NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA) VALUES ASSESSMENT FOR OPERABLE UNIT 3

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CCR	California Code of Regulations
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulation
DHS	California Department of Health Services
DOJ	U.S. Department of Justice
FS	feasibility study
FWEC	Foster Wheeler Environmental Corporation
HHRA	human health risk assessment
JPL	Jet Propulsion Laboratory
LAWC	Lincoln Avenue Water Company
LGAC	liquid-phase granular activated carbon
MCL	maximum contaminant level
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NPL	National Priorities List
OEHHA	California Office of Environmental Health Hazard Assessment
OU	operable unit
PHG	Public Health Goal
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SCAQMD	South Coast Air Quality Management Board
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1: INTRODUCTION

This National Environmental Policy Act of 1969 (NEPA) Values Assessment accompanies the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial documentation for Operable Unit 3 (OU-3) at the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), Pasadena, California. The Council on Environmental Quality (CEQ) and the Department of Justice (DOJ) advised that federal agencies should integrate NEPA values into the CERCLA process when feasible and appropriate (DOJ, 1995). This document was prepared to further of the purposes of NEPA and to assess the potential environmental impacts of the OU-3 response action at JPL.

1.1 Background

JPL comprises about 176 acres of land and more than 150 buildings and other structures. JPL is a NASA-owned facility where the California Institute of Technology performs research and development projects. JPL also serves as the federal government's lead center for research and development related to robotic exploration of the solar system. In addition to work for NASA, tasks are conducted at JPL for other federal agencies in areas such as remote sensing, astrophysics, and planetary science.

During execution of past projects, various chemicals (including laboratory chemicals, solvents, solid and liquid rocket propellants, and cooling tower chemicals) and other materials were used at JPL. During the 1940s and 1950s, many buildings maintained "seepage pits," which were subsurface areas used to dispose of liquid and solid sanitary wastes collected from drains and sinks within the buildings. Some of the seepage pits may have received volatile organic compounds (VOCs) and other waste materials that currently are found in vadose zone soil and groundwater at JPL. In the late 1950s and early 1960s, a sewer system was installed at JPL, and the use of seepage pits for waste disposal was discontinued.

In 1980, VOCs were detected in groundwater from City of Pasadena water-supply wells located in the Arroyo Seco, near JPL. At about the same time, VOCs also were detected in two water-supply wells at the Lincoln Avenue Water Company (LAWC), located downgradient of JPL. Subsequently, site investigations were conducted at JPL (Ebasco, 1990a and 1990b) and VOCs were detected in on-facility groundwater at levels above drinking water standards. In 1992, JPL was placed on the United States Environmental Protection Agency's (U.S. EPA's) National Priorities List (NPL) of CERCLA sites.

After being placed on the NPL, potential source areas were investigated from 1994 to 1998 during the Remedial Investigation (RI) phase, which included nine sampling events. During the RI for OU-1 and OU-3, VOCs and perchlorate were detected in groundwater both on- and off-site. The RI phase was followed by the Feasibility Study (FS) phase, which involved risk evaluation, data interpretation, and evaluation of alternatives for the remediation of groundwater.

The operable unit addressed in this NEPA Values Assessment, OU-3, consists of groundwater in the area located south and east of the JPL facility known as the Monk Hill Subarea of the

Raymond Basin watershed. OU-1 (all on-facility groundwater) and OU-2 (all on-facility vadose zone soil) are addressed separately from OU-3, and not in this NEPA Values Assessment.

1.2 Purpose and Need

Under CERCLA, NASA must determine the appropriate action to remediate VOCs and perchlorate in groundwater at the area known as OU-3. This document accompanies CERCLA documentation for OU-3 and serves to integrate NEPA values into the CERCLA process for the response action. Specifically, this assessment ensures that there are no statutory conflicts associated with the selected remedy between CERCLA and NEPA values.

1.3 Applicable Statutes and Regulations

This section discusses the federal, state, and local environmental statutes and regulations that are applicable or relevant and appropriate requirements (ARARs) to the response action at OU-3.

1.3.1 National Environmental Policy Act of 1969, as Amended

This document is prepared in compliance with NEPA, as amended, and the Council on Environmental Quality Regulations for Implementing NEPA (40 Code of Federal Regulation [CFR] Parts 1500-1508). It is prepared to comply with NEPA through the assessment of selected NEPA values associated with the remediation of OU-3 at JPL.

1.3.2 Chemical-Specific ARARs

Federal Safe Drinking Water Act and Federal Maximum Contaminant Levels (MCLs). Treated water intended for potable use must comply with the Federal ARARs associated with domestic use (federal MCL for tetrachloroethene, trichloroethene and carbon tetrachloride in drinking water as promulgated by U.S. EPA under the Safe Drinking Water Act at 40 CFR § 141.61[a] and [c]).

California Safe Drinking Water Act and State MCLs. California has established standards to sources of public drinking water, under the California Safe Drinking Water Act of 1976 (Health and Safety Code Section 4010.1 and 4026[c]) and state MCLs for organic chemicals are set forth in California Code of Regulations (CCR) title 22, Section 64444. Some state MCLs are more stringent than the corresponding federal MCLs, as is the case with carbon tetrachloride. In these instances, the more stringent state MCLs are applicable to the response action at JPL. NASA has determined that the substantive provisions of the standards in CCR title 22, Section 64444 are relevant and appropriate because VOCs will be remediated to a level expected to protect groundwater quality.

California Public Health Goals. A Federal or State MCL for perchlorate has not been set. However, the California Health and Safety Code §116365(a) requires the Department of Health Services (DHS) to set MCLs at a level as close as is technically and economically feasible to its Public Health Goal (PHG). The PHG is established by the California Office of Environmental Health Hazard Assessment (OEHHA) and is the concentration in drinking water that does not pose any significant risk to health derived from a human health risk assessment. OEHHA established a final PHG for perchlorate of 6 µg/L in March 2004 and, more recently, DHS has

proposed to set the California MCL at 6 µg/L. On January 26, 2006, the EPA issued guidance that the recommended preliminary remediation goal for perchlorate be 24.5 µg/L. The preliminary remediation goal is not a drinking water standard, but it is a chemical-specific value to be considered by NASA. However, until a standard is established, the treatment plant would meet the State PHG, which is currently 6 µg/L. Once the final drinking water standard is established, all treatment plants will meet that level for perchlorate removal.

Resource Conservation and Recovery Act (RCRA) Hazardous Waste Identification Criteria. These criteria are promulgated by the federal government to define RCRA hazardous waste. An RCRA hazardous waste is a waste that appears on one of the four hazardous waste lists (F-list, K-list, P-list, or U-list), or exhibits at least one of four characteristics (of hazardous waste) − ignitability, corrosivity, reactivity, or toxicity. Hazardous waste is regulated under RCRA Subtitle C. This requirement may apply to ion exchange and liquid-phase granular activated carbon (LGAC) media, which will be removed after each has become loaded with chemicals. All spent media will be characterized in accordance with RCRA and will be disposed of accordingly.

Non-RCRA (California) Hazardous Waste Identification Criteria. These criteria are promulgated by the State of California to define non-RCRA (California) hazardous waste. A non-RCRA (California) hazardous waste can be identified as a listed waste, or as a waste that exhibits hazardous characteristics − ignitability, corrosivity, reactivity, and toxicity. This requirement may apply to ion exchange and LGAC media, which will be removed after each has become loaded with chemicals. All spent media will be characterized in accordance with California hazardous waste requirements and will be disposed of accordingly.

1.3.3 Action-Specific ARARs

South Coast Air Quality Management District Rules. Fugitive dust must be controlled during construction to comply with South Coast Air Quality Management Board (SCAQMD) Rules 401 and 403. No other SCAQMD rules apply since VOCs and perchlorate are removed prior to discharge into the Windsor Reservoir, a covered reservoir open to the atmosphere. In addition, the treatment system will be completely contained within piping and vessels, and no emissions will be associated with the system. Dust control measures will be taken during system construction so as to maintain compliance with the SCAQMD rules.

DHS Policy Memo 97-005. *Policy Memo 97-005: Policy Guidance for Direct Domestic Use of Extremely Impaired Sources* provides guidance by which DHS would evaluate proposals, establish appropriate permit conditions, and approve the use of a source for any direct potable use within a CERCLA operable unit. According to DHS policy, drinking water downgradient of the JPL facility is considered an "extremely impaired source" because it meets the following criteria as quoted in the policy: (1) a chemical exceeds three times its associated MCL or Notification Level based on acute health effects; and (2) the drinking water is considered threatened due to the proximity to known chemicals in the groundwater from the JPL facility. This policy requires additional documentation from the City of Pasadena prior to restoring use of the drinking water supply wells.

CERCLA Offsite Rule. Another action-specific ARAR is the CERCLA offsite rule for waste disposal. The offsite rule (40 CFR §300.440) applies to any response action involving the offsite transfer of CERCLA wastes. Therefore, the offsite rule will apply to disposal of spent resin and LGAC associated with the LAWC and City of Pasadena treatment systems. The purpose of the offsite rule is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound (preamble to final Off-Site Rule, 58 *Federal Registrar* 49200, 49201, Sept. 22, 1993). Therefore, all waste will be disposed of at a facility that is permitted to accept waste from the CERCLA site.

1.3.4 Location-Specific ARARs

There are no Location-Specific ARARs associated with the selected remedy under CERCLA. Because the Windsor Reservoir is located within the city limits of Pasadena, as part of the new plant construction, the City of Pasadena will obtain local permits prior to constructing the new treatment facility. These include a Conditional Use Permit and a Building Permit. LAWC complied with the construction permitting requirements of the County of Los Angeles when it built its treatment plant in 2004.

In addition, the California Environmental Quality Act (CEQA) requires that the City of Pasadena evaluate the selected remedy based on potential impacts to the following environmental factors: aesthetics, biological resources, hazards and hazardous materials, mineral resources, public services, utilities/service systems, agricultural resources, cultural resources, hydrology/water quality, noise, recreation, air quality, geology/soils, land use/planning, population/housing, and transportation/traffic. This process ensures that work is conducted in such a way that environmental impacts associated with the treatment plant are minimized.

In 1944, the Superior Court of California approved the Raymond Basin Judgment, which adjudicated the rights to groundwater production to preserve the safe yield of the groundwater basin. Adjudication refers to the practice of landowners and other parties allowing the courts to settle disputes over how much groundwater can rightfully be extracted. In an adjudicated groundwater basin, the court appoints a Watermaster to administer the court judgment and determine an equitable distribution of water that will be available for extraction each year. The Raymond Basin Management Board, made up of representatives of the water purveyors, oversees the management and protection of the Raymond Basin. A total of six Raymond Basin water purveyors, including the City of Pasadena and LAWC, operate wells in the Monk Hill Subarea. The City of Pasadena and LAWC will continue being subjected to the extraction, reporting, and monitoring requirements associated with the Raymond Basin Judgment.

2: SELECTED REMEDY

During the OU-1/OU-3 RI, several VOCs were detected frequently at elevated concentrations in groundwater samples. In addition, perchlorate was detected frequently at elevated concentrations. The *Final Remedial Investigation Report for Operable Unit 1 and 3 On-site and Off-site Groundwater* (Foster Wheeler Environmental Corporation [FWEC], 1999) contains detailed information and data for all of the environmental media samples taken in the characterization of OU-3.

Under the selected remedy, NASA will fund the installation and operation of an aboveground treatment facility to remove perchlorate and VOCs from the aquifer used by four City of Pasadena drinking water wells (Windsor, Arroyo Well, Well 52, and Ventura Well). NASA will also continue funding an existing treatment plant for two LAWC wells. This approach is referred to as centralized treatment because groundwater pumped from the wells will be treated after the water is drawn from the wells and prior to use by City of Pasadena and LAWC customers. This combined alternative (i.e., the two centralized treatment systems) is preferred by NASA because it would support the final remedial outcome of removing the target chemicals from the groundwater in an aquifer being used by the local community (i.e., the City of Pasadena and LAWC) for drinking water. In addition, treatment allows for the immediate use of groundwater as a drinking water source, thereby restoring the beneficial use of the aquifer.

NASA will directly administer the work associated with designing, permitting, and construction of the new City of Pasadena treatment facility. The facility will be located adjacent to the Windsor Well and Windsor Reservoir (see Figure E-1) (NASA, 2006). The City of Pasadena will be funded by NASA to lease treatment equipment and operate the system. Groundwater from four City of Pasadena drinking water wells will be cleaned in this new treatment facility using a LGAC system to remove VOCs, and an ion exchange system to remove perchlorate. NASA will also continue to fund groundwater monitoring activities.

The new City of Pasadena treatment facility is expected to have a footprint of approximately 100 ft by 150 ft and be less than 25 ft tall at its highest point. Construction activities will last approximately 3 to 4 months, assuming no interruptions. During construction, daily deliveries of equipment and construction materials are expected. During operations, three to four deliveries per month of LGAC and/or ion exchange resin are expected. The system is estimated to operate for 18 years based on groundwater modeling predictions.

As a result of public concerns regarding aesthetics and noise, a team of landscape architects are developing landscaping alternatives to improve the streetscape aesthetics at the Windsor Reservoir treatment facility. These efforts involve developing a conceptual plan for the appearance of the site, including specific plant types, designs, and drawings of how various landscaping approaches might appear from Windsor Avenue and the surrounding neighborhood. These drawings will likely include a winding walkway, newly planted shrubs, and additional trees along the Windsor frontage. Prior to installation of the landscaping, these details will be provided to local residents. The City of Pasadena intends to discuss the landscape plan on an informal basis with residents, and receive resident input on their preferences and plant selections.

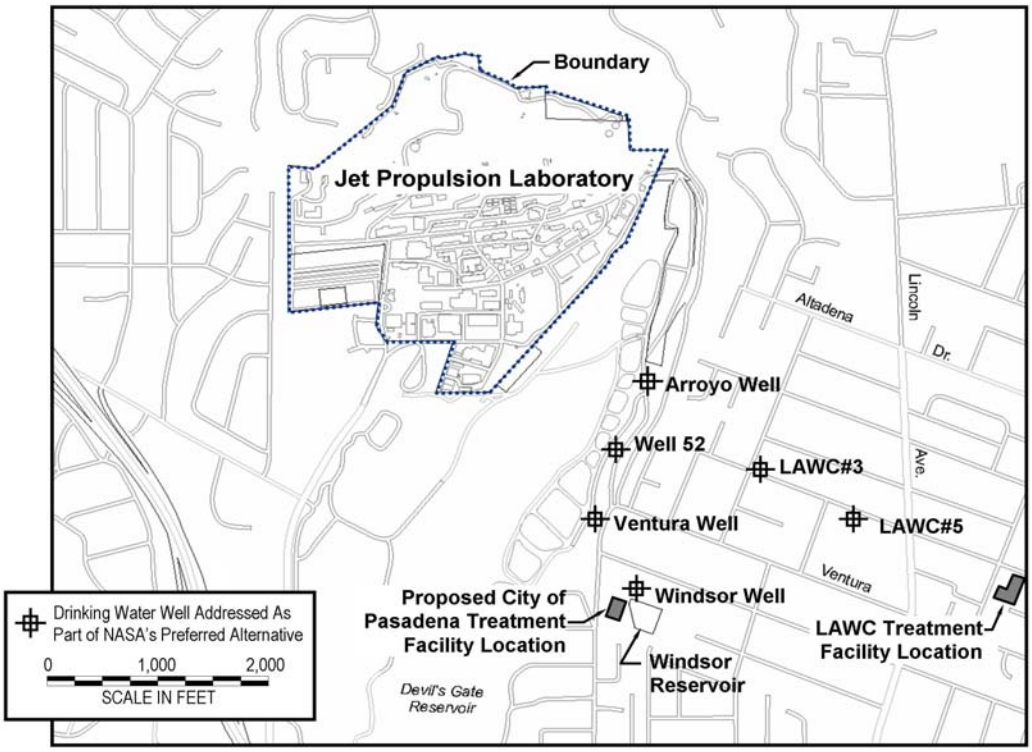


Figure 1. Map Depicting the Location of the City of Pasadena and LAWC Treatment Systems

A traffic management plan also will be an integral component of the project planning phase. The traffic management plan will include an evaluation of trucking routes to minimize the impacts on the neighborhood. Other measures will include adequate signage, a traffic monitor, and potential alterations to the roadway near the access to the site. Project-related traffic during construction will travel down Windsor Avenue.

Reducing noise levels will be a priority design consideration during the planning stages of the project. Acoustical controls will be used to mitigate and minimize noise resulting from the system so as to reduce impacts to the community. Acoustical controls consist of using materials that absorb sound waves to minimize the noise heard offsite. Most likely, acoustical materials will be used to enclose the sound generating components of the system. Also, if necessary it will be possible to construct barriers that will prevent a majority of noise from being transmitted into the neighborhood. At a minimum, the Windsor Reservoir treatment facility will comply with noise standards required by the City of Pasadena. For a residential area, such as the Windsor Reservoir site, operational noise levels will comply with the relevant requirement, which are 45 dB between 10 PM and 7 AM and 50 dB between 7 AM and 10 PM. These noise levels are comparable to background noise heard in an urban setting during the day.

The facility, including its structural components (i.e., piping and vessels), will be designed and constructed to ensure stability during periods of seismic activity and protection in inclement weather. In addition, sensors will be incorporated into the facility design. These sensors will be used to transmit pertinent operational information during facility operation. The sensor network

will be programmed so that the facility can automatically shut down in the event of any potential problems. In addition, valves will be installed throughout the facility. These valves can be opened or closed, thus allowing or preventing water from flowing in the event of any potential problems.

3: AFFECTED ENVIRONMENT

The JPL site is located within the San Gabriel Valley, in the eastern part of Los Angeles County. It is located between the city of La Cañada-Flintridge and the unincorporated city of Altadena, California, northeast of the 210 Foothill Freeway near Pasadena. OU-3 consists of groundwater in the area located south and east of the JPL facility, known as the Monk Hill Subarea of the Raymond Basin. Figure E-2 is a map of JPL and the surrounding area.

JPL is situated on a south-facing slope along the base of the southern edge of the east-west trending San Gabriel Mountains at the northern edge of the metropolitan Los Angeles area. The Arroyo Seco, an intermittent streambed, lies immediately to the east and southeast of JPL. Within the Arroyo Seco is a series of surface impoundments used as surface water collection and spreading basins for groundwater recharge. Residential development, an equestrian club (Flintridge Riding Club), and a Los Angeles County Fire Department Station (Fire Camp #2) border the JPL along its southwestern and western boundaries. Residential development also is present to the east of JPL, along the eastern edge of the Arroyo Seco.

3.1 Land Use

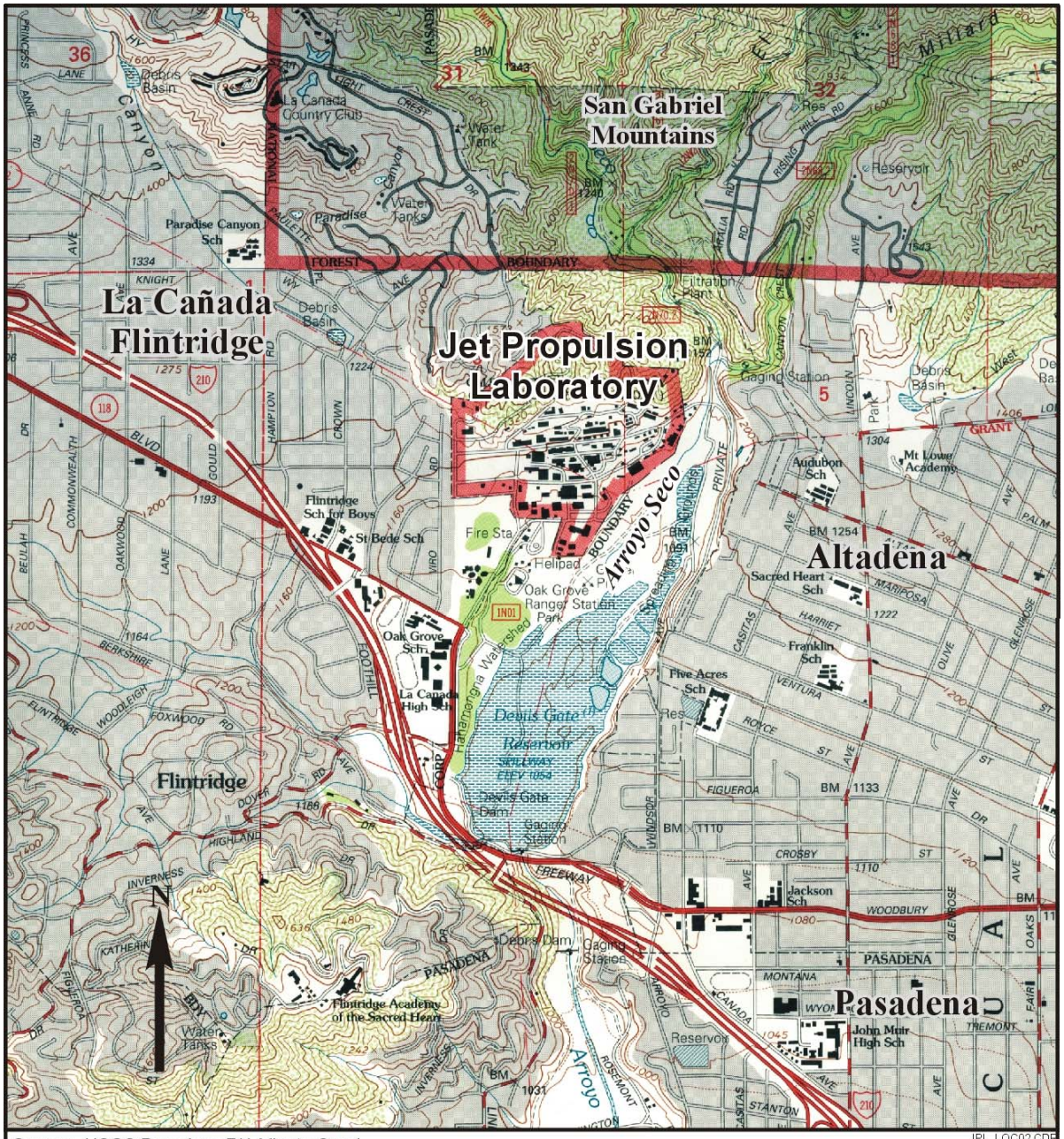
JPL comprises about 176 acres of land. Of these 176 acres, about 156 acres are federally owned. The remaining land is leased for parking from the City of Pasadena and the Flintridge Riding Club. The main developed area of JPL is the southern half, which can be divided into two general areas − the northeastern, early-developed area and the southwestern, later-developed area. Most of the northern half of JPL is not developed because of steeply sloping terrain.

The primary land use in the area of OU-3 is residential and light commercial. Industrial areas, such as manufacturing, processing, and packaging, are limited. The closest residential properties are those located along the western fence line of JPL. The nearest off-facility buildings are the Flintridge Riding Club and Fire Camp #2, both located approximately 100 yards from the southern border of JPL. The total number of buildings within two miles of JPL is about 2,500, primarily residential and community (e.g., schools, day-care centers, churches).

3.2 Regional Demographics

Based on the United States Census of 2000, the total population residing within 1 mile of JPL is 9,500 people. The population residing within 2 miles of JPL is 22,500 people, and the population residing within 3 miles is 44,000.

In 2001, the JPL workforce consisted of approximately 5,175 employees and contractors. Major sources of employment in the area surrounding JPL are office, retail, and service centers, primarily located within Pasadena. Residents of Altadena and La Cañada-Flintridge are generally employed outside their home community, except those conducting retail businesses or professional services for their respective communities.



Source: USGS Pasadena 7½-Minute Quad, 1995.
Note: (1) Devil's Gate Reservoir is dry most of the year.

Figure 2. Map of JPL and Surrounding Area

In 2000, the population of Pasadena was approximately 133,936 and was broken down into the following demographics: 71,469 Caucasian; 19,319 Black or African-American; 952 American Indian; 13,399 Asian; 132 Pacific Islander; and 28,665 multiracial or other ethnic group.

In 2000, the population of Altadena was approximately 42,610 and was broken into the following demographics: 20,156 Caucasian; 13,388 Black or African-American; 247 American Indian; 1,807 Asian; 56 Pacific Islander; and 6,956 multiracial or other ethnic group. In 2000, the population of La Cañada-Flintridge was approximately 20,318 and was broken into the following demographics: 15,142 Caucasian; 73 Black or African American; 36 American Indian; 4,180 Asian; 9 Pacific Islander; and 878 multiracial or other ethnic group.

According to the United States Census of 2000, 33.4% of the Pasadena population identified their ethnic group as Hispanic, while 20.4% of Altadena residents and 4.8% La Cañada-Flintridge residents identified themselves as Hispanic.

3.3 Meteorology and Climatology

The San Gabriel Valley has a semi-arid Mediterranean climate characterized by mild, relatively rainy winters and warm, dry summers. Rainfall in the area is variable, although it typically averages about 15 inches per year overall (Boyle Engineering, 1988). Rainfall in the vicinity of JPL is slightly higher than for the City of Los Angeles, averaging about 20 inches per year. The higher amount of rainfall near JPL results from the orographic effects generated along the southern slope of the San Gabriel Mountains. Roughly 80% of the precipitation occurs between the months of November and April.

Temperatures in the San Gabriel Valley are relatively mild, with August typically being the warmest month and January the coolest. Extremes for the area range from about 30°F in January to 105°F during the summer months. Wind patterns change seasonally in both strength and direction in response to normal seasonal variations in barometric pressure systems. Generally, winds are mild throughout the year, characterized by ocean breezes (onshore) during the day and land breezes (offshore) at night.

Occasionally during the fall, the area is affected by the Santa Ana winds. These winds occur as a result of strong high-pressure systems moving into parts of Nevada and Utah, creating strong, hot, dry winds from the northeast. Santa Ana windspeeds through Arroyo Seco have reached more than 100 miles per hour.

3.4 Geology and Seismology

This section discusses the geology and seismology of the area surrounding JPL. Figure E-3 is a map of the regional geology and physiography. Figure E-4 is a geologic map of JPL and the surrounding area.

JPL is located immediately south of the southwestern edge of the San Gabriel Mountains (see Figure E-3). The San Gabriel Mountains, together with the San Bernadino Mountains to the east and the Santa Monica Mountains to the west, make up a major part of the east-west trending

Transverse Ranges province of California. This province is dominated by north-south compressional deformation.

The San Gabriel Mountains are primarily composed of crystalline basement rocks. These rocks range in age from Precambrian to Tertiary and include various types of diorites, granites, monzonites, and granodiorites with a complex history of intrusion and metamorphism (Dibblee, 1982). The northwest part of the San Gabriel Valley, near JPL, is composed of about 1,500 to 2,000 ft of Cenozoic alluvial-fan deposits that unconformably overlie the crystalline basement complex exposed in the San Gabriel Mountains (Smith, 1986). These alluvial deposits typically consist of poorly sorted, coarse-grained sands and gravels, with some finer sand and silty material. Clasts within the alluvial deposits range from silt size to boulders more than 3 ft in diameter.

Periodic tectonic uplift of the San Gabriel Mountains has occurred during the past 1 to 2 million years. This uplift is responsible for the present topography of the area (Smith, 1986). Most of this uplift has occurred along north- to northeast-dipping reverse and thrust faults located along the south to southwest edges of the San Gabriel Mountains. This system of faults along the southern edge of the San Gabriel Mountains is the Sierra Madre Fault system. The Sierra Madre Fault system separates the San Gabriel Mountains to the north from the San Gabriel Valley to the south.

3.5 Hydrology

This section discusses the hydrology of JPL and the surrounding area. JPL is located in the northwest part of the Raymond Basin watershed (see Figure E-3).

3.5.1 Surface Water

There are no permanent surface water bodies within the boundaries of JPL. The northernmost part of JPL consists of Gould Mesa, a flat-topped southern promontory of the San Gabriel Mountains that rises 300 ft above the main part of the JPL complex. The remainder of JPL is moderately sloped and has been graded extensively throughout its development. The Arroyo Seco Creek intermittently flows through the Arroyo Seco wash on the east side of JPL. Within the Arroyo Seco, a series of surface impoundments are used as surface water collection and spreading basins for groundwater recharge.

3.5.2 Groundwater

The San Gabriel Valley contains distinct groundwater basins, including the Raymond Basin, where JPL is located (see Figure E-3). The Raymond Basin is bordered on the north by the San Gabriel Mountains, on the west by the San Rafael Hills, and on the south and east by the Raymond Fault. The Raymond Basin provides an important source of potable groundwater for many communities in the area around JPL, including Pasadena, La Cañada-Flintridge, San Marino, Sierra Madre, Altadena, Alhambra, and Arcadia.

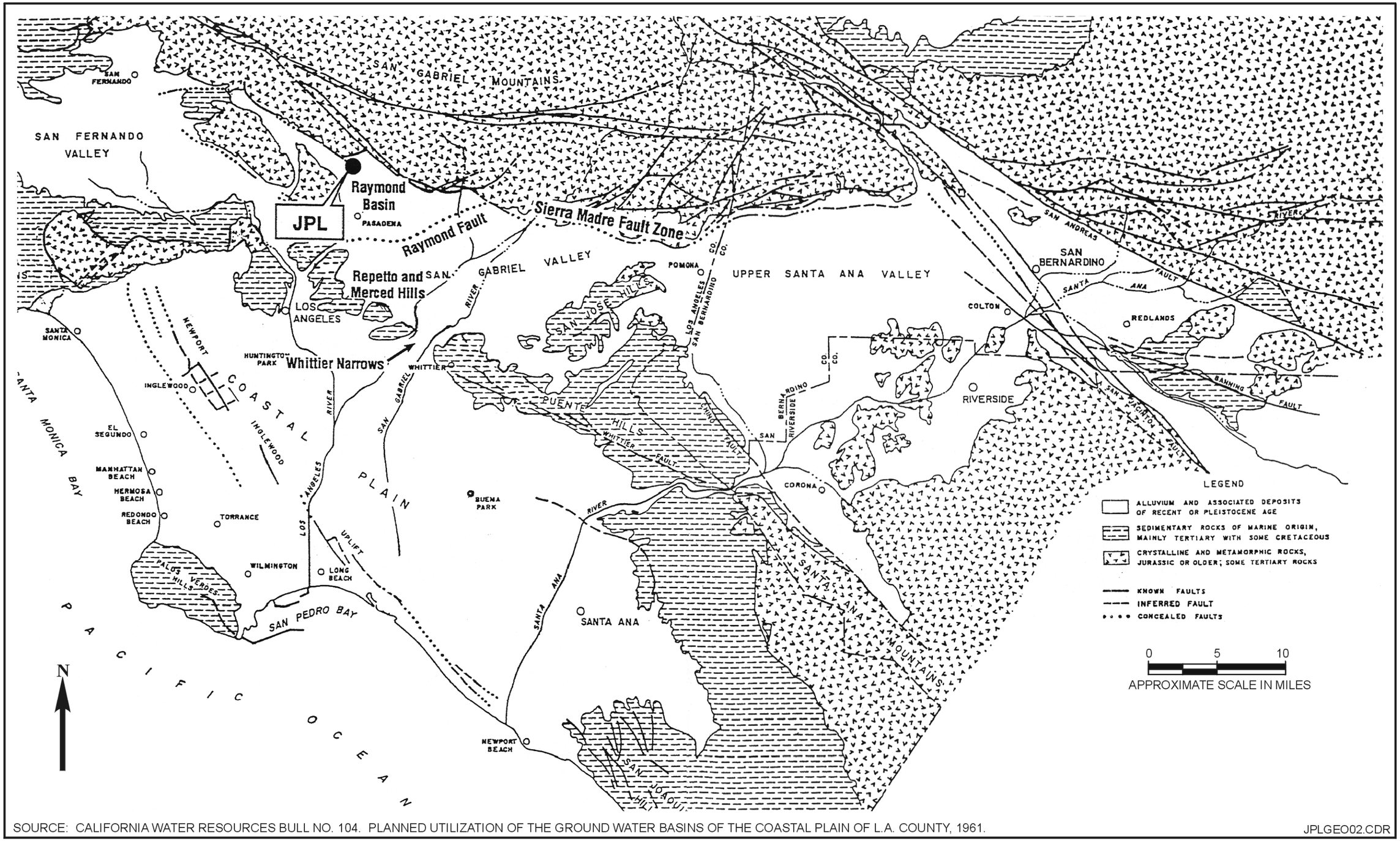


Figure 3. Map of Regional Geology and Physiography

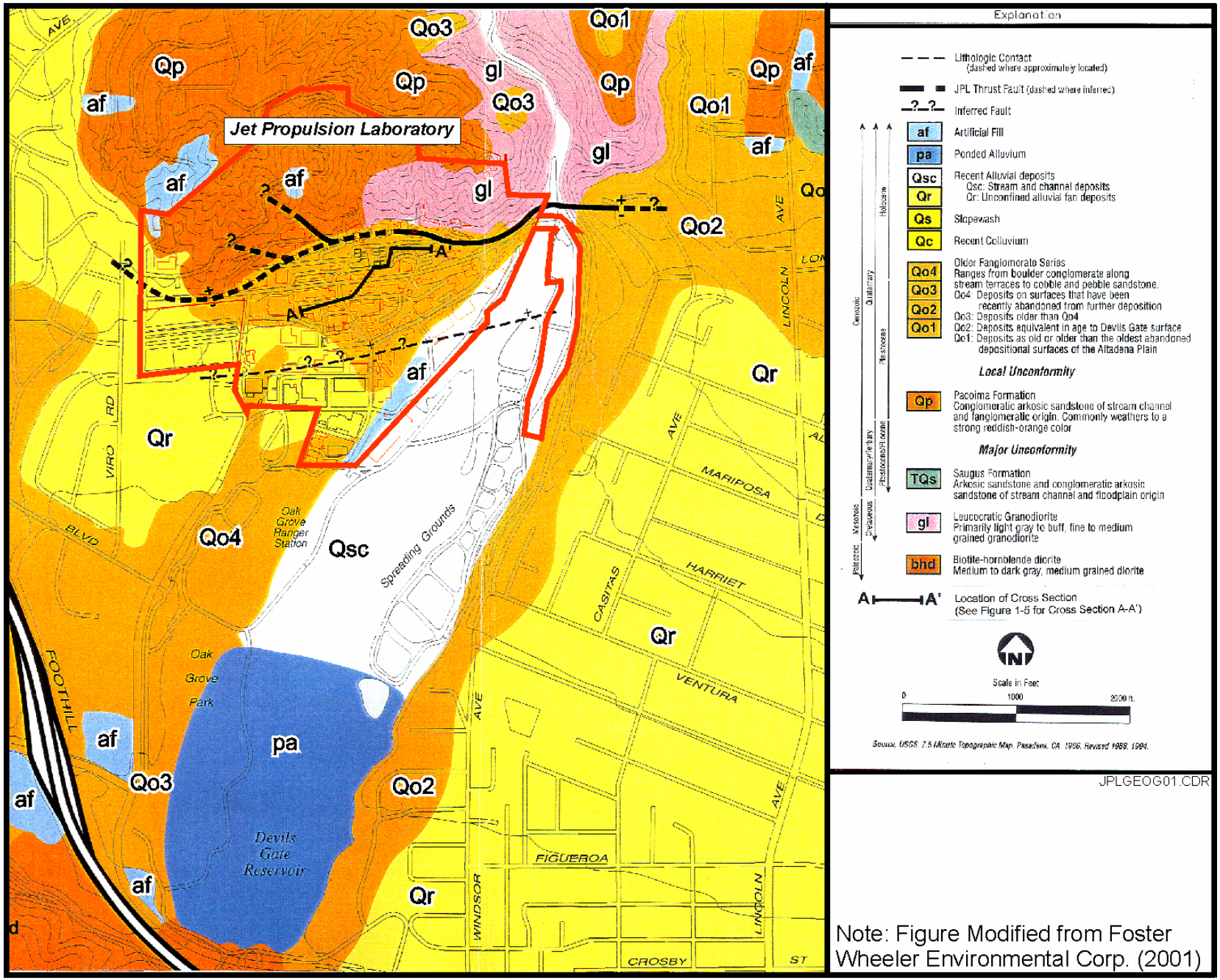


Figure 4. Geologic Map of the JPL and Surrounding Area

North of the JPL Thrust Fault (see Figure E-4), groundwater primarily occurs in joints and fractures in the bedrock. Because the bedrock is of low porosity, it is considered non-water-bearing. South of the JPL Thrust Fault, groundwater occurs in alluvial deposits.

The aquifer below JPL consists of four layers that are separated by noncontiguous, low-permeability silt layers (see Figure E-5). Layer 1 consists of the upper 75 to 100 ft of saturated alluvium. Layer 2 underlies Layer 1 and is about 150 to 200 ft thick. Layer 3 is about 200 to 300 ft thick and generally overlies crystalline basement rock beneath JPL. Layer 4 occurs only at the far eastern end of JPL, is about 150 ft thick, and rests on crystalline basement rocks.

Depth to groundwater at JPL ranges from 22 ft bgs to 270 ft bgs. This wide range of depth to water is attributed to steep topography in the northern part of the site and to seasonal groundwater recharge. The depth to groundwater under most of the JPL complex averages approximately 200 ft.

3.6 Natural and Ecological Resources

JPL is located along the northern edge of the San Gabriel Valley in the central part of Los Angeles County. The San Gabriel Valley is bound to the north by the San Gabriel Mountains, which consist of relatively steep, rocky ridges with numerous canyons. The northernmost part of JPL consists of Gould Mesa, a flat-topped, southern promontory of the San Gabriel Mountains that rises 300 ft above the main JPL complex. Chaparral covers the convex slopes of the mesa in this part of JPL as well as the upland banks of the Arroyo Seco, east of JPL.

The Arroyo Seco, which borders the east side of JPL, is about 1,000 ft wide. It contains mostly riparian and desert wash habitat, interspersed with chaparral. The Arroyo Seco Creek intermittently flows through the Arroyo Seco wash. The Arroyo Seco collects runoff from the north, east, and west. Several groundwater recharge ponds are located on the east side of the Arroyo Seco and west of the extended parking area (see Figure E-4). Groundwater beneath the Arroyo Seco is a current source of drinking water.

Riparian areas are located directly northeast and east of the JPL along the Arroyo Seco Creek. Riparian trees are thicker at the drain outfalls on the eastern boundary of JPL, where runoff from landscaped areas and pavement is year-round. However, there are no forest resources at JPL.

The predominant habitat type at JPL is urbanized landscape, with paved roads, parking lots, and buildings. Vegetation used in landscaping includes native and non-native plant species.

Species of special concern that potentially occur in the vicinity of JPL include the southwestern arroyo toad, the southwestern pond turtle, the San Diego horned lizard, the peregrine falcon, the bank swallow, the western yellow-billed cuckoo, and the least Bell's vireo. These species were identified using the California Department of Fish and Game Natural Diversity Database (California Department of Fish and Game, 1995) and the California Native Plant Society's list of rare, threatened, or endangered plant species (Skinner and Paulik, 1994). However, none of these species has been identified at the JPL site. If necessary, consultation under Section 7 of the Endangered Species Act will be directly undertaken with the U.S. Fish and Wildlife Service.

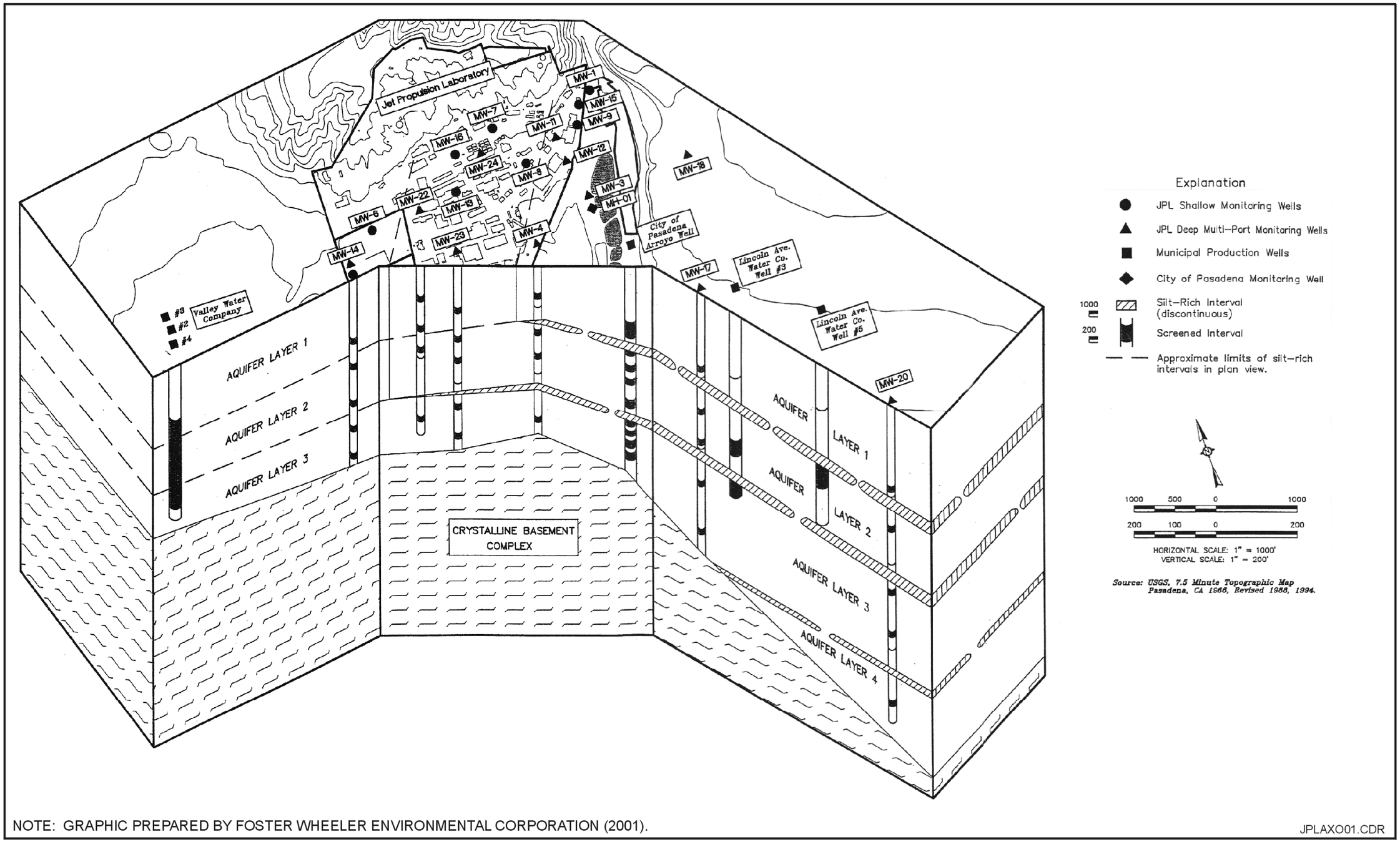


Figure 5. Conceptual Model of JPL Aquifer Layers

3.7 Archaeological and Cultural Resources

NASA has an obligation to determine whether any building, structure, or object listed or eligible to be listed on the National Register of Historic Places would be affected by the OU-3 response action. It also has the obligation to determine whether any historical or archaeological data could be destroyed through alteration of terrain as a result of implementation of the selected response action.

Because the Windsor Reservoir site has historically been used for drinking water distribution activities and because the LAWC treatment system has already been constructed, it is unlikely that property with historic, architectural, archaeological, or cultural value will be affected by the selected response action. However, a historical, archaeological, architectural, and cultural resource review will be conducted prior to implementation of the selected remedy if deemed necessary during permitting activities.

4: NEPA VALUES ASSESSMENT OF SELECTED REMEDY

The results of groundwater investigations conducted in OU-3 at JPL revealed the presence of VOCs and perchlorate above drinking water standards. These chemicals are currently impacting a drinking water aquifer; therefore, the following remedial action objectives were established:

- Remove target chemicals from the aquifer by treating water pumped from specified drinking water wells in the Monk Hill Subarea of the Raymond Basin;
- Prevent further migration of the chemicals in groundwater;
- Provide additional data to assess possible long-term cleanup remedies for groundwater both on and off the JPL facility.

Under the selected remedy, a new treatment facility will be constructed for treatment of groundwater from four City of Pasadena drinking water wells (Windsor, Arroyo Well, Well 52, and Ventura Well) located in the Monk Hill Subarea. In addition, the LAWC treatment system will continue to operate. Both systems will utilize ion exchange for treatment of perchlorate and LGAC for treatment of VOCs.

Air emissions from ion exchange treatment of perchlorate and LGAC treatment of VOCs will be limited to possible dust generation during the construction of concrete pads and associated piping. The dust generation during construction will be minimal and occur over a short duration; therefore, these emissions are expected to have negligible impacts on local air quality. The VOCs and perchlorate in the extracted groundwater will be removed by an aboveground treatment system in accordance with state and local ARARs (see Section E.1.2). These ARARs ensure protection of human health and the environment.

Facility installation and operation of the ion exchange LGAC treatment equipment will also result in negligible impacts. The proposed treatment facility will be designed and installed in a manner that will minimize impact to any vegetated areas of the project site. No clearing, grubbing, and/or removal of vegetation within or adjacent to the Arroyo Seco Master Plan Area will be conducted. Vegetation needing removal from the project site will be replaced with vegetation of an equal or greater canopy. Given the size of the aboveground system, the net impact to wildlife species will be negligible.

Solid waste, consisting of spent resin from the ion exchange treatment system and spent carbon from the LGAC treatment system, will be transported and disposed of offsite. Thus, implementation of the selected remedy will have negligible impacts and, during operation, will be protective of human health and the environment.

Moreover, because groundwater will be pumped from the subsurface and treated using ion exchange and LGAC treatment systems, perchlorate and VOCs will be permanently removed from the groundwater. Migration of chemicals will be prevented by hydraulic control, resulting in long-term environmental protection.

4.1 Socioeconomic Impacts

The installation of the ion exchange and LGAC treatment equipment for the City of Pasadena centralized treatment facility is expected to employ a minimum of six people on a short term basis (less then four months). Operation and maintenance of both the City of Pasadena and LAWC systems is expected to be conducted by existing staff. A treatment equipment vendor would be contracted to provide leased equipment and replace the ion exchange resin and granular activated carbon. These numbers are small compared to the total present employment at JPL (approximately 5,175), as well as employment at local businesses and industries in the surrounding area. Therefore, no measurable impact on the local economy would be expected and the socioeconomic impacts would be negligible.

4.2 Transportation Impacts

Three major freeways serve the Pasadena, Altadena, and La Cañada-Flintridge communities (see Figure E-2). The Pasadena Freeway (California Route 110) connects Pasadena to Los Angeles. The Foothill Freeway (Interstate 210) links communities to the north and east of Pasadena. The Ventura Freeway (U.S. Route 134) leads to Ventura County and beyond.

The response action for OU-3 at JPL under the selected remedy will create a small, short-term increase in traffic flow to and from the Windsor Reservoir as a result of the movement of equipment and materials during construction and periodic resin and/or carbon placement. However, based on current traffic volume in the Pasadena area, including traffic associated with the 5,175 JPL employees and various activities, the increased traffic associated with remediation efforts under the selected alternative would be negligible.

Most of the traffic around JPL is associated with morning and evening rush hours, 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m. Most of the traffic associated with the movement of equipment and supplies for the selected alternative will not be present at those peak periods of traffic flow. Further, all truck traffic associated with implementation of the selected alternative will be during daylight hours, which will further reduce the potential for accidents. Similarly, removal and transport of waste during daylight, non-rush hours are expected to have a negligible impact over the entire course of treatment.

4.3 Natural and Ecological Resources

Groundwater in the Monk Hill Subarea of the Raymond Basin is an important source of drinking water. The selected remedy for OU-3 treats water extracted from the four City of Pasadena drinking water wells (Arroyo Well, Well 52, Ventura Well, and Windsor Well) and two LAWC wells (LAWC #3 and LAWC #5) is expected to have a beneficial effect on groundwater near JPL.

The areal extent of VOCs and perchlorate in the groundwater and the proposed area for installation and operation of treatment system are located within previously disturbed and developed areas. These areas contain no wetlands and provide minimal wildlife habitat. The

proposed treatment system would be designed and installed in a manner that would minimize impact to any vegetated areas or ecological resources at the Windsor Reservoir site. Vegetation needing to be removed from the project site would be replaced with vegetation of an equal or greater canopy. Therefore, installation and operation of the treatment system is expected to have negligible impacts on vegetation and wildlife.

There is no floodplain or wetland involvement in the response action for OU-3; therefore, a floodplains/wetlands assessment is not required.

4.4 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. As described below, the risks from implementation of ion exchange and LGAC treatment for perchlorate and VOCs are low. Therefore, NASA expects little or no adverse human health affects from implementation of the selected alternative to occur in any off-facility community, including minority and low-income communities.

As part of the OU-1/OU-3 RI (FWEC, 1999), NASA conducted a human health risk assessment (HHRA) to determine the need for action to protect human health. The HHRA assessed cancer and noncancer risks associated with human exposure to untreated groundwater, which represents the only direct human exposure route at OU-3. Conservative assumptions with respect to VOCs, perchlorate, and other chemical concentrations in groundwater, exposure parameters, and toxicity ensured that the calculated risks were conservative. Exposure parameters included both commercial and residential land use scenarios, and risks were assessed for off-facility human receptors.

The results of the HHRA showed that the risks associated with exposure to groundwater are negligible and are within regulatory thresholds. In fact, the Agency for Toxic Substances and Disease Registry (ATSDR) has determined that on-facility and off-facility groundwater at JPL does not pose a present or future public health hazard because wellhead treatment and water blending are used by local water purveyors to meet drinking water standards prior to distribution of water for public use (ATSDR, 1998).

4.5 Irreversible and Irretrievable Commitment of Resources

The commitment of a resource is considered irreversible if primary or secondary impacts of the response action limit future options for the use of the resource. Under the selected remedy, groundwater would be treated using ion exchange and LGAC to remove perchlorate and VOCs. The primary objective of this treatment would be to remove the target chemicals from the groundwater and reduce the potential for further downgradient groundwater impacts. Thus, under the selected remedy, groundwater would be recovered as a resource. Implementation of

the selected remedy will result in the use of small amounts of construction materials, fossil fuels such as gasoline, and electricity.

4.6 Cost-Benefit Analysis

Costs associated with the selected action, centralized groundwater treatment for the specified City of Pasadena and LAWC drinking water wells, were presented in the Proposed Plan (NASA, 2006).

Costs associated with construction of the City of Pasadena treatment system include installation of a 7,000-gallon per minute ion exchange and LGAC system, production well rehabilitation, system design, and associated permitting. The estimated construction cost for the City of Pasadena treatment system is $3,171,400.

Operation and maintenance costs for the City of Pasadena treatment system and the LAWC treatment system include replacing activated carbon and ion exchange resin, system maintenance, sample analysis, and regulatory fees. The estimated annual operating cost for the City of Pasadena system is $3,080,900. Based upon costs incurred since July 2004, the estimated annual operating cost for the LAWC system is $923,500.

NASA and the regulatory authorities agree that the costs associated with ion exchange and LGAC treatment of perchlorate and VOCs in groundwater are justified because it supports the final remedial outcome of removing the target chemicals from the groundwater in an aquifer being used by the local community for drinking water and reduces the potential for further groundwater impacts due to continued migration of chemicals. Thus, the groundwater resource near JPL is recovered, as required under both the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Section 300.430(e)(2)(B)) and State of California regulations for the beneficial use of groundwater, including groundwater used as a source of drinking water.

5: CUMULATIVE IMPACTS

Minimal environmental impacts are expected from the implementation of the selected remedy. In particular, the selected remedy will have no significant adverse impacts on threatened or endangered species, floodplains, or wetlands. NASA expects no adverse impacts to cultural resources or human health. The selected remedy will slightly increase traffic on Windsor Avenue due to the transportation of equipment and supplies to and from the Windsor Reservoir during construction and operation of the treatment facility. There will be no measurable impact on the local economy as a result of the selected action and thus no socioeconomic impacts are anticipated. Also, under the selected alternative, there will be a minor irreversible and irretrievable commitment of resources due to the use of construction materials, fossil fuels, and electricity. The cost of remediation is justified to protect and restore the aquifer for use as a drinking water source.

NASA has examined the potential cumulative environmental impacts of the selected action in addition to other past, present, and reasonably foreseeable future actions at the site. NASA has initiated cleanup activities to address on-facility groundwater containing VOCs and perchlorate (OU-1) and has also implemented a response action for on-facility soil to address the VOCs in the vadose zone (OU-2), minimizing migration of chemicals to the groundwater resources located outside the JPL fence line. Remedial activities will continue to be conducted in accordance with all federal, state, and local regulations. NASA does not anticipate any cumulative environmental impacts from the activities conducted at JPL and remedial activities at OU-3. Rather, the remediation of OU-3, using ion exchange and LGAC for the treatment of perchlorate and VOCs, will have a positive impact on the environment by preventing chemical migration and by allowing beneficial use of the aquifer by the City of Pasadena and LAWC.

6: AGENCIES AND PERSONS CONTACTED

The Proposed Plan (NASA, 2006) for OU-3 states that the preferred alternative is the construction and operation of a centralized treatment system to remove target chemicals from four City of Pasadena drinking water wells in the Monk Hill Subarea. This also includes the continued funding of the LAWC treatment system and continued groundwater monitoring. NASA contacted and received approval for the Proposed Plan for OU-3 from the U.S. EPA, the California Department of Toxic Substances Control, California DHS, and the Regional Water Quality Control Board (Los Angeles Region). The Interim Record of Decision (ROD) documents that the preferred alternative identified in the OU-3 Proposed Plan is the selected remedy for OU-3. Public concerns were expressed during the public comment period (April 19, 2006 to July 7, 2006) and, in response to the public's concerns, NASA is implementing aesthetic and engineering controls to address concerns about aesthetic impacts, noise, and safety issues. These modifications/ additions to the selected remedy are summarized in Section E.2.

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