JET PROPULSION LABORATORY

SITE CONDITIONS

Presented by:
Charles L. Buril, P.E.
Manager, Environmental Affairs Office
Jet Propulsion Laboratory
May 31, 1995

JET PROPULSION LABORATORY EARLY ROCKET FUEL TESTING

1940'S WAS PRIMARILY LIQUID ROCKET FUELS

CHEMICALS INCLUDED:

- RED FUMING NITRIC ACID
- FLUORINE
- OXYGEN
- DIFLUORIDE
- ALCOHOL
- HYDRAZINE
- AMMONIA OF NITROGEN
- LIQUID HYDROGEN
- LIQUID OXYGEN
- DIBORANE
- OXYGEN DIFLUORIDE (OF2)
- CHLORINE PENTAFLUORIDE

ROCKETS WERE TYPICALLY VERY SMALL (1 TO 10 POUND THRUST)

TYPICALLY LESS THAN 100 GALLONS PER FIRING

EXHAUST WAS TYPICALLY SCRUBBED BEFORE DISCHARGE

TYPICAL BY PRODUCTS INCLUDED VARIOUS ACID AMMONIA, ETC. WHICH WERE NEUTRALIZED

JET PROPULSION LABORATORY EARLY ROCKET FUEL TESTING
(Continued)

1950'S WAS MORE SOLID ROCKET FUEL DEVELOPMENT

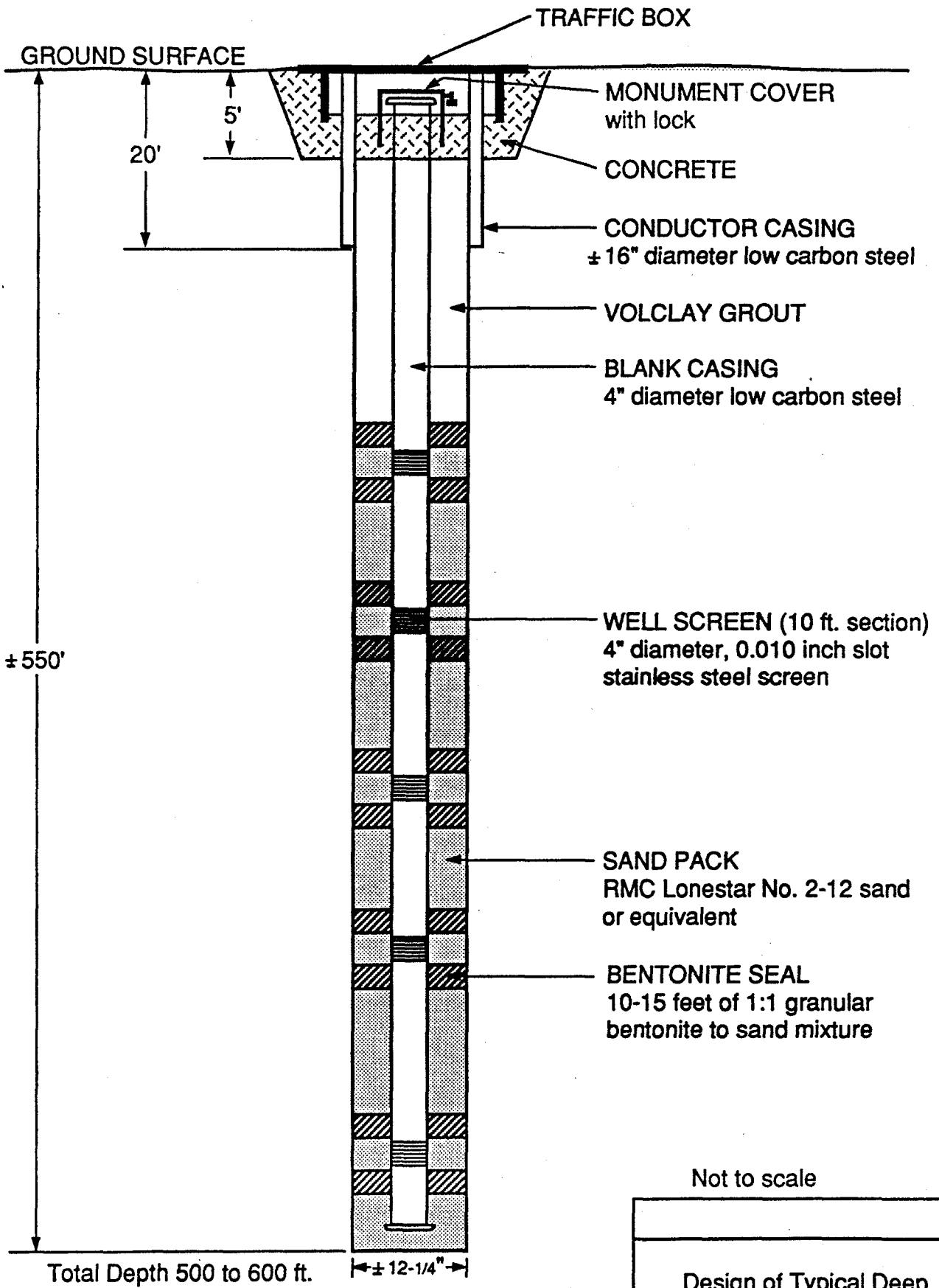
CHEMICALS INCLUDED:

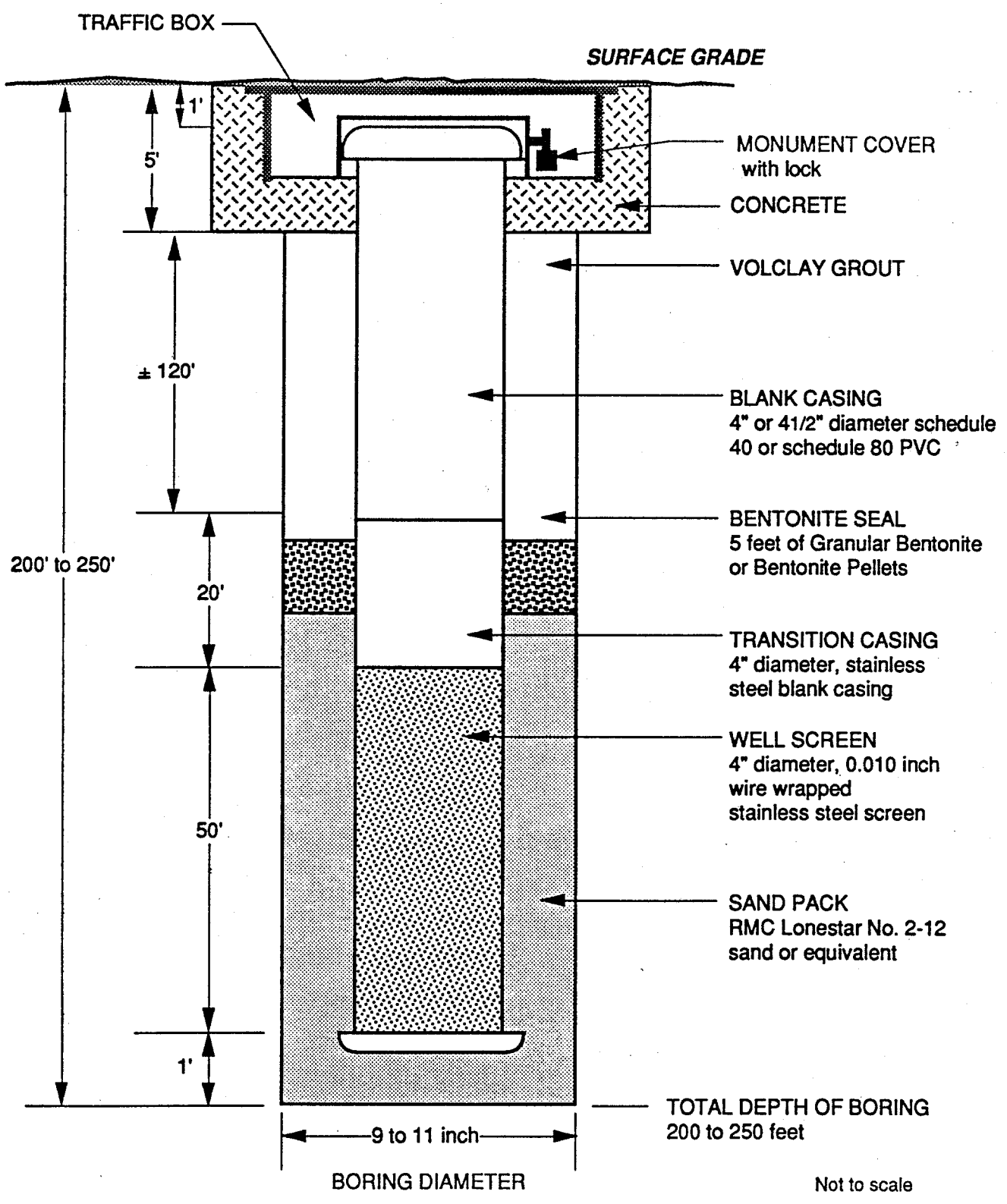
- ASPHALT BINDERS
- AMMONIUM PERCHLORATE
- POLYBUTADIENE ACRYLIC ACID
- AMMONIUM SULPHATE
- ALUMINUM
- SILICONE
- FLUORINE COMPOUNDS

EXHAUSTS WERE TYPICALLY GASEOUS WITH SOME PARTICULATE SILICONE DIOXIDE AND ALUMINUM OXIDES WERE POSSIBLE PARTICULATES

MAXIMUM ENGINE SIZE USED AT JPL WAS 30 POUNDS OF PROPELLANT

MOST WERE MUCH SMALLER


TRAFFIC BOX
GROUND SURFACE
MONUMENT COVER
with lock
5'
20'
CONCRETE
CONDUCTOR CASING
± 16" diameter low carbon steel
VOLCLAY GROUT
BLANK CASING
4" diameter low carbon steel
WELL SCREEN (10 ft. section)
4" diameter, 0.010 inch slot
stainless steel screen
± 550'
SAND PACK
RMC Lonestar No. 2-12 sand
or equivalent
BENTONITE SEAL
10-15 feet of 1:1 granular
bentonite to sand mixture
Not to scale
Total Depth 500 to 600 ft.
± 12-1/4"
Boring Diameter
Design of Typical Deep
Multi-Port Groundwater
Monitoring Well



Design of Typical Shallow Groundwater Monitoring Well

E 8&23

Environmental Cleanup REVIEW 4

Several important segments of work began in spring 1994 and are continuing this summer as the National Aeronautics and Space Administration's (NASA's) Jet Propulsion Laboratory (JPL) moves forward in the "Superfund" cleanup process. This fact sheet describes the work currently taking place or about to begin, as well as a brief summary of work completed thus far.

The Superfund Process

In October 1992, JPL was placed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List, a list of the most serious uncontrolled or abandoned hazardous waste sites that require remedial response under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). In popular language, JPL became a "Superfund site."

Previous fact sheets in this series describe the Superfund cleanup process in detail. This process consists of performing a preliminary assessment (PA), a site inspection (SI) and then a remedial investigation/feasibility study (RI/FS), before implementing the preferred cleanup alternative. Information gathered during the PA and SI is used to determine whether a release of hazardous substances has occurred and the nature of the threats associated with that release. If it is determined that further investigations are necessary, then an RI/FS will be performed at the facility.

NASA/JPL is currently in the RI/FS phase of the Superfund process. During the RI stage of the process, the facility will determine the nature and extent of the problem presented by the release through collection and analysis of soil and groundwater samples. After the collection of the appropriate data, the facility will perform an FS to develop and evaluate options for cleanup of the release.

NASA/JPL, with EPA and state agencies, has reviewed the cleanup project and agreed that it could be broken down into three parts, called "operable units." The first operable unit deals with groundwater contamination directly under the JPL site, and the investigation of the movement of these contaminants toward the Arroyo Seco. The second operable unit deals with possible soil contamination directly under the JPL site, which includes locating contaminant sources and defining the horizontal and vertical extent of soil contamination. The third operable unit deals with potential groundwater contamination that may have flowed eastward beyond the Arroyo Seco, as well as possibly to the south or west of JPL.

Areas encompassed by the three operable units include portions of Pasadena, La Cañada Flintridge and Altadena. The areas are shown on the map on page 2 of this fact sheet.

The first operable unit was the focus of Environmental Cleanup Review Fact Sheet No. 3, dated April 1994. The current fact sheet describes the second and third operable units in detail.

Operable Unit 2

Work in the second operable unit looks for sources of contamination by analyzing vapors in soil at potentially contaminated locations, and also by analyzing soil samples for suspected contaminants at those locations. Samples are collected at 10-foot (3-meter) intervals to a depth of 50 to 100 feet (15 to 30 meters), depending upon conditions (for example, depth to groundwater) encountered in the field.

The work is focusing on locations that were seepage pits during the 1940s and 1950s to dispose of various types of hazardous wastes (e.g., laboratory chemicals). Use of seepage pits was discontinued and the pits were filled in during the early 1960s. In all, there are 40 subsurface seepage pit locations, as well as 5 additional areas that are being investigated.

The soil vapor analysis method is being used at all of the locations, while soil samples are being collected for direct examination at 24 of the locations. At the remainder of the locations, soil samples are not obtainable because buildings or other facilities obstruct access to the soil.

All the soil gas samples and soil samples will be analyzed for contaminants including metals, volatile organic compounds and semivolatile organics, as described in plans approved by the EPA and by state environmental agencies.

Operable Unit 3

The investigation of the groundwater in Operable Unit 1 and Operable Unit 3 will determine if contaminants have moved offsite and their direction of movement, and define the extent of contamination. *(continued)*

Groundwater in the Arroyo Seco area typically flows under JPL toward the east or southeast, depending on the season of the year. Occasionally, the groundwater may flow to the south, or even reverse its direction, and is dependent on the amount of rainfall, water spreading and well pumping in the local area. To determine the direction of flow and thus the movement of contaminants in groundwater beneath the Arroyo Seco, it is necessary to place five wells to the south, east and southeast of JPL; this work makes up the project's third operable unit. Previous studies have shown groundwater was contaminated at the eastern side of the Arroyo Seco.

Four of the proposed wells will be located in neighborhoods directly east and southeast of the JPL site. The fifth is located in Oak Grove Park, near La Cañada High School. The map below shows these well locations (MW-17, MW-18, MW-19, MW-20 and MW-21).

Investigative Techniques

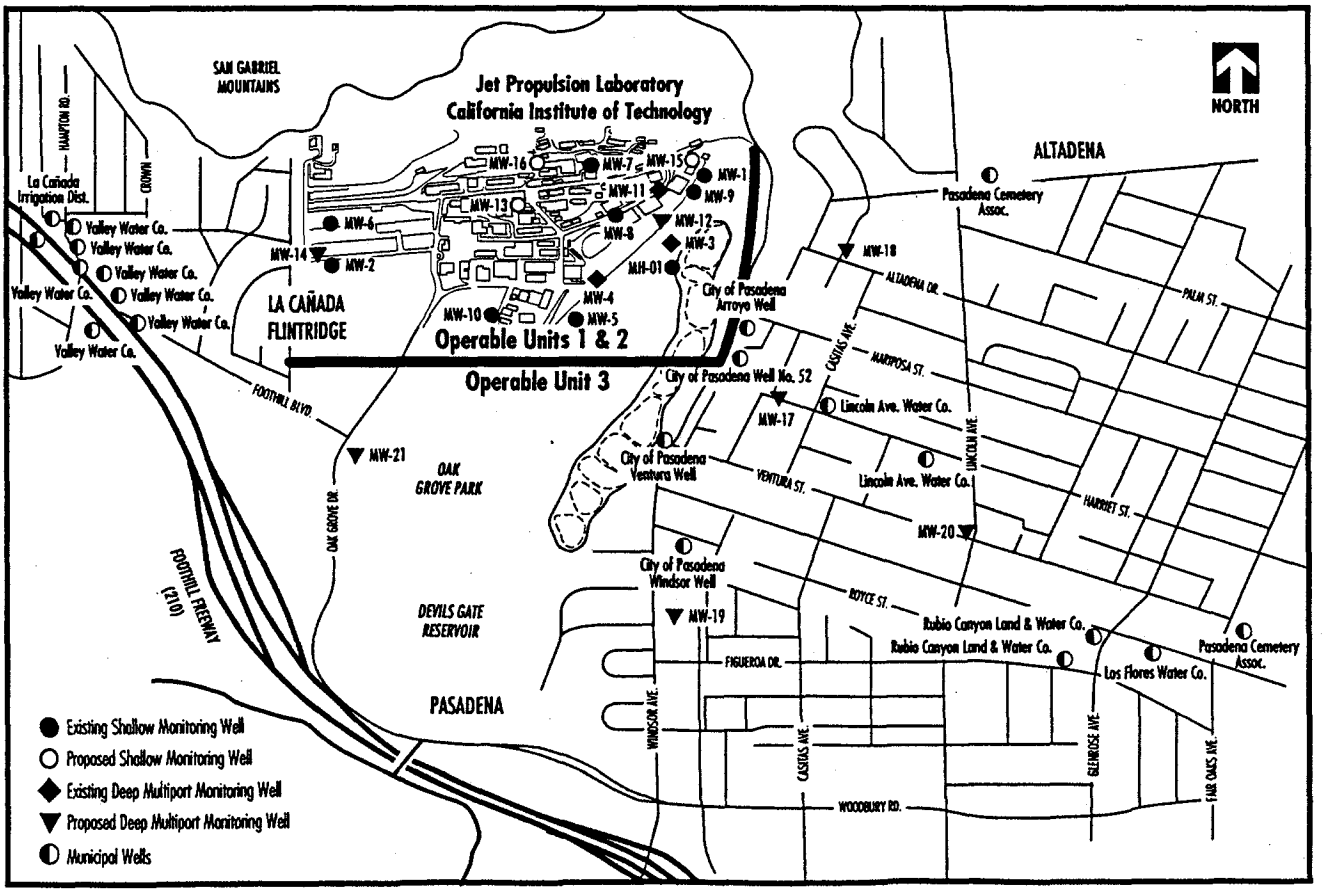
Techniques to obtain soil gas samples were described in Fact Sheet No. 2, dated April 1993. Techniques to build the groundwater monitoring wells and obtain soil samples are described here.

All the wells installed away from the JPL site as a part of the third operable unit will be drilled using a "mud rotary" drill rig. This type of rig uses a drilling fluid, or mud. The mud is generally water thickened with clay or other materials. This thickened fluid helps to carry soil cuttings from the drill bit to the surface. The soil cuttings are removed from the mud using special equipment, and the mud is returned to the drill rig for reuse. The mud also serves a secondary purpose by helping to prevent the hole from collapsing before the well can be installed.

The mud is mixed and maintained in a steel tank. Hoses carry the mud from the rig to the soil cutting removal equipment, then to the tank and back to the rig.

All the wells will be located in streets. An area about 150 feet (46 meters) long and 20 to 30 feet (6 to 9 meters) wide will be needed to set up the drill rig and drill the wells. This will require shutting down one lane of traffic in the area immediately around the drill rig. The area will be roped off so that bystanders cannot enter the area. The entire operation will be monitored with health and safety monitoring equipment to insure that no adverse effects are created if volatile organic compounds are released during the well construction. Work typically will begin at 7 a.m. and end at 5 p.m.

After the well is complete, the only evidence left will be a small manhole cover in the street. Periodically, water samples will be collected from the well. Each sample collection normally involves a pickup truck equipped with the



This map shows the general locations of monitoring and municipal wells at JPL and in the surrounding communities.

appropriate sampling gear, which parks above the well for less than one day.

The soil samples taken on the JPL site will be collected using a drill rig called an air percussion hammer rig. This rig is essentially a huge jackhammer that pounds down into the ground, removing soil as it goes, until the appropriate depth for the sample is reached. A soil sample is then removed and the rig continues to dig until the depth for the next sample is reached. This process continues until all the soil samples for a given location are collected. Much of the soil under JPL is very rocky and requires the use of this type of rig. Please note that the use of this type of equipment is planned only for the JPL site itself.

Schedule of Work

Work in the second operable unit began on January 14, 1994, with the first soil gas sampling already completed. After analyses of the data, the need for additional soil gas work will be determined. The soil sampling work at the JPL site is scheduled to begin in July 1994. It should take about six to eight weeks to complete.

Drilling of wells in the third operable unit should begin in summer 1994. Each well will typically take four to five weeks to construct. Field conditions may lengthen or shorten the construction period.

Questions and Answers

How were the locations for the wells selected?

The natural flow of groundwater dictates where potential contamination will move. The flow of groundwater in the Arroyo Seco usually varies from southerly to easterly. Wells were placed to try to locate potential contamination being carried by the flow of groundwater. To minimize impacts on individual residents, all the wells are being located in the street.

Is there any danger during construction or after the wells are completed?

As with any construction project, accidents are possible if unauthorized persons enter the construction zone. The zone will be roped off to prevent entry of unauthorized persons during construction work; the area will have a guard posted at night to assure that unauthorized persons do not enter between work shifts. Health and safety monitoring will be performed according to our EPA-approved plan.

The only sign of the well after construction is complete will be a small, locked manhole cover. Water samples will be taken periodically by a NASA/JPL contractor.

How noisy is the construction?

The equipment is powered by diesel engines fitted with mufflers as required by law. During operation, the noise level should be similar to that of a large electric generator. Daily work will begin no earlier than 7 a.m. and end no later than 5 p.m. to reduce the noise impact on the neighborhood.

Are there any less noisy or less intrusive alternatives?

Unfortunately, no. The construction of a monitoring well is the "state-of-the-art" method of sampling groundwater. The extreme depth to which the wells must be drilled (up to 900 feet [274 meters] below the surface), as well as the geology of the area and the needed analytical work, requires us to use these techniques.

What happens when the wells are sampled?

Typically, a pickup truck equipped with sampling gear is all that is needed to sample the wells. The level of noise that can be expected will be that of a small electric generator. The area immediately around the well will have access restricted during the sampling. The sampling should take less than a day per well. A sampling schedule has not been developed, but wells will likely be sampled once every three months.

How will the results be made available to the public?

Federal and state laws require that reports showing and discussing the results be made available to the public after they are reviewed and approved by the regulatory agencies. NASA/JPL has established several information repositories in the Pasadena, La Cañada Flintridge and Altadena public libraries to contain these approved reports. (The locations of the repositories are listed on page 4.)

Information will also be provided through a variety of means, including this series of fact sheets. With the approval of the regulatory agencies, future fact sheets will present results of the work before the final reports are developed.

If damage to a well is noted, who should be notified?

NASA/JPL would sincerely appreciate being notified if any problem occurs with any of the wells. Please call NASA/JPL at the number listed on page 4.

Community Relations

As the cleanup effort progresses, NASA/JPL will keep JPL's neighbors informed of developments and will solicit community feedback. The local community will be asked to comment on all cleanup alternatives that are under consideration before a specific remedy is selected. As part of this community relations effort, information repositories

containing copies of documents related to the cleanup are being maintained and updated at the following local sites:

- *Pasadena Central Library*
  285 East Walnut Street
  Pasadena

- *La Cañada Flintridge Public Library*
  4545 West Oakwood Avenue
  La Cañada Flintridge

- *Altadena Public Library*
  600 East Mariposa Street
  Altadena

For more information on the cleanup effort and community involvement, please call or write:

Public Services Office
Jet Propulsion Laboratory, MS 186-113
4800 Oak Grove Drive
Pasadena CA 91109-8099
Tel: (818) 354-0112

You may also contact any of the EPA representatives listed below:

- *Hank Yacoub*
  L.A. RWQCB
  101 Centre Plaza Dr.
  Monterey Park, CA 91754
  Tel: (213) 266-7500

- *Cal EPA*
  1011 N. Grandview Ave.
  Glendale, CA 91201
  Tel: (818) 551-2881

- *Brian Swarthout*
  U.S. EPA, Region IX
  75 Hawthorne St., MS H-9-1
  San Francisco, CA 94105
  Tel: (415) 744-1488

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

JPL 410-36-4 7/94

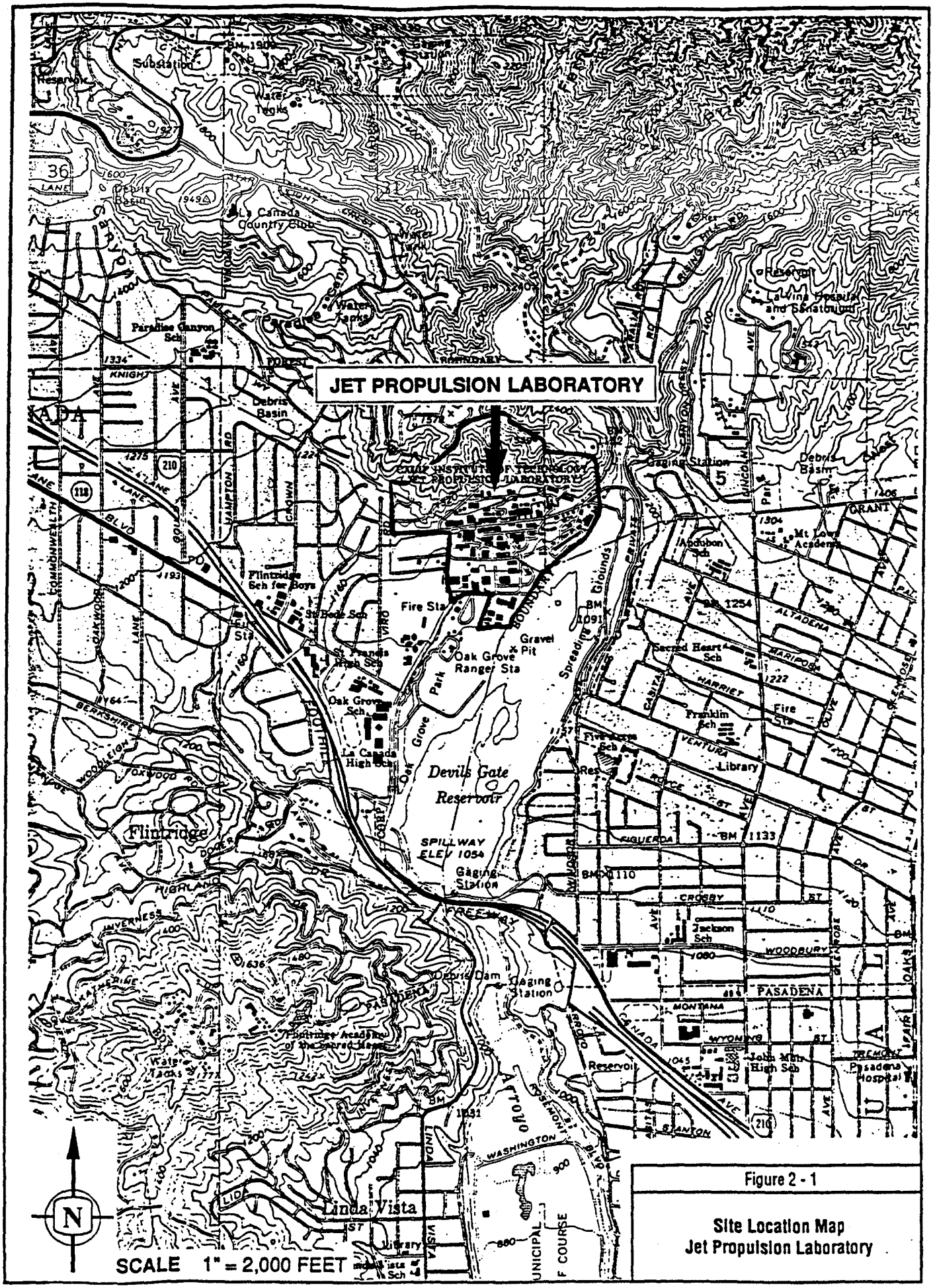


Figure 2 - 1

Site Location Map
Jet Propulsion Laboratory

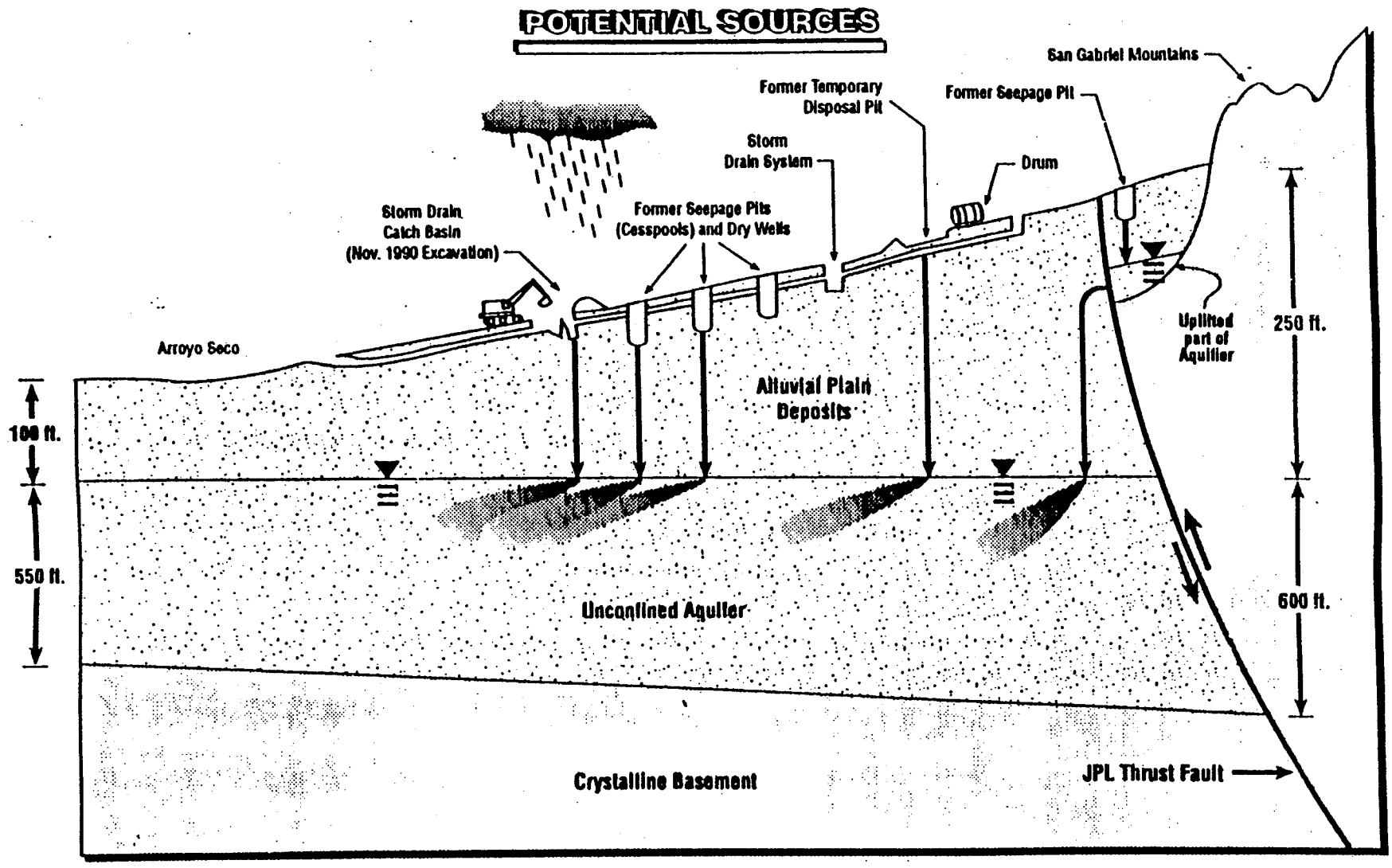
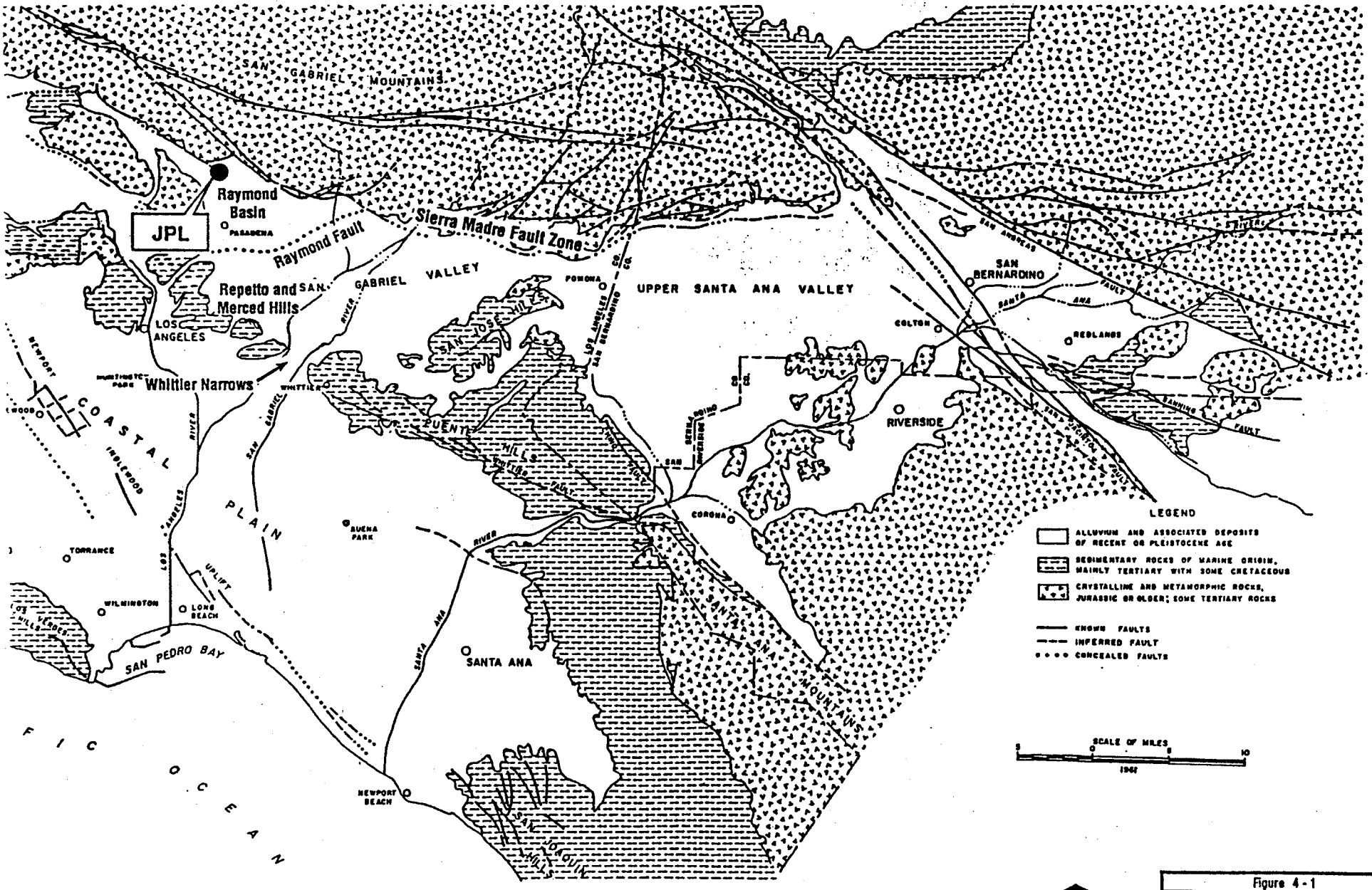


Figure 3 - 2

Conceptual Cross-Section Through the Jet Propulsion Laboratory



Source: California Department Water Resources Bull No. 104. Planned Utilization of the Ground Water Basins of the Coastal Plain of L. A. County, 1961.

Figure 4-1

General Geology Surrounding the Jet Propulsion Laboratory

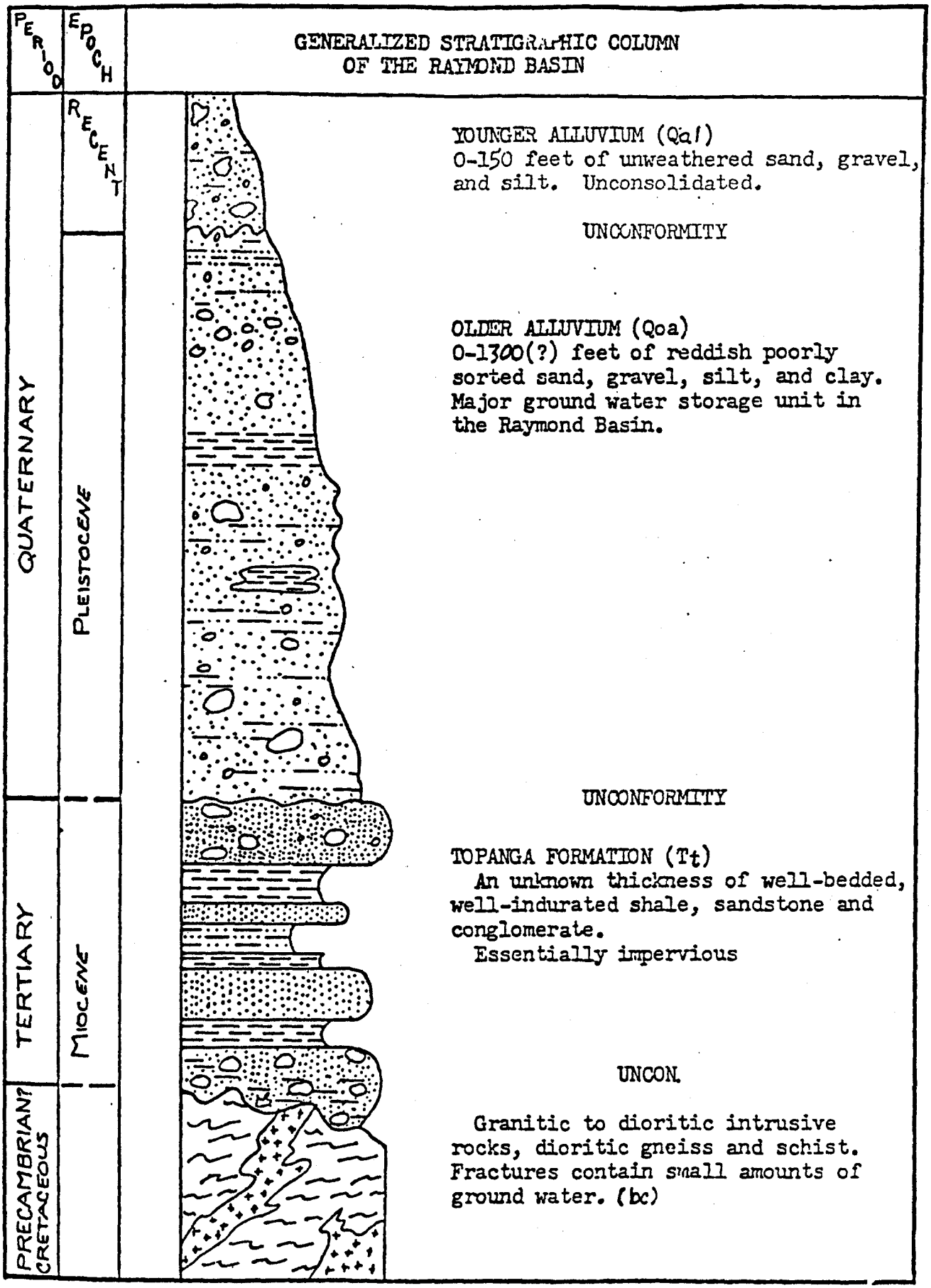


Figure 4-3

Stratigraphic Column of the Raymond Basin

Source: California Department Water Resources, "Stratigraphy of the Raymond Basin Area", 1969.

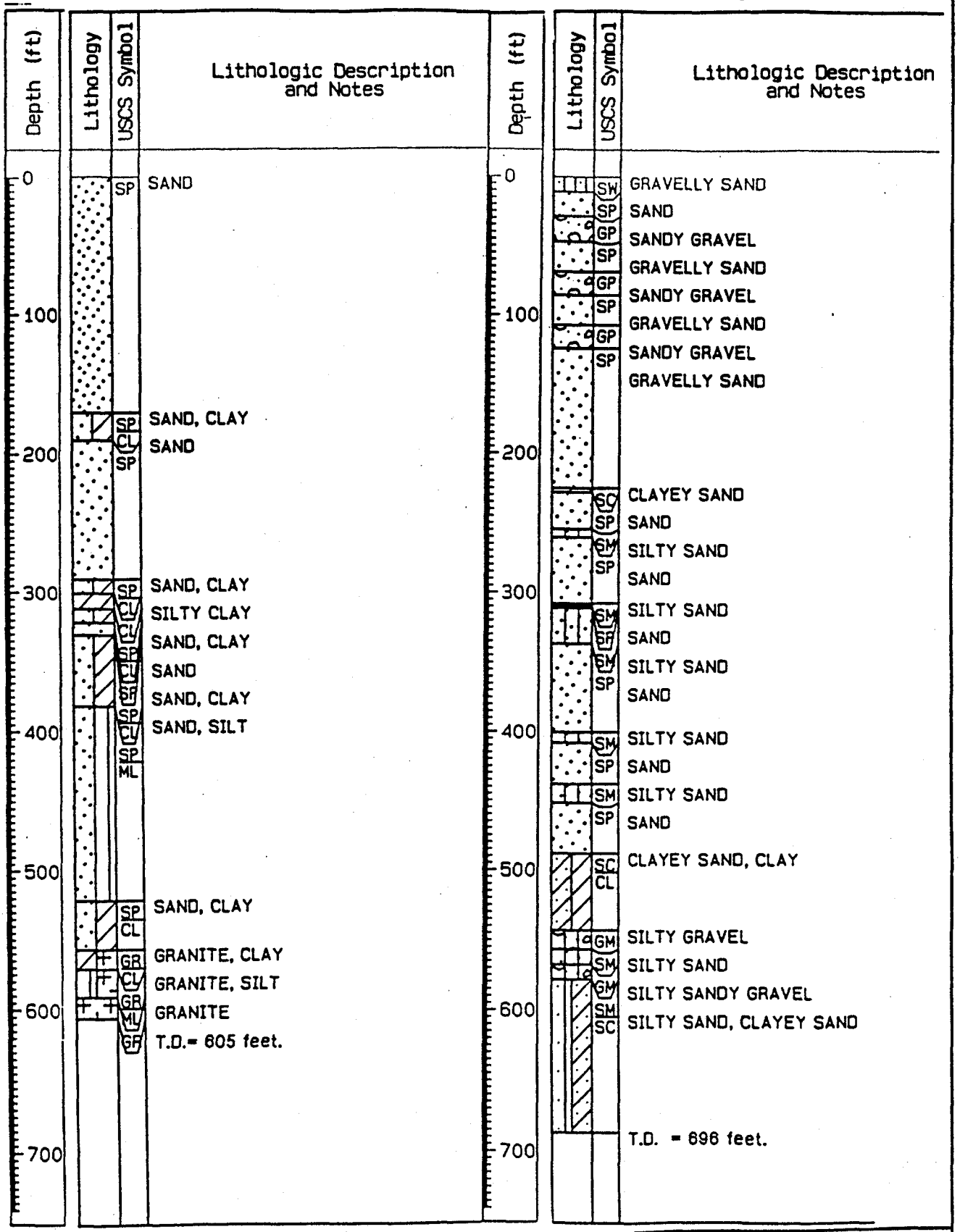


Figure 4 - 13

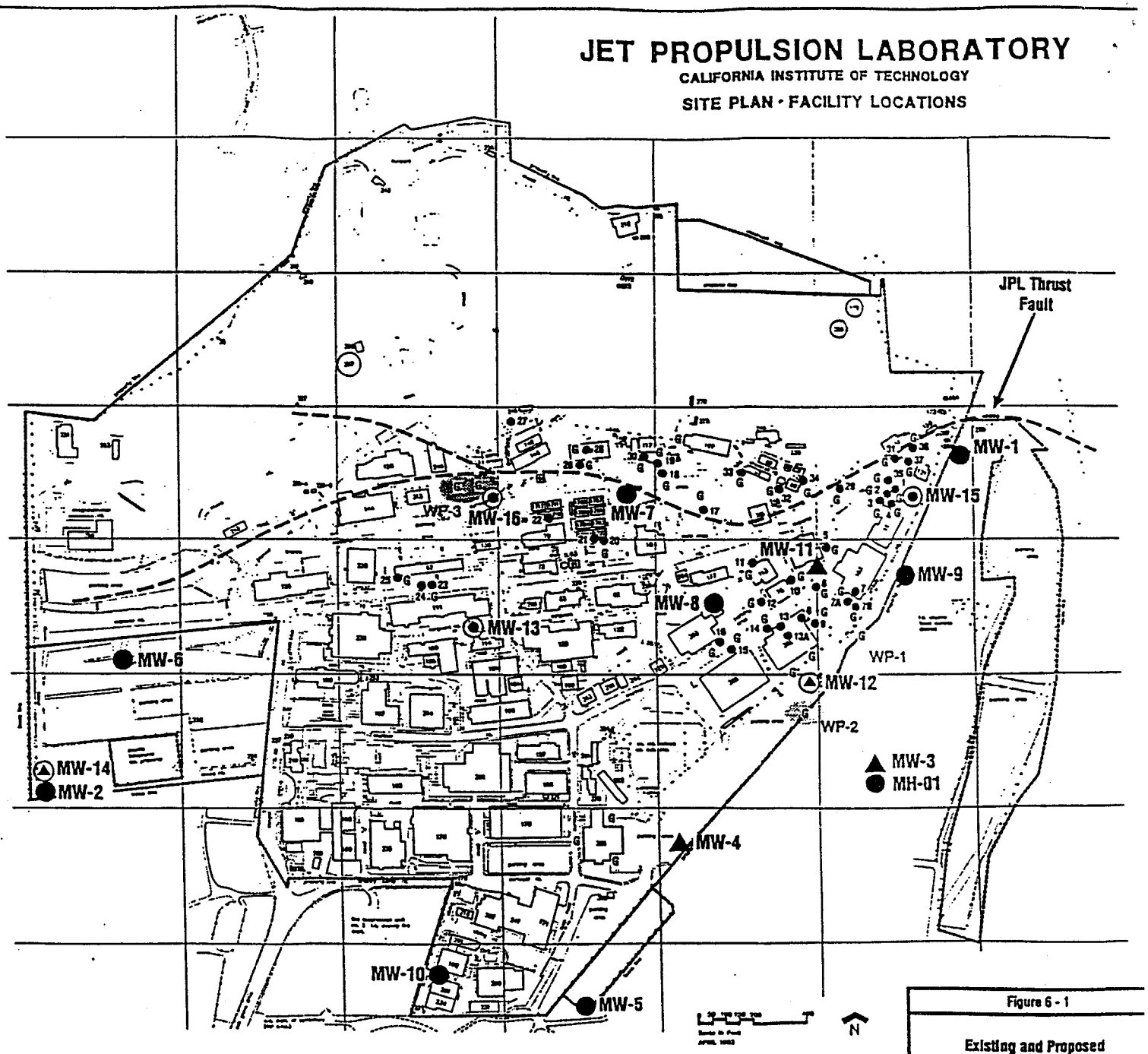
Summary of Field Boring Logs for Monitoring Wells MW-4 and MW-11 Jet Propulsion Laboratory

Note: Complete lithologic descriptions are included in Appendix A.

JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

SITE PLAN - FACILITY LOCATIONS

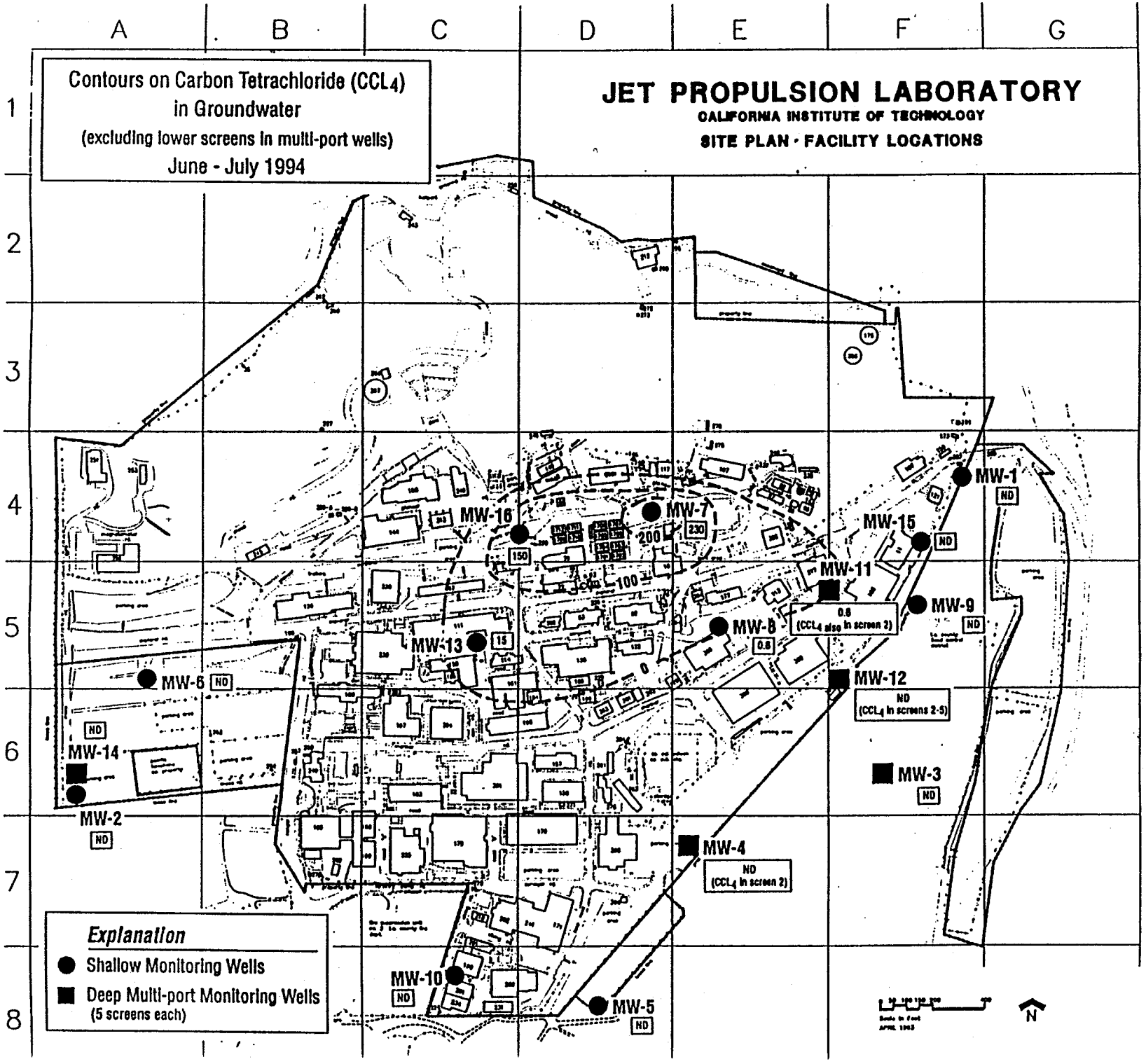


EXPLANATION

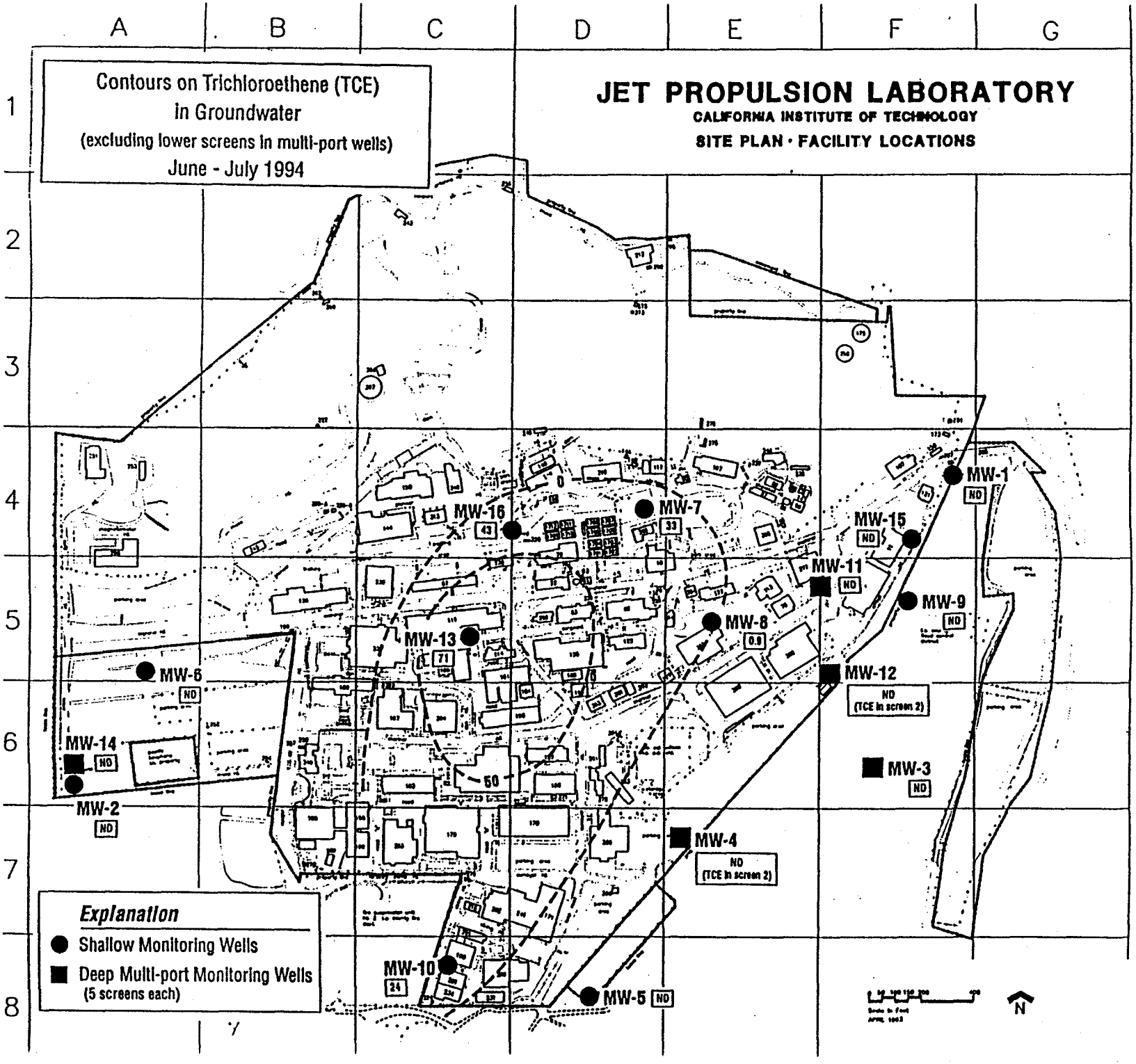
- Shallow Monitoring Well
- Deep MP Monitoring Well
- Proposed Shallow Monitoring Well
- Proposed Deep MP Monitoring Well
- 37 Seepage Pit or Dry Well Location
- G Soil Gas Sampling Location
- WP-3 Suspected Waste Disposal Area
- Trace of JPL Thrust Fault (Agbabian Associated, 1977)

Figure 6 - 1

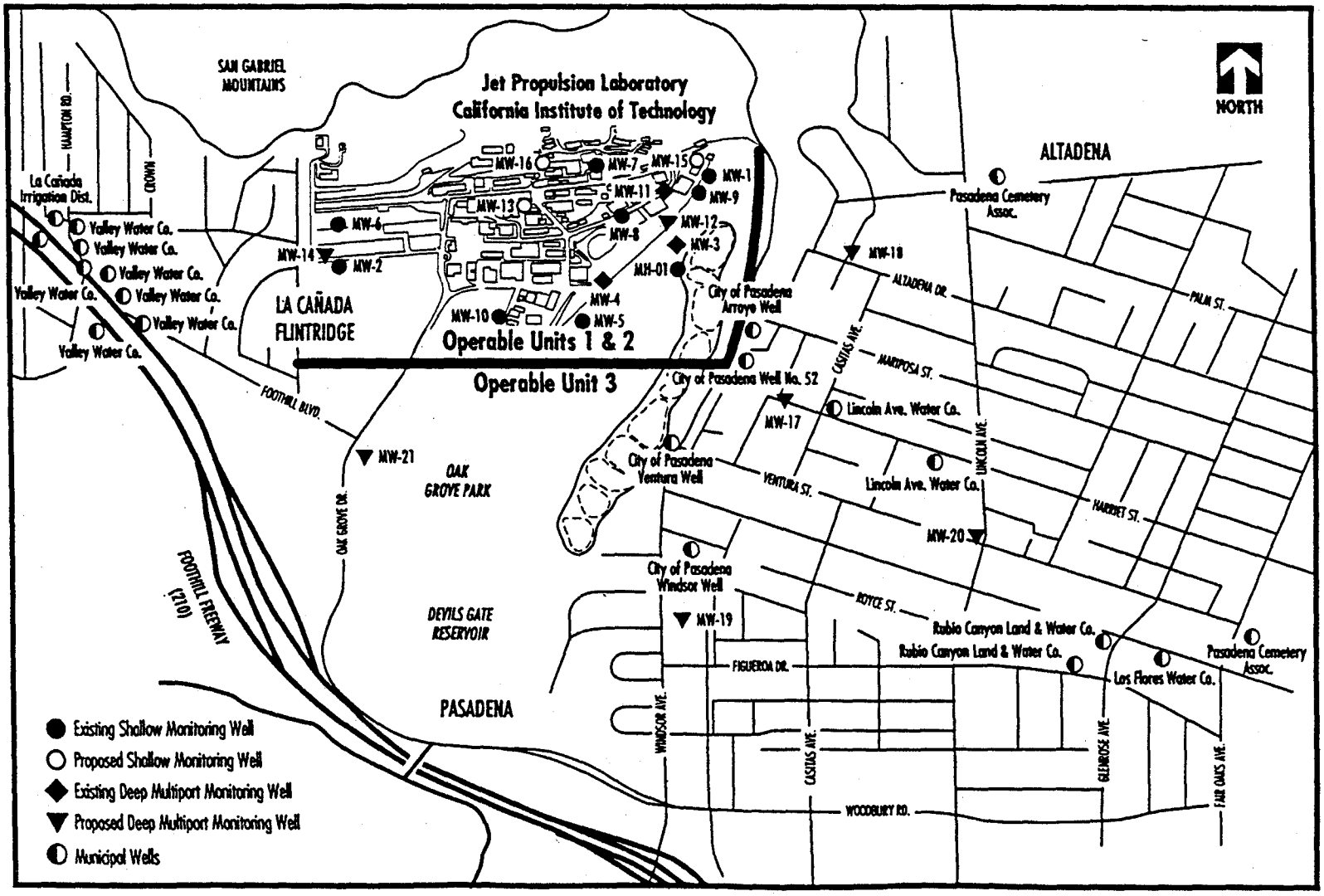
Existing and Proposed Monitoring Well Location Map



CLB - 23
05/24/95



CLB - 25
05/24/95



This map shows the general locations of monitoring and municipal wells at JPL and in the surrounding communities.

NASA - Jet Propulsion Laboratory

SUPERFUND PROJECT

JPL

May 24, 1995

Presented by: Charles L. Buril, P.E.

Manager, Environmental Affairs Office

JPL

PRESENTATION AGENDA

1. HISTORY LEADING TO THE SUPERFUND PROJECT

2. THE SUPERFUND PROCESS

3. TECHNICAL APPROACH TO THE PROJECT

4. TECHNICAL INFORMATION AVAILABLE TO DATE AND INTERPRETATION

5. REMEDIAL ACTION POSSIBILITIES AND THEIR ASSOCIATED ISSUES

6. POTENTIAL COST CONSIDERATIONS