathway)**

**Location # 30 RTL7.4MO, Herald Fire Station (Control)** -- On March 30, 2000, the monitoring badges at this location were missing during the routine changeout. Second Quarter 2000 monitoring badges were restored at this location. No data will be available for this location for the first quarter 2000.

**Air Sampler (Airborne Pathway)**

**RAS0.7EO, Meteorological Tower (control**) – On May 23, 2000, during the weekly change-out, the air sampler at this location was found not running. Air sampler stopped due to a blown fuse in the air sampler. Air sampler was replaced and sampling was restored at this location. Air sampling at this location did not meet continuous requirement. Minimum volume for air sample was met and sample data was reported for this sample period for this location. PDQ 2000-0053 was written to document the occurrence.

**RAS0.7EO, Meteorological Tower (control**) – On July 18, 2000, during the weekly change-out, the air sampler at this location was found not running. Air sampler stopped due to a blown fuse in the air sampler. Air sampler was replaced and sampling was restored at this location. Air sampling at this location did not meet continuous requirement. Minimum volume for air sample was not met and sample data was reported for this sample period for this location. PDQ 2000-0074 was written to document the occurrence.

**RAS0.7EO, Meteorological Tower (control**) – On July 24, 2000, during the weekly change-out, the air sampler at this location was found not running. Air sampler stopped due to a blown fuse in the air sampler. This was the second occurrence for a blown fuse with two different air samplers. Air sampler was replaced and sampling was restored at this location. Air sampling at this location did not meet continuous requirement. Minimum volume for air sample was not met and sample data was reported for this sample period for this location. PDQ 2000-0076 was written to document the occurrence.

**APPENDIX G**
**2000 MISSED SAMPLE REPORT**
**(Continued)**

### *Algae (Liquid Effluent Pathway*

Algae samples are collected on a semi-annual basis from seven locations along the Clay/ Hadselville creeks and at the site reservoir. These samples are administratively controlled. Samples for the second half of 2000 were not collected at the following locations due to excessive flow, which prevented the growth of algae.

RAG0.3MO Plant Effluent outfall

RAG0.6MO Site Boundary

RAG2.2NO Hadselville Creek at Hwy 104

No data will be reported for these locations for the second half of 2000.

**APPENDIX H**
**ADDENDUM TO 1999 AREOR REPORT**

1. Page 9 of Section IV-E. Water monitoring, Algae data was repeated.

# Attachment WM-229i

# Rancho Seco Data on Landfill/Trenches

The following data is provided:

- September 16, 1968 Agreement Between California Resources Agency and SMUD (see para. 2 & 5)
- Bechtel Construction Summary of the Trenches
- Figure showing trench locations
- Picture of construction spoils area taken from the cooling towers
- Area "C" Evaporation Pond Summary

# COSUMNES POWER PLANT (01-AFC-19)
# DATA RESPONSES, SET 3D

## INSERT

## Attach WM-229i.pdf

# Attachment WM-229j

# Data on Radiological Environmental Monitoring Program

## Radiological Environmental Monitoring Program

### Garden/ Vineyard/ Pasturage Sample Data

| Sample Type | Frequency | Analyzed for | Location | Status | Comments |
|---|---|---|---|---|---|
| **Garden** | **Seasonal/ Semi annual** | **Gamma isotopic** | **Site Boundary, near effluent creek** | **Active** | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | North of site, north of offsite perimeter road | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | East of site | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | South of site | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | West of site | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | Marciel Ranch | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | Clay Station Garden, Tippling's | Inactive | |
| Garden | Seasonal/ Semi annual | Gamma isotopic | Truck Farm Garden, control location | Inactive | |
| **Vineyard** | **Seasonal** | **Tritium, gamma isotopic** | **West of site** | **Active** | |
| **Vineyard** | **Seasonal** | **Tritium, gamma isotopic** | **South of site, control location** | **Active** | |

Note: Inactive sample locations have not been used since Plant shutdown

## Radiological Environmental Monitoring Program

### Garden/ Vineyard/ Pasturage Sample Data
(continued)

| Sample Type | Frequency | Analyzed for | Location | Status | Comments |
|---|---|---|---|---|---|
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Site boundary | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Water sump, near site boundary | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Marciel Ranch | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Silva Property | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Confluence of Clay and Hadselville Creeks | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Mederios Dairy | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Luis Angelo Dairy | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | Warmerdam Dairy | Inactive | |
| Pasturage | Seasonal/ semi-annual | Gamma isotopic | DeSnayer Dairy | Inactive | |
| | | | | | |

Note: Inactive sample locations have not been used since Plant shutdown

# Rancho Seco Nuclear Station

## Radiological Environmental Monitoring Program
## Sample Results

Year: 1975-2001

Type: Garden

| Year | Number of Samples | Analysis | Results | Location |
|---|---|---|---|---|
| 1975 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1976 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1977 | 5 | Gross Beta | <0.02pCi/g | Offsite |
| 1978 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1979 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1980 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1981 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1982 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1983 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1984 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1985 | 4+ | Gross Beta | <0.02pCi/g | Offsite |
| 1986 | 8 | Gross Beta | <0.02pCi/g | Offsite |
| 1987 | 20 | Gross Beta/ Gamma Scan | 5.41-19.75 pCi/g / <MDA | Onsite (2) |
| 1988 | 28 | Gamma Scan | <MDA | Onsite (4)/ offsite |
| 1989 | 106 | Gamma Scan | <MDA | Onsite (4)/ offsite |
| 1990 | 99 | Gamma Scan | <MDA | Onsite (4)/ offsite |

## Rancho Seco Nuclear Station

## Radiological Environmental Monitoring Program
## Sample Results
## (Continued)

Year: 1975-2001

Type: Garden

| Year | Number of Samples | Analysis | Results | Location (number of locations onsite) |
|---|---|---|---|---|
| 1991 | 48 | Gamma Scan | <MDA | Onsite (4)/ offsite |
| 1992 | 19 | Gamma Scan | <MDA | Onsite (4)/ offsite |
| 1993 | 10 | Gamma Scan | Cs-137 18 ± 4 pCi/kg (note 1) | Onsite (1)/ offsite |
| 1994 | 10 | Gamma Scan | Cs-137 29 ± 21 pCi/kg (note 1) | Onsite (1)/ offsite |
| 1995 | 6 | Gamma Scan | <MDA | Onsite (1)/ offsite |
| 1996 | 2 | Gamma Scan | <MDA | Onsite (1)/ offsite |
| 1997 | 6 | Gamma Scan | <MDA | Onsite (1)/ offsite |
| 1998 | 6 | Gamma Scan | <MDA | Onsite (1)/ offsite |
| 1999 | 6 | Gamma Scan | <MDA | Onsite (1)/ offsite (grapes) |
| 2000 | 6 | Gamma Scan | <MDA | Onsite (1)/ offsite (grapes) |
| 2001 | 12 | Gamma Scan | <MDA | Onsite (1)/ offsite (grapes) |
| | | | | |

Note 1

- Cs-137 Lower Limit of Detection (LLD) 29 pCi/kg
- Reporting level for Cs-137 in Garden samples is 2000 pCi/kg

## Attachment WM-229k

# SACRAMENTO MUNICIPAL UTILITY DISTRICT

***MEMORANDUM***

DATE: May 23, 2002
CPP 02-049

TO: CPP Project File

FROM: Kevin Hudson

SUBJECT: Record of Communication with Rancho Seco Plant Staff

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I corresponded with Rancho Seco Plant Staff and requested a list of water treatment chemicals that have been used at Rancho Seco. I was provided with the following information.

Historical water treatment chemicals

| | |
|---|---|
| Ammonia | Steam plant feedwater |
| Hydrazine* | Steam plant feedwater |
| NaOH | Resin regeneration |
| Sulfuric Acid | Cooling tower water |
| Chlorine | Cooling tower water |
| Coagulant aid (Surfactant) | Make up water |
| Nitrite Borax | Closed cooling system HVAC |
| Aluminum Sulfate | Make up water |

*Treated with hydrogen peroxide & copper sulfate

It appears that only Sulfuric Acid and Chlorine were used in the open loop cooling tower water system.

cc: John Carrier (CH2M HILL)
California Energy Commission
California Department of Toxic Substances Control

## Technical Area: Water and Soil Resources

**Author:** Philip Lowe, P.E., Greg Peterson, P.E., and Richard Latteri
**CPP Authors:**

These Water and Soil Resources Data Requests are a follow-up to the data response sets and AFC supplement listed below:

Set 1A, dated January 9, 2002;
Set 1B, dated January 18, 2002;
Set 1C, dated February 4, 2002;
Set 1D, dated February 15, 2002;
Set 1G, dated March 19, 2002; and
AFC Supplement A, dated March 15, 2002

Follow-up data requests for Data Response Set 1E, Power Plant Cooling Analysis, are being deferred until the analysis of the data can be completed. If follow-up is deemed necessary, another set of data requests will be submitted. In order to reduce the number of future data requests, data responses provided by the applicant need to have sufficient detail to validate the bases, assumptions, quantities, unit processes, and cost components therein.

## BACKGROUND

As part of the National Pollutant Discharge Elimination System (NPDES) permitting process, a Report of Waste Discharge (ROWD) is necessary to evaluate and support the proposed wastewater treatment and management for the CPP. The Central Valley Regional Water Quality Control Board (CVRWQCB) in their letter to Mr. Colin Taylor dated February 25, 2002, deemed the initial NPDES application as incomplete requiring additional information including a revised ROWD.

## DATA REQUEST

235. Please provide a copy of the accepted ROWD that includes discharge characteristics for both the Folsom South Canal as the primary water source, Rancho Seco Reservoir as the backup source, and all receiving water characteristics.

**Response:** SMUD submitted water quality data for the Folsom South Canal in Table 7.1-2 of the AFC, filed in September of 2001. Rancho Seco Reservoir receives water from Folsom South Canal, and the water quality is believed to be identical to Folsom South Canal. There are no additional sampling data for nutrients or priority pollutants from Rancho Seco Reservoir.
SMUD submitted an NPDES permit application on January 21, 2002. Supplemental information responding to concerns of the RWQCB was provided on March 28, and April 25, 2002. The RWQCB responded that the NPDES application was complete on May 13, 2002. (See Attachment W&SR-234, Set 3C for a copy of these materials).

Therefore the requirements of the ROWD have been met by SMUD. The RWQCB is now considering the application and developing recommendations for the NPDES permit. SMUD looks forward to a cooperative relationship with the RWQCB.