1 of 1

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue, Argonne, Illinois 60439

**Preliminary Assessment Report for
Redmond Army National Guard Facility,
Installation 53120,
Redmond, Washington**

Prepared for

National Guard Bureau, Army Directorate
Aberdeen, Maryland

August 1993

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Prepared by

Applied Geosciences and Environmental Management Section
Environmental Research Division
Argonne National Laboratory

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Acronyms

ARNG	Army National Guard
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	U.S. Environmental Protection Agency
ESO	environmentally significant operation
gpm	gallons per minute
IRP	Installation Restoration Program
LWSD	Lake Washington School District
OMS	Organizational Maintenance Shop
PA	preliminary assessment
POL	petroleum, oils, lubricants
USGS	U.S. Geological Survey
UST	underground storage tank
WAARNG	Washington Army National Guard

**Preliminary Assessment Report for
Redmond Army National Guard Facility,
Installation 53120,
Redmond, Washington**

Summary

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Washington Army National Guard (WAARNG) property in Redmond, Washington. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Redmond ARNG property, Phase I of the Department of Defense Installation Restoration Program.

The Redmond ARNG Facility is a 11.77-acre site located in the city of Redmond, Washington, about 11 mi northeast of the city of Seattle, in King County. The facilities included in this PA are Organizational Maintenance Shop No. 10 (OMS 10) and the Armory. The environmentally significant operations (ESOs) associated with the property are (1) supply/storage of hazardous materials, (2) weapons cleaning, (3) the underground storage tanks (USTs), and (4) the use of herbicides. These ESOs are no longer active because of the closure of OMS 10 activities in 1988.

The review of both historical and current practices at the property indicated that the Redmond ARNG property poses a minimum level of risk to human health or the environment. This statement is based on the fact that OMS 10 operations ceased in April 1988 and all USTs used for storage of gasoline, diesel fuel, and heating oil have been removed from the site. A release from the heating oil USTs was cleaned up upon removal of the tanks in 1988. The site was said by the U.S. Army Corps of Engineers in 1992 not to require further remedial action resulting from the USTs. A closure report concerning these tanks was filed with the state of Washington in May 1992.

1 Introduction

This document is a report of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Washington Army National Guard (WAARNG) property known as Redmond Army National Guard (ARNG) Facility, located in Redmond, Washington.

1.1 Authority for the Preliminary Assessment

The National Guard Bureau, Army Directorate, has engaged Argonne to perform PAs of selected ARNG properties. These assessments are being done in a manner consistent with both the Department of Defense Installation Restoration Program (IRP) and the U.S. Environmental Protection Agency's (EPA's) Potential Hazardous Waste Site Preliminary Assessment Guidance. Preliminary assessments of ARNG properties are conducted under the authority and direction of the IRP; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or, more commonly, Superfund); and the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499).

1.2 Objectives

This PA report is based on existing information from the WAARNG records that were made available to Argonne investigators and from other sources. Although this PA effort did not extend to the generation of new data, it nonetheless identifies areas where existing data are incomplete, unreliable, or ambiguous and recommends ways to address such shortcomings.

The objectives of the PA are to satisfy Phase I of the IRP and to

- Identify and characterize the environmentally significant operations (ESOs),
- Identify property areas or ESOs that may require a site investigation.
- Identify ESOs or areas of environmental contamination that may require immediate removal,
- Identify properties for which no further action is needed, and

- Provide information sufficient to prescore the site with the EPA's PA Scoresheets (EPA 1991).

1.3 Procedures

The PA began with a review of WAARNG files located at Camp Murray, Tacoma, Washington, on May 18, 1993. A site visit was conducted on May 19, 1993, to obtain additional information through direct observation and interviews with personnel familiar with the property and its operations. Other relevant information was obtained on May 20-21, 1993, from the Washington State Department of Ecology, Olympia, Washington; the State Department of Ecology, Bellevue, Washington; the City of Seattle Water Department; and the City of Redmond Planning Department.

1.4 Report Format

This PA report presents a summary and evaluation of the data relevant to the PA for this property. Section 2 describes the property and its surrounding environment and land uses. Section 3 identifies and characterizes the ESOs at the site. Section 4 discusses known and suspected releases to the environment, and Section 5 discusses potential human and environmental receptors for such releases. Section 6 summarizes the findings and conclusions, discusses the quality and reliability of the supporting information, identifies areas requiring further action, and (as appropriate) suggests how such actions can be accomplished. Section 7 lists pertinent materials reviewed. Appendix A contains interview information.

2 Property Characterization

2.1 General Property Information

The Redmond ARNG Facility is operated by the WAARNG under license from the Department of the Army. The license is for a 25-year period ending August 31, 2005. The location of the installation is shown in Figure 1, and Table 1 provides some relevant information about it.

The number of personnel on site during the week averages about five, and one weekend per month the population increases to 100-120 for training exercises for Company C, Third Battalion, 161st Infantry Regiment. Specialized training is conducted, usually in September for one week, for the Washington Military Academy, and the personnel are housed on site in Building 500.

2.2 Description of Facilities

The Redmond ARNG Facility, shown in Figure 2, consists of 11.77 acres with six buildings and paved parking areas. The facility is located within the city limits of Redmond and is surrounded by single-family residential areas. The site is secured by a chain link fence and a locked gate after hours, with no sentry on duty. For monthly weekend training exercises, troops rendezvous at the Redmond ARNG Facility and are then transported to Fort Lewis near Tacoma, Washington, or to the Yakima Military Reservation, on the eastern side of the Cascade Mountain Range. Except for the specialized classroom training sessions, very little training is actually conducted on site.

2.2.1 EM Barracks

The EM Barracks, Building 500, is 216 ft 6 in. by 32 ft 4 in., with a wing 147 ft 4 in. by 35 ft 4 in., for a total of 12,413 ft². Building 500 is a single-story concrete block building with a flat roof. The building can accommodate 84 personnel and has no mess facilities. The building is also used for classroom instruction and training by the Washington Military Academy, for leadership courses.

FIGURE 1 General Location of Redmond Army National Guard Facility

TABLE 1 Identifying Information for Redmond Army National Guard Facility

Installation address	Redmond Army National Guard Facility 17230 NE 95th Street Redmond, Washington 98052
Geographic location	
Township	25N
Range	5 E
FISP ^a installation number	53120
Commander	Capt. Ted Martinelli
Types of facilities	Armory and administration buildings
License information	Department of the Army License No. DACA67-3-80-357 Expires August 31, 2005
Principal contact	Staff Sgt. James T. Horn

^a Facility Inventory and Stationing Plan.

2.2.2 Battalion Headquarters

The Battalion Headquarters, Building 501, is 175 ft 4 in. by 46 ft, with an offset 20 ft 8 in. by 46 ft, for a total of 9,011 ft². It is a single-story concrete block building with a flat roof and is used primarily as an administration building.

2.2.3 Motor Repair Shop

The Motor Repair Shop, Building 506, is 60 ft × 36 ft, for a total of 2,160 ft². It is a single-story concrete block building with three vehicle bays and separate rooms for storing battery acid and various supplies. This building has not been used for vehicle maintenance since the closure of the Organizational Maintenance Shop (OMS) in 1988. The structure is now used as a carpenter shop when the need arises. All materials and supplies related to vehicle maintenance have been removed from the building.

FIGURE 2 Locations of Environmentally Significant Operations at Redmond Army National Guard Facility

2.2.4 Spare Parts Building

The Spare Parts Building, Building 507 in Figure 2, is 14 ft 8 in. by 32 ft, or 469 ft². It was originally used to store spare parts required in vehicle maintenance operations and as an office area for OMS 10 activities. It is a single-story concrete block structure.

2.2.5 Pumping Plant

Building 508, located to the north of Building 500, is the water pump plant. It is 16 ft 8 in. by 10 ft 8 in., approximately 178 ft². The building contains an air compressor, a water pump, and water chlorinating equipment.

2.2.6 Other Buildings and Areas

Building 415, shown in Figure 2, is the Flammable Material Storehouse. It is a single-story concrete block structure, 7 ft 4 in. by 7 ft 4 in., used for storing vehicle batteries and other flammable materials when the OMS 10 was in operation.

One additional building found at the facility during the site visit was not on the site plan. This structure, Building T448 in Figure 2, is located to the east of Building 507 and is a metal single-story structure used for vehicle storage. It is approximately 800 ft² in area.

Other numbered designations in Figure 2 refer to the following open areas: 502, gas station; 504, lube shed; and 505, a vehicle wash platform. The gas station consisted of a single pump island used for refueling vehicles. According to the real estate property records, the facility had a 10,000-gal underground storage tank (UST) that was removed when OMS 10 ceased operations in April 1988.

The lube shed, Area 504, consisting of a concrete slab 8 ft 4 in. by 16 ft 4 in. with side rails and a built-up roof, is secured by a locked gate. This was a storage area for various lubricants used in routine vehicle maintenance procedures. No lubricants have been stored here since OMS 10 ceased operations. To the east of Area 504 is the wash platform, Area 505, consisting of a concrete slab 16 ft × 24 ft with a 4-in. drain connected to an oil-water separator and then to the municipal sewer. The wash platform is no longer in service.

2.3 Property History

The Redmond ARNG Facility site was originally part of the Seattle Defense Area Nike Batteries 13-14 Military Reservation, which consisted of four distinct parcels of land: a control area, a family housing area, a vehicle maintenance shop area, and the Nike missile launch area. The control area totaled 126.34 acres, of which 33.9 acres were fee simple, 1.03 acres were subject to use permit, 70.62 acres were under line-of-sight and sewer easement, 20.34 acres were leased land, and 0.45 acre was licensed for joint-use road. This property was acquired in stages between 1954 and 1973. Redmond was one of two dual batteries and one of three facilities converted from the Nike Ajax to the Nike Hercules system. Construction started in the mid 1950s, and the facility was operational until the end of the 1960s.

The disposal of the property occurred in 1976 and 1977. The 33.9 acres of fee-simple property were approximately divided between the Redmond ARNG (11.77 acres), the city of Redmond (5 acres), and the Lake Washington School District (LWSD, 18 acres). The city of Redmond property is now Nike Park, and the LWSD parcel is now owned by a developer seeking to build houses on the property. The Redmond ARNG has used the property continuously since receiving it. According to plans dating back to 1956, OMS activities (which ceased in 1988) have been present since the original acquisition and development of the land by the Department of Defense.

2.4 Permitting Status

2.4.1 Resource Conservation and Recovery Act Status

This installation has no ESOs that require a permit under the Resource Conservation and Recovery Act.

2.4.2 CERCLA Status

None of the ESOs at this installation is designated for CERCLA activities.

2.4.3 Waste Water Permit Status

No waste water discharge permits have been issued in connection with ESOs at this installation.

2.5 Surrounding Environment and Land Use

2.5.1 Demographics and Land Use

King County extends approximately 50 mi in an east-west direction and 40 mi in a north-south direction, with its western boundary lying in Puget Sound. The greater Seattle metropolitan area lies within King County, and the city of Redmond is a portion of this area. Redmond is approximately 11 mi east-northeast of Seattle, near the north end of Lake Sammamish. The estimated population of Redmond (1990 Census) is 35,800 people. The estimated population of King County (1990 Census) is 1,507,319.

The Redmond ARNG is completely surrounded by residential areas, Nike Park, and the parcel of land proposed for housing development. All nearby structures are served by public water and sewer systems. Approximately 60% of the water supplied by the city of Redmond is obtained from the city of Seattle, which in turn obtains water from reservoirs in the Cascade Mountains via pipeline. The remainder of the water is obtained from private water systems supplying well water to the city for distribution.

As Figure 3 shows, Redmond Junior High School, Mann Elementary School, and Redmond High School are all located within 0.75 mi of the Redmond ARNG Facility. The Sammamish River is within 2 mi of the site, and Lake Sammamish is within 3 mi.

FIGURE 3 Area Surrounding Redmond Army National Guard Facility, Showing the Area of Concern within a Four-Mile Radius of the Site

2.5.2 Climate

King County is located at approximately 47-48 degrees north latitude in a temperate climatic zone. The mean monthly temperature in Seattle, the nearest weather reporting station, varies from 38°F in January to 65°F in July. The prevailing wind direction in Seattle is from the south during most of the year and southeasterly from October to December. Because of topographic features in the area, the prevailing wind direction in Redmond might differ from that of Seattle. The mean wind speed of approximately 8 mph is rather uniform throughout the year.

Topographic features cause rainfall in King County to be highly dependent on the specific location under consideration. Redmond lies within the lowland area surrounding Puget Sound, and therefore it receives approximately 41 in. of rainfall per year. December is the wettest month, and July and August are the driest.

2.5.3 Surface Water and Physiography

Northwestern King County lies mainly in the Puget Sound lowland, located between the Cascade Mountains on the east and the Olympic Mountains on the west. Topographically, northwestern King County consists of gently rolling plains about 200-600 ft above mean sea level, mantled by glacial drift deposited during the Vashon glacier. Numerous lakes and peat bogs occur in surface depressions created during the glacial retreat. The surface of the Vashon drift has not been greatly modified by postglacial erosion, although spring-fed streams have cut short, steep-sided canyons into the margins of the drift plains, and some wave erosion has occurred adjacent to the Puget Sound.

The plains of northwestern King County are separated by north-trending major river valleys and lakes and are classified into ten physiographic units (Figure 4; Liesch et al. 1963). Redmond is located east of the Sammamish River valley on the Eastern Drift Plain in the central portion of northwestern King County. The Redmond ARNG Facility is located on a hilly tract of land, about 400 ft above mean sea level. The nearest surface water body is the Bear Creek, about 0.75 mi southeast of the site. Bear Creek flows into Evans Creek to the south. Evans Creek discharges into the Sammamish River, which passes about 1 mi to the southwest of the site. Surface runoff from the ARNG site drains into Bear Creek and Evans Creek along the steep slopes to the south and east.

FIGURE 4 Map of Northwestern King County Showing Principal Physiographic Units (Source: Liesch et al. 1963)

The soils in the Redmond area are classified as brown to pale reddish brown, Alderwood, gravelly-sandy loam on the uplands and dull or grayish brown, Kitsap silt loam on terrace-like positions (SCS 1973). The parent material of these soils is cemented till in the case of the Alderwood and silty lake-laid sediments for the Kitsap. Both of these soils have moderately good drainage and support forest vegetation.

2.5.4 Geology

The geology of the northwestern King County consists of consolidated rocks and semiconsolidated to unconsolidated materials (Liesch et al. 1963). The consolidated rocks of Tertiary age are the bedrock in the area. The bedrock crops out in the southwestern portion of northwestern King County (near Seattle) and is buried beneath several hundred feet of unconsolidated deposits in the northern portion. The consolidated rocks consist primarily of

sedimentary rocks, shale, graywacke, sandstone, and conglomerate, as well as some igneous intrusions of andesitic composition.

Unconsolidated deposits of Quaternary age overlie the bedrock in most of northwest King County. These deposits consist of sediment derived from three principal areas: (1) Mount Rainier volcano; (2) the central Cascade Range to the east; and (3) British Columbia and the north Cascade Range in Washington. The source areas of the sediments can be identified on the basis of rock types, which are distinctively different in the three areas.

The unconsolidated deposits consist of four principal units, the Orting and Intermediate drifts, pre-Vashon drift, the Vashon drift, and the Postglacial deposits. The Orting and Intermediate glacial drift deposits are the oldest (Pleistocene age) deposits overlying the Tertiary bedrock. The Puyallum Formation, consisting of mudflows, volcanic ash, and fine to medium sand and minor drift deposits, lies between the Orting/Intermediate drift and the overlying pre-Vashon drift. The pre-Vashon drift consists of at least four layers of gray till separated by fluvial sand and gravel and a thick sequence of oxidized lacustrine sand, silt, clay, peat, and fluvial sand and gravel. The Vashon drift consists of advance and recessional outwash deposits and a till unit. Postglacial deposits consisting of peat and swamp materials, mudflows, and alluvium overlie the Vashon drift.

In the vicinity of the ARNG facility in Redmond, the unconsolidated deposits range in thickness from 400 ft to more than 1,000 ft. Several wells drilled to depths of up to 1,000 ft 2 mi northeast or northwest of the ARNG facility indicate the presence of all of the units characteristic of the unconsolidated deposits in the rest of northwestern King County.

2.5.5 Groundwater

The consolidated Tertiary rock is not a significant source of water in most of northwestern King County (Liesch et al. 1963; USGS 1968). Some groundwater is obtained from the bedrock in the southern portion of northwestern King County, where the Quaternary deposits are thin or absent.

Groundwater is obtained from all units of the Quaternary deposits. The older unconsolidated deposits (older than pre-Vashon drift) are not a dependable source of groundwater. Sand and gravel deposits of the pre-Vashon drift are one of the most productive units because of

their high permeability, their thickness of as much as 200 ft, and their wide areal extent. These deposits are saturated throughout most of their thickness. The principal development of groundwater supplies from the pre-Vashon sand and gravel is in the Interlake and Eastern Drift Plain physiographic units. The average depth to water in these deposits is about 135 ft, and the yields vary from a few to as much as several hundred gallons per minute (gpm), with an average of about 135 gpm.

The most productive deposits of the Vashon drift are the recessional outwash deposits. Water can be obtained almost everywhere in northwestern King County from these deposits. Large yields are obtained where a considerable thickness of coarse-grained material occurs within the zone of saturation.

Significant sources of groundwater are also found in the highly permeable gravel lenses at about 20 ft depth in the postglacial deposits that overlie the Vashon drift, particularly on the floors of major stream valleys.

In the Eastern Drift Plain physiographic unit, where the Redmond ARNG Facility is located, groundwater wells generally range in depth from less than 10 ft to 350 ft, with an average depth to water of about 45 ft. Small quantities of water are obtained from shallow wells tapping the till deposits of the Vashon drift. Locally, yields of up to 100 gpm are obtained from shallow wells tapping the recessional outwash deposits of the Vashon. Most of the wells in the Eastern Drift Plain obtain water from the advance outwash deposits of the Vashon. The average depth of wells in these deposits is about 100 ft.

Where the Vashon aquifers are absent or do not provide sufficient yield, groundwater is obtained from the pre-Vashon sand and gravel aquifers. The average depth of wells tapping these aquifers is 220 ft, with an average depth to water of 110 ft and an average yield of about 30 gpm.

A large number of domestic, municipal, and irrigation wells are located in the Redmond area. Most of these wells are screened in sand and gravel layers at depths of 30-70 ft and 125-200 ft, tapping aquifers in the Postglacial, Vashon drift, and pre-Vashon deposits.

Because of the large number of private wells within a relatively small area, the well locations were not plotted on a map for visual inspection. Some actual well logs used for geologic interpretation are included in Appendix B. Contemporaneous water level data are not available in this area to determine the direction of groundwater flow.

The city of Redmond obtains its water from groundwater wells as well as surface water sources. Groundwater, constituting about 60% of the total water supply, is withdrawn from four wells located about 0.25-0.6 mi northeast of the ARNG facility. The surface water is obtained from the Seattle water department, which in turn taps the reservoirs located in the foothills of the Cascades.

2.5.6 Sensitive Environments

No environmentally sensitive areas or endangered species have been identified within a 4-mi radius of the Redmond ARNG Facility.

3 Environmentally Significant Operations

The PA team from Argonne identified no current ESOs at the Redmond ARNG Facility. This finding is attributable to the closure of OMS 10 activities, which ceased in 1988. Prior to 1988, four ESOs have been identified at this installation: (1) supply/storage of hazardous materials, (2) weapons cleaning, (3) USTs, and (4) use of herbicides. Each ESO is characterized in more detail in the following sections.

3.1 Supply/Storage of Hazardous Materials

The supply/storage of hazardous materials is related to the operation of the OMS 10 facility. Materials required for vehicle maintenance were stored in and around the bays of Building 506 (Figure 2) and in the petroleum, oil, and lubricant (POL) storage area, Building 504. The POL storage area consists of a cement slab with chain link fencing around its perimeter, a locked gate, and a shed-type roof. Materials stored in this area include motor oils, cleaning solvents, antifreeze, carbon-removing compound, transmission fluid, brake fluid, glycol ether, and starting fluid. Records indicating the quantities of the stored materials were not available during the site visit, because OMS activities ceased in 1988. Used liquids and oils were also stored in the POL storage area until enough was accumulated, generally in 55-gal drums, for removal through the Defense Reutilization and Maintenance Office at Camp Murray. Personnel on hand during the site visit were not aware of any problems attributable to the POL storage area in the past.

The POL storage area has no provision for containment of spills, and any spilled material could run off directly onto the ground surrounding it. No evidence of a spill was observed during the site visit, and the foliage surrounding the POL showed no signs of stress.

Building 506, the three-bay vehicle maintenance building, has a battery storage room described as having a cement floor with no drain. A sink/eye wash in the room drains directly into the municipal sewer system serving the facility. Redmond ARNG Facility personnel were not aware of any acid spill or other related problems attributable to the handling of vehicle batteries. In the earlier years of OMS 10 operation, batteries were filled on the site as needed, and acid in the old batteries was neutralized and poured into the municipal drainage system. In the years just prior to the shutdown of OMS 10 operations, private vendors brought filled, new batteries into the facility and removed the discarded batteries. Thus there was no need to work directly with battery acid.

3.2 Weapons Cleaning

When the OMS 10 was in operation, weapons were cleaned on the site at one end of Building 506. Weapons were cleaned in a 55-gal drum cut in half lengthwise, and then the guns were placed horizontally on a rack. As required, waste solvent was collected in 55-gal drums and was sent to WAARNG headquarters at Camp Murray in Tacoma for disposal. No additional information was available from site personnel during the site visit concerning this activity.

3.3 Underground Storage Tanks

Three USTs have been removed from the site since the closure of OMS 10 operations in 1988. A 10,000-gal gasoline UST was removed almost immediately after OMS 10 operations stopped. According to information received from environmental personnel at Camp Murray, no complications were associated with the removal of this tank.

Two additional tanks were removed in May 1992. These USTs had stored fuel oil used for heating. The first UST, referred to as Tank R1A, had a 1,000 gal capacity and was found, upon its removal, to have an extensive leak around the fill pipe. This leak resulted in a 25-ft plume, and 700 cubic yards of contaminated soil were removed from the site and replaced with clean soil. The second UST, Tank R1B, with a 500-gal capacity, was also found to be leaking around the fill pipe as well as from holes in its body. This leakage resulted in the removal of 100 cubic yards of soil, which was replaced with clean soil. These tanks are discussed in a Closure Report filed with the state of Washington in June 1992. No other USTs are currently located on the site, according to ARNG records.

3.4 Use of Herbicides

When the site was operational as a Nike control facility, herbicides were used routinely to control the growth of vegetation along roads and the site perimeter. No documentation exists as to the type and quantity of herbicide used at the time. Herbicide applicators were cleaned at the vehicle wash platform after use. It is safe to assume that herbicides have not been used since the Nike activities stopped in the late 1960s. No evidence of herbicide use was found during the site visit.

4 Known and Suspected Releases

4.1 Releases to Groundwater

No documentation of any release of contaminants to groundwater was found for the Redmond ARNG Facility.

4.2 Releases to Surface Water

No documentation of on-site releases to surface water was found, nor was any evidence of adverse impact to surface water observed during the site visit. Runoff of rainwater from the installation would be to the east, down the valley slope to Bear Creek and Evans Creek, the nearest bodies of surface water.

4.3 Releases to Soil

As discussed in Section 3.3, two USTs were found to be leaking upon their removal. The contaminated soil (a total of 800 cubic yards) was removed and replaced with clean soil. No other evidence or documentation of releases to soil was found for this installation.

4.4 Releases to Air

No documentation of atmospheric emissions of toxic substances was found for this installation.

4.5 Other Releases

No releases related to a threat from fire or explosion were documented or observed during the site visit.

5 Human and Environmental Receptors

5.1 Groundwater

Approximately half of the city of Redmond is served by water obtained from local wells. These wells are generally located in areas of lower elevation in and around Redmond. The wells are typically 30-50 ft deep. The public water supply well nearest to the Redmond ARNG Facility is approximately 1.5 mi east.

5.2 Surface Water

As indicated earlier, surface runoff from the Redmond ARNG Facility will travel downslope in an easterly or southeasterly direction and enter Bear Creek and Evans Creek, located within a mile of the site. Bear Creek enters Evans Creek about 0.8 mi southeast of the site; Evans Creek flows southwesterly approximately 2 mi and enters the Sammamish River, then flows another 1.5 mi before entering Lake Sammamish. The extent to which these waterways are used for public or industrial purposes is uncertain. Lake Sammamish is used extensively for recreational purposes.

As the runoff from the Redmond ARNG Facility proceeds downhill, it may pass through one or more of the residential areas on the hillsides surrounding the site. Other contaminants may be picked up by the runoff as it passes through the areas, and local residents may be exposed to direct contact with the runoff water. Contaminants may also be deposited in the soil in the area of the runoff. The total population that might be exposed in this manner is unknown.

5.3 Soil

The Redmond ARNG Facility is secured by fences, and the possibility of direct contact with contaminated soil would be limited to ARNG personnel and/or authorized on-site visitors. The number of personnel routinely on the site is about five.

5.4 Air

On-site personnel and local residents adjacent to the site are potential receptors for toxic emissions from the site. However, such emissions are very unlikely because OMS 10 activities have ceased. No toxic emissions were recorded when OMS 10 was in operation.

5.5 Other Receptors

No concern for other receptors in terms of fire and explosion is warranted because all substances capable of such a threat have been removed. All flammable and potentially explosive substances were taken from the site with the closure of OMS 10.

6 Preliminary Assessment Findings and Conclusions

6.1 Summary of Preliminary Assessment Findings

The Redmond ARNG Facility in Redmond, Washington, is an 11.77-acre site in northwestern King County, operated under license from the Department of the Army. The number of personnel on the site during the week numbers about five; one weekend per month the population increases to about 120 for training exercises for Company C, Third Battalion, 161st Infantry Regiment. Additional training is conducted on-site by the Washington Military Academy, one week per year. The primary ESOs are (1) the supply/storage of hazardous materials; (2) weapons cleaning; (3) USTs; and (4) the use of herbicides. The PA examined the nature of the surrounding area and the Redmond ARNG operations in order to identify direct pathways for environmental impact.

6.2 Recommendations for Further Action

The primary objective of the PA was to identify and evaluate ESOs that would result in either (1) immediate action, (2) site investigation, or (3) no further PA/IRP action. Generally, the available information indicates that the Redmond ARNG Facility presents a minimal threat to human health and the environment, because all OMS 10 activities have ceased, and all potentially hazardous materials have been removed from the site. In addition, all USTs have been removed from the site, and all areas where leakage was found have been remediated.

7 Sources of Information

7.1 References

EPA, 1991, *Guidance for Performing Preliminary Assessments under CERCLA*, Publication 9345.0-01A, Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

Liesch, B.A., S.E. Price, and K.L. Walters, 1963, *Geology and Ground-Water Resources of Northwestern King County, Washington*, Washington Division of Water Resources, Water Supply Bulletin 20.

SCS, 1973, *Soil Survey of King County*, U.S. Department of Agriculture, Soil Conservation Service.

USGS, 1968, *Water Resources of King County, Washington*, Geological Survey Water Supply Paper 1852.

7.2 Other Sources

City of Seattle Water Department, 1992, *Water Supply Plan, Draft Environmental Impact Statement*, August.

City of Seattle Water Department, 1993, *Water Supply Plan*, March.

King County, 1992, *King County Annual Growth Databook, 1992*, Planning and Community Development Division, August.

King County, 1992, *King County Census Bulletin #1, 1990 Census*, Planning and Community Development Division, Parks, Planning, and Resources Department.

U.S. Department of Commerce, 1968, *Weather Atlas of the United States*.

USGS, 1973, *Topographic Map - Issaquah, Washington Quadrangle*, U.S. Geological Survey, 7.5 minute quadrangle.

USGS, 1973, *Topographic Map - Kirkland, Washington Quadrangle*, U.S. Geological Survey, 7.5 minute quadrangle.

USGS, 1973, *Topographic Map - Mercer Island, Washington Quadrangle*, U.S. Geological Survey, 7.5 minute quadrangle.

USGS, 1973, *Topographic Map - Redmond, Washington Quadrangle*, U.S. Geological Survey, 7.5 minute quadrangle.

WAARNG, 1965, *Redmond Nike Site*, Tacoma, Washington.

Appendix A:
Interview Information

Appendix A:
Interview Information

Individuals Interviewed

State Environmental Officer
Washington Army National Guard
Camp Murray
Tacoma, Washington

Staff
Redmond ARNG Facility
Redmond, Washington

Argonne Investigators

Peter Ketels
(303) 986-1140

Pradeep Aggarwal
(708) 252-7053

Appendix B:
Well Logs Used for Geologic Interpretation

Permit No.

Bearing and distance from section or subdivision corner

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of spall and the kind and nature of the material in and around penetration, with at least one entry for each change of formation

MATERIAL	FROM	TO
Surface	0	3
Brown hardpan	3	18
Gray hardpan	18	46
Gray clay & gravel	46	70
Gray clay	70	110
Gray silt	110	150
Gray hardpan	150	163
Brown hardpan	163	176
Gray clay	176	208
Gray hardpan	208	247
Gray gravel-clay	247	271
Gray decayed rock	271	310
Gray medium rock-essence	310	401

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " DIAM. from 0 ft. to 165 ft.
 Threaded ☐ 6 " DIAM. from 0 ft. to 280 ft.
 Welded ☒ 4 " DIAM. from 0 ft. to 400 ft.

Performances: Yes ☒ No ☐ Torch
 Type of performer used _____
 SIZ of perforations 175 in. by 3 in.
32 perforations from 300 ft. to 400 ft.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.

Screens: Ym ☐ No ☒

Manufacturer's Name _____

Type _____ Model No _____

Diam. _____ Shot size _____ from _____ ft. to _____ ft.

Diam. _____ Shot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: You ☒ No ☐ To what depth? 18 ft.
Material used in seal padding clay
Did any strata contain unburnable material? You ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ HP _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
 Static level 235 ft. below top of wall Date 10/15/77
 Artesian pressure _____ lbs. per square inch Date _____
 Artesian water is withdrawn by _____ (Cap. valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____

Yield:	gal/min. with	ft. drawdown after	hrs
"	"	"	"
"	"	"	"

Recovery data (time taken as seen when pump turned off) (water level measured from well top to water level)					
Time	Water Level	Time	Water Level	Time	Water Level
1:10:00	10.00	1:15:00	10.00	1:20:00	10.00
1:25:00	10.00	1:30:00	10.00	1:35:00	10.00
1:40:00	10.00	1:45:00	10.00	1:50:00	10.00
1:55:00	10.00	2:00:00	10.00	2:05:00	10.00
2:10:00	10.00	2:15:00	10.00	2:20:00	10.00
2:25:00	10.00	2:30:00	10.00	2:35:00	10.00
2:40:00	10.00	2:45:00	10.00	2:50:00	10.00
2:55:00	10.00	3:00:00	10.00	3:05:00	10.00
3:10:00	10.00	3:15:00	10.00	3:20:00	10.00
3:25:00	10.00	3:30:00	10.00	3:35:00	10.00
3:40:00	10.00	3:45:00	10.00	3:50:00	10.00
3:55:00	10.00	4:00:00	10.00	4:05:00	10.00
4:10:00	10.00	4:15:00	10.00	4:20:00	10.00
4:25:00	10.00	4:30:00	10.00	4:35:00	10.00
4:40:00	10.00	4:45:00	10.00	4:50:00	10.00
4:55:00	10.00	5:00:00	10.00	5:05:00	10.00
5:10:00	10.00	5:15:00	10.00	5:20:00	10.00
5:25:00	10.00	5:30:00	10.00	5:35:00	10.00
5:40:00	10.00	5:45:00	10.00	5:50:00	10.00
5:55:00	10.00	6:00:00	10.00	6:05:00	10.00
6:10:00	10.00	6:15:00	10.00	6:20:00	10.00
6:25:00	10.00	6:30:00	10.00	6:35:00	10.00
6:40:00	10.00	6:45:00	10.00	6:50:00	10.00
6:55:00	10.00	7:00:00	10.00	7:05:00	10.00
7:10:00	10.00	7:15:00	10.00	7:20:00	10.00
7:25:00	10.00	7:30:00	10.00	7:35:00	10.00
7:40:00	10.00	7:45:00	10.00	7:50:00	10.00
7:55:00	10.00	8:00:00	10.00	8:05:00	10.00
8:10:00	10.00	8:15:00	10.00	8:20:00	10.00
8:25:00	10.00	8:30:00	10.00	8:35:00	10.00
8:40:00	10.00	8:45:00	10.00	8:50:00	10.00
8:55:00	10.00	9:00:00	10.00	9:05:00	10.00
9:10:00	10.00	9:15:00	10.00	9:20:00	10.00
9:25:00	10.00	9:30:00	10.00	9:35:00	10.00
9:40:00	10.00	9:45:00	10.00	9:50:00	10.00
9:55:00	10.00	10:00:00	10.00	10:05:00	10.00
10:10:00	10.00	10:15:00	10.00	10:20:00	10.00
10:25:00	10.00	10:30:00	10.00	10:35:00	10.00
10:40:00	10.00	10:45:00	10.00	10:50:00	10.00
10:55:00	10.00	11:00:00	10.00	11:05:00	10.00
11:10:00	10.00	11:15:00	10.00	11:20:00	10.00
11:25:00	10.00	11:30:00	10.00	11:35:00	10.00
11:40:00	10.00	11:45:00	10.00	11:50:00	10.00
11:55:00	10.00	12:00:00	10.00	12:05:00	10.00
12:10:00	10.00	12:15:00	10.00	12:20:00	10.00
12:25:00	10.00	12:30:00	10.00	12:35:00	10.00
12:40:00	10.00	12:45:00	10.00	12:50:00	10.00
12:55:00	10.00	1:00:00	10.00	1:05:00	10.00
1:10:00	10.00	1:15:00	10.00	1:20:00	10.00
1:25:00	10.00	1:30:00	10.00	1:35:00	10.00

Date of test 1/5
 Boiler test 1/5 gal/min. with 50 ft. drawdown after 3 hrs.
 Artesian Sew. 5 p.m. Date 1/5
 Temperature of water 50 Was a chemical analysis made? Yes ☐ No ☒

Work started 10/3 10:29 AM 10/15 10:29 AM
WELL DRILLER'S STATEMENT of 10/15
 This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Johnson Drilling Co., Inc.
(Person, firm, or corporation) (Type of party)
Address 19415 102nd Ave SE Renton 980
(Signed) Brad Johnson
(Full Name)
License No. 0233 Date 10/15/82

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with
Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

25/00/1
Application No. [REDACTED]
Permit No. [REDACTED]

(1) OWNER: Name Cascade View Developers Assoc. Address 16 Wembley Lane, Mercer Island, WA
(2) LOCATION OF WELL: County KING SW 1/4 NW 1/4 Sec 12E T. 25N R. 6E W. M.
Bearing and distance from section or subdivision corner 2540'S 100'E of NW corner of Section 12

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
New well ☒ Method, Dug ☐ Bored ☐
Deepened ☐ 0-75' Cable ☐ Driven ☐
Reconditioned ☐ 75'-95' Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 955 ft Depth of completed well 954 ft

(6) CONSTRUCTION DETAILS:

Casing installed: 12 Diam from +1 ft to 477 ft
Threaded ☐ 8 Diam from +1 ft to 797 ft
Welded ☒ 6 Diam from +2.2 ft to 865 ft

Perforations: Yes ☐ No ☒

Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
perforations from _____ ft to _____ ft
perforations from _____ ft to _____ ft
perforations from _____ ft to _____ ft

Screens: Yes ☒ No ☐ Johnson

Manufacturer's Name _____
Type Stainless Steel Model No _____
Diam 6 Slot size 20 from 945 ft to 975 ft
Diam 6 Slot size 20 from 982.5 ft to 987.5 ft
Diam 6 Slot size 20 from 990 ft to 995 ft
Diam 6 Slot size 20 from 999 ft to 1000 ft

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft to _____ ft

Surface seal: Yes ☒ No ☐ To what depth? 20 ft
Material used in seal Ben-tonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation ~640 ft
Static level 523.0 ft below top of well Date 7/30/90
Artesian pressure _____ lbs per square inch Date _____
Artesian water is controlled by _____ (Cap. valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test timer used? Yes ☒ No ☐ If yes by whom? R=N
Yield 180 gal min with 52.35 ft drawdown after 24 hrs

Recovery rate: Time taken as zero when pump turned off (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
1	533.9	12	529.6	82	527.9
3	531.2	25	529.95	120	527.55
6	528.4	42	529.4	1600	524.63

Date of test 7/30 - 7/31/90
Bailer test _____ gal min with _____ ft drawdown after _____ hrs
Artesian flow _____ gpm Date _____
Temperature of water 51.5 ° Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Bun silt with gravel	0	5
Bun silty sand and gul	5	11
Lt. Bun silty sand and gul	11	21
Gravelly gray silt	21	40
Sand and gul in gray silt matrix	40	72
V. compact sand, gul, coars. boulders		
in silt and clay matrix, fill	72	186
Sand and gul, water	186	189
Sand and gravel in silt matrix, fill?	189	211
Gray silt and silty clay	211	302
Silt with sand seams, seepage	302	355
Silt and sand, minor water, laminated	355	467
Gray silt	467	520
Silt with sandy silt layers, seepage	520	600
Sandy silt, becomes clayey + gul downward	600	640
Gray silt and clay	640	700
Sandy silt, seepage	700	790
Silty sand, woody, minor water	790	830
Sand and gul, silty, woody, water	830	870
Sand and gul		
Gravelly sand layered with sand and gul, occ matrix, water	870	910
Gravelly sand with silt matrix, woody water	910	925
Sand and gul in sandy gul water	925	955

To be sold to King County WD 122
in late 1990

Prepared by Robinson + Nade Inc.

RECEIVED

AUG 6 1990

DEPT OF ECOLOGY

Work started May 3 1990 Completed July 31 1990

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME DELKE DRILLING, INC.
(Person, firm, or corporation) (Type or print)

Address 4312 166th Ave E, Sumner 98391

(Signed) Don P. M. [Signature]
(Well Driller)

License No. 0837 Date 8/14 1990

USE ADDITIONAL SHEETS IF NECESSARY

File Original and First Copy with
Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Water Right Permit No. _____

Blair Card No. 26/066-10 5
420

(1) OWNER: Name Bob Bachman APR 3 1990
(2) LOCATION OF WELL: County King DEPT OF ECOLOGY NE & SE 1/4 10 26 N 6 E W 1/4
(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐
☐ Irrigation ☐ Test Well ☐ Other ☐
☐ DeWater ☐ Rotary ☐ Jetted ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Bored ☐
Cable ☒ Driven ☐
Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 500 feet. Depth of completed well NA ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 Diam. from 1 ft. to 371 ft.
Welded ☐ Diam. from _____ ft. to _____ ft.
Liner installed ☒ Diam. from _____ ft. to _____ ft.
Threaded ☐ Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____ Model No. _____
Type _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unyieldable water? Yes ☒ No ☐
Type of water? Incl. High clay content 358'-369'
Method of sealing strata off cased off

(7) PUMP: Manufacturer's Name NA HP _____
Type _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level NA ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (See note on p. 1)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test _____

Baker test 0 gal./min with _____ ft. drawdown after _____ hrs.

Arrest _____ gal./min with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each strata penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tan sandy clay	0	4
Tan clay & boulders	4	14
Blue clay	14	163
Blue clay w/ some gravel, boulders	163	243
@ 183 & 199		
Blue clay (soft)	243	331
Blue clay (hard) w/ sand	331	345
some pea		
Sandstone, (blasted)	345	358
Gray clay w/ some gravel, (sloppy) heavy	358	369
Shale, dark colored	369	400
coarse black sand (heavily) 5'	400	401
(set 5" liner through shale, bailed dry. (No H ₂ O) must be a confined sand)		
Shale (dark)	401	406
Shale, light colored, semi soft	406	600
@ 424, changing color to green-gray, getting softer.		

6" casing was driven tight into shale to seal strata @ 358'-369'.
Drilled open hole to 400'.
5" liner was installed to 400'.
Black heavy sand @ 400' was bailed dry.
5" liner was then extracted, then continued to drill open hole to 600'.
Well has been capped with a welded on plate, for future drilling @ Owners request.

Work started 2-22 1990 completed 3-30 1990

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Alpine Drilling Co., Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. Box 392 - Fall City

(Signed) Don R. Hays License No. 1459

Contractor's Registration No. ALPINE DRILLING CO. Date 4-2 1990

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with
Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 261-1
Permit No. 3

(1) OWNER: Name KIM County Div. Parks & Recreation Address 2040 84th Ave SE Everett, WA 98040
(2) LOCATION OF WELL: County King NW 1/4 SW 1/4 Sec. 26, T. 26 N., R. 5E W 1/2
Bearing and distance from section or subdivision corner SAMMAMISH RIVER TRAIL Well

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well 1 (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 370 ft Depth of completed well 370 ft

(6) CONSTRUCTION DETAILS:

Casing installed: 6 Diam. from 4.1 ft. to 9.5 ft.
Threaded ☐ Diam. from ft. to ft.
Welded ☒ Diam. from ft. to ft.

Perforations: Yes ☐ No ☒

Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒

Manufacturer's Name Model No.
Type Slot size ft. to ft.
Diam. Slot size ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth: 18 ft.
Material used in seal Pentapize 51.00
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata

(7) PUMP: Manufacturer's Name NONE
Type HP

(8) WATER LEVELS: Land-surface elevation above mean sea level 17 ft.
Static level 6.1 ft. below top of well Date Oct 31 86
Artesian pressure 0 lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken to raise water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test DEPARTMENT OF ECOLOGY
NORTHWEST REGION
Bailer test 10 gal./min. with 0 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒
P.H. 5 M/L - TDS 15 M/L

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	2
Brown clay	2	15
Brown clay/sand gravel	15	20
Gray clay sand/gravel	20	25
Gray clay sand + some gravel	25	26
Gray sand gravel clay water	26	30
Gray gravel sand clay water	30	40
Gray clay sand gravel water	40	58
Gray clay sand	58	98
Gray clay	98	112
Gray clay - water bearing	112	114
Gray clay - sand gravel	114	124
Gray clay sand	124	126
Gray clay	126	128
Gray clay/gravel	128	130
Heaving sand - water	130	140
Heaving sand	140	143
Cemented clay gravel	143	150
Cemented clay gravel	150	194
Gray clay	194	200
Gray clay - a little sand	200	217
Same water		
Heaving sand water	217	223
Gray clay	223	243
Fine gravel - water	243	245
Fine gravel + sand - water	245	250
Gray clay	250	255
Fine Gravel	255	257
Fine gravel - silt	257	259
Very silty sand	259	266
Large boulder	266	267
Silty sand	267	268
Clay clay	268	370

(water was 15 M/L +)

Work started Sept 18 1986 Completed Oct 31 1986

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME B + J Drilling 352-382
(Person, firm, or corporation) (Type or print)

Address 9026 38th SW Seattle 98

(Signed) Elmer E. Hudson
(Well Driller)

License No. 1456 Date Dec 14 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

**DATE
FILMED**

11 / 22 / 93

END