# METROPOLITAN SERVICE DISTRICT

# PHASE I: SITING ISSUES - POTENTIAL SANITARY LANDFILLS

FEASIBILITY REPORT

FOR

DURHAM PITS

TASK 1. LEACHATE: IMPACT AND CONTROL

25 October 1979

P12946.B0

Metropolitan Service District 527 S.W. Hall Boulevard Portland, Oregon 97201

Attention: Mr. Merle Irvine, Director

Solid Waste Division

Gentlemen:

One copy of <u>Task 1, Leachate: Impact and Control</u> is attached, pursuant to the terms of the contract between Metro and CH2M HILL NORTHWEST, INC., dated 12 July 1979, to conduct a feasibility study report on the possible use of the Durham Pits site as a sanitary landfill.

The report is the result of a thorough literature search, field investigation, and technical analysis. Existing conditions at the site are documented, the probable water quality impacts of landfill development are discussed, and potential engineering alternatives for leachate control are analyzed.

Our findings indicate that a combination of leachate control alternatives and solid waste operational techniques will reduce the potential for leachate contamination of ground water. The report discusses the range of risks associated with development of the Durham Pits for sanitary landfill. Any major construction project has associated levels of risk. The designer attempts to reduce those risks to an acceptable level through responsible design. The community served by the facility must then review the risks and evaluate the project.

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Based on the findings of this study, we recommend that the Metropolitan Service District seek formal opinions concerning the acceptability of the Durham Pits site from the appropriate State and Federal regulatory agencies, particularly the State of Oregon Department of Environmental Quality, regarding the Federal Environmental Protection Agency Guidelines for new landfills. Our staff will be available to answer questions regarding the report or to provide supporting data gathered during the study.

We appreciate the opportunity to be of service to the Metropolitan Service District on this important project.

Sincerely,

Michael D. Kennedy, P.E.

Project Manager

Rhea Lydia Graham

Engineering Geologist

Jeffery H. Randall

Ground-Water Hydrologist

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Enclosure

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#### I. PREFACE

#### A. INTRODUCTION

## 1. PURPOSE OF STUDY

CH2M HILL NORTHWEST, INC., under contract to the Metropolitan Service District of Portland, Oregon, performed studies addressing the potential for leachate impact from proposed sanitary landfill operations at the Durham Pits site. The gravels exploited at the Durham Pits contain a ground-water aquifer, which many private wells in the area tap for drinking water use. The U.S. Environmental Protection Agency (EPA) (13 September 1979 Federal Register) requires that a new sanitary landfill facility or practice not endanger ground water currently used as a drinking water supply. Endangerment is defined as the introduction of a contaminant that would require additional treatment of current drinking water supplies or would otherwise make the water unfit for human consumption.

This report presents:

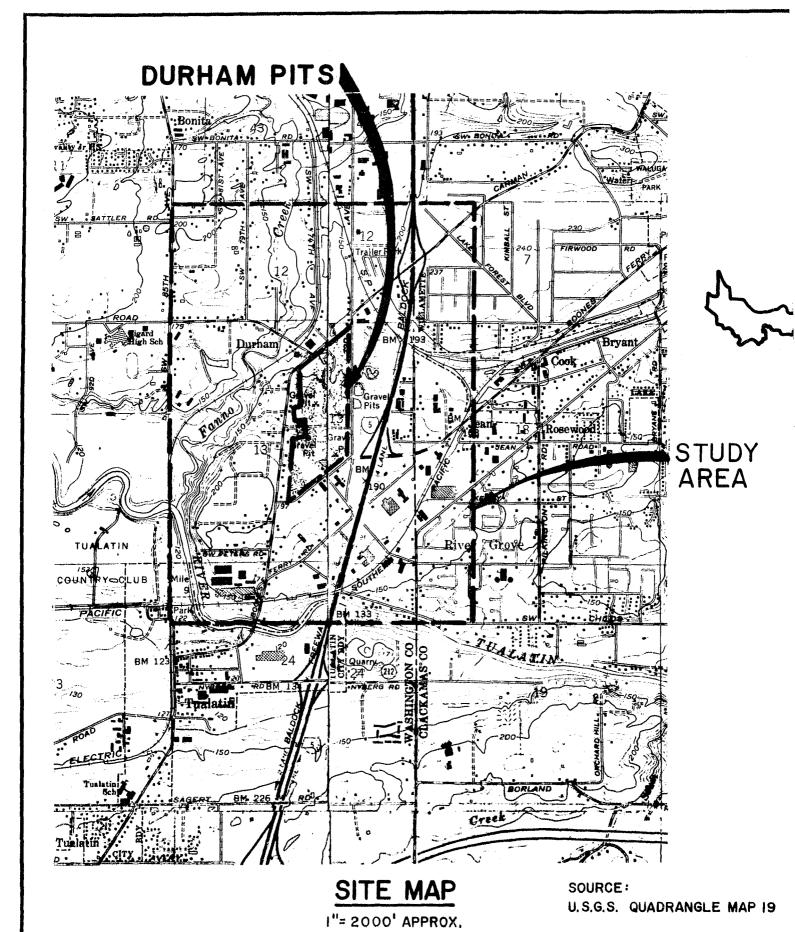
- Data sets gathered for the studies
- Conclusions drawn from analyses
- Recommendations for leachate control at the Durham site
- Appendices containing supporting data

All statements made in this report are based upon available data and information for the Durham site and the surrounding area (see Figure I-1). The recommendations are based solely on technical criteria.

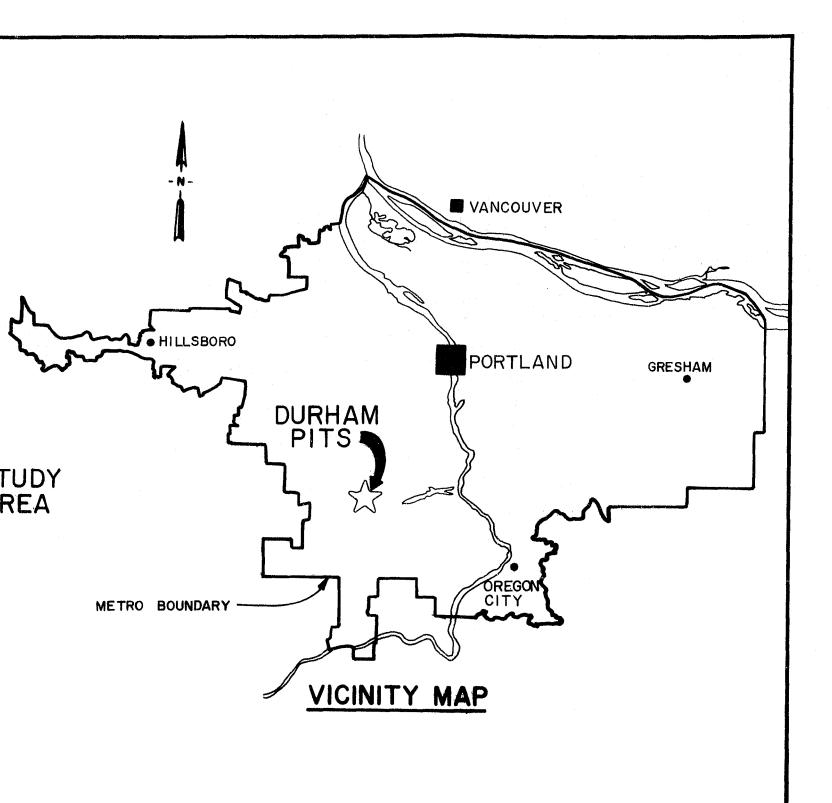
#### 2. SCOPE OF STUDY

Hydrological, geological, and geotechnical analyses were performed to determine:

 Existing character of the ground-water aquifer present in the Durham gravels



P12946.80



# FIGURE I-I

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



- Impact upon the aquifer water quality of leachate generated by sanitary landfilling operations
- Technical feasibility of leachate control at the Durham site

Appendix A-1 presents the detailed scope of services for this study.

#### II. EXISTING PHYSICAL CONDITIONS

#### A. SITE DESCRIPTION

#### 1. PHYSICAL SITE

The Durham gravel pits are located in the eastern half of Section 13, Township 2 south, Range 1 west, Washington County, Oregon.

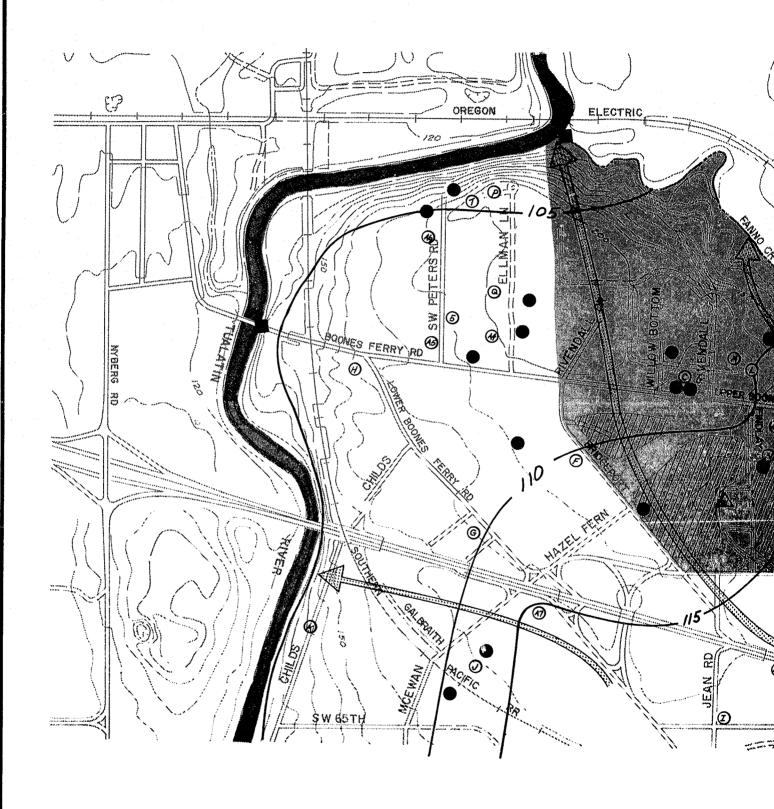
The site is located partly in the cities of Tualatin and Tigard, near the city of Durham, and close to Interstate 5 and the Washington/Clackamas County lines. Figure I-1 shows a site location map and vicinity map of the project area. The property, consisting of 69.97 acres (Washington County Department of Planning, Durham Gravel Pit Study, 1974) is bordered by S.W. 72nd Avenue on the east and by S.W. Boones Ferry Road on the west. (Figure II-1 shows the location in more detail.)

The site is operated as a gravel pit by the Washington County Public Works Department. It was previously operated by Tigard Sand and Gravel. The county uses a portable crusher to process gravel extracted from the site. Currently, the crusher is not located on the site. A pumphouse is located at a pond in the northeast center of the site. A plastic pipe waterline runs from the pond to the crusher location. An unimproved north-south dirt road runs through the site, with a spur to the pond with the pumphouse. A 6-acre parcel of privately owned property separates the southwest pit from the other excavated areas.

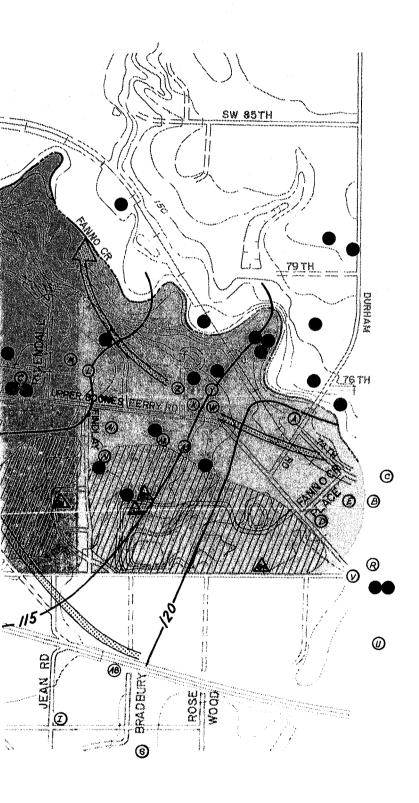
#### 2. SURFACE DRAINAGE

The Durham gravel pits are located in the Tualatin Valley, where the Tualatin River and its tributaries are the major drainage system. Fanno Creek, draining the southwest slope of the Portland Hills, is the western boundary of the study area. The southeast-flowing Tualatin River forms the southern boundary of the study area (see Figure I-1 for the site map).

The Tualatin River and Fanno Creek gradients are very slight in the study area. Their drainage patterns are typical of those associated with mature streams. Fanno Creek joins the Tualatin River in the southwest corner of the study area.



DURHAM PITS STUDY AREA: WELL LOCATIONS



#### SYMBOLS AND LEGEND



AREA OF POTENTIAL LEACHATE IMPACT



DURHAM PITS

---/50---

LANDSURFACE ELEVATION (WASHINGTON CO. BASEMAP 1 IN. = 400 FT, SCALE)

\_\_\_//0-

ELEVATION GROUND WATERTABLE.

\_\_\_\_\_\_

GENERALIZED DIRECTION OF GROUND-WATER FLOW.

**(1)** 

WELLS USED IN WATER LEVEL SURVEY (SEE APPENDIX I FOR DETAILED INVENTORY)

•

WELLS FOR WHICH DRILLING LOGS WERE OBTAINED FROM CREGON WATER RESOURCES DEPARTMENT. LOCATIONS ARE APPROXIMATE.



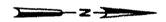
CH2M HILL TEST BORINGS WITH PIEZOMETERS

FOR GROUND WATER MONITORING.



CH2M HILL SURFACE WATER SAMPLING SITES

NOTE: GROUND WATERTABLE ELEVATIONS WERE CALCULATED BY SUBTRACTING DEPTH TO WATER BELOW LAMB SURFACE FROM SURFACE ELEVATIONS AS DETERMINED FROM THE CITY OF TIGARD AND THE CITY OF TUALATIN 1 in. == 180 FT.
SCALE TOPOGRAPHIC MAPS.



400 0 400 800

SCALE IN FEET

OCATIONS & GROUND-WATER TABLE ELEVATIONS

FIGURE II-I
BETROPOLITAN SERVICE BISTRICT
POTENTIAL SAMITARY LAMBFILL SITE
LEACHATE (BPACT AND CONTROL
FOR BURNAR SITE
WASHINGTON COUNTY, ORECON

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#### 3. UTILITIES

## a. Gas Pipeline

The property is crossed by a 10-3/4-inch natural gas line, installed in 1956, that is owned and operated by Northwest Natural Gas Company. The line is located along S.W. Findley Road, which was vacated within the property boundary in 1972. The pipeline right-of-way has been retained by Northwest Natural Gas Company, so that the gravels underlying the pipeline remain intact and have not been exploited. The line runs east-west near the center of the property, thus dividing it into north and south regions.

## b. Sewer Service

Currently, most of the residences and businesses in the area surrounding the Durham gravel pits are not served by a municipal sewage treatment facility. Exceptions to this are Kingsgate Development, directly west of the gravel pits, and the motels and restaurants to the southeast—all served by the Unified Sewerage Agency through its Durham wastewater treatment plant, located to the northwest on S.W. Durham Road.

# c. Water Supply

The majority of homes in this area are supplied with water from their own wells, with only the Kingsgate Development and some of the homes along S.W. Upper Boones Ferry Road being supplied by the Lake Grove Water District.

## B. CLIMATOLOGICAL CONDITIONS

The generation of leachate within refuse is partly a function of the quantity of water entering the refuse. Therefore, climatological data on storm intensity, annual precipitation, and evapotranspiration rates were collected. The appropriate climatological data have been used in analyses relating to surface water drainage and leachate generation.

#### C. GEOLOGY

#### 1. GEOLOGIC UNITS

The bedrock underneath the Durham Pits consists of several lava flows known collectively as the Columbia River Basalt. The basalt is probably 1,000 feet thick and was extruded between 11 and 25 million years ago.

Undifferentiated fill (less than 1 million years old), commonly in thicknesses of 300 to 600 feet, overlies the Columbia River Basalt at Durham. It is probably entirely a freshwater deposit.

The gravels at Durham consist of cross-bedded, bouldery pebble and cobble gravel in a matrix of silt and medium to coarse sand. Boulders in the gravel are as much as 5 feet in diameter. The gravels are principally basalt with scattered granitic, metamorphic, and limonite clasts. Most of the basalt clasts have been derived from the Boring Lava and Columbia River Basalt in the Tualatin Mountains adjacent to Lake Oswego. Quartzite and granite cobbles are from gravel deposits of southeast Portland opposite the east end of Lake Oswego. Limonite cobbles probably have their source in an iron deposit at Lake Oswego.

#### 2. GEOLOGIC HISTORY

Gravel deposits at Durham are considered to be of lacustrine origin and to have been deposited during torrential floods. Trimble (1963) mapped the deposits at Durham as an extension of widespread Pleistocene lacustrine deposits in the east Portland area.

Composition of the gravels and the structure of the deposit and its orientation give credence to the occurrence of a gigantic flood during the late Pleistocene. Flood waters poured through the gap, eroding out the present Lake Oswego, and washing gravels and blocks of basalt through the Tualatin Mountains to deposit them in the fan-shaped delta at Durham. The evidence and mechanism for such a flood are well documented in geological publications (Bretz, 1925, 1928; Allison, 1933).

Before these gravels were deposited, a structural change depressed the Columbia River Basalt, producing a basin between Cooper Mountain and the Tualatin Mountains.

#### 3. GEOTECHNICAL INVESTIGATION

The major concerns in developing a leachate impact and control design recommendation for a solid waste disposal facility are the ground-water hydrology and the soil parameters present at the proposed site. In order to better understand the soil conditions, a two-part geotechnical investigation was made of the site.

#### a. Site Reconnaissance

The first part of the investigation was a geologic reconnaissance of existing exposures on the site. The gravel layers exploited there vary from fine-grained, cross-bedded sands to coarser beds of sandy gravels. All depositional patterns are of fluvial origin. The gravels are rarely clean; they usually contain silt and sand fines. The coarser gravels occur in lenses and do not show major lateral continuity. To the north, these beds diminish in extent and in coarseness of the gravels. Several feet of silt to clayey silt material with no gravel is present north of boring B-3. The silt is varved, indicating that quieter water conditions existed at the time of deposition.

Because of the gravel exposures on the site, test pits were not warranted as part of the geotechnical exploration.

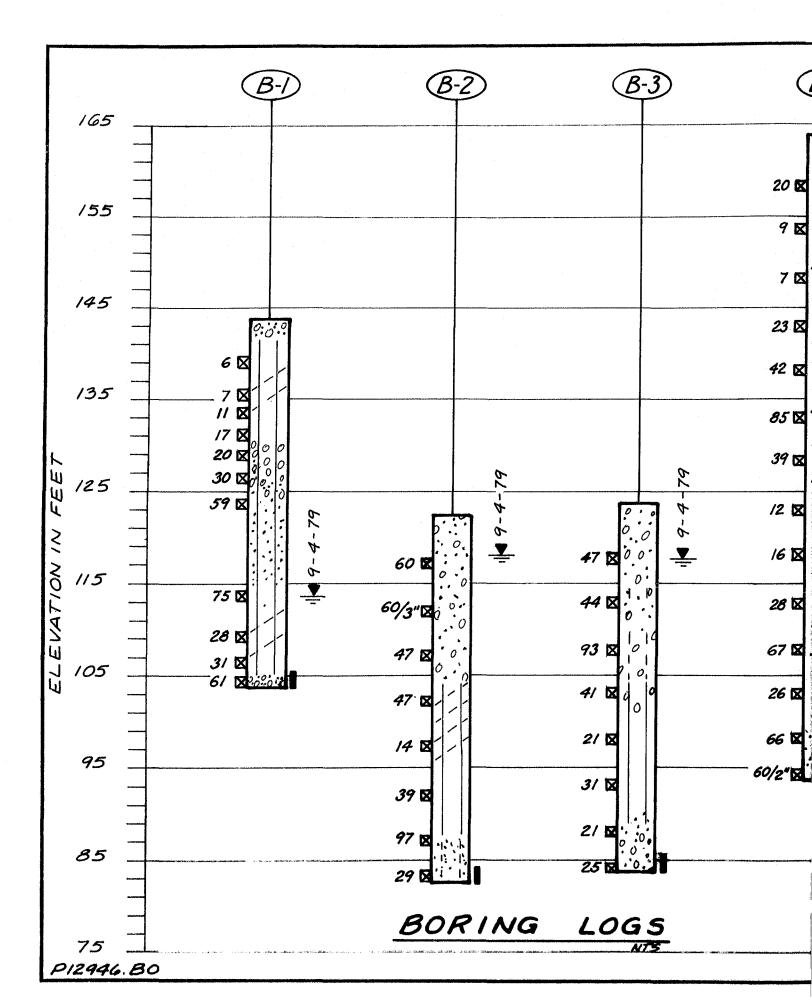
## b. Site Borings

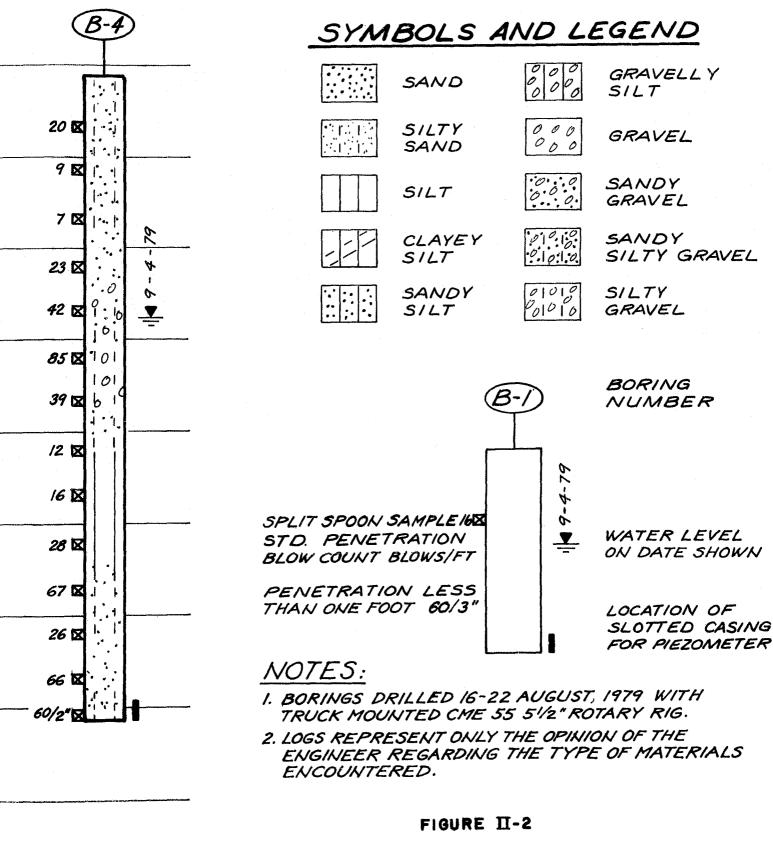
The second part of the investigation consisted of drilling four subsurface borings to determine the soil conditions below the surface. The borings were terminated below the existing water table so that permanent piezometers could be installed to monitor ground-water elevations and quality. The locations of the test borings are shown on Figure II-1. The criteria used for choosing the boring locations were:

(a) surface elevations to be at the lowest accessible elevation on the site, since the existing cuts provided information from the higher elevations; and (b) the locations to be arranged such that the directional flow and quality variations of the ground water might be detected.

The borings were drilled from 16 to 22 August 1979 by Don Kenner of Sherwood, Oregon, a soils sampling contractor. The drilling rig was a CME-55 truck-mounted rotary unit specially equipped to retrieve samples at given intervals from the hole. The sample interval was usually 5 feet, unless changes in materials encountered warranted more frequent sampling. During the drilling process, material in the hole was continually washed up out of the hole as cuttings, which are small pieces of material. These cuttings and the samples retrieved from specific depths were examined by a CH2M HILL geologist on site at the time of drilling. No in-hole tests were performed in any of the borings.

Figure II-2 is a graphical presentation of the material types at each boring location. The boring locations are shown on Figure II-1. The materials penetrated were basically gravels, with silt and/or sand matrix overlying less permeable silts, which in turn overlie more gravels. The upper 25 feet





METROPOLITAN SERVICE DISTRICT

POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON

of B-1 encountered bouldery fill pushed into the area and not natural ground conditions. Borings B-2 and B-3 were begun at the lowest surface elevations of the four borings. The material penetrated by these two borings probably has not been reworked by the gravel pit operations. Boring B-4, the northernmost boring, was drilled outside of the pit excavation; therefore, the subsurface materials have probably not been disturbed.

East of B-2, a permanent pond, representing the ground-water table, is present. A seasonal pond, perched on the varved silts mentioned earlier in the site reconnaissance, is present west of B-3. Little or no water stands in this pond during summer months.

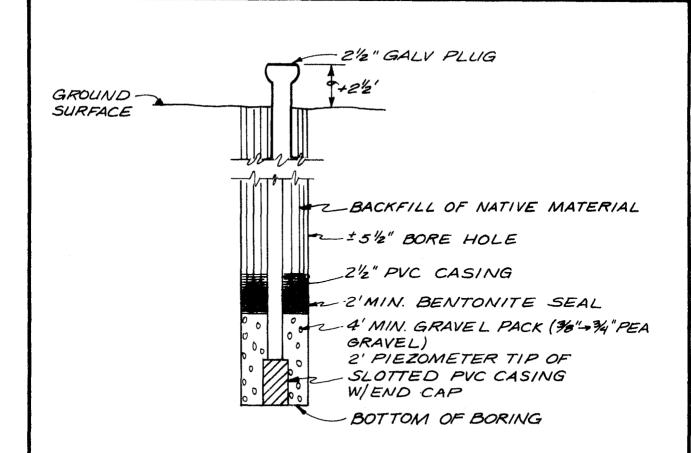
These boring logs do not directly show the hydraulic characteristics of these materials, such as permeability. Also, it is not possible to determine exactly the areal distribution of materials that underlie the entire site based on four sampling points.

Construction details of the piezometers installed in the boreholes are shown in Figure II-3. After each boring was drilled to total depth, the hole was washed out with water to remove all remaining cuttings. The 2-1/2-inch PVC pipe and piezometer tip assembly were lowered to the bottom of the hole. Pea gravel was then carefully poured into the annulus between the PVC pipe and borehole wall. The purpose of the gravel was to provide a highly conductive zone around the piezometer tip and keep fine material in the formation from plugging the piezometer slots. A seal was placed over the gravel pack to prevent entry of water from above. The seal consists of highly compressed clay pellets manufactured by Earl B. Hall, Inc. (EBHI). When the pellets become moist, they expand, thus forming a plug around the PVC pipe.

The remainder of the hole was then backfilled to the surface with native materials. The top of the PVC pipe was capped with a galvanized plug to keep the piezometer from being contaminated.

## c. Laboratory Analyses

A determination of the coefficient of permeability of the soil materials present in the Durham Pits allows us to quantify the infiltration rate of fluids through these materials. Bag samples of three types of the materials present were classified and a sieve analysis performed on each. The samples were of the coarsest gravel, sample S-2; the finest sand without gravel, S-1; and the siltiest fraction, S-3. Results of sieve analyses are given in Appendix B.



PIEZOMETER INSTALLATION IN BORINGS FOR GROUND WATER MONITORING

## FIGURE II-3

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



The coefficient of permeability, K, was computed using the Hazen grain size method. The average K of the Durham gravels is  $3x10^{-2}$  cm/sec (90 ft/day). This value is an approximation of the permeability and indicates that these soils have good drainage and moderate infiltration rates.

#### D. GROUND-WATER HYDROLOGY

#### 1. HYDROGEOLOGY

The Durham gravels form the major aquifer or water-bearing unit in the study area. Many local residents obtain their domestic water from this formation. Review of driller's logs obtained from the Oregon Department of Water Resources (DWR) (Appendix C) indicates significant variations laterally and with depth of the aquifer's lithology. The gravels are a series of overlapping, truncated, discontinuous lenses of silt to clay, fine to medium cross-bedded sands, and cross-bedded bouldery cobble gravel in a silty sand matrix. Typically, the lateral extent of any lens may vary from a few hundred to a few thousand feet. No clay or clean gravel layers were exposed in the pitwalls or found in test borings.

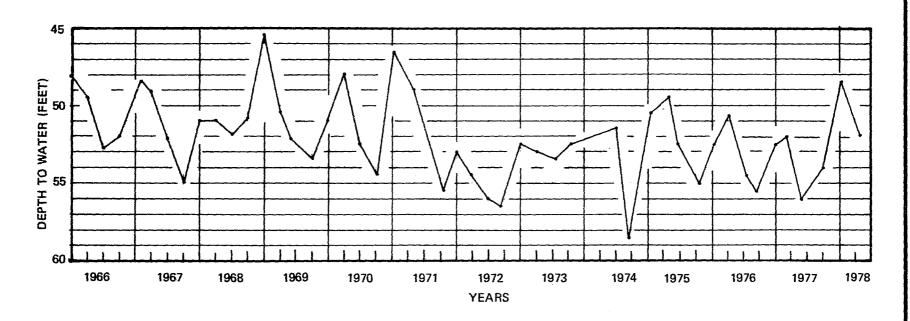
The average permeability of the Durham gravels was calculated as 90 feet per day, based primarily on the grain size analysis. This moderate value is controlled not by the gravel fraction, but by the silty sand matrix through which the water must flow.

Surface infiltration is generally good at the site because of the high permeability of the topsoil, which reduces runoff.

#### 2. GROUND-WATER MOVEMENT

We conducted a water level survey of 31 wells in the vicinity of Durham Pits from 31 July to 1 August 1979 (see Appendix C). The purpose of the survey was to obtain water level information to aid in estimating the direction and rate of ground-water flow in the study area.

The water levels were plotted and contoured as shown in Figure II-1. The direction of ground-water flow is at right angles to the contours. In general, the ground water flows southwest, discharging to Fanno Creek and the Tualatin River. The water table elevation is about 130 feet in the



WATER TABLE FLUCTUATIONS AT THE PILKINGTON NURSERY WELL, DURHAM, OREGON

FIGURE II-4

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPAGT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



northeast, sloping to 105 feet along the Tualatin River. The water level contours are based on one set of measurements obtained during the driest period of the year. Seasonal fluctuations in water-table elevation near Durham Pits have been measured by the Oregon DWR for many years. Figure II-4 is a plot of the Pilkington Nursery well, which shows a maximum fluctuation of 12 feet. This change probably reflects localized summer decline due to extended irrigation pumpage at the measured well. In general, the regional water-level fluctuation is estimated as 5 feet. We recommend continued monitoring of the test piezometers to establish seasonal fluctuations at the pits.

Water levels in most wells at the northern extremity of the study area are very near the surface. These shallow, hand dug wells probably tap a perched water table formed above a low-permeability clayey silt layer. The elevation difference between the perched and regional water table is about 15 feet.

The estimated quantity of flow beneath the Durham site through the upper saturated 50 feet is 154 gallons per minute. This quantity was calculated using Darcy's law (flow rate (Q) = permeability (K) x cross-sectional area (A) x gradient (I)), with the following values:

K = 90 feet per day

A = 2,200 feet wide x 50 feet thick

I = 0.003 (15 feet/5,200 feet)

#### 3. WATER QUALITY

Available surface water quality data were collected from the Oregon Department of Environmental Quality and the Unified Sewerage Agency. To supplement the existing data, we collected water samples from Fanno Creek, the Tualatin River, and test boreholes B-2 and B-4. The water quality data are presented in Appendix D.

In general, the data show that the ground and surface water is of good quality, except for the high bacteria counts in the surface water. Comparison of ground- and surface-water qualities indicates that the Tualatin River and Fanno Creek are higher in nitrate, sulfate, chloride, sodium, and pH than the regional ground water. These chemical constituents are indicators of the sewage effluent discharges (including septic tanks) to these streams. The ground water was higher in iron and manganese as would be expected, based on the lower pH and the presence of limonite (hydrous iron oxides) coatings on some gravels.

Bacteria (total and fecal coliform) counts were not obtained from ground-water samples; however, it is highly unlikely that they exist in the water below the site. Fanno Creek and the Tualatin River have high levels of total and fecal coliforms, indicative of sewage effluent contamination or other animal-caused pollution.

The ground-water quality of test boring B-4 was anomalous. During installation of the piezometer, a large volume of "imported" water was used to flush out the hole. Some of this residual water near the well may not have been completely bailed out prior to sampling. This well has been resampled, but the analysis has not been completed.

#### III. LEACHATE

#### A. CHARACTERISTICS

#### 1. PHYSICAL AND CHEMICAL

#### a. Leachate Generation

Leachate is an obnoxious mineralized liquid produced when decomposing refuse buried in a landfill comes in contact with water. The water can come from several sources, including precipitation on the site, offsite runoff onto the top of the site that percolates through the refuse, or ground water intrusion.

The decomposing refuse has the capacity to hold a certain amount of water before any liquid will be released. After the landfilled refuse has reached its maximum water-holding capacity (field capacity), any additional water entering the refuse will cause an equal amount of water (leachate) to leave the site. This leachate that leaves the landfilled refuse must be controlled to prevent damage to the environment.

# b. Leachate Quality

Leachate is composed of many different chemical compounds, organic and inorganic. Its characteristics can vary dramatically from site to site, according to the specific types of refuse placed in the site and the length of contact time between the refuse and water. Table III-1 indicates the range of characteristic constituents found in leachate from municipal solid waste.

There is the possibility that this site will be used for disposal of boiler ash from the proposed Resource Recovery Facility in Oregon City. The boiler ash will be relatively inert with regard to organic compounds but could contain substantial inorganic chemical material. If the combustion of the refuse within the boiler is incomplete, there will be some degree of organic residue. This leachate will require collection and treatment prior to disposal. Table III-2 presents ash leachate characteristics from a specific test program.

## 2. GROUND-WATER INTERACTIONS

Concepts useful for describing surface-water pollution are generally not valid for ground water. The relatively slow velocity of ground water results in laminar flow, which

Table III-1

RANGE OF LEACHATE CHARACTERISTICS

	Value <sup>a</sup>	mg/l
Constituent	Range <sup>b</sup>	Typical
BOD <sup>5</sup> (5-day biochemical oxygen demand) TOC (total organic carbon) COD (chemical oxygen demand) Total suspended solids Organic nitrogen Ammonia nitrogen Nitrate Total phosphorus Ortho phosphorus Alkalinity as CaCO <sub>3</sub> pH Total hardness as CaCO <sub>3</sub> Calcium Magnesium Potassium Sodium Chloride Sulfate Total iron	2,000-30,000 1,500-20,000 3,000-45,000 200- 1,000 10- 600 10- 800 5- 40 1- 70 1- 50 1,000-10,000 5.3- 8.5 300-10,000 200- 3,000 200- 2,000 200- 2,000 100- 3,000 100- 1,500 50- 600	10,000 6,000 18,000 200 200 25 30 20 3,000 6 3,500 1,000 250 300 500 500

aExcept pH.

Source: Tchobanoglous, George, Hilary Theisen, and Rolf Eliassen, Solid Wastes: Engineering Principles and Management Issues.
McGraw-Hill, Inc. 1977.

Note: Constituents will also include the total array of heavy metals in concentrations which will range from only trace amounts to several 100 mg/l dependent on the wastes deposited in the landfill.

Representative range of values. Higher maximum values have been reported in the literature for some of the constituents.

Table III-2
ASH LEACHATE CHARACTERISTICS

Parameter	Leachate Analysis (mg/l)
Alkalinity	1,800
Aluminum	2.5
Arsenic	0.21
Barium	1.3
Biochemical Oxygen Demand	890
Cadmium	0.015
Calcium	540
Chloride	4,200
Chromium	<0.01
Chemical Oxygen Demand	1,100
Conductivity	20,000
Copper	2.8
Fluoride	3.0
Hydrocarbons	<1
Iron	<0.1
Lead	0.09
Magnesium	1.8
Manganese	<0.1
Mercury	<0.001
Nickel	0.2
Nitrate - N	0.28
Nitrite - N	0.13
pH Phone to the second (Motor)	12.20
Phosphorous (Total) Potassium	0.41
Selenium	1,900 0.46
Silicon	1.4
Silver	0.05
Sodium	2,000
Sulfate	140
Tin	2.0
Titanium	<0.1
Total Dissolved Solids	11,000
Zinc	0.05

Source: CH2M HILL, and Winzler and Kelly Water Laboratory, Humboldt County Solid Waste Resource Recovery Study, East Hamilton Solid Waste Reduction Unit, Hamilton, Ontario, Canada. June 1977.

Note: Biochemical oxygen demand value of 890 mg/l indicates incomplete combustion.

exhibits different mixing characteristics than does turbulent flow usually associated with surface streams. If water of different chemical composition enters the ground-water system, it does not mix with the entire ground-water body. Instead, it moves with and in the direction of the ground-water flow as a plume undergoing minimal mixing. Diversions in flow direction from induced changes in gradient (e.g., a pumping well) will also divert the leachate plume. The plume shape is determined by the physical characteristics of the soil. Hydraulic and geologic conditions and leachate density determine the vertical depth to which leachate will migrate into the aquifer. The thickness and width of the plume will probably increase with distance down gradient from the source.

The chemistry of leachate interaction with ground water and soil material is highly complex and variable. There are no hard and fast rules to predict quality changes when leachate mixes with ground water. The following discussion emphasizes major trends; however, all possible chemical conditions and resulting reactions may not be represented.

Attenuation is defined as a reduction in dissolved constituent concentration with distance in the direction of flow. Attenuation may result from chemical, physical, or biochemical reactions that remove the constituent from solution. Apparent attenuation occurs from dilution through mixing with water of better quality. Not all leachate constituents are attenuated to the same degree, and some are not attenuated at all.

In soils and sediments underlying landfills, the cation exchange capacity (CEC) will immobilize a certain amount of the leached cations. When the capacity has been reached, further percolation of cations will not be affected.

It should be noted that cation exchange is not a permanent fixation. Cations may be desorbed with changes in solution composition, pH, or oxidation-reduction (redox) potential.

Divalent and trivalent cations include most of the heavy metals. These are held more strongly than sodium, potassium, or ammonium on the cation exchange complex. Heavy metals will displace monovalent cations, which are adsorbed. Heavy metals are also prone to adsorption on hydrous oxide coatings in the soil. The hydrous oxides are frequently cited as so limiting metal solubility that agricultural deficiencies of copper, zinc, and cobalt occur. Attenuation of heavy metals present in leachate is desirable. In locations virtually free of clay minerals, these coatings may be present on sand grains, giving the sandy formation some ability to attenuate metallic ions.

In general, heavy metal anions containing chromium, arsenic, boron, and selenium are not attenuated to any degree in ground-water environments where pH <7 and Eh <0 (slightly acid and reducing conditions).

Chemical precipitation in the aquifer is possible if the natural ground-water composition includes ions that form insoluble compounds with leachate constituents. An example would be formation of insoluble hydroxyapatite with leachate phosphate and calcium in ground water. Iron, aluminum, and manganese can also form virtually insoluble precipitates with phosphate.

Carbonate can react with calcium, magnesium, and some heavy metals forming relatively insoluble compounds. Also, changes in redox potential, buffering reactions, or changes in lithology may produce other precipitation reactions.

The second means of attentuation in aquifers is by physical filtration. This mechanism removes only suspended matter, such as turbidity or microorganisms in the leachate, not dissolved constituents. The finer the grain size of the aquifer material, the more efficient the filtering will be. Usually ten feet are sufficient to remove most suspended solids.

The third means of attenuation is termed decay. Oxidation of organic compounds reduces them to carbon dioxide and water. Microorganisms carried into the aquifer zone are deprived of a good nutrient supply and are subjected to a cooler temperature than in the solid waste zone. This results in a lowering of biochemical activity, frequently to the point of cessation. The inactivation, coupled with natural die-off, tends to reduce bacterial and viral numbers rapidly.

Table III-3 summarizes the susceptibility of leachate components to major attenuation in ground-water systems.

## B. CONTROL

#### 1. DESIGN

The potential for environmental degradation from leachate produced in landfills is a serious problem and one that has been the subject of an increasing number of studies and Federal regulations. Most recently, the Environmental Protection Agency has promulgated solid waste disposal facility criteria under Section 4004 of the Resource Conservation and Recovery Act of 1976 (RCRA). Section 257.3-4 "Groundwater" of these regulations stipulates practices that

Table III-3 Susceptibility of Leachate Constituents to Major Attenuation

Constituent	Attenuation Mechanism
Chloride	0
Sulfate	0
Phosphate	A-C
Nitrate	0
Ammonium	A
Sodium	0
Potassium	A
Calcium	A
Magnesium	A
Heavy Metal Anions	0
(Cr, Se, B, As)	
Heavy Metal Cations	A-C
(Pb, Cu, Ni, Zn, Cd, Fe, Mn, Hg,	Cr)
COD	0
Volatile Acids	0
Phenols	O-A
MBAS	O <b>-A</b>
Bacteria and Virus	F-B

O = No Attenuation

A = Adsorption
B = Biological Degradation
C = Chemical Precipitation
F = Filtration

will be unacceptable in a solid waste disposal facility. The specific rule indicates that "a facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or beyond an alternative boundary specified in accordance with Paragraph B of this section." The primary leachate control objective in designing a landfill in an active area of ground water use is to prohibit significant migration of leachate beyond the landfill boundary.

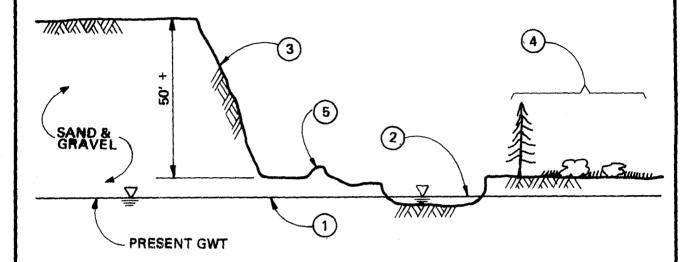
Geotechnical soils parameters furnish some of the information used to determine lining criteria for the prevention of leachate escape, as well as information about the potential for leachate migration through the surrounding soils. Some means to prevent leachate escape must be used at this site. The gravels, sands, and silts on the site are free-draining and permeable. In addition, ground-water aquifers are contained within these soils. The following discussion addresses design techniques for leachate control.

Because the site is located in relatively permeable soils, and because a number of shallow wells around the site are used for domestic water supply, a conservative approach should be used in designing a leachate control system. This is especially true because (a) the ground water could become contaminated, and (b) it would be extremely expensive to make repairs or corrections later in a landfill if the leachate is not controlled initially. Basically, a "belt and suspenders" approach should be used.

Such an approach consists of (a) minimizing the amount of water that can enter the landfill by using a relatively impermeable cover over the complete landfill, and (b) controlling the water that does enter the landfill by catching it on a bottom lining and removing it with a leachate collection system. The intercepted leachate can then be sent to a wastewater treatment facility or other disposal facility.

## a. Proposed Leachate Control System

The existing conditions are illustrated in Figure III-1. The summer ground-water table is generally less than 10 feet below most of the pit floor. In some areas, excavation has been made below the summer ground-water table; consequently, ponds have been formed. The side slopes of the pit are very steep and have a rough surface; occasionally, large boulders and other material are in some danger of ravelling off this slope. The bottom of the pit has trees, brush, and grass, and the pit floor is generally rough and uneven. Accurate topographic mapping of the pits was unavailable during the preparation of this study.



- PRESENT GROUND WATER TABLE USUALLY A FEW FEET BELOW MOST OF THE PIT FLOOR.
- SOME AREAS OF DEEPER EXCAVATION, WITH WATER.
- 3 VERY STEEP SLOPES, ROUGH SURFACE, OCCASIONAL LARGE BOULDERS THAT MAY FALL.
- 4 SMALL TREES, BRUSH, & GRASS.
- 5 ROUGH, UNEVEN SURFACE OVER MUCH OF THE PIT FLOOR.

# EXISTING CONDITIONS

FIGURE III-1

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



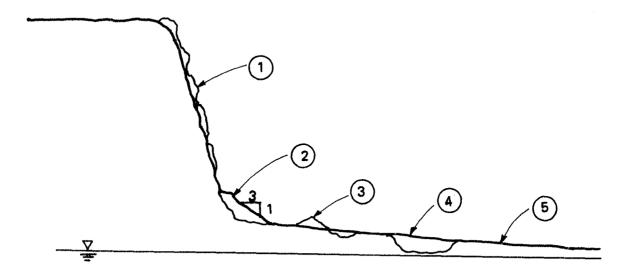
Figure III-2 illustrates some of the needed site preparation. It will be necessary to clear, grub, and strip all vegetative material from the pit floor as a first step. The side slopes should be smoothed to remove overhangs and to generally scale down any loose material that might fall during the operation of the landfill. A fillet or fill should be placed at the juncture of the pit floor and side walls, with a gentle slope of about three on one. This will form a good working surface for construction of the bottom lining. The bottom of the pit floor should be graded to a smooth shape and sloped to drain. The existing ponds should be filled in as part of the grading in the bottom.

Figure III-3 illustrates the proposed concept for leachate control. The top of the completed landfill will be covered by a 3- to 4-foot layer of topsoil capable of supporting vegetation. Under this 3- to 4-foot layer of soil, a "roof" lining, probably of synthetic material, would be placed. Bedding material would separate the top liner from the refuse. The side slopes of the pit would be covered by a plastic lining draped from the top of the banks to the bottom. The bottom of the pit would be covered with an impermeable lining, probably a synthetic liner. Just above the bottom lining would be a system of perforated pipes, laid in gravel to collect any leachate that forms.

Because of the steep side slopes, it will take special care during construction to make the side lining watertight. Therefore, a granular material should be placed between the refuse and the side lining. This granular material will function to intercept water moving laterally through the refuse or any water that may leak through the side lining from the outside, and will transport the water to the drain pipes in the bottom.

The heavy arrows on Figure III-3 indicate the direction of water flow; the wavy arrows schematically show the direction of landfill gas. The relative amount of water is shown by the width of the large arrows. Most of the precipitation falling on the top would be directed off the site by the roof lining to adjacent surface drainages. The 0 to 5 gallons per minute of water that may leak through the roof lining will go downward to the pervious top cover material and then laterally to the granular material placed against the side slopes. The water will then proceed downward to the pervious material on top of the bottom lining and through this material to the collection pipes.

The elevation of the edge of the bottom lining should be above the maximum anticipated ground-water level.



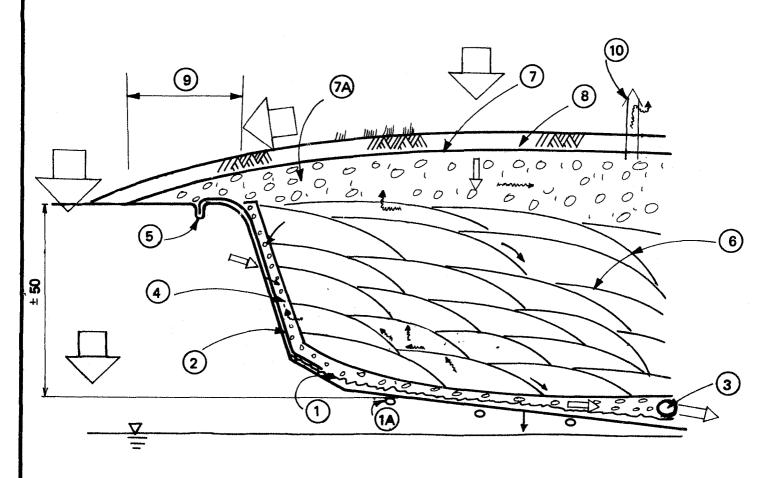
- SMOOTH SIDE SLOPES, REMOVE OVERHANGS AND GENERALLY SCALE DOWN LOOSE, DANGEROUS MATERIAL
- FILL HERE TO TOP ELEVATION= 3'± ABOVE FLOOR ELEVATION OR TO ABOVE MAXIMUM ESTIMATED GW ELEVATION
- GRADE SMOOTH AND SLOPE TO DRAIN
- 4 FILL AREAS NOW WATER FILLED
- 5 CLEAR, GRUB, AND STRIP ALL VEGETATIVE MATTER

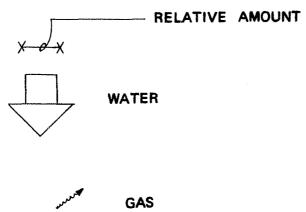
# SITE PREPARATION

## FIGURE III-2

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON







COMPLETED LANDFILL

1	IMPERMEABLE MEMBRANE LINER, PROVIDE SAND BELOW AND ABOVE, PROVIDE 18" PERVIOUS COVER FOR MECHANICAL PROTECTION AND TO LEAD LEACHATE TO DRAIN 3
1A)	POSSIBLE VENT PIPES TO PREVENT AIR PRESSURE: WHICH MAY LIFT LINING 1) BEFORE WASTE IS IN PLACE AND TO MONITOR LEACHATE ESCAPE
2	PLASTIC LINER DRAPED OVER SLOPES, SHEETS OVERLAPPED WITH NO FIELDSEAM, COVER WITH SUNSHADE IF NECESSARY, STAKE TO SLOPE OR COVER WITH WIRE NET TO PREVENT WIND DAMAGE UNTIL WASTE IS PLACED
3	LEACHATE COLLECTION PIPE(S) AT LOW POINTS
4	PERVIOUS, GRANULAR MATERIAL PLACED AS PIT
5	ANCHOR TRENCH FOR SLOPE LINER
6	PERVIOUS COVER ON CELLS SERVES TO CONDUCT WATER QUICKLY TO THE BOTTOM. ALSO GAS CAN. VENT UPWARDS
7	PLASTIC LINER FOR ROOF, SLOPED TO DRAIN AWAY
7A)	PERVIOUS MATERIAL TO ALLOW GAS VENTING TO 10
8	SOIL COVER WITH TOPSOIL AND PLANTED
9	EAVE OR OVERHANG ON "ROOF"
10	GAS VENTS

FIGURE III-3

METROPOLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



Figure III-4 illustrates the eave effect that can be realized by making the roof lining extend about 30 feet beyond the edge of the pit. This overlap will be coordinated with the detailed surface drainage plan to be developed during preliminary design.

### b. Design Considerations

Some of the specific items that will have to be considered in the later detailed leachate control system design are discussed below.

Bottom Liner. The bottom liner must be of high quality construction. A watertight lining should be the goal. Mechanical protection, consisting of about 18 inches of soil, must be provided to prevent damaging the lining with equipment during solid waste placement operations. This lining material must also be selected to be resistant to attack by the leachate. Other sanitary landfill sites in the United States currently operate with a synthetic bottom liner. Examples of these sites are listed in Appendix E.

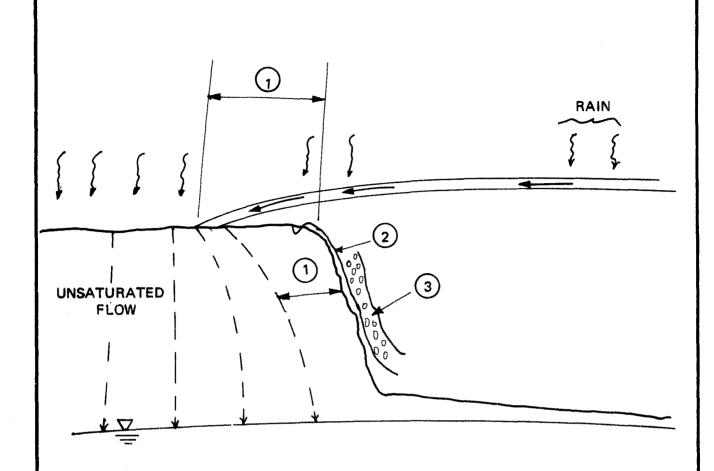
Side Liner. The side lining will be exposed to the elements for the period of time until the landfill is completed. This lining will be subject to sunlight and ozone, which deteriorates some lining materials. Therefore, either a lining material that will not deteriorate due to exposure to the elements should be selected, or a sunshade should be provided by using a second lining over the primary lining material. This sunshade material should be resistant to deterioration by sunlight.

In addition, wind may cause flutter and possible mechanical damage to the lining. This could be prevented by securing the side lining to the side slope at frequent intervals or by placing wire net over the lining. It may also be possible to install the side lining in phases as filling progresses, to minimize exposure to damage. The detailed timing of side lining installation would be determined in the operational plan.

Roof Liner. There are no other special requirements. This lining will be subject to mechanical damage during its construction, so care should be taken during placement. It should not be in contact with leachate.

#### c. Grading

A great deal of effort will be required to develop a suitable grading plan for the pit floor. The plan must consider the needs of the leachate collection system and drainage during



- EAVE WILL MINIMIZE RAINWATER INFILTRATION ENTER REFUSE
- 2 SLOPE LINING MINIMIZES AMOUNT OF WATER THAT
- GRANULAR MATERIAL COLLECTS THAT WATER WHICH PENETRATES SLOPE LINING AND QUICKLY LEADS IT TO LEACHATE COLLECTION SYSTEM, THEREBY MINIMIZING CONTACT TIME WITH REFUSE

## EAVE EFFECT

FIGURE III-4

METROPLITAN SERVICE DISTRICT POTENTIAL SANITARY LANDFILL SITE LEACHATE IMPACT AND CONTROL FOR DURHAM SITE WASHINGTON COUNTY, OREGON



operation of the pit. The preparation will necessarily require careful construction and inspection to ensure a smooth base for the liner to prevent mechanical damage.

A grading plan will also be necessary for the top of the landfill when it is completed. Proper drainage of precipitation away from the pit will minimize the amount of seepage into the landfill. A minimum top slope of 3 percent will ensure adequate runoff to adjacent surface drainages.

#### d. Additional Data Required for Detailed Design

To establish the proper elevation for the edge of the bottom lining, it will be necessary to determine the maximum anticipated ground-water levels. This should be accomplished by taking periodic readings of the piezometers and the water levels of the ponds that now exist in the pits.

The bottom synthetic lining material must be resistant to attack from leachates. Manufacturers' data on existing landfills using synthetic liners should be reviewed, as well as specific product specifications. Data from leachate contact tests with synthetic lining materials should be reviewed.

#### 2. SOLID WASTE OPERATIONAL TECHNIQUES

A detailed operations plan for complete filling and closure of the site will be developed in future work, if the site is acceptable from the technical standpoint. The operations techniques presented below address only the topic of control of leachate impacts.

Several solid waste operational techniques should be incorporated into a new sanitary landfill to decrease the potential of leachate escape from the site into surrounding soils and/or ground water. These methods include refuse shredding, amount and type of final cover material and final slope, and alternative methods of compacting and placing refuse to minimize leachate generation. These various techniques are discussed below.

#### a. Shredded Refuse Landfill Operation

Shredding is a size reduction process whereby raw solid waste is mechanically reduced, in a milling machine, to a homogeneous mass of relatively consistent small-particle-sized material. In the size reduction process that occurs in the milling machine, the refuse is violently torn and experiences an increase in temperature. The food and other organic particles present in raw refuse are dispersed and absorbed

by the paper portion of refuse during the shredding process. In the shredding process, the incoming heterogeneous refuse is reduced to some consistent predetermined particle size. This particle size, being less than the average particle size of the incoming refuse, increases the total surface area of the milled waste, and allows accelerated chemical and biological decomposition reactions to occur. This increased reaction time is enhanced by the mixing action of the shredding process that distributes the water, chemicals, bacteria, and nutrients present in the incoming wastes evenly throughout the final processed mass. Rapid decomposition in the landfilled refuse allows settlement and stabilization to occur much more quickly than in an unprocessed refuse landfill. Studies have shown that significant settlement has occurred within the first 2 years after completion of a shredded refuse landfill.

There are several important differences in composition and production rates of leachate from milled refuse and unprocessed refuse. The general differences are:

- Initial leachate production rates are generally higher from shredded refuse, although this depends to a large degree on the amount and permeability of final cover.
- Organic matter is leached from shredded refuse at a higher concentration and more quickly than from unshredded refuse.
- Shredded refuse leachate is initially acidic and approaches neutrality with time. Unshredded refuse leachate becomes more acidic with time.
- Shredded refuse leachate characteristics are influenced less by seasonal variations in weather than is unshredded refuse leachate.
- Shredded refuse reaches a "mature" decomposed state much more quickly than unshredded refuse.

 $<sup>\</sup>frac{1}{2}$  Reinhardt and Ham, 1973, Final Report on a Milling Project at Madison, Wisconsin, between 1966 and 1972.

These conclusions support the beneficial aspects of landfilling shredded refuse when leachate is collected from the site and treated. Because the major portion of decomposition and leachate generation occurs evenly and guickly, shredded refuse landfills can be returned to productive uses sooner than nonshredded landfills.

Shredding increases the rate of physical-chemical leaching and biological decomposition by increasing the surface area of the refuse, thereby exposing more of the refuse to biological and leaching activity. Also, water flows more evenly through the entire volume of refuse rather than through channels, as in unprocessed refuse. The shredding process also breaks up large items and allows the refuse to decompose uniformly, so that the readily removable matter is quickly extracted from the refuse at an even rate, leaving a relatively inert mass behind.

The objective of lining the site is to prevent leachate escape, and the integrity of the liner is crucial. It is anticipated that the top liner will prevent any significant infiltration of precipitation and, hence, generation of leachate. The accelerated rate of decomposition of shredded refuse will result in less reliance being placed on the long-term durability of the liner. The sooner the refuse reaches a "mature" decomposed state, the lower the potential for ground-water impact from leachate.

In summary, shredding refuse appears to be a useful technique to accelerate the generation of leachate. With a leachate collection system in operation beneath the proposed landfill site, the likelihood for capture and removal of leachate is greatly enhanced if this leachate is produced rapidly. The impact of time-related failures of the underdrained system and/or the site liner can be minimized if leachate production occurs within the first several years after completion of the site.

#### b. Final Cover

The thickness of final cover and the top slope are both critical items to determine the quantity of infiltration that will percolate through the cover and into the refuse. In a well-designed site, this infiltration of precipitation falling directly on the site will be the primary source of leachate generation. An impermeable layer of synthetic material placed over the final lift of refuse will prohibit infiltration of most precipitation. Placement of a thick layer of soil over the synthetic cover will provide a base for future landscaping and will also allow moisture retention. Landscaping with a high consumptive water use will also aid in decreasing infiltration through the top cover.

Another operational technique for final cover is for an increase in the top slope of the site. This increased slope will result in a greater rate of runoff to adjacent surface water drainages. Top slopes of approximately 3 percent are adequate for most drainage and are aesthetically pleasing as well. Greater slopes of up to 10 to 15 percent could be designed to rapidly drain surface water into drainage swales lined with half-round culvert pipe. The drainage could then be conveyed away from the site.

#### c. Operational Techniques

Several techniques can be employed during filling of the landfill that will either minimize leachate generation or tend to minimize the total escape of leachate from the completed site.

One technique addresses daily cover. Studies and experience at operating landfills have indicated that daily cover is not necessary for shredded refuse. The cover is primarily for aesthetic reasons. For this site, if an impermeable daily cover were used, a small reduction in leachate generation could be expected.

It is important that the daily refuse cells be placed and compacted in layers sloping from the outer edges of the site toward the middle. This will tend to create horizontal layering within the site and direct the flow of any rainwater that may percolate through the site toward the middle. The water will move laterally to the center of the site, down through the refuse and may then be collected in the leachate collection system.

#### d. Leakage Through Liner

The design approach chosen for the Durham Pits site is to line the landfill with an impermeable synthetic membrane to contain all generated leachate. However, small holes may develop during construction and placement of the liner. The estimated seepage rate through a typical installed synthetic membrane is about 10 inches per day at 20 feet of head. This value is based on actual measured losses after 1 year of service. The calculated seepage rate at the Durham site is 0.1 gallons per minute, using site parameters of 70 acres surface area and 1.0 foot maximum depth of leachate. The 0.1 gallons per minute seepage is an average value. Maximum worst case values should not exceed 1 gallon per minute (10 times greater).

<sup>1/</sup>Kays, W. B., 1978, Construction of Linings for Reservoirs, Tanks, and Pollution Control Facilities, John Wiley & Sons, p. 213.

Upward leakage of ground water into the landfill may also occur where the bottom liner is below the maximum ground-water table elevation. However, this small volume of leakage (less than 1 gpm) can easily be controlled by the leachate collection/drainage system described earlier in this report.

#### C. GENERATION VOLUMES

#### 1. WATER BALANCE

Leachate containing suspended and dissolved materials as a result of contact with the disposed solid waste is generated in all sanitary landfills. A reasonable estimate of leachate quantity is needed in order to evaluate collection, treatment, and discharge capacity.

To assist in determining infiltration and evapotranspiration quantities, a water balance was constructed for the Durham Pits site, incorporating:

- Average monthly precipitation
- Average monthly potential evapotranspiration
- Average monthly actual transpiration (assuming 3-inch water soil capacity)

A total site precipitation of approximately 42.1 inches per year is realized, of which approximately 14.4 inches per year are estimated to be lost to evapotranspiration. The water balance for the Portland area indicated that:

- On the average, excess potential evapotranspiration capacity exists (above that which can be drawn from soil moisture utilization) from approximately mid-May through mid-September.
- On the average, from mid-November through mid-May, a water surplus will exist and excess rainfall that does not become surface runoff or evapotranspirate will infiltrate and may produce leachate.

#### 2. MAXIMUM LEACHATE QUANTITY

Several assumptions must be made in calculating the potential leachate quantity generated at the Durham site. The most conservative (worst case) assumptions yield the upper limit for leachate quantity.

The maximum potential volume of leachate generated by precipitation recharge at the Durham site was calculated by the water balance method to equal 53 million gallons per year, or about 100 gallons per minute. Table III-1 summarizes these calculations. The form of the water balance equation used is:

Leachate Volume = Precipitation - Evapotranspiration

Runoff was assumed to be negligible from the fill cover. A synthetic top cover was not included; hence, precipitation that does not evapotranspirate will infiltrate the refuse. Soil moisture-holding capacity was also taken to be negligible, assuming the fill will reach a quasi-steady state after operations begin. These assumptions are conservative in that they tend to yield leachate volumes that are maximums.

The maximum height that leachate will stand above the bottom of the pit is 7.7 feet. This "worst case" value assumes no leachate is collected during the year, and porosity (or void spaces) of the fill equals 30 percent.

#### 3. EXPECTED LEACHATE QUANTITY

The conceptual leachate control system should prevent the generation of significant quantities of leachate within the site. The assumptions used to calculate the expected leachate quantity are:

- Runoff from the top cover to adjacent surface drainages is assumed to be 98 percent, due to the impermeable top cover.
- Soil moisture-holding capacity was assumed to equal 4 inches of water.
- Field capacity of the refuse was assumed to equal
   50 percent.

Based on these assumptions, potential leachate volume due to recharge by precipitation is calculated to equal about °20,000 gallons per year or about 2 gallons per minute.

The site life will be determined in later tasks. If the site can be completed and the top cover placed before the refuse reaches field capacity, leachate generation from precipitation recharge may not occur. The specifics of site life and placing final cover should be investigated in more detail during preliminary design.

With the top cover and the leachate collection underdrain system, maximum height of leachate in the site should never exceed 1 foot.

#### D. GROUND-WATER IMPACT

Figure III-5 is a simplified diagrammatic representation showing how the small amount of leachate that may escape the landfill will move through the subsurface and ultimately discharge to the Tualatin River and Fanno Creek. The areal extent of potential impact is shown on Figure II-1.

The estimated volume of leachate leakage to ground water ranges from 1 to 0.1 gallon per minute. The leachate will probably mix with the upper 50 feet of ground-water flow beneath the site. The estimated flow in this zone is 154 gallons per minute, therefore yielding dilution ratios of 1:154 to 1:1,540. This means the diluted concentration of any leachate component in ground water will be 0.6 to 0.06 percent of its undiluted concentration.

In addition to pure dilution, many of the leachate constituents will be attenuated by various mechanisms. Table III-2 summarizes the susceptibility of leachate components to attenuation.

The magnitude of attenuation cannot be quantified for the Durham site without extensive laboratory column tests using site materials and leachate of the quality expected to be generated at the site.

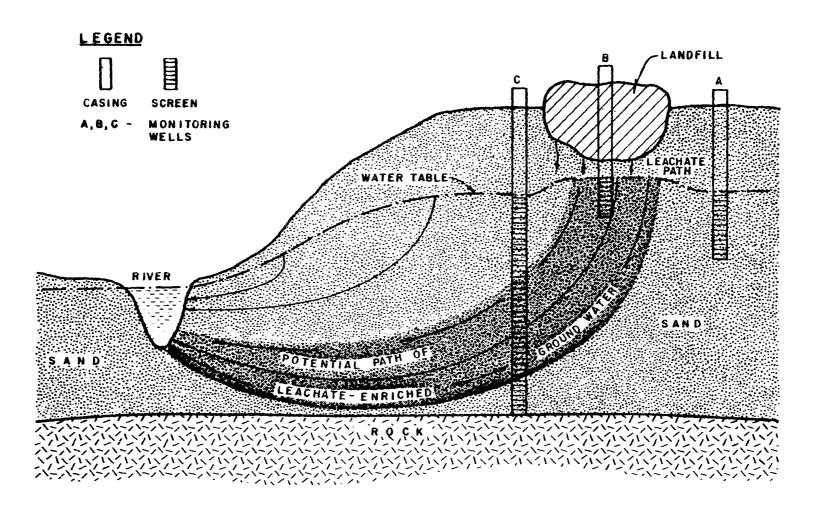


Figure III-5 Diagrammatic Cross-Section of Leachate Plume Beneath the Durham Site

#### IV. RECOMMENDATIONS AND RISKS

This report discussed the geotechnical, hydrogeological, and solid waste aspects of developing the Durham Pits site for sanitary landfill. The objective of this study was to determine if there is a technically feasibile method by which the Durham site can be used for sanitary landfill, taking into account leachate impact and control.

The determination of acceptability of any given site will have to be based upon relative risks and benefits. No major construction project is free of risk. The same is true with construction of a new sanitary landfill. The best technical solutions and construction methods are subject to risk.

The Durham site is technically feasible for sanitary landfill use, within certain levels of risk. The final determination of acceptability should be made by decision makers sensitive to the social and political concerns of the community, in full awareness of the technical solutions and resultant risks.

The recommendations outlined in this section present a technically feasible solution to use of the Durham Pits for sanitary landfill. The associated risks are also presented for decision making.

#### A. RECOMMENDATIONS

The following actions, if implemented at the Durham site, will reduce the risks of contamination of ground water by leachate to the levels indicated at the end of this section.

- 1. All refuse delivered to the Durham site should be shredded off-site prior to landfilling. Unprocessed refuse should be prohibited from disposal at the site.
- The site design should include a bottom liner.

  The bottom liner should be composed of an impermeable membrane such as polyvinyl chloride (PVC),

  Hypalon, chlorinated polyethylene (CPE), or butyl rubber. These types of materials have an elongation of over 100 percent. They provide a flexible liner that can be more easily installed. The membrane will need to be covered with an appropriate thickness of fine-textured earth cover, as well as placed over a suitably prepared smooth surface, so that heavy equipment can operate in the landfill without a high risk of tearing the liner.

Membrane liner thicknesses of 20 mil are usually used in landfills, but 30 mil thicknesses are sometimes used where heat generation could be a problem. Reinforced materials may be necessary in critical areas, such as areas of bottom leachate collection.

- 3. The site design should include a side liner. The side liner should also be constructed of an impermeable membrane such as PVC, Hypalon, CPE, or butyl rubber and other. Side slopes of 3:1 or flatter, where possible, will minimize stretching in unreinforced sheets of PVC of a length of 25 feet. Otherwise, a reinforced liner must be used to obtain strength. The sides can be lined in sections as cells of fill are constructed.
- 4. The site design should include a top cover. The top cover should also be of an impermeable membrane, which can then be covered with earth so that the ground can be planted. This membrane will adjust to differential settlement that may occur. The cover should be crowned to a minimum slope of 3 percent so that the water runs off and is not impounded on the membrane.
- 5. The site design should include a bottom leachate collection system. The bottom leachate collection drain system should be installed in a manner to minimize ponding of leachate directly over the A method for achieving this goal includes liner. the use of perforated pipe to collect leachate, sloped to transmit the leachate to a sump. A pump would then periodically discharge the leachate to a disposal area. The perforated pipe should be covered with a gravel blanket to increase its effectiveness. The bottom must be sloped to direct leachate flow towards the collection drain system and sump.
- 6. The possibility of the Lake Grove Water District providing domestic water service to all residences and businesses now using well water in the Durham pits study area, should be investigated. This would further minimize the risks of ground water contamination to drinking water.
- 7. Piezometers should be installed around the perimeter of the landfill operation to monitor ground-water quality at the landfill boundaries.

#### B. RISKS

The recommendations presented here outline a technically feasible solution to use the Durham Pits for sanitary landfill. This solution requires the use of impermeable membranes to contain leachate. Membranes have been used in landfill construction since 1970; however, their long-term field durability (greater than 10 years) has not been determined.

Liners of natural or synthetic material are the best alternative solution for areas where the site's natural soil or hydrogeology is less than desirable. The technique depends on near total containment, followed by collection and treatment of the leachate. The containment must last in perpetuity to have zero risk. However, there can be no absolute guarantee that the membranes will not leak some leachate to ground water.

The existing conditions, potential leachate composition, and expected liner performance have been evaluated. The estimated volume of leachate leakage ranges from 0.1 to 1.0 gallons per minute. The estimated qualitative impacts of leachate contamination of ground water are summarized below.

- 1. Dilution due to mixing with native ground water ranges from 1:86 to 1:860.
- 2. Dissolved species such as sodium, potassium, chloride, sulfate, calcium, nitrate, and the heavy metal anions such as chromate, selenium, borate, and arsenic will increase in concentration in the ground water.
- 3. Heavy metal cations in the leachate such as lead, copper, zinc, cadmium, and iron will be attenuated to some degree by various chemical mechanisms in the aquifer.
- 4. Bacteria and viruses will be removed from the leachate-enriched ground water after passing through less than 100 feet of material.

#### V. REFERENCES

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# APPENDIX A SCOPE OF SERVICES

#### APPENDIX A

#### SCOPE OF SERVICES

FOR THE

#### METROPOLITAN SERVICE DISTRICT'S

## FEASIBILITY REPORTS FOR POTENTIAL SANITARY LANDFILLS

#### DURHAM SITE

#### PHASE I - SITING ISSUES

#### TASK 1. LEACHATE: IMPACT AND CONTROL

Work on this task will include:

Analyze existing geologic, hydrologic, and topographic data.

Analyze existing recent subsurface investigations, including soils, ground water, and geology, for other sites in the vicinity of the Durham site.

Analyze existing climatological data as to wind characteristics and rainfall, including intensity-duration characteristics for 5-, 10-, 25-, and 100-year storms.

Analyze drainage characteristics.

Analyze ground and surface water pollution potential, using existing water quality data and projected leachate quality and quantity, including leachate from boiler ash.

This information, combined with the geotechnical information obtained from the subsurface exploration discussed below, will be used to determine depth to aquifers, direction of flow, local users, and possible impacts of contamination by leachate. The analyses and conclusions will be detailed in a short technical memorandum.

A surface drainage plan will be prepared indicating natural drainages, proposed drainages during filling operations, and final surface drainage system.

A comprehensive geotechnical investigation of the Durham site will be completed. A three-phase field investigation will be undertaken, as follows:

- 1. Review of available soils and geologic data for the Durham area and a cursory field inspection by a geotechnical engineer.
- 2. Backhoe test pits to identify bottom conditions in the pit areas.
- 3. Drilling and sampling to determine subsurface hydrogeologic conditions.

Following these investigations, a laboratory testing program would be completed to determine material parameters such as strength, permeability, consolidation, and compaction. The laboratory data and field investigations will be summarized in a geotechnical design memorandum, including settlement, seepage rates, and material balance. Selected soils boring will be installed to allow ground water sampling.

An analysis of possible leachate control alternatives wil be completed and include specific features of site design and operation that act in concert to control total leachate escape from the site. These considerations will include:

- o Shredding of refuse
- o Type of final cover material and slope
- o Leachage collection underdrains
- o Ground water barrier system under site to prohibit ground water intrusion
- o Type of site liner, including synthetic materials, admix liners, or a combination of these
- o Alternative methods of compacting and placing of refuse during wet and dry periods to minimize leachate generation

All these methods will be evaluated for effectiveness by considering the impact on the local site ground and surface water hydrology. The analyses and recommendations will be detailed in a technical memorandum. A recommendation will be made regarding the suitability of the Durham site for sanitary landfill operations considering potential leachate impact.

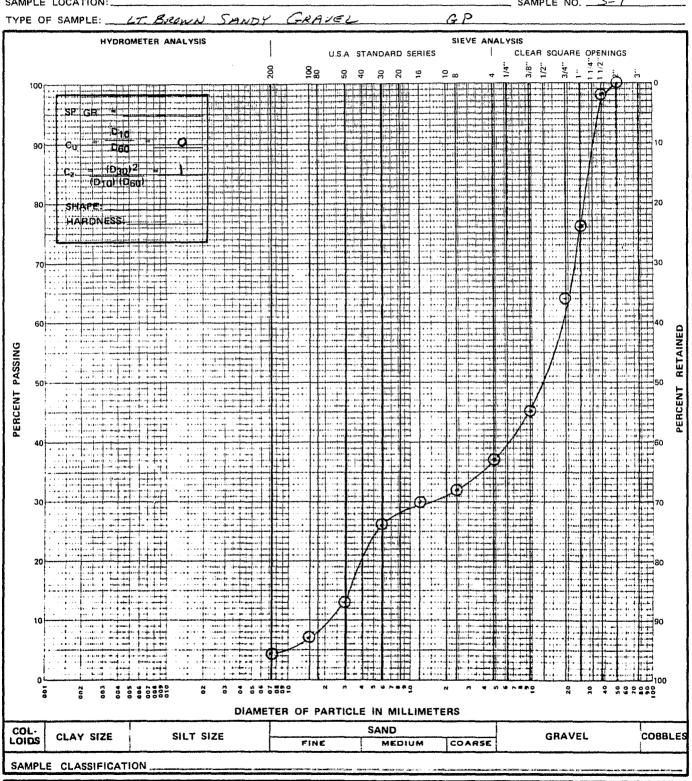
## APPENDIX B CH2M HILL GEOTECHNICAL LABORATORY TEST DATA



P12946,80

#### PARTICLE-SIZE ANALYSIS

METRO DURNAM PROJECT DESCRIPTION: \_\_\_ MATERIALS LABORATORY: CHIM HILL INC SAMPLE NO. S-/ SAMPLE LOCATION:\_



COMPUTED BY: CHECKED BY: RANIONDON ZZCETBAER1979 J. PANIONDON -ZCETCHER14-4

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YFIELD	$\mathbf{\Omega}$	
ONOMISTS	כ	
1.04		

				0: <u>S-1</u>	~ ~ ~ ~	AIR A. HILL & ASSO	CIATES
DEPTH:						NEVE 4441.	
TYPE OF N	ATERIAL:	IT. BROWN	SANDY C	KAVEL		SIEVE ANALY	515
GROSS WT. S	SAMPLE: /Z	24 165.	TARE WT.	: ON SCALE	NET W	T. SAMPLE: /2	24/6
U.S. STANDARD	GROSS	TARE	NET WEIG	HT RETAINED	PERCENT	RETAINED	ACCUMUL PERCE
SIEVE	WEIGHT	WEIGHT	INDIVIDUAL	ACCUMULATIVE	INDIVIDUAL	ACCUMULATIVE	PASSIN
Z "		ON 82845		0,00/63		2	100
15				0.25		2	98
				2,90		24	76
3/4 3/B				4,40		36	64
3/B				6,67		55	45
No. 4				7.73		63	37
8				8.32		68	32
16				8.59		70	30
30				9,03		74	26
50				10,68		87	/_3_
100				11.41		93	
200				11.71		95.7	4,3
PAN				12.20			
-							

Date: 12:27-79

Checked:

Date: ....

Prepared by: R.E.S.

Date: 10-19-79

Tested by: JBP

 $CH_2M$ 

SAMPLE LOCATION: \_

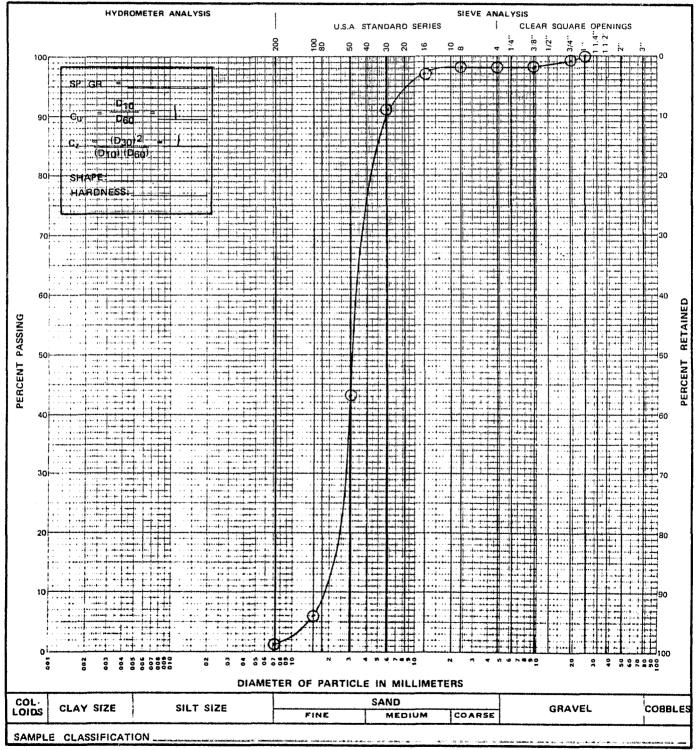
PROJECT NUMBER

P12946,30

#### PARTICLE-SIZE ANALYSIS

ASTM D422 METRO DURHAM PROJECT DESCRIPTION: \_ MATERIALS LABORATORY: CHZM HILL INC. SAMPLE NO. 5-2

TYPE OF SAMPLE: LT. BROWN MED. - SAND SP



TESTED BY: COMPUTED BY: DATE: CHECKED BY: DATE: 1. PLAMONDON 22 OCTOHEN 1979 V. PLANIN NOWN 22 007 32 2 19-1

				7/2946.13.		AIR A. HILL & ASSI	OCIATES
			SAMPLE N	0: <u>5-</u> フ			CH
DEPTH:				= SAND		SIEVE ANALY	1 32-3
TARE OF W	MATERIAL:_	ZI ORDINA	MED -	- 3ANS			HI
GROSS WT.	SAMPLE: 10	58.9 o	TARE WT.	: 130.4	R-13NET V	VT. SAMPLE:	128.5
U,S. STANDARD	GROSS	TARE	NET WEIG	HT RETAINED	PERCEN	T RETAINED	ACCUMULATI
SIEVE	WEIGHT	WEIGHT	INDIVIDUAL	ACCUMULATIVE	INDIVIDUAL	ACCUMULATIVE	PASSING
		ON SCRE		0.0 9			100
3/4"				12.5			99
				18-4		<u>  Z</u>	98
No. 4		-		20.9		2	98
8			·	21.8		2	93
16				26.8		3	97
3 <i>0</i>				<i>74.6</i>		9	91
<i>50</i>				525.7		57	43
100				877.9		94	6
200				916.5		98.7	1.3
PAN				929,8			
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PROJECT NUMBER

P12946,80

#### PARTICLE-SIZE ANALYSIS

PROJECT DESCRIPTION:

METRO DURHANI

MATERIALS LABORATORY:

CH2M HILL INC.

SAMPLE LOCATION: SANDY TYPE OF SAMPLE: \_\_ /T BROWN HYDROMETER ANALYSIS SIEVE ANALYSIS U.S.A. STANDARD SERIES 1 CLEAR SQUARE OPENINGS 88 4 4 40 30 20 16 D-10 C<sub>2</sub> = (D30)<sup>2</sup> = (D<sub>10</sub>) (D<sub>60</sub>) HARDNESS PERCENT PASSING The state of the s 囯,,, w 4 0 4 / # # 5 DIAMETER OF PARTICLE IN MILLIMETERS COL-SAND CLAY SIZE COBBLES SILT SIZE GRAVEL LOIDS FINE MEDIUM COARSE SAMPLE CLASSIFICATION .

TESTED BY: DATE: COMPUTED BY: DATE: CHECKED BY: DATE:

J. PLAMONDON ZZ OCTOBER 1979 J. PLAMONDON ZZ CCTERER 1978

		DURHAM		<i>P12946.B</i> No: <u>5-3</u>	0	RNELL, HOWLAND, HA AIR A. HILL & ASSO PLANNET	CIATES
						SIEVE ANALY	CH:
TYPE OF	MATERIAL: 4	LT BROWN	E. SAND	14 SILT		SIEVE ANALT	H
GROSS WT.	SAMPLE: 6	01.3 g	TARE WT	.: 128.9 g	R-3_NET W	T. SAMPLE:	172.4 g
U.S. STANDARD SIEVE	GROSS WEIGHT	TARE WEIGHT		GHT RETAINED	<del></del>	RETAINED	ACCUMULATI PERCENT PASSING
No. 30	128.9	128.9	0.0	0.0		0	100
50	128,9	128.9	0.0	0.0		0	100
100	138.4	128.9	9.5	9,5		2	98
200	180.7	128,9	51.3	61.3		13.0	77.0
PAN	194.0	128.9	65.1	126.4			
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d by: REE	Date://2-/	2-79 Tested t	Y.J. PLANIDA	2: Date: 10-22-79	Checked:		- Date:

### APPENDIX C

### WELL INVENTORY

AND

OREGON DEPARTMENT OF WATER RESOURCES
WATER WELL REPORTS



#### INVENTORY OF WELLS USED IN WATER LEVEL SURVEY

OWNER/TENANT ADDRESS	INVENTORY NUMBER	DATE MEASURED	DEPTH TO WATER (ft)	LAND SURFACE ELEVATION (ft)	WATER TABLE ELEVATION (ft. above MSL)
Resident 7420 S.W. Durham Road Tigard, Oregon 97223	A	7/31/79	9	132	123.0
Resident 15930 S.W. 74th Tigard, Oregon 97223	В	7/31/79	10.0	143	133.5
John Bowles 15575 S.W. 74th Tigard, Oregon 97223	С	7/31/79	30.5 (pumping)	146	115.5 (pumping)
Resident 7325 S.W. Fanno Creek Tigard, Oregon 97223	D	7/31/79	4.5	145	140.5
The Beebe Company 16075 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	E	7/31/79	at surface	142.5	142.5
Leane Eastas Tank Lines 7380 S.W. Bridgeport Road Tigard, Oregon 97223	F	7/31/79	85.5	195	109.5
Le Rose Mobile Park 18040 S.W. Lower Boones Ferry Road Tigard, Oregon 97223	G	7/31/79	69	178	109.0
Resident 18230 S.W. Boones Ferry Road Tigard, Oregon 97223	H E	7/31/79	56	165	109.0
Mr. Schogren 6625 S.W. Jean Tigard, Oregon 97223	I	7/31/79	61.5	178.5	117.0
Resident 7055 S.W. McEvan Tigard, Oregon 97223	J	7/31/79	59	170.5	111.5
Mrs. Nelson 6956 S.W. Childs Tigard, Oregon 97223	K	7/31/79	21.5	130	108.5
Resident 16935 S.W. Upper Boones Ferry Poad Tigard, Oregon 97223	L	7/31/79	74	184	110
No Measurement	М	7/31/79			
Mr. Ed Huebotter 16870 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	N	7/31/79	70	182.5	112.5
Resident 17015 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	o	7/31/79	>75 (no water)	191.5	⊲16.5
No Measurement	P				
Henry Russell 7920 S.W. Ellman Tigard, Oregon 97223	Q	7/31/79	95	198	103.0
Jack E. Smith 15895 S.W. 72nd Tigard, Cregon 97223	R	7/31/79	5.5	149	143.5
E. F. Hale 17650 S.W. Meridian Tigard, Oregon 97223	s	7/31/79	22	164	±142
Mr. Lauterbach 8300 S.W. Peters Tigard, Oregon 97223	т	7/31/79	96.5	200	103.5

OWNER/TENANT ADDRESS	INVENTORY NUMBER	DATE MEASURED	DEPTH TO WATER (ft)	LAND SURFACE ELEVATION (ft)	WATER TABLE ELEVATION (ft. above MSL)
Resident 15835 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	U	8/1/79	7	±156	±149
Connie's Market S.W. 72nd and Boones Ferry Road Tigard, Oregon 97223	٧	8/1/79	16.5	154	137.5
No Measurement	W	8/1/79			
Mr. Haines 16515 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	х	8/1/79	55	167.5	112.5
Mr. Lows 16555 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	Y	8/1/79	26	140	114
Mrs. Bowles 16605 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	z	8/1/79	61	167,5	106.5
Mr. Martinesi 16790 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	Al	8/1/79	70.5	180.5	110
W. Dale 16650 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	A2	8/1/79	55	168.5	113.5
Mr. Sittel 16520 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	А3	8/1/79	62.5 (pumping)	167	104.5 (pumping)
Resident 7760 S.W. Ellman Tigard, Oregon 97223	A4	8/1/79	85	194	109
Mr. Lawson 17995 S.W. Upper Boones Ferry Road Tigard, Oregon 97223	A5	8/1/79	75.5	185	109.5
B. Stark 8100 S.W. Peters Road Tigard, Oregon 97223	A6	8/1/79	81.5	190.5	109
Hangock Lumber Company 17990 S.W. McEwan Tigard, Oregon 97223	A7	8/1/79	62.5	178.5	116
Joe Barker 6727 S.W. Bridgeport Road Tigard, Oregon 97223	8 A	8/1/79	103 (pumping)	178	75 (pumping)
CH2M HILL Test Borings	B1 B2 B3 B4	9/4/79 9/4/79 9/4/79 9/4/79	32.5 6.7 8.4 29.0	146.27 <u>b</u> / 124.89 <u>b</u> / 126.16 <u>b</u> / 166.31 <u>b</u> /	113.8 118.2 117.8 137.3

 $<sup>\</sup>frac{a}{L}$ Land Surface Elevation estimated from City of Tigard 1 inch to 100 feet topographic maps.

 $<sup>\</sup>underline{b}/_{\texttt{TOP}}$  of casing as surveyed by CH2M HILL.

## OREGON DEPARTMENT OF WATER RESOURCES WATER WELL REPORTS

NOTICE TO WATER WELL CONTRACTOR

The original and first copy to the original and first copy t

State Well No	20/14/13	
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State	Permit	No.	***************************************

) OWNER:	(10) LOCATION OF WELL:			
Name Charles Dean	County Washington Driller's well n	umber		
Address 10985 S.W. Hazelbrook Rd., Tigard, Ore	% % Section 13 T. 2S	R. 1	N	W.M.
	Bearing and distance from section or subdivis	ion corne	er	
(2) TYPE OF WORK (check):		A		
New Well 🖰 Deepening 🗆 Reconditioning 🗀 Abandon 🗀				
If abandonment, describe material and procedure in Item 12.	(11) WATER LEVEL: Completed v	70]]		
(3) TYPE OF WELL: (4) PROPOSED USE (check):	· ·	25		
	Depth at which water was first found		7	ft.
Cable	Static level 5 ft, below land			7-12-7
Dug   Bored     Irrigation   Test Well   Other	Artesian pressure lbs. per squa	re inch.	Date	
6 Diam. from 0 ft. to 600 ft. Gage 10	(12) WELL LOG: Diameter of well Depth drilled 600 ft. Depth of comp	leted wel	1 600	ft.
PERFORATIONS: Perforated? No.	Formation: Describe color, texture, grain size and show thickness and nature of each stratu with at least one entry for each change of form position of Static Water Level and indicate pri	ım and a ation. Rej	quifer pe oort each	enetrated, change in
Type of perforator used Cutting torch	MATERIAL	From	To	SWL
Size of perforations 1/4 in by 12 in.	Tonsoil-Brown	0	3	-
36' perforations from 580 ft. to 600 ft.	Clay-Brown	3	25	ļ
	Clay-Br-Sandy-Water seep	25	60	25
perforations from ft. to ft.	Clay-Blue	60	37	
perforations from	Clay-Brown	87	90	
/7) SCREENS: Well screen installed?   Yes  No	Clay-Gray	90	105	
rufacturer's Name	Clay-Brown	105	150	
, pe Model No	Clay-Gray	150	195	
Diam. Slot size Set from ft. to ft.	Clay-Blue	195_	300_	
Dlam. Slot size Set from ft. to ft.	Clay-Tan	300	360	
(8) WELL TESTS: Drawdown is amount water level is	Clay-Gray	360	390	
iowered below static level	Clay-Brown	390	495	
Was a pump test made? ☐ Yes ₹ No If yes, by whom?	Clay-Blue-Rock seams-Blk	495	510	ļ
Yield: gal./min. with ft. drawdown after hrs.	Clay-Br-Roch seams-Blk-Wate	<del>† 510</del>	582	ļ
1 Protary 30 Total " 2 "	Trace Rock-Blk-water	582	600	5
<u>"" " 15 100 " 2 "</u>	TOCK-DIK-WALEF	1002	1000	
Bailer test gal./min. with ft. drawdown after hrs.		1		
Artesian flow g.p.m.				
rature of water Depth artesian flow encountered ft.	Work started 10-11 19 71 Comple	ted 1	0-13	19 7
	Date well drilling machine moved off of well		0-14	1971
(9) CONSTRUCTION:	Date wen drining machine moved off of wen			19 -
Well seal—Material used Bentonite-cement grout  Well sealed from land surface to	Drilling Machine Operator's Certification This well was constructed under my Materials used and information reported best knowledge and belief.  [Signed (Drilling Machine Operator) Drilling Machine Operator's License No.	direct above Date	are true 10-27	e to my
Brand name of bentonite			<del></del>	
Number of pounds of bentonite per 100 gallons	Water Well Contractor's Certification:			
of water	This well was drilled under my jurisc true to the best of my knowledge and be	liction a	nd this r	eport is
a drive shoe used?  Yes No Plugs Size: location ft.	S & M Desilian & Summ	lv		
any strata contain unusable water? 🖂 Yes 🟝 No	(Person, firm or corporation)	(T	ype or pri	nt)
Type of water? depth of strata	Address Rt. 1 Box 31, Canb	y, Or	e. 970	J13
Method of sealing strata off	0 7/1/2			
Was well gravel packed?   Yes   No   Size of gravel:	[Signed] (Water Well Con	tractor)	**********	*:414******
Gravel placed from #1. to #1.	Contractor's License No. 520 Date	10-2	7	797

State Well No.	25/1W	13
----------------	-------	----

NOTICE TO WATER WELL CONTRACTOR

The original and first cody
of this report are to both
OCT 26 1970

STATE ENGINEER, SALEM, CHASON 97310

Within 30 days from the data I E ENGINEER write above this line)
of well completion. SALEM. OFFECON

State Well No.	35,1m	13
State Permit No.	***************************************	

OWNER:	(10) LOCATION OF WELL:			
Name Bayword D. Thomas Durice	County Jashington Driller's well number			
Address 17365 Unpor Book Dorry Pond Discord or				
	Bearing and distance from section or subdivision corner			
(2) TYPE OF WORK (check):	And the second s			
New Well → Deepening □ Reconditioning □ Abandon □				
If abandonment, describe material and procedure in Item 12.	(11) XII A MYNYD, X MYNYNY, CO., 1.4, 1 11			
(3) TYPE OF WELL: (4) PROPOSED USE (check):	(11) WATER LEVEL: Completed well.			
	Depth at which water was first found (1) ft.			
Rotary Driven Domestic Dindustrial Municipal Domestic Dindustrial Municipal	Static level 70 ft. below land surface. Date 10-7-70			
Dug	Artesian pressure lbs. per square inch. Date			
( CASING INSTALLED: Threaded □ Welded 行				
6 "Diam, from 0 ft. to 9 ft. Gage 4 122	(12) WELL LOG: Diameter of well below casing 6			
" Diam from	Depth drilled 105 ft. Depth of completed well 105 ft.			
" Diam, from ft. to ft. Gage	Formation: Describe color, texture, grain size and structure of materials;			
Diam, Itom	and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in			
(6) PERFORATIONS: Perforated?  Yes No.	position of Static Water Level and indicate principal water-bearing strata.			
e of perforator used torch	MATERIAL From To SWL			
Size of perforations 1/S in. by 6 in.	Jos 2011 0 2			
20 perforations from	Brown Clay 2 6			
perforations from	Sand and gravel 6 91			
perforations from	Pen cravel and course blue said 91 105			
perforations from	7.13.75.03.75.03.05.05.05.05.05.05.05.05.05.05.05.05.05.			
(7) SCREENS: Well screen installed? □ Yes □XNo				
ufacturer's Name				
je				
Diam. Slot size Set from ft. to ft.				
Diam. Slot size Set from ft. to ft.				
(8) WELL TESTS: Drawdown is amount water level is lowered below static level				
Was a pump test made? Tyes & No If yes, by whom?				
Yield: gal./min. with ft. drawdown after hrs.				
" " " " " " " " " " " " " " " " " " "				
" H				
ax 10				
Artesian flow g.p.m.				
Temperature of water Depth ariesian flow encountered ft.	Work started 10-7-70 19 Completed 10-7-70 19			
CONSTRUCTION:	Date well drilling machine moved off of well 10-7-70 19			
Well seal-Material used Bortospito	Drilling Machine Operator's Certification:			
Well sealed from land surface to 60 ft.	This well was constructed under my direct supervision.			
	Materials used and information reported above are true to my best knowledge and belief.			
Diameter of well bore to bottom of seal	15 mars Profes ( 12 10 10 10 10 10 10 10 10 10 10 10 10 10			
Number of sacks of cement used in well seal	[Signed] Date (0-17, 1976)			
Number of sacks of bentonite used in well sealsacks	Drilling Machine Operator's License No254			
Brand name of bentonite National				
Number of pounds of bentonite per 100 gallons	Water Well Contractor's Certification:			
of waterlbs./100 gals.	This well was drilled under my jurisdiction and this report is			
Was a drive shoe used? [] Yes [SNo Plugs Size: location	true to the best of my knowledge and belief.			
any strata contain unusable water?   Yes [YNo	(Person, firm or corporation) (Type or print)			
Type of water? depth of strata	Name Rolph Jurier Drillius Co. (Person, firm or corporation) (Type or print) Address Rtc   Box 141 Hillsboro. orc.			
Mathed of earther strate off				
TO SEE THE PROPERTY OF THE PRO	[Signed] (Water Well Contractor)			
Was well gravel packed?  Yes No Size of gravel:	Contractor's License No. 247 Date /U			
Gravel placed from management ft. to community ft.	Contractor's License No Date 1920			

NOTICE TO WATER WELL CONTRACTOR The original and first copy of this report are to be filed with the

STATE OF OREGON (Please type or print) STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

State Well No. State Permit No. .....

(1) OWNER: Name		(11) WELL TESTS:	iowered below static it	evel	is
Address CIH A' COMMEL'I CAL MIC		Yield: gal./m	in. with ft. drawdo	wn after	hrs.
TOTAL LANGE OF L		11 11	71		**
(2) LOCATION OF WELL:		Bailer test /O gal./m	in, with 💋 ft, drawdo	wn after	hrs.
County ( H5/117 for / Driller's well		Artesian flow	g.p.m. Date		
14 14 Section 1.3 - T.		Temperature of water 52	Was a chemical analysis	made? 🔲 🗅	res 💢 No
Bearing and distance from section or subdivisi		(12) WELL LOG:			<i>i</i>
LIT 90 Missis	1.1 2.1 (2.2. )	Depth drilled 97	Diameter of well below ca ft. Depth of completed w	20.0	*
(*************************************		]			ft.
		Formation: Describe by colo show thickness of aquificrs stratum penetrated, with at	and the kind and nature of least one entry for each	the mater change of	ial in each formation.
	And the second s	MAT	ERIAL	FROM	TO
(3) TYPE OF WORK (check):	· · · · · · · · · · · · · · · · · · ·	1 Zint	Kyloricaldis, V	0:	125
Well A Deepening □ Recon- habandonment, describe material and proceed	ditioning Abandon D	4	par Camperial stay of	<u>  25_</u>	4.5
r-abandonment, describe material and proceed	1	A) levery	Concentate many of		7.5
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	- John Land	Hexart & Karker	1	77
Domestic Municipal   Municipal	Rotary   Driven   Cable     Jetted	jk-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k-	-/	<del> </del>	
Irrigation Test Well Other	Cable A Jetted   Dug   Bored	the state of the second	· · · · · · · · · · · · · · · · · · ·	<del> </del>	<u> </u>
(C) C A CARLON WAYDINA T F TOTAL	1. 1 P3 - TV-1 1- 3 P4			<del> </del>	<del> </del>
(6) CASING INSTALLED: Thre	aded Welded	And the second of the second o	**************************************	-	
***	•	And the second s		1	
" Diam. from ft. to ft. to					
Diam. Irom	To Gage				
(7) PERFORATIONS: Per Type of perforator used	rforated? 🗆 Yes 🛕 No				
Size of perforations in by	in.		Miles Tille - Virginia a Tille	<del> </del>	
perforations from	ft. to	an a problem a control of the contro	The state of the s		
perforations from					
perforations from		Andread Angles (1980) - 1 The control of the second specific c			
perforations from	ft. to ft.	the state of the s			
perforations from	ft. to ft.	The distance of the same of th			ļ
(8). SCREENS: Well screen instr	alled? [] Yes T No				
Manufacturer's Name	1717 18884 (**********************************		**************************************	<b>_</b>	
. М		throughout the constant of the page of	-B3	1	
Blam Slot size Set from		Work started 6	19 6 1. Completed	11	19,6
Diam Slot size Set from .		Date well drilling machine	moved off of well	/ ;	19 (
(9) CONSTRUCTION:	· f	(13) PUMP:		v	
Well seal-Material used in scal	druite	Manufacturer's Name	,		
Depth of seal ft. Was a	packer used?? i.di	Type:	***************************************	H.P.	
Diameter of well bore to bottom of seal					
Were any loose strata cemented off? TYes	No Depth	Water Well Contractor's	Certification:		
Was a drive shoe used? Yes [] No	•	This well was drilled	i under my jurisdiction	and this	report is
Was well gravel packed? [] Yes M No S	Size of gravel:	true to the best of my k	nowledge and belief.	i)	
Gravel placed from ft. to		NAME KALP	PI /URNO		
n't any strata contain unusable water?   Yes No		D 1 (Person)	firm or corporation)	Typt	or protes
e of water? Depth of	strata	Address	J 44/ F1	4471	
Method of sealing strata off	magestations of a company of the com	Drilling Machine Operat	or's License No. 3	//	
(10) WATER LEVELS:		2.//	- Literate Ho.	ines Person i gallelas	
125. 2	surface Date [/6/16	[Signed]	11.51		*.*********
The state of the s	are inch Date	Cantingalanta Viscour ***	7 (Water Well Contracto	7	
Artesian pressure lbs. per squ	THE PARTY OF THE P	Contractor's License No.	Ly Date Of	<b>U</b>	, 10.15.1

(USE ADDITIONAL SHEETS IF NECESSARY)

WATER WELL REPORT

Depth at which water was first found

banding level after perforating

\* og Accepted by:

ding level before perforating NAXX

File Original, and	VV STABLED VV BLACKS					
Duplicate with the STATE ENGINEER, SALEM, OREGON	STATE OF OR	REGON	Fill In	State Permit 1	1, 25/1W	13
(1) OWNER:  Name J.E.Reid		1 ' '	LL TESTS:			#20
A 25 Rt 1 Bx 290, Tig	gard, Oregon	Yield:	gal./min. wit		draw down after	hre
		-:-	**		11	*
(2, LOCATION OF WELL:	1/2	Artesian flo	wwww.	g.p.m.	**************************************	
	thany Nene	Shut-in pre	ssure			
R. F. D. or Street No. <u>パナ, リ パス ユザC</u> Bearing and distance from section or subdivision	n corner P. D.O. C.O.A.	Baller test			rotal n	
HET EIST OF FINE SOU WAY	Frit IN NE T	Temperatur Was electric	c log made of well?		nalysis made?	Yes 🙀 N
SCUTIL PUNGE I WES	LOWNSHIP Z	(11) WE	LL LOG:			
/9) MXDD ON YKODIT (-11-)		Diameter of	f well, i	nches.		
(3) TYPE OF WORK (check):  New well <b>50</b> Deepening   Recondi	tioning [ Abandon [	Total depth	E-II	t. Depth of com		.00 #
abandonment, describe material and procedu		Formation:	Describe by color, ness of aquifers and netrated, with at le	character, size of the kind and n	if material and strature of the mate	ructure, an erial in eac
(4) PROPOSED USE (check):	(5) EQUIPMENT:	stratum per	netrated, with at le ft.	ast one entry fo	r each change of	f formation
Domestic 🔁 Industrial 🗆 Municipal 🗀	Rotary 🖳	0 "		rt & Cla	v	
Irrigation [ Test Well [ Other [	Cable A	10 "	1.6 " D1	rty Grave	el	
3) CASING INSTALLED:		16 "		own Silt		
readed □ Welded □	lf gravel packed	28 "		avelWat		777 - 4
Gage or	Diameter from to	34 "	<b>-</b>	e Clav	cravel-	vater
FROM ft. to ft. Diam. Wall	of Bore ft, ft.	80 "	······		otten Woo	A 20
<u>" 0 " 65 " 6 " •290</u>	no	"	"Abou"	t 1 G.P.1	M. but N. G	<u> </u>
1) 1) 1) 1) 1) 1) 1)	, , , , , , , , , , , , , , , , , , ,	85 "		e Clay no		•
21 32	11 11	"	"			
	řt II			- The same of the		
Type and size of shoe or well ring Steel	Size of gravel:		n 	<del></del>		
ribe joint		· · · · · · · · · · · · · · · · · · ·				
(7) PERFORATIONS:			11		***************************************	
Type of perforator used			11			
SIZE of perforations 1 in.,	length, by $3/16$ in.	11	13			
	per foot No. of rows	"	11			
" 32 " 34 " 8 "	"" 1 "" "" "" "" "" "" "" "" "" "" "" ""		**			
" 33 " 36 " 8 <i>"</i>	1 " " 1		11			
18 19 39 P)	11 11 11 11	"	"			
SCREENS:			,,			
Give Manufacturer's Name, Model No.	and Size					
none			) f			
) CONSTRUCTION:			);			
Was a surface sanitory seal provided? X Yes	No To what depth 22ft.		1		<del></del>	
Were any strata scaled against pollution? 22 Y	es GGG	Ground ele	vation at well site	?? 200	feet above me	an sea leve
FROM ft. to SUFFACE WE	iter	Work starte	ed Nov	1955. Compl	leted NOV	19 5
, ,	*		er's Statement:			
METHOD OF SEALING		true to the	vell was drilled u e best of my knov	nder my juris vledge and bel	diction and thi	s report i
		ļ		_		
(9) WATER LEVELS:  Depth at which water was first found	25 st.	NAME	Steinman (Person, firm, or		(Typed or pr	inted)
						-

11

£ŧ,

ft.

Driller's well number

1

23

Address 8332, S.F. 16th. Ave. Portland. Ore.

## NOTICE TO WATER WELL CONTRACTOR

The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

#### WATER WELL REPORT

STATE OF OREGON (Please type or print)

State Well No. 2/1w-13

State Permit No.

(1) OWNER: Name HLADING A. PEARSON	(11) WELL TESTS: Drawdown is amount water level is lowered below static level Was a pump test made? Yes No If yes, by whom?
Address \$150 S.W. Peters Rd.	Yield: gal./min. with ft, drawdown after hrs.
Tigged 23, Cre	" " "
	11 11 11
(2) LOCATION OF WELL:	Bailer test 15 gal./min. with 3 ft. drawdown after 2 hrs.
County , West Driller's well number	Artesian flow g.p.m. Date
1. 14 14 Section / 3 T. Z 3 R. / W/	W.M. Temperature of water 5 3 Was a chemical analysis made?  Yes No
Bearing and distance from section or subdivision corner	(12) WELL LOG: Diameter of well below casing 6 "
	Depth drilled //7 ft. Depth of completed well //7 ft.
	Formation: Describe by color, character, size of material and structure, and show thickness of aquifiers 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
(3) TYPE OF WORK (check):	two Sail C 2
An arm to a management of the	ndon D Rivilla 1 2 25
)abandonment, describe material and procedure in Item 12.	Sand 4- see Gravel 25 88
(4) PROPOSED USE (check): (5) TYPE OF W	Brown Land 18E 100
Domestic in industrial industrial Cable Dettec	
Irrigation   Test Well   Other   Dug   Bored	
(6) CASING INSTALLED: Threaded [] Welded []	
E Diam. from	24
Diam. fromft, toft. Gage	
"Diam, fromft, toft, Gage	1
Dian. Mon	
(7) PERFORATIONS: Perforated? □ Yes 東 N Type of perforator used	0
Size of perforations in. by in.	
perforations from ft. to	tt.
perforations from	
perforations from ft. to	
perforations from ft. to	
perforations from ft. to	
(8) SCREENS: Well screen installed? ☐ Yes 📈 No	
Manufacturer's Name	MATHORITAN .
pe Model No	
am, Slot size Set from ft. to	11. Work started 30 1 25 1963. Completed 71.17-11 1963
Diam Slot size Set from ft. to ft. to	tt. Date well drilling machine moved off of well 1, 1963
(9) CONSTRUCTION:	
· · · · · · · · · · · · · · · · · · ·	(13) PUMP:
Well seal—Material used in seal	Manufacturer's Name
Diameter of well bore to bottom of seal	Type:
_	Water Well Contractor's Certification;
Was a drive shoe used? ALYes □ No  Was well gravel packed? □ Yes ALNo Size of gravel:	This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Gravel placed from	and a second sec
	NAME RALPH TURNER WELL DRILLING (Person, firm or corporation)  Address RIBON 141 HICLS BOILE
'd any strata contain unusable water?   Yes No	Address RI Bon 141 Hi (15 bon)
ype of water? Depth of strata	
Method of sealing strata off	Drilling Machine Operator's License No3//
(10) WATER LEVELS:	
Static level 795 ft. below land surface Date	[Signed] (Water Well Contractor)
Artesian pressure lbs. per square inch Date	Contractor's License No. 247 Date 19
	The second of the second secon

45

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# WATER WELL REPORT STATE OF OREGON

State Well No. 9/14/13	
State Permit No.	

OWNER:		(11) WELL TESTS:	Drawdown is amount lowered below static l	
hame lir. Henry F. Hears		Was a pump test made? [] Ye	es 🔏 No II yes, by who	om?
Address 2382 NW Pettygrv		Yield: gal/min.	with ft. drawdo	
Portland Ore.		**	##	11
(2) LOCATION OF WELL:		7.0	with 2 ft. drawdo	
	umber, if any—	Bailer test 10 gal./min. Artesian flow	with 4 ft. drawdo	wn after 55 hrs
34 34 Section 13 T	2S R. $1$ W W.M.		Was a chemical analysis r	made? [] Yes [] N
Bearing and distance from section or subdivis		7	ras a chemical analysis i	inade, El res El ri
tockwood Iots Lot 16 3W	Peters Rd.	(12) WELL LOG:	Diameter of well	~ .
Tualitan			tt. Depth of completed	
		Formation: Describe by color show thickness of aquifers an stratum penetrated, with at	r, character, size of mater id the kind and nature of least one entry for each	ial and structure, an f the material in eac
		MATER		FROM TO
TYPE OF WORK (check):		Clay		1.0
	nditioning	Large blue gray	<i>r</i> e1	4 24
If abandonment, describe material and proceed		Fine gravel and		21, 31
(A) propogram view (1 1)	(E) MALE OF STREET	Blue gravel	angelijika geller vedi. (Anto anno an emperature) i filik bylagilishikkilik (Pelikilishik)	31 37
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	Small gravel and		37 44
estic 🗴 Industrial 🗋 Municipal 🗎	Rotary Driven Cable X Jetted	Med. blue gravel		44 87
Irrigation   Test Well   Other	Dug 🖸 Bored 🖸	blue clay		87 89
(6) CASING INSTALLED: The	readed   Welded\	Control of the Contro		
5/800 rom _0 rt. to				_
" Diam, from ft. to			kalapanga sakatan kalapatangangan menangan 19. Indonés - ese -es sakatan nama	
" Diam from ft, to	<del>-</del>			
Seald At 18 ft Cemment	and Bentemite	Commission of the Commission o		
( )	erforated?   Yes XXNo			-
Type of perforator used				
	in,			
perforations from				
perforations from perforations		***************************************		
perforations from				
perforations from		**************************************		
	,			
/	installed Yes No	Particularly		
ifacturer's Name		alatin anjungang ngang ngang ng agang ng agang ng agang ng agan		_
Type				
Diam Slot size Set from Diam Set from		00+ 26	19 6.2 Completed N	1027 7 62 ra
Diam Siot size Set from	T. W	Work started Oct. 26	19 O.c Completed IV	10 A * T=05 18
CONSTRUCTION:		(13) PUMP:		
Was well gravel packed? Tyes No Siz	e of gravel:	Manufacturer's Name		(Market Market
Gravel placed from ft. to	£t.	Туре:	·····	н.р
Was a surface seal provided?  Yes No Material used in seal—	To what depth? it.	Well Driller's Statement:		
Did any strata contain unusable water?	es 🔀 No	This well was drilled	under my jurisdiction	and this report is
Type of water? Depth or		true to the best of my kno		and this report is
Method of sealing strate off		NAME MEEKER WEL	A.DRITATIVE	
(40) THAMES TESTET C.			n, cr corporation) (	Type or print)
(10) WATER LEVELS:  1	d mindage Wada	Address 2902 Hoove	r BLVD Newberg	0:1E.
	i surface Date	1 1	_	
sian pressure lbs. per sqt	A THAN TO BE FOUND AND AND THE STATE OF THE	Driller's well number	)1/M	<i>y</i>
Log Accepted by:		[Signed]	X TUCK	1.1/
[Signed] Date	10	1 (/ '	(Well Driller)	- In
(Owner)		License No. 111	Date . Nov.	1-62 , 19

N.L

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## WATER WELL REPORT STATE OF OREGON

			2/11	
State	Well	No.	2/1w -	13

STATE ENGINEER, SALEM. OREGON	STATE OF	OREGON	State Permit No		
OWNER:	Taylor	(11) WELL TESTS:  Was a pump test made?  Yes	Drawdown is amount was lowered below static levents.	vel	is .
Address 16565 SW. Upps	Boyes Ferry Rd	Yield: gal./min.	, , , , , , , , , , , , , , , , , , , ,		hrs.
- Tigged Oragin		**	**		**
(2) LOCATION OF WELL:		" "	***		"
(2) LOCATION OF WELL:  County Owner's num	ber. if any-	Bailer test / 5 gal /min. v	with 110 ft drawdown	n after	hrs.
% Section /3 T.2		Artesian flow	g.p.m. Date		
Bearing and distance from section or subdivision	n corner	Temperature of water W	as a chemical analysis ma	de? X Y	es No
		(12) WELL LOG:	Diameter of well	6	inches.
			. Depth of completed we	ell /	99 11.
		Formation: Describe by color, show thickness of aquifers and stratum penetrated, with at le	character, size of materia d the kind and nature of t east one entry for each c	l and stru the materi hange of f	cture, and al in each ormation
		MATERI	(AL	FROM	то
(3) TYPE OF WORK (check):		Buryn Danil		Ò	2
New Well Deepening   Recond	itioning 🗌 💢 Abandon 🗖	Rel Clay	and the straight and th		7
If abandonment, describe material and procedur	re in Item 11.	Coarse Gravel		2	33
(4) PROPOSED USE (check): (	5) TYPE OF WELL:	Clay - 112 ruchin	burn Baril	£5.	133
Domestic M Industrial   Municipal	Rotary Driven D	Clay " Pagani	- dray	-35 43	77
Irrigation: Test Well Other	Cable Z Jetted  Dug Bored	Gage Clark	NIV	72	54
	246 D 20104 D	gray Clay	defacto	84	74
	eaded   Welded	Clay Clidy		94	95
6 Diam from O ft to		Duk dien		95	184
Diam. from ft, to	· ·	Sand - Dink	black	184	199
" Diam. from ft. to	ft. Gage	-			
( , PERFORATIONS: Perf	orated? 🗆 Yes 💢 No		Harris Ha		
Type of perforator used		and the second and th			
SIZE of perforations in. by	in.	eggagiya as angaggan i angagnagana kanana ka angag gangagayna angag gangagayna angag gangagan kanan angag babb	· http://www.unchine.com/share-research		
perforations from		and a second control of the second of the se			
perforations from perforations		Party of the second sec			
perforations from					
(A) perforations from					
		A service relative control of the service of the se			
<b>\</b>	stalled 🗌 Yes 🐔 No				
Manufacturer's Name	odel No	Photography distributed in the photography and the providing any photography and individual a difference in individual and the photography and individual an			
7 3 Slot size Set from		ign and the secretary to the second the second			
Slot size Set from		Work started July 24	19 6 2 Completed 77	11.5-	1962
(9) CONSTRUCTION:	and the second s	(13) PUMP:	. 1 1 2	<u>~</u>	2
Was well gravel packed?   Yes No Size		Manufacturer's Name The	erbanke-	forms	
Gravel placed fromft. to		Type: Oyelmusi	ale	н.р. 🖊 🏻	
Was a surface seal provided? Yes I No. To	o what depth?	Table 11 To 211 and a Colonian and a			,
Did ony strata contain unusable water?   Yes	□No	Well Driller's Statement: This well was drilled u	indar my jurisdiction (	and this	roport is
Type of water? Depth of a		true to the best of my know	wledge and belief.	and tills	(cport is
Method of sealing strata of	o angle analogo at a 1948 a common composition and a magnetic actions and a supplementation of a supplementation of	NAME SKY 155/	W. A. Such		
(10) WATER LEVELS:	surface Date 245-67	Address (Person, f.rm	cr corporation) (75	pe or prin	1)
sian pressure lbs per squar		Driller's well pumber	122	·····	***************************************
Log Accepted by:		[Signed]	(Well Driller)	les_	٠
[Signed] Date	19	License No.	- /1//1	2 /	7 19.6.7

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# WATER WELL REPORT STATE OF OREGON

State Well No.	3/100	-/3
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STATE ENGINEER, SALEM OREGON	STATE U	r OKEGON	State Permit No		
OWNER:		(11) WELL TESTS	Drawdown is amount violenced below static le	water leve	l is
Name John & Katherine		Was a pump test made?	Yes No If yes, by whom		
Address c/o Shell Oil Co			nin, with ft. drawdow		hrs.
Morrison, Portla	nd, Ore.	,,	11		**
(2) LOCATION OF WELL:		,,			
1.7 m m la al ma andre man	umber, if any—		nin, with 1 ft. drawdow	n after	2 hrs.
¼ ¼ Section T	. R. W.M.	Artesian flow	g.p.m. Date		
Bearing and distance from section or subdivis	ion corner	Temperature of water	Was a chemical analysis ma	ade? ☐ Y	es Ka No
	,	(12) WELL LOG:	Diameter of well		inches.
13 2S 1 W		Depth drilled 96	ft. Depth of completed w		6· 11
7		Formation: Describe by c show thickness of aquifer.	olor, character, size of materic s and the kind and nature of	il and stru the materi	cture, and ial in each
<b>\</b>		stratum penetrated, with	at least one entry for each c	hange of	formation.
			TERIAL	FROM	TO
(3) TYPE OF WORK (check):		Fill		<u> </u>	2
New Well Deepening Record Repair Record Resorribe material and process	nditioning	Topsoil	cobble & boulders	1 -	80
H attandonment, describe material and process	itale in Item 11.	Quick sand &			- 00
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	no water	<del></del>	80	85
Domestic 重 Industrial 🗌 Municipal 🗎	Rotary Driven Cable Detted	Blue clay	AND ADDRESS OF THE PARTY OF THE	85	90
Irrigation [] Test Well [] Other	Cable X Jetted   Dug   Bored	Brown sand &	gravel	90	96
Type of perforator used  SIZE of perforations in. by  perforations from perforations from perforations from perforations from perforations from perforations from	ft. Gage  ft. Gage  ft. Gage  rforated? □ Yes ■ No  in.  ft. to ft.	Work started 3/27	19 61. Completed	4/8	19 61
(9) CONSTRUCTION:		(13) PUMP:			
Was well gravel packed? 🗌 Yes 🗷 No Siz	e of gravel:	Manufacturer's Name			
Gravel placed from ft, to			H.P.		
Was a surface seal provided? 🖭 Yes 📋 No			· · · · · · · · · · · · · · · · · · ·		
Material used in seal— Driving casi	· · ·	Well Driller's Statemer	ı <b>t</b> :		
Did any strata contain unusable water?   Penth of		This well was drille true to the best of my l	ed under my jurisdiction a	and this	report is
Type of water? Depth of  Method of sealing strata off		İ			
The second second distinction with the second secon	- Martine de la companya del companya del companya de la companya del la companya de la companya		INSEN DRILLING CO.	pe or prin	
(10) WATER LEVELS:  10 level 58 to below land	surface Date 4/7/61		W. Tualatin Valley		
.sian pressure lbs per squ	iare inch Date	Driller's well number			
Log Accepted by:		[Signed Liellie	( M. Micke	l. Klin	
[Signed] Date	19	License No. 79	(Well Defler) Date 4/1	8	19 61

STATE OF OREGON



State Permit No. 25/16/13/13

**Supump lest madef   Yes   No liyes by whom?  **Supump lest madef   Yes   No liyes hybrids   Palmin, with total is, drewdown after   Instruction of water   Supump lest madef   Yes   No lited   Instruction   In	(1) OWNER:	_ (11) WE	ELL TESTS: Drawd lowere	lown is amount water level d below static level	"('ab)
22 LOCATION OF WELL:	nede turniba 13300 Seue tocu	Was a pum			
Ealier test   Sal_min with total R. drawdown site: 1   Mrs. Mrs. Nr. Nr. Nr. Nr. Nr. Nr. Nr. Nr. Nr. Nr	ess Tigard, Oregon		gal,/min, with	ft. drawdown after	hrs.
Selice test   Selice   Selice   Table   Tabl			***	##	
Maintington   Owner anumber it any—  Mastrington   Sal, min. with positive and strained from section or subdivision corner   Market   Ma	(2) LOCATION OF WELL:	**			
Section of the control of the contro		Bailer test	5 gal./min. with tot.	al ft. drawdown after	1 hrs.
Name	NE 1/ Section T2 T 25 P 3W	TEV N.			
Comparison of the comparison		Temperatu	re of water 57 Was a cher	nical analysis made? 🔲 🖰	res 🕱 No
Experiment of the perforations from ft. to ft. perforations from ft. to		(10) 197	** * * O.C		
Pormain   Describe by color, character, size of material and structure, and find the charge of particular the structure, and the stud and nature of the metric it is each structure, and the stud and nature of the metric it is each structure, and the stud and nature of the metric it is each structure, and the stud and nature of the metric it is each structure, and the stud and nature of the metric it is each structure, and the structure is the structure, and the structure, and the structure, and the structure is the structure, and the stru		1 ' '			
MATERIAL   FROM   FO	y makanamany a yanggangaman mpintangan spinta a - to a sensiti Anada di Andronian pintangan Palamana di manada Mandalan pintangan mpintangan pintangan pinta	The second secon	A MARKAGE AND AND AND AND A STATE OF THE AND ADDRESS OF THE ADDRES	and the second of the second o	7
MATERIAL   FROM   FO		show thick	ness of aquifers and the kind	d and nature of the mater	rial in each
Yellow sandy clay   16   23   16   23   16   23   16   24   16   24   16   24   16   25   16   25   16   25   16   25   16   25   16   25   16   25   25   25   25   25   25   25   2				/	1
Abandon   Aban	AND THE PROPERTY OF THE PROPER	32.33			
If abandonment, describe material and procedure in Rem 11.   (4) PROPOSED USE (check):   (5) TYPE OF WELL:   Cashe   Driven   Dr	•				
A   PROPOSED USE (check):   (5) TYPE OF WELL:					
Some stic   District   Municipal   Rotary   Driven   Cable   Cable   Driven   Cable	if abandonment, describe material and procedure in item 11.		g sand and line g		
Domestic	(4) PROPOSED USE (check): (5) TYPE OF WEI	<b>T</b>			
Section   Test Well   Other   Duy   Stated   Blue Clay   Stated   Blue Clay   Stated   Blue Clay   Stated   S	The first of the contract of t	Dine a			1
Solution   Construction   Construc	Cable 10 Jetted	Brown		1 1	
(6) CASING INSTALLED:  Threaded Welced E  6. "Diam. from 0. ft. to 1111. 1111. Gage 250  "Diam. from ft. to 1111. 1111. Gage 250  "Diam. from ft. to 11. Gage 250  PERFORATIONS:  Perforations ft. to 1. Gage 250  E of perforations from 1. to 1. St. perforations from 1. St. p	ngadon     Test well   Other     Dug   Bored				_
6 Diam from 0 ft to 1111-1111. Gage e250  "Diam from ft. to ft Gage Blue sandy clay 129 137.  "Diam from ft. to ft Gage Blue sandy clay 129 137.  "PERFORATIONS: Perforated? Yes & No perforations in. by in.  perforations from ft. to ft. ft. to ft. to ft. perforations from ft. to ft. perforations from ft. to ft. to ft. perforations from ft. to ft. perforations from ft. to ft. perforations from ft. to ft. pe	(6) CASING INSTALLED: Threaded [] Welded []				
"Diam from ft. to ft. Gage Blue sandy clay 1.29 1.37 1.38 Blue sandy clay 1.29 1.37 1.38 Brown packed sand 1.37 1.					
PERFORATIONS:  Perforated?   Yes	The state of the s	DIOMII			
PERFORATIONS:  Perforated?   Yes		22400			
Fine gravel—water 11:2 11:3 11:6  For perforations in. by in.  perforations from ft. to ft. to ft. perforations from ft. perforations from ft. to ft. perforations from ft. perforations ft. perforations ft. perforations		DIONII			
E of perforations in. by in.  Perforations from ft. to ft. perforations ft. perforations from ft. to ft. perforations ft.	PERFORATIONS: Perforated?   Yes   N				
perforations from ft. to ft. perforations from ft. perforations from ft. perforations from ft. to ft. perforations from ft. perforations from ft. to ft. perforations from ft. perforations from ft. perforations from ft. perforations from ft. perforations ft. perforations from ft. perforations ft. perfor	1, pe of perforator used				
perforations from ft. to ft. perforations from ft. perforations from ft. to ft. perforations from ft. to ft. perforations from ft. perforations from ft. to ft. perforations from ft. to ft. perforations from ft. perforations from ft. to ft. perforations from ft. perforations ft. perforations ft. perforations ft. perforations from ft. perforations	E of perforations in. by in.	HAD DI	ue cray		1110
perforations from ft. to ft.  (8) SCREENS: Well screen installed   Yes   No    ufacturer's Name  Type	perforations from	£t.	والمتعارض		
perforations from ft. to ft. t	perforations from ft. to	1t.			<del> </del>
perforations from.  ft. toft.  (8) SCREENS:	•	1			+
(8) SCREENS: Well screen installed   Yes   No  Yufacturer's Name  Type	-	į.			+
Tufacturer's Name  Type	perforations from	ft.	المستوانية والمستوانية والمستو		+
Tufacturer's Name  Type	(9) COPENS. Well server installed II Ver II N	To	,		-
Model No.  Diam. Slot size Set from 2t. to 1t.  Diam. Slot size Set from 2t. to 1t.  Diam. Slot size Set from 2t. to 1t.  CONSTRUCTION:  Is well gravel packed? Exes No Size of gravel: 1th minus  Gravel piaced from 11:0 it to 11:6 it.  Was a surface seal provioed? Yes No To what depth? 23 it.  Material used in seal— Drill cuttings  Did any strata contain unusable water? Yes No  Type of water? Depth of strata  Method of sealing strata off  (10) WATER LEVELS:  Static level 11: it below land surface Date July 21  estan pressure ibs per square inch Date  Accepted by:  Accepted by:  Accepted by:  Construction:  At to 11: Work started July 1957 Completed July 1957  Manufacturer's Name Myers  Type:  Jot H.P.  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 Steinman Bros.  15112 State and Completed July 21  Address Milwaukie 22; Oregon  Driller's well number 20-57  [Signed] Solution:  (well Driller)	• •				-
Diam. Slot size Set from it, to ft.  Diam. Slot size Set from it, to ft.  Diam. Slot size Set from it, to ft.  CONSTRUCTION:  Is well gravel packed? Myes No Size of gravel: in minus  Gravel piaced from LiO ft to Lil.6 ft.  Mass a surface seal provided? Myes No To what depth? 23 ft.  Material used in seal— Drill cuttings  Did any strata contain unusable water? Yes No  Type of water?  Method of sealing strata off  (10) WATER LEVELS:  Static level li ft. below land surface Date July 21 esian pressure ibs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  Construction:  Work started July 1957 Completed July 1957  Manufacturer's Name Type:  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 Steinman Bros.  15112 S. E. McLoughilli (Type or print)  Address Milwaukie 22; Oregon  Driller's well number 20-57  [Signed]  Well Driller)		1			<del> </del>
Diam. Slot size Set from it, to ft. Work started July 1957 Completed July 1957  CONSTRUCTION:  Is well gravel packed? Keys No Size of gravel: In minus  Gravel placed from 1140 it to 1146 ft.  Was a surface seal provided? Keys No To what depth? 23 it.  Material used in seal— Drill cuttings  Did any strata contain unusable water? Yes No  Type of water?  Depth of strata  Method of sealing strata off  (10) WATER LEVELS:  Static level 11 if below land surface Date July 21 eslan pressure lbs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  Completed July 1957 Completed July 1957  Mork started July 1957 Completed July 1957  Mork started July 1957 Completed July 1957  Manufacturer's Name Type: Jet H.P.  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 Steinman Brose 15112 See McLoughilm (Type or print)  Address Milwaukie 22, Oregon  Driller's well number 20-57  [Signed]  (Well Driller)					1
CONSTRUCTION:  is well gravel packed? If yes   No Size of gravel: It minus  Gravel placed from   110   it to   116   it.  Was a surface seal provided? If yes   No To what depth?   23   it.  Material used in seal   Drill outtings   Did any strata contain unusable water?   Yes   No   Type of water?   Depth of strata  Method of sealing strata off  (10) WATER LEVELS:  Static level   11   it. below land surface   Date   July   21    selan pressure   ibs   per square inch   Date    Accepted by:  Accepted by:  Accepted by:  Accepted by:  Accepted by:  Construction:  Manufacturer's Name   Myers    Type:   Jet   H.P.    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   Steinman   Bros.    15112 Solution    1511				Completed 7.3	
Manufacturer's Name  Type:  Jet  H.P.  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  Static level  It ft. below land surface Date July 21  estan pressure  ibs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  Corporation  (Type or print)  Address  Milwaukie 22; Oregon  Driller's well number  [Signed]  God M. C.  [Signed]  Commell  (Well Driller)	2411)	WOLK STATE	rea 1117 137	Completed JHIV	
Gravel piaced from 140 ft. to 146 ft.  Was a surface seal provided?	CONSTRUCTION:	(13) PU	MP:		
Gravel piaced from 140 ft. to 146 ft.  Was a surface seal provided?	is well gravel packed? 2 Yes 🗆 No Size of gravel: 📆 minu	Manufactu	rer's Name Myars		
Material used in seal— Drill cuttings Did any strata contain unusable water? ☐ Yes ☐ No Type of water? Depth of strata  Method of sealing strata off  (10) WATER LEVELS: Static level 11: ft. below land surface Date July 27 esian pressure ibs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  (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 Steinman Bros.  15112 Store Coughiling (Type or print)  Address Milwaukie 22; Oregon  Driller's well number 20-57  [Signed] Bot M. C. Grandle (Well Driller)	Gravel placed from 140 ft. to 146 ft.	i			
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  Type of water?  Depth of strata  Method of sealing strata off  (10) WATER LEVELS:  Static level  11: ft. below land surface Date July 27  estan pressure  ibs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  (Well Driller)  This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E frec Coughlish  (Type or print)  Address Milwaukie 22, Oregon  Driller's well number  (Well Driller)					
true to the best of my knowledge and belief.  Method of sealing strata off  (10) WATER LEVELS:  Static level 11: ft. below land surface Date July 27 esian pressure ibs. per square inch Date  Accepted by:  Accepted by:  Accepted by:  (Weil Driller)  True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  15112 So E True to the best of my knowledge and belief.  NAME Steinman Bros.  1512 So E True to the best of my knowledge and belief.	Material used in seal— Drill cuttings	Well Dril	ler's Statement:		
Method of sealing strata off  (10) WATER LEVELS:  Static level 11 ft. below land surface Date July 21  estan pressure lbs. per square inch Date  Accepted by:  Accepted by:  (Weil Driller)	Did any strata contain unusable water? 🗍 Yes 🗟 No				report is
(10) WATER LEVELS:  Static level  11.	Type of water? Depth of strata	true to th	e best of my knowledge a	nd belief.	
Static level 11	Method of sealing strata off	NAME	Steinman Bros-		
Static level 11	(10) WATER LEVELS:	1	15112° 3° E "Well 69789	(Type or pr	nt)
salan pressure ibs. per square inch Date Driller's well number 20-57  Accepted by:  [Signed] Bok Mc Concell  (Weil Driller)	· ·	Address	Milwaukie 22 Ore	70n	
Accepted by:  [Signed] Bok Mc Compell  (Well Driller)					
(Well Driller)	The state of the s	Driller's	wen numoer	÷Y <del></del>	1420068-0200804044
Igned) License No	Accepted by:	[Signed]	6506-7/2 e	ounell Driller)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	(Owner)	License N	lo	DateAug 8,	, 19.57.

# Data from

# WATER WELL REPORT

State Well No. 1111 -1

File Original and	WATER WE	LL REPORT	State Well No.	1-170	71.7
File Original and First Copy with the STATE ENGINEER, JEM, OREGON	STATE OF	FOREGON	State Permit No	( 0	(ط.
OWNER: Name Pilkington Nu	rsery	(11) WELL TESTS:  Was a pump test made? ② Yes  Yield: gal./min. v	Drawdown is amount lowered below static le	water lovel i evel m?	hrs.
(2) LOCATION OF WELL:  County WAS NOT Section Owner's many of the section of Subdivision of Subd		Bailer test gal./min. w Artesian flow Temperature of water Wa  (12) WELL LOG:	ith ft. drawdow g.p.m. Date as a chemical analysis m Diameter of well	ade? 🗆 Yes	
		Depth drilled (4°) ft. Formation: Describe by color, show thickness of aquifers and stratum penetrated, with at ie.  MATERIA			ft. ure, and in each rmation. TO
(3) TYPE OF WORK (check):  New Well Deepening Record Bear and process  H abandonment, describe material and process	nditioning [] Abendon []	Brari and I	o cyld fr s	<del> </del>	2 C
PROPOSED USE (check):  Domestic   Industrial   Municipal    Irrigation   Test Well   Gther	(5) TYPE OF WELL:  Rotary	Sand Sean	280 to a		
(6) CASING INSTALLED: Tr. "Diam. from	ft. Gage	Well aband because of 1	onud night Nent		
(7) PERFORATIONS: Perforations in by perforations from perforation	# to # to # # # # # # # # # # # # # # #				
Diam Slot size Set from	Model Noft toft				
(9) CONSTRUCTION:  Was well grave: packed?  Yes No Siz  Gravel placed from tt. to  Was a surface seai provided?  Yes No No Material used in seal—	te of gravel;	Type:	15 Completed	н.р.	16
Did any strata contain unusable water? Y Type of water? Depth o Method of sealing strata off  NATER LEVELS:	f strata		cr corporation) (T	ype or print)	***********
	d surface Date 1929	Driller's well number	(Wali Driller)	*************	************
(Owner)	AV-interent	License No.	Date	***************	10

ATE ENGINEER Salem, Oregon Well Record STATE WELL NO. 25/1W 13B(1)
COUNTY Washington
APPLICATION NO. (Ab)

OWNER: Pilkington Nursary	MAILING ADDRESS:	- /
- ·	CITITIST ANTO	
		********
Bearing and distance from section or subdivision		
corner		
Altitude at well 160 ft.		
TYPE OF WELL: drillad Date Constructed		
Depth drilled 640 ft. Depth cased 640 ft.	Section	
CASING RECORD: 6-6 XX inch.		
FINISH:		
AQUIFERS: g		
AQUIFERS: Sand from 630 to 632 ft.		
WATER LEVEL: 2 ft. below land surface.		
PUMPING EQUIPMENT: Type	н.р.	
Capacity G.P.M.		
WELL TESTS:		
Drawdown ft. after		P.M.
Drawdown ft. after h	ioursG	P.M.
USE OF WATER	Гетр °F, 1	9
SOURCE OF INFORMATION USGSDRILLER or DIGGER		
ADDITIONAL DATA:		
Log Water Level Measurements	Chemical Analysis	
REMARKS: Penetrated gravel and boulders fr	om O to 80 ft., black clay from 80 to	
640 ft. with sand seam at 630 ft.; well had a chloride content; see table 4 for chemical as	small yield; abandoned because of high	

#### STATE ENGINEER Salem, Oregon

#18

State Well No. 2/1W-13B1 (ab)
County Washington
Application No

## Chemical Analysis

OWNER Pilkington Nursery	OWNER'S NO	***************************************
ANALYST unknown		
Date of Collection		
Point of Collection		
	Р.Р.М.	B.P.M.
Silica (SiO <sub>3</sub> )	13	
Iron (Fe) Total		
Manganese (Mn)		
Calcium (Ca)		nd - Consultant de la c
Magnesium (Mg)		and the second s
Sodium (Na)		
Potassium (K)		
Bicarbonate (HCO,)	120	
Carbonate (CO <sub>1</sub> )		
Sulfate (SO <sub>4</sub> )		
Chloride (Cl)	350	
Fluoride (F)		
Nitrate (NO,)		
Boron (B)		
Dissolved Solids	780	
Hardness as CaCO,	240	
Specific Conductance (Micromhos at 25°C)		
рН		
Percent Sodium		
Sodium Absorption Ratio (S.A.R.)		
CLASS		

#S6

File Original and First Copy with the FTATE ENGINEER, EM, OREGON

# WATER WELL REPORT STATE OF OREGON

State W	ell No	1w-13c
		(h)

",EM, OREGON	1 1,11	State Permit No		69 <i>j</i>
OWNER: D. A. Wilkinson		(11) WELL TESTS: Drawdown is amount lowered below static		
		Was a pump test made? Yes No If yes, by who		
		Yield: 20 gal./min. with 330 ft. drawdo	wn after	5 hrs.
Tigard, Oregon		· · · · · ·		
(2) LOCATION OF WELL:		11 11		•••
• •	nber, if any—	Bailer test gal./min. with ft. drawdo	wn afte:	hrs.
NR 14 NW 14 Section 13 T.	28 R. 1W W.M.	Artesian flow g.p.m. Date		
Bearing and distance from section or subdivisio		Temperature of water 58 Was a chemical analysis r	nade? 🔲 🥈	res No
		(10) YEVET Y Y O.C.		
		(12) WELL LOG: Diameter of well	-	_
<del></del>		Depth drilled 613 ft. Depth of completed		·
		Formation: Describe by color, character, size of mater show thickness of aquifers and the kind and nature o stratum penetrated, with at least one entry for each	dal and stri f the mater change of	ucture, and rial in each formation.
		MATERIAL	FROM	то
(3) TYPE OF WORK (check):		Brown silt and sand	0	23
• •	iitioning 🗀 Abandon 🗇	l w	23	53
7' handonment, describe material and procedu		Blue silt	53	60
			60	124
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	Blue clay		<del></del>
Domestic II Industrial   Municipal	Rotary   Driven	Grey clay	124	229
	Cable 🖫 Jetted 🔲	Brown clay	229	_313
Irrigation Test Well Other	Dug 🖸 Bored 🔯	Grey clay	_  313_	380
(6) CASING INSTALLED: Thr	eaded   Welded K	Brown clay	_ _380	1111
6 Diam from 0 rt to		Blue clay	_   414_	459
_		IDIACK BADG ( 5 prom)	459_	461_
	-	Blue clay	161	493
" Diam. from ft, to	ft. Gage	Brown sandy olay	493	508
DEDECT ACTONS.		Blue clay	508_	558_
	forsted? 🛘 Yes 🔼 No	Brown clay	558	565
Type of perforator used			565	578_
SIZE of perforations in. by	in.	Grey brittle shale		
perforations from	ft, to ft,	Grey clay	578	<b>\$\$\$60</b> 0
perforations from	ft. to ft.	Brown and green shale sand and	600	610
perforations from	ft. to ft.	gravel (water)		
perforations from	ft. to ft.	Brown clay	610	613_
perforations from	ft. to ft.			
(8) SCREENS: Well screen in	istalled 🔲 Yes 🧰 No		_	
Manufacturer's Name				
Type M	fode) No			
Slot size Set from	ft. to ft.			
Diam, Slot size Set from	ft. to ft.	Work started 10/12/61 18 Completed	11/15/6	57 10
		Non Blanca 20/22/02 iv Compress	<u> </u>	
(9) CONSTRUCTION:		(13) PUMP:		
Was well gravel packed? 🗋 Yes 🗷 No Size	of gravel:	Manufacturer's Name		
Gravel placed from ft. to	ft.	Туре	нр	
Was a surface seal provided?  Yes No 7	Fo what depth? ft.			
Material used in seal	_	Well Driller's Statement:		
Did any strata contain unusable water? 🛣 Yei	B [] No	This well was drilled under my jurisdiction	and this	report le
Type of water? <b>Iron</b> Depth of	strata 459 to 461	true to the best of my knowledge and belief.		report as
Method of scaling strata off 6 inch of		1		
		NAME Steinman Bros. (Person, firm, or corporation)	(Type or pr	
(a) WATER LEVELS:			-	
	surface Date 11/15/61	Addras112.S. E. Moloughlin, Milwa	mukie,	Q <b>ro</b> +
	are inch Date	Dulllania wali mumban	•	
		Driller's well number	<b>4</b>	
Log Accepted by:	4	[Signed]	٠ ١٠	
181 All (himbole	12-5-,106/	(west valual)		
(Owner)	monte de la company de la comp	License No Date .12/4	/61	19
•			,	

#26

TER WELL CONTRACTOR

WATER WELL REPORT

It is report are to be
SEP 18 1862 STATE OF OREGON

(Please type or print)

Of well completion.

State Well No. 2/1W -13 C

of Well Completion.							
WNER:		(11) WELL	TESTS:	Drawdown lowered be	is amount v	vater level	l is
· Jerry Wilkinson		Was a pump test		No II	es, by whom	n?Stein	man Br
dress 16500 S. W. 85th		Yield: 35	gal./min. w	vith 200	ft. drawdow	n after	8 hrs.
Tigard, Oregon		] -:		<del></del>			
(2) LOCATION OF WELL:		Dalles and					
County Washington Driller's wel	11 number 65-61	Bailer test Artesian flow	gal,/min.		ft, drawdov	m after	hrs.
NE 14 MW 14 Section 13 T.	S R. JW W.M.	Temperature of	water E6 v	g.p.m. D		made2 🖂 1	Vas Ei No
Bearing and distance from section or subdivis	ion corner	Temperature or	water 50 v	vas a chemic	ar anarysis r	nader ()	res Millo
		(12) WELL	LOG: 1	Diameter of	weli below c	asing	6
* - <del>quantitativa de la constantitativa de l</del>	Professional Control of the Control	Depth drilled	770 st	Depth of	completed w	ell 77	0 1t
		Formation: Descr show thickness of stratum penetrate	the by color, f aquifers and ed, with at is	character, si I the kind an east one entr	ze of materio d nature of y for each o	il and stru the mater hange of	icture, and ial in each formation.
			MATER	IAL		FROM	TO
(3) TYPE OF WORK (check):		Brown clay				613	650
•	ditioning	Green conc		)		659	692
bandonment, describe material and proced	ure in Item 12.	Brown cong	J		and soft		750
(4) proposition (1 1)		Grey broke		(wate:		750	770
(4) PROPOSED USE (check):	(5) TYPE OF WELL:						
Domestic 🖫 Industrial 🗀 Municipal 📋	Rotary Driven Cable						
Irrigation 🗌 Test Well 🗎 Other 🗎	Dug 🗆 Bored 🖸						
AN CACANO PAGE AND PRO							
(6) CASING INSTALLED: The 65.7.1	readed Welded CK						
Diam. from ft. to	=						
Dlam. from ft. to	ft. Gage						
(7) PERFORATIONS: Per	forated?   Yes   No						
Type of perforator used							
Size of perforations in. by	in.						
perforations from							
perforations from							
perforations from						ļ	
perforations from						<u> </u>	
perforations from			·····				
							<u> </u>
(8) .SCREENS: Well screen in	stalled Tes ENo			<del> </del>			
Manufacturer's Name			A			-	<del></del>
е Мо						<u> </u>	
Diam Slot size Set from	·	Work started	3/14/62	19 Cor	noleted 9/5	<b>/14</b>	19
Diam Slot size Set from	ft. to ft.	Date well drilling	g machine me	oved off of a	vell 9/6	/62	19
(9) CONSTRUCTION:		(13) PUMP	)•				
Well seal-Material used in seal		Manufacturer's		Sumo			
Depth of seal		Tune!		Submersi			
Diameter of well bore to bottom of seal							
Were any loose strata cemented off?   Yes		Water Well Co	ntractor's C	Certification	:		
Was a drive shoe used? ☐ Yes ☐ No		This well w	vas drilled t	ınder my i	urisdiction	and this	report is
Was well gravel packed?   Yes No Size	of gravel:	true to the best	t of my kno	wledge and	belief.		-
Gravel placed from ft. to	<del>-</del>		non Disc				
any strata contain unusable water?		NAMEStein	(Person, firm	or corporation	n) ('	Type or pri	int)
e of water? Depth of		Address15112	•		-		
Method of sealing strate off		Į.		-			
		Drilling Machi	ne Operator	r's License	No6.7	*********	> > 4 > 4 0 4 4 4 7 5 4 4 5 <del>0 10 4</del>
(10) WATER LEVELS:		resman /	leun	/	9		
Static level 15 ft. below land	surface Date9/5/62	[Signed]	Terres VIAN	(Water We	Il Contractor)	.470+0070100000	i da a pomoia d o modo 944
	are inch Date	Contractor's Li	cense No	<b>I</b> 1	Date9/1	5/62	19

File Original and First Copy with the STATE ENGINEER, SALEM OREGON

## WATER WELL REPORT STATE OF OREGON

#23 State Well Nd/W	-/3本で
	(1)

SALEM, OREGON		State Permit No				
, OWNER: Lelville Eastham		(11) WELL TESTS: Drawdown is amount water icvel is lowered below static level  Was a pump test made?  Yes   You Drawdown is amount water icvel is lowered below static level  You have a pump test made? Yes You if yes, by whom?				
Aress 17015 S.W. Ur	oper Boones Formy 3d					
Tirard Or	-	a reid. Sai/min. with 15. Grawde	WII atter	hrs.		
		11 11 10	·			
(2) LOCATION OF WELL: County Washington Owner's no	umber, if any	Bailer test 35 gal./min. with 16 ft. drawdo	wn after	2 hrs		
N. E. & N. W. & Section 13 T	2 S. R. 1 W. W.M.	Artesian flow g.p.m. Date				
Bearing and distance from section or subdivis	ion corner	Temperature of water 52 Was a chemical analysis i	nade? Y	es 🕞 No		
		(12) WELL LOG: Diameter of well Depth drilled 200 ft. Depth of completed	well 20	0 n		
		Formation: Describe by color, character, size of mater show thickness of aquifers and the kind and nature o stratum penetrated, with at least one entry for each	ial and stru f the materi change of f	cture, and al in each formation		
		MATERIAL	FROM	TO		
(3) TYPE OF WORK (check):		Ton Soil		13		
New Well Deepening Recor	nditioning 🔲 Abandon 🗀	Loose Gravel & Boulders	13	27		
If abandonment, describe material and proceed	iure in Item 11.	Dirty Sand	27	31		
A PROPOSED VICE (-1-1-)	(E) MATERIA OF THE E	Sand & Gravel	$-\frac{31}{31}$	3€		
) PROPOSED USE (check):	(5) TYPE OF WELL:	Sandy Clay	_  3e	- <u>f</u> ö		
Domestic 🗗 Industrial 🔲 Municipal 🗀	Rotary Driven Driven Cable B Jetted	Gravel	-1.0	75		
Irrigation  Test Well  Other	Dug   Bored	Grey Clay	-\ <del>-75</del>	-85		
AGO OF A CURRENT VALUE OF A STATE	- x	Brown Sand & Poa Gravel		-83		
	nreaded ロ Welded 色	Grey Sand				
O	00 187	Brown Sand & Pea Gravel	<del>- %</del>	392		
5	i i	Brown Clay	92	27		
	ft. Gage	Grey Clay	97	30%		
PERFORATIONS: Pe	erforated? 🖫 Yes 🔲 No	Grey Sand	1.34	155		
	1	Grey Clay	155	171		
Type of perforator used  SIZE of perforations  1/8 in. by		Grey Sand (water)	171	1.76		
40 perforations from 17.0		Brown Clay	176	178		
perforations from	Į.	Grev Clav	178	187		
perforations from	į	Brown Clay & Sand	187	191		
perforations from	į –	Grey Sand (Coarse)(water)	רסו	200		
perforations from	Ī					
periodic at the second						
(6) SCREENS: Well screen Manufacturer's Name	installed 🗌 Yes 💆 No					
Туре	Model No	Prompt of Alexandria States in State				
Diam Slot size Set from	ft. to ft. tt.					
ım Siot size Set from	ft. to ft.	Work started 6/29/50 19 Completed	7/10/59	19		
(9) CONSTRUCTION:		(13) PUMP:				
Was well gravel packed? 🗆 Yes 🙊 No Si:	ze of graves:	Manufacturer's Name	**************************************	b. 4.72.286.7g,406mi		
Gravel placed from ft. to		Type:	H.P			
Was a surface seal provided? ☐ Yes ☐ No Material used in seal—	To what depth?	Well Driller's Statement:				
Did any strata contain unusable water? [] Y	res D No	This well was drilled under my jurisdiction	and this	report is		
Type of water? Depth o	d strata	true to the best of my knowledge and belief.				
Method of sealing strata off	ing and the state of the state	MANUS Steinman Bros				
THE APPEND T PRINT C.		NAME Steinman Bros. (Person, Lim, or corporation) (	Type or prin	t)		
WATER LEVELS:	d surdays Data or to a total	Address .15112.S.E.McLoughlinKilw				
	d surface Date 7/10/59 uare inch Date	っったの		_,		
		Driller's well number 2233	**************			
Log Accepted by:		[Signed]	سيكشك			
[Signed] Melville Easther Bate by Hour V. (Own)	19	License No	59	., 19		

A20#20

NOTICE TO WATER WELL CONTRACTOR
The original and first copy
of this report are to be
flied with the
STATE ENGINEER, SALEM 10, OREGON
within 30 days from the date
of well completion.

#### WATER WELL REPORT STATE OF OREGON (Please type or print)

State Well No. 2/1w-13C.

) OWNER:ameallace Ua	ole	(11) WELL TESTS: Drawdown is amount v lowered below static le Was a pump test made? ☐ Yes ☐ No If yes, by whom	evel	is
Address 15 70 3. W. Upmer F		Yield: gal,/min, with ft. drawdow		hrs.
Ticard, Or		21 11 11		
		)		*1
(2) LOCATION OF WELL:	(2 1 / 3	Bailer test 20 gal./min. with 7 ft. drawdow	vn after	2 hrs.
County designation Driller's well		Artesian flow g.p.m. Date		
N 24 1. 1 1/2 Section 13 T.		Temperature of water 52 Was a chemical analysis r	made? 🛭 Y	es 🖸 No
Bearing and distance from section or subdivisi	ion corner	(19) THEFF LOC.		
		(12) WELL LOG: Diameter of well below c  Depth drilled 70 ft. Depth of completed w		<u> </u>
		Formation: Describe by color, character, size of materia show thickness of aquifers and the kind and nature of stratum penetrated, with at least one entry for each c	il and structhe materic the materic hange of f	ture, and al in each ormation.
		MATERIAL	FROM	то
(3) TYPE OF WORK (check):		Soil, top	0	1
• •	ditioning 🗀 Abandon 🗆	Conglomerate , brown clay & bould	ers 1	20
.bandonment, describe material and proced	ure in Item 12.	Gravel , loose dry	20	1.9
(A) PROPOSED LISE (-LL).	(5) MADE OF WELL.	Conglon rate, brown clay & gravel	1,9	ć2
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	Sand agravel . loose	62	67
Domestic 🖸 Industrial 🗌 Municipal 🗍	Rotary   Driven   Cable   Jetted	Clay grey	67	70
Irrigation   Test Well   Other	Dug 🗆 Bored 🗀			
(6) CASING INSTALLED: The	readed  Welded			
CASING INSTALLED:				
	-			
Dlam. from ft. to	-			
Diam. from	The Gage			
	forated? 🗌 Yes 🔯 No		<del>                                     </del>	
Type of perforator used	4	garage political account of the control of the cont		·
Size of perforations in. by	<u>In.</u>			
perforations from				
perforations from			1	
perforations from		A STATE OF THE PROPERTY OF T		
perforations from		Section of the second section of the section of the second section of the section of		
was a second sec		The state of the s		
(8) SCREENS: Well screen in:	stalled 📋 Yes 🔀 No			
Manufacturer's Name	***************************************	Parks and appropriate tracks are appropriate an appropriate an appropriate an appropriate and		
e ,	odel No.		<u>l</u>	
	it. to	Work started 1/22/63 19 Completed 1	<u> </u>	15
Diam. Slot size Set from	it. 10 it.	Date well drilling machine moved off of well 1/	<u>20/63                                    </u>	15
(9) CONSTRUCTION:		(13) PUMP:		
Well seal-Material used in seal Grillout	trings & clay	Manufacturer's Name		
^ ~	acker used? fine crushed	Type:	7 <b>D</b>	************************
Diameter of well bore to bottom of seal	13 the Fock	Type, I		
Were any loose strata cemented off? Tyes	IXNo Depth	Water Well Contractor's Certification:		
Was a drive shoe used? 2 Yes 1 No		This well was drilled under my jurisdiction	and this	report is
Was well gravel packed? Tyes No Size	of gravel:	true to the best of my knowledge and belief.		•
avel placed from		arasem statuman Dans		
any strata contain unusable water?		(Person, firm or corporation) (7	Type or prin	t)
Type of water? Depth of		Address 5112 S.E. McLoughlin Milway	kie 22	0
sthed of sealing strata off				•
(10) WATER LEVELS:		Drilling Machine Operator's License No.	Qد م	************
Static level 53 ft. below land	surface Date 1/26/63	[Signed] Summer		
	ere inch Date	Contractor's License No Date _1/28	3/63	10
		: Constructor's lacense no Date	Active many	. IV

#### STATE ENGINEER Salem, Oregon

# Well Record

		,	(DP)
•	STATE WELL	NO. 25/10	1300)
	STATE WELL COUNTY	Washing	eton
	4 TOT	/	

<b>^ .</b>	B & A TT TRIC	III I DICATION	NO
OWNER: Durham School	MAILING . ADDRESS:		•••••
LOCATION OF WELL: Owner's No	CITY AND STATE:		
N. E.	_		
	W.M.		1
Bearing and distance from section or subdivision	}.		
corner			
,		i l	
Altitude at well 170 ft.			
TYPE OF WELL: drilled Date Constructed	<u>L</u>		
Depth drilled 150 ft. Depth cased 142 ft	· <b></b>	Section	
CASING RECORD: 6 inch			
·			
FINISH:	<del>-100,1003,100-112-, 111-12-, 111-12-</del> 1		Return the Research and the court of
AQUIFERS: inavel from 135 to	148 11		
	. , ,		
WARDY A DAVIN			
WATER LEVEL:			
PUMPING EQUIPMENT: Type		•••••	. <b>H</b> .P
Capacity G.P.M.			
WELL TESTS: Drawdown ft. after	hours		CDM
Drawdown ft, after			
USE OF WATER Sublic supply SOURCE OF INFORMATION 4.5.4.5.	Temp °I	9 * **	, 19
DRILLER or DIGGER			
ADDITIONAL DATA:			
LogX Water Level Measurements		<del>-</del>	
REMARKS: Reported water - hearing a clay from 148 to 150 ft; see	cand from	n 65 to 135 Ju	: and
class from 148 to 150 St. see	- table 2.	for los.	
The state of the s	sel.	0	

#### STATE ENGINEER Salem, Oregon

State Well No. 25/10 13D(1)
County Washington
Application No.

## Well Log

Date Drilled951	/
(Feet below land surface) From To	Thickness (feet)
4	15- 45
	65 20
	35 76
	18 13
	50 2
	**************************************
- W- FT	Patricipals of the second seco
TO THE RESIDENCE OF THE PROPERTY OF THE PROPER	Mala, Links, spins on Edgessia (1984)
	From To

# ORIGINAL File Original, and Duplicate with the STATE ENGINEER, EATEM. OREGON

# WATER WELL DRILLERS REPORT STATE OF OREGON

Do Not Fill In	State Well NB 2/1W-13 D (66)
	State Permit No. GR- 26/5 Cat.

SALEM, OREGON		State Pennit No
(1) OWNER: Washington	School Dif # 82	(10) WELL TESTS:
- 10 .2		Was a pump test made?  Yes  No If yes, by whom?
1. 1 = 23 Occ.	1	Yield: /7 gal./min, with ft. draw down after in
(2) LOCATION OF WELL:		" " "
	48	Artesion flow g.p.m.
County hispington Owner's number.	II any	Shut-in pressure
R. F. D. or Street No. Bearing and distance from section or subdivision		Boller test
U"5 E 100' Feet 76 SW		Temperature of water Was a chemical analysis made?   Yes   1
Durham dous, Nosh Bloke	C. C.	Was electric log made of well? ☐ Yes ☐No
1000 E & 31015 from 11W Con	. S.M. 13	(11) WELL LOG:
(2)	44 4	Diameter of well,
	g. Striement	Total depth 200 it. Depth of completed well 150
* well Deepening Reconditi	turn turn	
abandonment, describe material and procedure		Formation: Describe by color, character, size of material and structure, a show thickness of aquifers and the kind and nature of the material in eastratum penetrated, with at least one entry for each change of formatic
(4) PROPOSED USE (check):	(5) EQUIPMENT:	It. to It.
Domestic Industrial I Municipal I	Rotary	0" 8 " Brown Sift
Irrigation   Test Well   Other	Cable 🖫	8 " 64 " " Sand
	Dug Well	64" 74 " Clay blue very steek.
(v) CASING INSTALLED:	If gravel packed	74" 95 " Silt brown & blue
Threaded   Welded	•	95" 105 " Clay Hu Sticky
Gage	Diameter from to	105" 120 " Sit from + ofus
	of Bore 1t. 1t.	120" 135 " Sitt Howi
	1) 11	135" 140 " Sit Her - Sand & water begins
11 11 11 11	16 12	140" 150 " Shele blee
- 11 11 11 11 11 11	** **	150" 200 " Shale blue idan care Louis
		" " " " Jane, will fair, carry Lane
1) 1) 1)	Cine of equiple	11 11
	Size of gravel:	II II
Describe joint		11 11
(7) PERFORATIONS:		1) 11
Type of perforator used unk		11
SIZE of perforations in., le	ength, by in.	11 11
FROM ft. to ft. perf;	per foot No. of rows	19 16
"IID " 147 " ? "	21 11 10 10 11	If II
" "	11 11 11 11 11	15 53
11 11 21	11 11 11 11 15	11 11
ES 33 17 27	21 75 57 55	17 27
SCREENS:		11 11
Give Manufacturer's Name, Model No.	and Size	16 tf
1		11
(8) CONSTRUCTION:		11 11
Was a surface sanitary seal provided? ☐ Yes ☐	No To what depth ft.	ff th
Were any strata sealed against pollution?   Yes	■ '□ No	Ground elevation at well site feet above mean sea le
If yes, note depth of strata	**	Work started July 1857. Completed Aug 19.
FROM 1t. to	#.	Well Driller's Statement:
\$5 AP	) † Particular manifesia in instantia internatiana managan para.	This well was drilled under my jurisdiction and this report
METHOD OF SEALING		true to the best of my knowledge and belief.
(9) WATER LEVELS:		NAME Unk,
oth at which water was first found	1L.	(Person, firm, or corporation) (Typed or printed)
ding level before perforating	1L	Address
iding level after perforating	n.	Driller's well number
Log Accepted by:		
	46	[Signed](Well Driller)
[Signed] Dated	· · · · · · · · · · · · · · · · · · ·	License No Dated 10

#### NOTICE TO WATER WELL CONTRACTOR

The original and first copy

#### WATER WELL REPORT

-22	./	\ <u>\</u>
State Well	No 2/11/-	1510
	/	

state engineer, salem, oregon 9776 within 30 days from the dath of well completion. THE STATE OF OREGON

AUG 6 1963 Dead write above this line) State Permit No. .....

STATE ENGINER				
OWNER: "ALLM. OREGOM	(11) LOCATION OF W	ELL:		
Name William C. Winthers	County Washington	Driller's well number	44-69	
Address 16775 S. W. Upper Boones Ferry	SW 14 NW 1/4 Section	13 T.25 R.1	W	W.M.
Tigard, Or. 97223	Bearing and distance from section	on or subdivision corner	•	
(2) TYPE OF WORK (check):				
New Well Deepening Reconditioning Abandon	PHART			
If abandonment, describe material and procedure in Item 12.				
(3) TYPE OF WELL: (4) PROPOSED USE (check):	(12) WELL LOG: Dia	ameter of well below ca	sing	
Cable Detted Domestic industrial Municipal Domestic	Depth drilled 191 it. i	Depth of completed we	11 11	91 n.
Dug Bored I Irrigation Test Well Other	Formation: Describe color, text	ure, grain size and stru	cture of n	naterials;
CASING INSTALLED: Threaded  Welded	and show thickness and nature with at least one entry for each			
.6 " Diam from	in position of Static Water Leve			
5-9/160 n. Liner 181 n. to 191 n. Gage 10	MATERIAL	From	То	5WL
" Diam. from	Clay, sandy, brown	0		
(E) PERFORATIONS: Perforated? M Yes   No.	Cemented gravel		56	
1, se of perforator used Torch	Clay, brown			
Size of perforations 1/8 in. by 12 in.	Sand, grey		89	
18 perforations from 182 n to 190 n	Sand, brown			
perforations from	Clay, grey			
m perforations from ft, to ft.	Clay, grey			
m perforations from the to m the to	Sand, grey	76	-7	
perforations from tt. to tt.	Clay, grey	169		
(7) SCREENS: Well screen installed? Tyes Y No	Sand, grey, coarse	181	187	75
Afacturer's Name	Clay, grey	187	191	
Type Model No.	Post-Post-contract - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		<u> </u>	
Diam. Slot size Set from it to the			<u> </u>	
Diam. Slov size Set irom ft. to ft.				
(9) WATED VEVEL Completed well				
(8) WATER LEVEL: Completed well.  Static level 75 ft. below land surface Date 7-29-69			-	
dan pressure lbs. per square inch Date				
(9) WELL TESTS: Drawdowr, is amount water level is			<del> </del>	
lowered below static level	Commission of the state of the		<del> </del>	
Was a pump test made? Yes No If yes, by whom?	Work started 3117 76	19 60 Completed Ju	1i	10 60
Yield: gal./min. with ft. drawdown after hrs.	Date well drilling machine move		ly 29 y 31	19 69
* ************************************			<u>y )</u>	13 07
N	Drilling Machine Operator's			W# n. 4 -
Bailer test 20 gal./min. with 90 ft. drawdown after 1 hrs.	This well was constructed rials used and information	reported above are	pervision true to r	ny best
Artesian flow g.p.m. Date	knowledge and belief.	1) 01		
Temperature of water 54° Was a chemical analysis made?   Yes No	[Signed] Continue Machine	2- Cornell Date A	ug5	, 19 69
(10) CONSTRUCTION:	Drilling Machine Operator's	License No.	OR	
Well seai-Material used Bentonite	Diming Machine Operator's	Tirelise 140,	· · · · · · · · · · · · · · · · · · ·	
Depth of seal 0000 34 rt.	Water Well Contractor's Cer	tification:		
Diameter of well bore to bottom of seal	This well was drilled und		nd this r	eport is
any loose strata cemented off?   Yes   No   Depth   Depth	true to the best of my knowl			
4 drive shoe used? X2 Yes No	NAME Steinmen Bros. (Person, firm or cor	poration) (Ty	pe or print)	************
* any strata contain unusable water?   Yes  No	Address 15112 S.E.McLo		e.Or.	97222
. , pe of water? depth of strata		-		,,,,,,,,,,,,,,,
Method of sealing strata off	[Signed (Nolecat E.	Mc Conn	el Q	***********
Was well gravel packed? [] Yes D No . Size of gravel:	(₩	ater well Contractor)		à
Gravel placed from	Contractor's License No	I Date Aug.	5	19.69

# ESEIVED

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Original and it Copy with the ATE ENGINEER, LEM. OREGON WATER WELL REPORT

State Well No. 2/1W-13 G (QC)

OWNER:	1		iown is amount water love ed below static level	el is
ddress 15870 Boones Forry Pd		test made? 🔲 Yes 🖰 No	If yes, by whom?	
Tigard, Crevon	Yield:	gal./min, with	ft. drawdown after	hrs.
11 114 016 011			••••••••••••••••••••••••••••••••••••••	
(2) LOCATION OF WELL:	} ~~~~~			· · · · · · · · · · · · · · · · · · ·
County WASH Owner's number, if any—	====================================	9-17-17-17-17-17-17-17-17-17-17-17-17-17-	ft. drawdown after .	hrs.
14 14 Section 13 T. R. 1 W	/.M. Artesian flow		m. Date	
Bearing and distance from section or subdivision corner	Temperature	or water was a cne	mical analysis made?	Yes U No
Tract 25 Lots 1-2-3	(12) WEL	L LOG: Dia	meter of well 6	inches
	Depth drilled	1 80 ft. Depth	of completed well 80	ft.
· ·	Formation: I show thickne stratum pene	Describe by color, characters of aquifers and the king trated, with at least one	er, size of material and str id and nature of the mate entry for each change of	ucture, and rial in each formation
		MATERIAL	FROM	ro
(3) TYPE OF WORK (check):	Clay		0	7 1.
New Well Deepening Reconditioning Abando	Canalia	oulders	4	5
If abandonment, describe material and procedure in Item 11.	Gravela	nd clay	5	11
PROPOSED VICE (-LL). (F) MAYDE OF THEY	Emall b	oulders and gray		37.
( PROPOSED USE (check): (5) TYPE OF WELI	Cray and	d gravel	14	17
Coble M Tested		oulders and grav		19
	Clay and	gravel	1.9	27
(6) CASING INSTALLED: Threaded  Welded 20	gravel	ga maganaring and allay and regular and the control of the state of the control of the control of the control of	27	34
(6) CASING INSTALLED: Threaded Welded 23 5/30.) Diam. from	ravel ;	andre en anne grape de common communicación de la compansión de la compansión de la compansión de la compansión	31:	39_
Diam. from	Clay an	d ;ravel		$\frac{1}{1}$ $\frac{51}{1}$
"Diam from ft. to ft. Gage	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	and some clay		52
Dian IIIII IIIII IIII IIII IIII IIII IIII	0100	d small gravel ree gravel	<u>6?</u> 68	65
(7) PERFORATIONS: Perforated?   Yes  No	neavy L	ree Travel	00	<u> </u>
Type of perforator used				
SIZE of perforations in by in.				
perforations from ft. to	. ft.			
perforations from	. tt.			
ft, toft	(			<del></del>
perforations from	. ft.			
perforations from ft. to	. ft.			<del></del>
8) SCREENS: Well screen installed    Yes  No		والمراوية والمراوي ورد مواهد برسواه والواقد والمواهد بالمواود والمواود والمراود والمراود والمراود وا		
Manufacturer's Name				-
Type Model No.	[			
Diam Slot size Set from	}			
Set from	ft. Work starter	. Jan 5 1961	. Completed Jan 16	1951
A. AALTONIATAMIAK			Manager of the Control of the Contro	
9) CONSTRUCTION:	(13) PUM	I <b>P:</b>	Y	
Vas well gravel packed? Tyes X No Size of gravel:	Manufacture	r's Name 1/4 MP	Jacuzzi	************
Frave) placed from ft. to ft.  Was a surface seal provided? □ Yes □ No To what depth?			Н.Р.	
Material used in seal—	1	r's Statement:		
Did any strata contain unusable water?   Yes No	• • • • • • • • • • • • • • • • • • • •		y jurisdiction and this	report is
Type of water? Depth of strata		best of my knowledge		, supple is
dethod of sealing strata off	25	BEKER WELL DRILL	בות.	
MAN BULLDER Y DAYEY C.	***************************************	(Person, f.rm, cr corp.	oration) (Type or pr	
(10) WATER LEVELS:  10 level 66 ft below land surface Date/IAD 15-	Address	2902 Hoover Blvd	l. Newberg, Creto	1
	57			
sian pressure lbs per square inch Date	Driller's we	ell number		***********
Log Accepted by:	[Signed]	- Clay I	Thehe	<u>/</u>
[Signed] Cauch Date 1-20-51 19.	License No.		Date Jan 16	19 <u>.61</u>

N MAY 2 9 1961 W

N4# 10

e Original and at Copy with the ATE ENGINEER,

STATE L. GREENWATER WELL REPORT

•			2/	! *****	 1	$\overline{}$	1-1
State	Well I	٧o,		IM	 پ	G	

LEM, OREGON	BIAIE OF	State Permit No		
OWNER:		(11) WELL TESTS: Drawdown is amount lowered below static	water icvel is	
Mr. E.D. Huebotter		Was a pump test made? Yes No If yes, by who		
iddress 16870 Boones Ferry	Rd.	Yield: gal./min. with ft. drawdo	wn after	hrs
Tigard Ore.		91 95 97	, , , , , , , , , , , , , , , , , , ,	*
(2) LOCATION OF WELL:	ļ	" at bottom"		**
	umber, if any	Bailer test 15 gal./min. with ft. drawdo	wn after 글	hre
34 34 Section T		Artesian flow g.p.m. Date		
Bearing and distance from section or subdivis	sion corner	Temperature of water Was a chemical analysis	nade? 🗆 Yes [	D No
SSee other Log		(12) WELL LOG: Diameter of well Depth drilled 85 ft. Depth of completed	-/-	ches ft
		Formation: Describe by color, character, size of mater show thickness of aquifers and the kind and nature o stratum penetrated, with at least one entry for each	rial and structure f the material in change of forma	eaci eaci ation
		MATERIAL	FROM T	o
(3) TYPE OF WORK (check):		Gravel		89
New Well □ Deepening □ Reco	nditioning 🗀 Abandon 🗀	blue clay		<u>96</u>
If abandonment, describe material and proce	dure in Item 11.	Brown clay	96 11	•
( PROPOSED USE (check):	(5) TYPE OF WELL:	Blue silt With a little sand		25
Domestic M Industrial   Municipal	Rotary Driven	Blue sand silt		55_
Irrigation   Test Well   Other	Cable A Jetted Dug Bored	11 11 15	155	165
		Blue clay	165	
	hreaded Welded			
15/8 ODpiem from 80 rt to 241t rt to	1110-11. ft. Gage17.6.02#	Water was hard to clear		
Diam from 1/16 ft. to				
Diam. from	R. Gage		_	
PERFORATIONS: PO	erforated? 🛣 Yez 🗆 No		_	
Type of perforator used			-	
SIZE of perforations in. by			_	
perforations from 116			<del></del>	
ROWS perforations from		WITTENSON OF THE STATE OF THE S	-	
perforations from				
perforations from perforations from				
and the second s				
(8) SCREENS: Well acreen Manufacturer's Name	· <del>· · -</del>			
Type	Model No.			
P" Slot size Set from			<u> </u>	
Di Slot size Set from		Work started # 3/7/61 19 Completed	3/20/61 1	19
(9) CONSTRUCTION:	]	(13) PUMP:		
Was well gravel packed?  Yes No Si	ze of gravel:	Manufacturer's Name Jacuzzi		
Gravel placed from ft. to	It.	Type: 2 Stage Jet	н.р. 1	
Was a surface seal provided? ☐ Yes ☐ No	To what depth? ft.			
Material used in seal—  Did any strata contain unusable water? X6 Y	Zee C No.	Well Driller's Statement:		
	of atrata 65-90	This well was drilled under my jurisdiction true to the best of my knowledge and belief.	and this repo	irt L
	seing past it			
		NAME MEEKER WELL DRILLING (Person, firm, or corporation)	(Type or print)	•••••
(10) WATER LEVELS:		Address 2902 Hoover Blvd. Newbe		
	d surface Date	1 0-11	····	
tesian pressure   Ibs. per aq	uare inch Date	Driller's well number		
Log Accepted by:		[Signed] July 1 Lee	su -	
(Blened) Mithering Auchotter Date		(Well Driller)	***************************************	
(Owase)		License No. 111 Dat 3/20/6	<u>4</u> 17	)

#### UBSERVATION WELL

#### STATE ENGINEER Salem, Oregon

#### Well Record

11			1	COP!
STATE	WELL.	NO.	2/11/-	13K/2
STATE COUNT	Υ	ii	IN SHING	772 N
APPLIC				

(OLO ENDICCT)	APPLICATION NO
OWNER: TRUCK PARTS DISTRIBUTERS ADDRES	
LOCATION OF WELL: Owner's No STATE:	ND
$NW_{4}$ SE $\frac{1}{4}$ Sec. $\frac{13}{13}$ T $\frac{2}{13}$ S, R. $\frac{1}{10}$ W, W.M.	
Bearing and distance from section or subdivision	
corner	
Altitude at well	
TYPE OF WELL: Du6 Date Constructed	
Depth drilled 92 Depth cased 92	Section 13
CASING RECORD:	
FINISH:	
AQUIFERS:	
GRAVEL	
WATER LEVEL: 81.08 (3.30-62)	
PUMPING EQUIPMENT: Type G.P.M.	H.P.
WELL TESTS:  Drawdown ft. after hours	GPM
Drawdown ft. after hours	
USE OF WATER DOMESTIC Temp. SOURCE OF INFORMATION FIELD LAS.	
ADDITIONAL DATA:  Log	Analysis Aquifer Test
REMARKS:	

WATER WELL REPORT STATE OF OREGON

State Well No. (Cd)

State Permit No. (CR) 2-156

Copy from File Original and First Copy with the TATE ENGINEER,

CEM, OREGON () I	,	State Perinit No	dan dan dan dari	
1) OWNER:	ham	(11) WELL TESTS: Drawdown is amount to lowered below static le		l is
Address 17015 SW. Usa	Cr. Boom Ferry Rd	Yield: 25 C. gal./min. with 6, ft. drawdow		hre
Tigasi		" " "		*
A FORTER HEY	MY MUCHS, AST.	11 11		**
(2) LOCATION OF WELL:		Bailer test gal./min, with it. drawdow	n after	hra
	ımber, if any—	Artesian flow g.p.m. Date		
MAR NOW N Section 13 T. 2 S. R. WW.		Temperature of water Was a chemical analysis ma	ade? 🗆 Y	es 🗆 No
Bearing and distance from section or subdivis			7	
7 41 40 E 34/1	23:472	(12) WELL LOG: Diameter of well	1 3.	inches
22 to vater 2 dt	<u>13</u>	Depth drilled 1 7 It. Depth of completed w		·
		Formation: Describe by color, character, size of materia show thickness of aquifers and the kind and nature of stratum penetrated, with at least one entry for each c	il and stru the mater hange of	cture, and lal in each formation
		MATERIAL	FROM	70
(3) TYPE OF WORK (check):		587	_0_	5
•	nditioning [] Abandon []	Boulder-> 4 Clai	5	50
If abandonment, describe material and proceed	iure in Item 11.	Leess cravel stan	50	36
	(#) myrne on tring t	and class		
PROPOSED USE (check):	(5) TYPE OF WELL:	Graver cies and brokers	36	20
Domestic 🗌 Industrial 🗍 Municipal 🗍	Rotary   Driven	Lapse aravel	50	105
Irrigation 🔀 Test Well 🛘 Other 🔻	Dug 🛘 Bored 🗍	Giraval and clay	105	120
		J		
	readed [] Welded []			
" Diam, from ft, to				
	<u> </u>			
Diam. from ft, to	ft. Gage			
.) PERFORATIONS: Po	erforated? XYes   No			
· · · · · · · · · · · · · · · · · · ·	· •			
SIZE of perforations in. by	in,			
perforations from				
Destate as one management			<b> </b>	<u> </u>
(8) SCREENS: Well acreen	<del>-</del>			·
Type				
Diam Siot size Ser from				
L Slot size Set from		Work started 15 Completed		104
(9) CONSTRUCTION:		(13) PUMP:		
Was well gravel packed? [] Yes [] No Sin		Manufacturer's Name Cmcnh		
Gravel placed from ft, to		Type:	н.Р	<u> </u>
Was a surface seal provided?  Yes No Material used in seal—	To what depth? ft.	Well Driller's Statement:		
Did any strata contain unusable water? 🔲 Y	es 🗍 No	This well was drilled under my jurisdiction a	and this	report is
Type of water? Depth o	f strata	true to the best of my knowledge and belief.		-
Method of sealing strate off	angelia melitari (1800-180). Na pili lebaga di daga mengalagi daga daga daga daga daga daga daga d	NAME Steinman Bros		
0) WATER LEVELS:		(Person, firm, or corporation) (T)	pe or prin	-
static level CC ft. below land	d surface Date June 1941	Address	************	264044444444444
rtesian pressure 15s. per sq	uare Inch Date	Driller's well number	************	
Log Accepted by:		(Signed) (Well Driller)	************	4. 44 . 10 1 0 mi 9 1 0 mi
[Signed] Date	19	License No		

(11) WELL TESTS	' lowered	own is amount videlow static le	vel	i in
Was a pump test made?	*	If yes, by whor		
Yield: 250 gal./i	nin, with 6,	ft. drawdow	n after	hre
**				
	nin, with	žt. drawdow	n after	hrs
Artesian flow	<b>g</b> .p.n			
Temperature of water	Was a chem	ical analysis m	ade? Y	es   No
(12) WELL LOG:	It. Depth	of completed w	ell 17.	·
Formation: Describe by c show thickness of aquifer stratum penetrated, with	s and the kind at least one e	and nature of natry for each c	the materi hange of	cture, und al in each formation
MA	TERIAL		FROM	70
583			_0_	臣
Ballder	5 4 C \r.		5	20
I or Co		7.0	120	31
- 5000	<u> </u>			
- ana		1 1 1 1 1 2 2	1	0.0
- Freyer	703 1.00	d be differe	36	
	-over		<u> </u>	105
Girayul a	21.5 QU	4	105	100
		<del></del>	ļ	
<del></del>				
	· · · · · · · · · · · · · · · · · · ·			
***************************************		······································	<del></del>	
		·	<del></del>	
			ļ	
-	<del></del>	·····		
	·	<del></del>		
				<del></del>
	<del></del>			
		···· ·································		
Work started	15	Completed		104
(13) PUMP: Manufacturer's Name Type:	Pome	nu	н.р3	
Wint - 0.0 Who . 199			······································	
Well Driller's Statemer This well was drille true to the best of my		jurisdiction i	and this	report L
true to the best of my	knowledge at	nd belief.		
	NY CY	Byes (T)	pe or prin	
Address				
Driller's well number .	***************************************		********	, <del>.</del>
(Signed)	(Well D	eillari	***********	
	(men D	******		

STATE	<b>ENGINEER</b>
Saler	n. Oregon

Well Record STATE WELL NO 2/1W-/3L COUNTY WAS HINGTON APPLICATION NO. GR 2259, GR 215

OWNER: Henry S. Mears	MAILING ADDRESS: 17015 Sw 1	Jeger Boone Ferry
LOCATION OF WELL: Owner's No		
NE 1/4 SW 1/4 Sec. 13 T. Z S, R. 1 W., V		
Bearing and distance from section or subdivision	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
corner N49° 40' E 347.6' to the		
Center of Soction 13 from the		
Wc]/		
Altitude at well		
TYPE OF WELL: D. L. Date Constructed 194		
Depth drilled 120 Depth cased 120	Section 12	<b>&gt;</b>
CASING RECORD:		
8-Inch		
FINISH: Casing pertorated		
AQUIFERS:		
Loose gravel from Bo to 10	s feet.	
WATER LEVEL:	f	
80 feet below land sw		
PUMPING EQUIPMENT: Type Pomono. Capacity 3.9. G.P.M.		н.р3
WELL TESTS: Drawdown ft. after ft.	ours Plantine 250	CDM
Drawdown ft. after h		
USE OF WATER In Age 1 is Source of Information GR 22.59	emp ° F'	, 19
SOURCE OF INFORMATION GR 22.59  DRILLER or DIGGER 51610man 2 cos-	***************************************	***************************************
ADDITIONAL DATA: Log Water Level Measurements	Chemical Analysis A	quifer Test
REMARKS.		

## 04#13

#### STATE ENGINEER Salem, Oregon

State Well No. 2/1W-13L

County WASHINGTON

Application No. GR. 2259, GR. 2156

### Well Log

iller: Steinman Bros.	Date Dril	led 1941	***************************************
CHARACTER OF MATERIAL	/Feet below From	'and surface) To	Thicknes (feet)
50'11	0	5	5
Boulders and Clay	5	20	15
Loose comented grove, sond & clay	50	36	16
Gravel, clay and boulders	36	08	44
Loose gravel	୧୨	105	25
Grove and clay	105	120	15
	***************************************	***************************************	
			1
		**************************************	
	**************************************		
	y der amende de frie in yn dy amendings, gynn ysann amenn i		

U- SL, 34 1959

# File Original and First Copy with the STATE INCHIEER WATER WELL REPORT

>	
	9/
	The same to the
State Well No	1/1W-12P

STATE ENGINEER, SALEM, OREGON	STATE OF	F OREGON State Permit No	
OWNER:		(11) WELL TESTS: Drawdown is amou	nt water level is
RE HAINSEN		Was a pump test made? Yes No If yes, by w	
Address TURLATIN, CIRL			lown after hrs.
		25 95	7 11
		11 11	) <u>***</u>
(2) LOCATION OF WELL:		Baller test 父 gal./min. with 👩 ft. drawd	lown after hrs.
County VVASALINGTON Owner's n	umber, if any—	Artesian flow g.p.m. Date	Administrações e e maior el Ambanos, el Malandon maior en actual de la companya d
14 14 Section 7	r. R. W.M.	Temperature of water Was a chemical analysis	made? [] Yes [] No
Bearing and distance from section or subdivis			
S.W. PETERS ROAD	HWY 217 EN	(12) WELL LOG: Diameter of well Depth drilled ft. Depth of completed	inches twell ft.
SIDE OF ROAD - 75		Formation: Describe by color, character, size of mat	erial and structure, and
( 20 FT FROM WES	T PROPERTY LIN	Formation: Describe by color, character, size of mat show thickness of aquifers and the kind and nature stratum penetrated, with at least one entry for eac	of the material in each h change of formation.
		MATERIAL	FROM   TO
(A) MATTER ON THOMAS (1.1)			- 1 m
(3) TYPE OF WORK (check):		Sign	
	onditioning	BOULDERS +GRAYEL	- 22
andonment, describe material and proce	dure in Item 11.	SAAD	22 20
(4) PROPOSED USE (check):	(5) TYPE OF WELL:	WAIFR	78 7
	1 ' '		
Domestic 🙀 Industrial 🗌 Municipal 🗎	Rotary Driven Cable B Jetted		
Irrigation   Test Well   Other	Dug 🖺 Bored 🗋		
(A) A A CHARA TAYON A T T WIN	2.4		
	hreaded   Welded		
	_		
	ft, Gage		
	ft. Gage	The state of the s	
	al a second	detainment in description of the control of the con	
	erforated?   Yes   No	<ul> <li>Виниродичествення предуставлення дорження дорження дорження предуставлення предуставлення дорження дорження доржения д доржения доржения дорж</li></ul>	
Type of perforator used			
SIZE of perforations in. by	in.		
perforations from	ft. to ft.		
perforations from	ft. to ft.	Mariana, may district among personal production of the production of the state of t	
perforations from	fi, to ft.		
perforations from	ft. to ft.		
perforations from	ft. to ft.		
(8) SCREENS: Well screen	installed 🔲 Yes 🎵 No		
Manufacturer's Name			
Type	Model No	the specific and plants and plants are an in the specific and the specific	
Slot size Set from			<u> </u>
Dann, Slot size Set from		Work started 4//2 1957 Completed	5 / 2 19 J
			7
(9) CONSTRUCTION:		(13) PUMP:	
Was well gravel packed? 🛘 Yes 💢 No Siz	ze of gravel:	Manufacturer's Name DORWARd	PLUMP CC
Gravel placed fromft. to	ft.	Type: JET	нр. 3/4
Was a surface seal provided? 🗌 Yes 📋 No	To what depth? ft.		
Material used in seal—	**************************************	Well Driller's Statement:	
Did any strata contain unusable water? 🔲 Y	es 🖸 No	This well was drilled under my jurisdiction	on and this report is
Type of water? Depth o	f strata	true to the best of my knowledge and belief.	
Method of sealing strata off		DAN E	<b>5.</b> 00
	The second secon	NAME (Person, firm, or corporation)	(Type of mint)
(10) WATER LEVELS:			
Static level 75 ft. below land	d surface Date 5/2/59	Address 2. 0.40 SW 17.2	4.K.C.D.A.MC.C.
	uare inch Date	Dvillar's wall number	
All the company of th	- The state of the	Driller's well number	<i>'</i>
Log Accepted by:		[Signed] (Well Driller)	كمستنة التسنع
[Glanad] Yele	in	(Well Driller)	
[Signed] Date	19	License No. 15	20 100

# The original and first copy of this report are to be MAR 3 19/0 STATE WELL REPORT filed with the MAR 3 19/0 STATE OF OREGON STATE ENGINEER, SALEM, ORESTATE ENGINEER, SALEM, ORESTATE ENGINE PRotection of well completion. SALEM. OREGON



(1) OWNER:	(11) LOCATION OF WELL:									
Name Witt. J. Nerris	County WASA Driller's well numbe	160								
Address 8280 SW PETERS Rd TIRAN OFR.	SE 14 SW 14 Section /3 T. 25	R. /W W.M.								
(2) TYPE OF WORK (check):	Bearing and distance from section or subdivision co	rner								
New Well Deepening Reconditioning Abandon Resonant If abandonment, describe material and procedure in Item 12.										
(3) TYPE OF WELL: (4) PROPOSED USE (check):										
Rotary Driven	(12) WELL LOG: Diameter of well below									
Cable	Depth drilled 33 ft. Depth of completed									
(5) CASING INSTALLED: Threaded   Welded	Formation: Describe color, texture, grain size and and show thickness and nature of each stratum a	nd aquifer penetrated,								
" Diam from tt to / ft Gare	with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.									
Diam from A BANGON n. Gage	MATERIAL Fr	om To SWL								
Diam. from ft. to Non Et. Gage	Brown Soil	0 3								
(6) PERFORATIONS: Perforated ↑ Yes No.	Brown chy & CaBBles	3 38								
Type of perforator used	Medium GRAY GRAVEL 3	8 35								
Size of perforations in. by ir.	CASING Pulled									
perforations from ft. to ft.	Holel Eilled									
perforations from ft. to ft.	WITH COMENT CO	ROUT								
perforations from										
perforations from fi. to fi.										
(7) SCREENS: Well screen installed?   Yes WNo										
Manufacturer's Name										
Diam. Slot size Set from ft. to ft.										
Diam. Slot size Set from ft. to ft.										
(8) WATER LEVEL: Completed well.										
Static level ft. below land surface Date										
tesian pressure lbs. per square inch Date										
(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.		2-20 1076								
	Date well drilling machine moved off of well	-20 1970								
# # # # # # # # # # # # # # # # # # #	Drilling Machine Operator's Certification:									
Batler test gal./min. with ft. drawdown after hrs.	This well was constructed under my direct rials used and information, reported above a									
Artesian flow g.p.m. Date	knowledge and belief.	5 30 M								
Temperature of water Was a chemical analysis made! Yes No	[Signed] Cylling Machine Operator)	10 2 - 20, 19, 70								
(10) CONSTRUCTION:	Drilling Machine Operator's License No	105								
Well seal-Material used ABATTA Cue										
Depth of seal	Water Well Contractor's Certification:	n and this report to								
in in.	This well was drilled under my jurisdiction true to the best of my knowledge and belief.	u and this report U								
.as a drive shoe wed?   Yes     No	NAME (Person, firm or corporation)	(Type or petri								
Did any strata contain unusable water?   Yes   No	Det 3 D 25	(Type or print)								
Type of water? depth of strate	Address Address	TO COULTOOLS								
Method of sealing strata off	[Signed] Saymond a So	there								
Was well gravel packed! Tes No Size of gravel:	(Water Well Contractor)	26								
Gravel placed from the factor of	Contractor's License No 404 Date 2	-20 1076								

#### STATE ENGINEER Salem, Oregon



STATE WELL NO 2/1W-132 COUNTY SALL GIOL APPLICATION ON GP-3010

OWNER: Ben Brehm	MAILING ADDRESS:	13069 Lo	er Boones	Ferrey !	Rd.
LOCATION OF WELL: Owner's No	CITY AND . STATE:	' <i>l</i> ashingt	on		********
	W.M.				
Bearing and distance from section or subdivision corner 2230' S & 400' E from cor of sec 13					
Altitude at well			• a		
TYPE OF WELL: Drilled Date Constructed 194  Depth drilled 91' Depth cased 91'		Secti			
CASING RECORD: 6-inch					
FINISH:					
AQUIFERS:					
WATER LEVEL: 561					
PUMPING EQUIPMENT: Type Montgomery Mard Capacity	- Jet			H.P1	
WELL TESTS: Drawdown					
USE OF WATER Imigation SOURCE OF INFORMATION GR-3945	<u> </u>	***********			
DRILLER or DIGGER Sam Hunson ADDITIONAL DATA: LogA. Water Level Measurements					•
REMARKS:					

#25

NOTICE TO WATER WELL CONTRACTOR The original and first copy of this report are to be filed with the

TE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

#### WATER WELL REPORT

STATE OF OREGON (Please type or print)

State	Well No.	2/1W-	13R
	**********		******************

State Permit No. ...

Drawdown is amount water level is lowered below static level (11) WELL TESTS: OWNER: Name J. C. Pilkington Was a pump test made? Yes No If yes, by whom? Address 16515 S. W. Upper Boones Ferry Rd. Yield: gal./min. with ft. drawdown after hrs. Tigard, Oregon. (2) LOCATION OF WELL: Bailer test 30 gal./min, with no ft. drawdown after 1 hrs. Driller's well number 11-62 County Washington Artesian flow g.p.m. Date T. 25 14 SE 14 Section 13 W.M. Temperature of water 5 2 Was a chemical analysis made? 

Yes 8 No Bearing and distance from section or subdivision corner (12) WELL LOG: 85 ft. Depth of completed well Formation: Describe by color, character, size of material and structure, and show thickness of aquifiers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation. MATERIAL FROM (3) TYPE OF WORK (check): Yellow sandy clay 0 Deepening [ Reconditioning [ Apandon 🔲 5 Cement gravel and boulders If abandonment, describe material and procedure in Item 12. 56 31 Cement gravel 56 61 (5) TYPE OF WELL: Loosely cemented gravel (water) (4) PROPOSED USE (check): 80 Blue silty clay 61 Rotary [] Driven [ Domestic 🚺 Industrial 🗀 'Municipai 🗀 85 Brown sandy clay Jetted 📋 Cable Irrigation [ Test Well [ Other Dug Borea 🗆  $\Box$ (6) CASING INSTALLED: Threaded | Welded K 6 " Diam, from 0 11, to 62 ft. Gages 250 Diam. from ...... ft. to ..... ft. Gage ... ..." Diam, from ...... it. to ...... it. Gage .... (7) PERFORATIONS: Perforated? 🗆 Yes 🏅 No Type of perforator used in. by Size of perforations perforations from ...... ft. to ...... ... perforations from ...... ft. to ...... ft. \_\_\_\_\_ ft. to \_\_\_\_\_ ft. ...... perforations from ...... ft, to ...... ft, to (8) SCREENS: Well screen installed? 
Yes 1 No Diam. Slot size ..... Set from ..... ft. to ..... 196L 1964 CompletedApr. 13 Work started Apr. 6 Diam. ..... Slot size ...... Set from ...... 1t. to ...... 1964 Date well drilling machine moved off of well Apr. 14 (9) CONSTRUCTION: (13) PUMP: Well seal-Material used in seal Bantonita .... Manufacturer's Name Myer type: Submersible H.P. 2 Water Well Contractor's Certification: Were any loose strata cemented off? 🗆 Yes 🍒 No ... Depth .... Was a drive shoe used? Yes D No This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. Was well gravel packed? | Yes \$\infty\$ No Gravel placed from ......ft. to .. NAME Steinman Bros.
(Person firm or corporation) (Type or point) y strata contain unusuable water? [] Yes [] No Address 15112 S. E. McLoughlin, Milwaukie, Ore. 97222 depth of strata e of water? .thod of sealing strain off Drilling Machine Operator's License No. 68 (10) WATER LEVELS: [Signed] ... Illinman 50 ft. below land surface Date 4/13/64 Static level Artesian pressure lbs. per square inch Date Contractor's License No. ... Date Apr. 13 1564

#### APPENDIX D

#### WATER QUALITY DATA

CH2M HILL

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
UNIFIED SEWERAGE AGENCY

CH2M HILL
WATER QUALITY DATA
NEAR
DURHAM, OREGON



Environmental Laboratory

Date: 20 September 1979

Project No.: Pl2946.B0

Page 1 of 2

Subject: Analysis of water samples for MSD--Durham Landfill.

The samples were received 5 September 1979 and

assigned reference numbers 7476-7483.

					Fanno	Creek at		n R. at Ferry					
Parameter	Bori	ng #2	Во	ring #4		in River	Road B	_					
as mg/l	B-2-A	-	B-4-A	_	FC-A	FC-B	TR-A	TR-B					
Calcium, Ca	15.7	17.9	1.87	1.88	15.0	15.0	10.9	10.9					
Magnesium, M	g 5.55	6.20	0.79	0.76	5.55	5.55	3.82	3.90					
Potassium, K	2.60	2.85	0.87	0.47	2.77	2.79	2.11	2.15					
Sodium, Na	6.10		3.28	3.07	7.84	7.83	10.90	11.40					
Alkalinity,	Alkalinity, as CaCO <sub>3</sub>												
Carbonate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Bicarbonate	e 45.2	45.2	10.7	10.7	47.2	46.6	40.6	40.2					
Chloride, Cl	2.85	1.55	2.95	2.33	10.4	10.4	9.69	9.84					
Nitrate, N	0.03	0.04	0.02	0.03	0.91	0.91	2.56	3.55					
Phosphate, P	0.11	0.17	0.10	0.05	0.17	0.17	0.11	0.14					
Sulfate, SO <sub>4</sub>	5.5	9.8	6.8	7.5	17.0	19.1	14.8	14.8					
Hardness, 4													
CaCO3	63.7	73.5	9.21	9.21	57.4	57.8	43.7	44.5					
pH 3	5.60	5.58	5.38	5.95	6.15	6.20	6.20	6.12					
Conductivity	,												
µmhos/cm	118	129	32	28	1.32	132	121	122					
Turbidity, NT	ປ 90	115	33	12	47	47	8.3	7.5					
Color	180	280	7.5	7.5	140	140	50	50					
Odor	None D	etected	None	Detected	None De	tected	None De	tected					
Total Dis-													
solved													
Solids	144	168	42	39	148	147	119	129					

Date: 20 September 1979

Page 2 of 2

Parameter as mg/l	Bori	ng #2 <u>B-2-B</u>	Bor:	ing #4 <u>B-4-B</u>	Fanno Ci Tualatir FC-A		Tualatin Boones I Road Br TR-A	Ferry
Arsenic, As	0.003	0.004	<0.001	<0.001	0.003	0.002	0.001	0.001
Barium, Ba	0.16	0.17	0.09	0.06	0.11	0.10	0.05	0.08
Boron, B	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Cadmium, Cd	<0.010	0.016	0.016	<0.010	0.033	0.020	<0.010	<0.010
Chromium,								
Total Cr	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper, Cu	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide, CN	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoride, F	0.19	0.20	0.09	0.09	0.16	0.16	0.19	0.19
Iron, Fe	3.72	7.55	0.22	0.48	2.93	2.38	0.30	0.72
Lead, Pb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese, M	n 1.12	1.28	0.11	0.11	0.29	0.28	0.14	0.23
Mercury, Hg	<0.000	5<0.000	5<0.000!	5<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Selenium, Se	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver, Ag	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc, Zn	0.20	0.20	0.96	0.94	0.070	0.061	0.022	0.035

<sup>&</sup>lt; Indicates "less than."

All tests are performed in accordance with current Environmental Protection Agency guidelines as published in the Federal Register.

The information shown on this sheet is test data only and no analysis or interpretation is intended or implied.

Samples will be retained 30 days unless otherwise requested.

Reported by: Mary E Player

dmk

# OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY SURFACE WATER QUALITY

AND

SEWAGE TREATMENT PLANT EFFLUENT QUALITY

NEAR

DURHAM, OREGON

# SUMMARY OF OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY SURFACE WATER QUALITY DATA NEAR DURHAM, OREGON

STATION	DATE	pH COLOR	TURB	TOTAL SOLIDS	SUSP SOLIDS	ALK	HARD	so <sub>4</sub>	NH <sup>3</sup> N	19-и	PO <sub>4</sub>	<u>CI.</u>	TEMP.	D.O.	% O <sub>2</sub>	BOD	MPN/1 TOTAL	00 ml FECAL
Fanno Creek at Durham	3-31-69 7-8-69 8-12-69	7.4 2.5	10	286	24	156	90.5	14.1	6.74 41.2 12.5	1.4 0.10 0.16	8.90 13.2 23.8	45.0	12.5 19.0 19.0	7.1 3.1 0.9/	66 33	6.1 10.8 17.4/	2300 600 6200	450
ac Dalian	9 12 02		20	200	~-		50.5		22.5	0.20	23.0	.5.0	13.0	2.		20.		100
	9-16-69								4.20	0.56			14.0	0.7	16	<66	70000	
	11-10-69												12.0	3.4	31	3.2	600	
	4-20-76	6.5											12.0	1.8		4.6	7000	620
Fanno	8-12-69	6.9											2.0	1.6/		9.4/	<450	<450
Creek at Hwy. 217														2.	. 5	19.	8	
Tualatin	3-31-69									0.68	0.33		9.5	10.3	89	1.25	6200	
River	7-8-69									0.50	0.62		20.5	9.2	102	4.6	450	
Hwy. 212	8-28-69									••••			20.0	8.4	91	4.1		
Bridge	9-16-69												16.5	4.7	48	4.5	1300	
•	11-10-69									0.90	0.43		10.0	8.3	75	1.25	2400	
	4-20-76	6.7											11.0	7.7		2.7	2400	620
Tualatin River at Hwy. 217 Bridge	4-20-76	6.6											11.0	6.8		3.0	2100	230
Tualatin River at Boones Fer Rd.	3-31-69 7-8-69 ry 9-16-69 11-10-69								0.41 0.53 0.43				10.0 20.0 16.5 10.0	9.7 7.5 4.7 7.8	86 82 48 70	1.4 3.8 4.5 1.4	24,000 2300 1300 600	ı

# SUMMARY OF OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY SEWAGE TREATMENT PLANT EFFLUENT QUALITY NEAR DURHAM, OREGON

STATION	DATE	FLOW MGD COLOR	TURB	TOTAL SOLIDS	SUSP SOLIDS	ALK	HARD	Нg	NH <sub>3</sub> -N	NO <sub>3</sub> -N	PO <sub>4</sub>	CL		TEMP.	% O <sub>2</sub> D.O. SAT.		MPN/100 ml	
Fanno	7-22-69	6	4.5			2.0												
Creek	8-12-69										]	1.4				2300	<450	
STP	8-6-70				10										17	2400	4.5	
	5-15-72	3.5										1.3	16			2400 2600	< 45	
	5-13-74															<100	< 10 <100	
	9-10-74 3-2-76		125/2									2.4				1600	< 100	
	3-2-76 4-9-76		135/2. 102/2									1.0				<100	< 10	
	6-8-76		98/2.5									2.0				600	< 10	
	0-8-19		70/2.3													000	10	
Tualatin	5-15-72	0.47									:	1.0				1300	1300	
STF	5-13-74															<100	<100	
	9-10-74															5000	<100	
	1-6-76		27/0									2.0				110	<2	
	2-5-76		81/0.5									1.5				< 10	<2	
	4-7-76		388/1								•	2.5				<100 6x10 <sup>6</sup>	<10 <sub>5</sub>	
	6-8-76		290/2.5									0				6X10 <sup>5</sup>	6x10 23,000	
	7-7-76		77/2.5									3.0 7.5				4X10° <100	< 10	
	8-3-76		36/2									,.5				100	` 10	
Ramada	11-22-66	0.009			38			6.2			:	1.5		3.9	12			
Inn	5-15-72	0.02										0				>7000	<7000	
STF	5-13-74															<1000	<1000	
	9-10-74															18,000	<100	
	1-6-76		172/2.5									2.0				110	< 10	
	2-5-76		86/2.5									1.5				<100	< 10	
	3-1-76		53/3									2.0				2700	160	
	4-7-76		06/3									3.0				<100	< 10	
	5-5-76		102/3								,	0.1				27,000	1800	
	6-8-76		110/3+									0				730,000	< 10	
	7-7-76		126/3								•	3.0				110,000	1500	
	8-3-76		298/3									0 0				200,000		
	10-5-76		54/3+									U				200,000	280,000	
Durham	7-7-76		290/1.5									3.5				<100	< 10	
STP	8-3-76		130/2									2.0				<100	< 10	
	10-5-76		75/1.5									3.5				<100	< 10	
Feerless Truck	5-15-72	0.015									<(	0.1				7x10 <sup>5</sup>	7x10 <sup>5</sup>	

STF

UNIFIED SEWERAGE AGENCY
WATER QUALITY DATA
NEAR
DURHAM, OREGON

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-ELSNER RD BR

20-JUI	79			INHTHIT	A LAMETER	ter km ak		PAGE 1
<b></b>						RANGE		STANDARD
PARAMI	ETER	UNITS	MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP'-C	DEG	3	0	7.00	18.00	13.33	5.69
76	TURB	UTM	3	0	8.00	180.00	66.67	98.17
95	COND-LAB	UMHO	3	0	82.00	195.00	126.33	60.30
299	DO	MG/L	3	0	5.90	11.00	8,30	2.56
310	BOD(5)	MG/L	3	0	0.85	1.38	1.14	0.27
340	T-COD	MG/L	1	Ø	6.00	6,00	6.00	0.00
403	PH-GRAB	FΉ	3	0	7.07	7.25	7.15	0.09
410	OH-CACO3	MG/L	1.	0	47.00	47.00	47.00	0.00
440	HC03-ION	MG/L	1	Ø	60.38	60.38	60.38	0.00
500	TR	MG/L	3	٥	98.00	127.00	114.33	14,84
515	TFR(TDS)	MG/L	3	0	83.00	109.00	99.00	14.00
530	TNFR(SS)	MG/L	3	0	9.40	21.80	15.20	6.24
610	инз-и	MG/L	3	0	0.22	0.38	0.32	0.09
625	TKN-N	MG/L	3	0	1.02	1.35	1.13	0.19
630	N02N03-N	MG/L	3	0	0.86	2.24	1.39	0.75
665	TP04-P	MG/L	3	0	0.16	0.23	0.20	0.04
680	TOC	MG/L	1	0	3.50	3.50	3.50	0.00
720	TCYANIDE	MG/L	1	1	0.00	0.00	0.00	0.00
745	T-S COMP	MG/Ľ	1	0	0.35	0.35	0.35	0.00
940	CHLORIDE	MG/L	1	0	6.75	6.75	6.75	0.00
951	T-F(-)	MG/L	3	1	0.12	0.55	0.34	0.30
1002	T-AS	MG/L	3	0	0.00	0.00	0.00	0.00
1007	T-BA	MG/L	1	1	0.00	0.00	0.00	0.00
1022	T-B	MG/L	3	O	0.12	0.14	0.13	0.01

# UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-ELSNER RD BR

PAGE 2 20-JUL-79 RANGE STANDARD PARAMETER UNITS NUM ZEROS MIN XAM MEAN DEVIATION 1027 T-CD MG/L 3 2 0.00 0.00 0.00 0.00 0.00 0.00 0.00 MG/L 0.00 1034 T-CR 1 1 0.03 0.02 0.01 1042 T-CU MG/L 3 Ö 0.01 1045 T-FE MG/L 1 0 0.87 0.87 0.87 0.00 1051 T-PB MG/L 3 2 0.02 0.02 0.02 0.00 MG/L 3 0.07 0.17 0.06 1055 T-MN 0 0.11 1067 T-NI MG/L 1 1 0.00 0.00 0.00 0.00 MG/L 1092 T-ZN 3 Ø 0.01 0.01 0.01 0.00 31400 ATP UG/L 3 Ö 0.11 0.60 0.28 0.28 31503 TOT-COLI /100 :3 0 75.00 200.00 131.67 63.31 31616 FEC-COLT /100 3 30.00 220.00 94.00 109.12 0 32230 CHLPYL A UG/L 3 2.14 15.60 7.15 7.36 32231 CHLPHL B UG/L :3 Ö 0.70 2.45 1.29 1.00 32232 CHLPYL C UG/L 3 0.89 2.06 1.37 0.61 32234 T-CHLFYL UG/L :3 0 3.73 20.10 8.96 9.81 71900 T-HG UG/L 3 3 0.00 0.00 0.00 0.00

# UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-TUALATIN FARK

20-JUL	79		•	TUALAT I	IN R-TUAL	LATIN PARK		PAGE 1
						RANGE		STANDARD
PARAME	ETER	UNITS	MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP-C	DEG	3	0	5.50	18.00	12.67	6.45
76	TURB	UTN	3	0	8.60	220.00	80.20	121.08
95	COND-LAB	UMHO	3	0	90.00	195.00	131.67	55.75
299	po	MG/L	3	0	8+30	11.20	9.33	1.62
310	BOD(5)	MG/L	3	0	1.00	4.00	2.10	1.65
340	r-con	MG/L	1	0	17.00	17.00	17.00	0.00
403	PH-GRAB	PH	3	0	7.11	7.21	7.15	0.03
410	OH-CACO3	MG/L.	1	0	52.20	52.20	52.20	0.00
440	HCO3-ION	MG/L	1	0	65.31	65.31	65.31	0.00
500	TR	MG/L	3	0	104.00	148.00	129.33	22.74
515	TFR(TDS)	MG/L	3	0	93.00	130.00	110.00	18.69
530	TNFR(SS)	MG/L	3	0	10.90	28.80	19.37	8.99
610	N-2HN	MG/L	3	0	0.28	1.67	0.82	0.75
625	TKN-N	MG/L	3	o	102	1.80	1.49	0.41
630	N02N03-N	MG/L	3	0	0.88	2.24	1.43	0.72
665	TP04-P	MG/L	3	0	0.15	0.27	0.22	0.06
680	TOC	MG/L	1	0	3.20	3.20	3.20	0.00
720	TCYANIDE	MG/L	1	1	0.00	0.00	0.00	0.00
745	T-S COMP	MG/L	1	0	0.35	0.35	0.35	0.00
940	CHLORIDE	MG/L	1	0	11.30	11.30	11.30	0.00
951	T-F(-)	MG/L	3	1	0.13	0.58	0.35	0.32
1002	T-AS	MG/L	3	0	0.00	0.00	0.00	0.00
1007	T-BA	MG/L	1	1	0.00	0.00	0.00	0.00
1022	T-B	MG/L	3	0	0.12	0.15	0.14	0.01

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-TUALATIN PARK

20-JUL	_ <b>-</b> -79							PAGE 2
PARAME	ETER	UNITS	MUM	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
1027	T-CD	MG/L	3	2	0.00	0.00	0.00	0.00
1034	T-CR	MG/L	1	1	0.00	0.00	0.00	0.00
1042	T-CU	MG/L	3	0	0.01	0.03	0.02	0.01
1045	T-FE	MG/L	1	0	0.87	0.87	0.87	0.00
1051	T-PB	MG/L	3	2	0.02	0.02	0.02	0.00
1055	T-MN	MG/L	3	0	0.08	0.17	0.11	0.05
1067	T-NI	MG/L	1	1	0.00	0.00	0.00	0.00
1092	T-ZN	MG/L	3	O	0.01	0.02	0.02	0.00
31400	ATP	UG/L	3	0	0.05	2.25	0.81	1.25
31503	TOT-COLI	/100	3	O	160.00	350.00	240.00	98.49
31616	FEC-COLI	/100	3	0	48.00	160,00	85.67	64.38
32230	CHLFYL A	UG/L	2	0	2.36	5.68	4.02	2.35
32231	CHLFHL B	UG/L	2	0	0.54	1.31	0.93	0.54
32232	CHLFYL C	UG/L	2	<b>(</b> )	0.61	4.10	2.36	2.46
32234	T-CHLFYL	UG/L	2	0	3.51	11.10	7.31	5.37
71900	T-HG	UG/L	3	3	0.00	0.00	0.00	0.00

# UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-HWY 212 BR

20-JUL	79		ļ	DALAIIN	TWH-74 V	ALA BR		PAGE 1
				my pro po, po, po,		RANGE	34 P* A 3 I	STANDARD
FARAME				ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP'-C	DEG	3	0	6.00	20.00	13.67	7.09
76	TURB	UTM	3	0	5.60	230.00	82.53	127.75
95	COND-LAB	OHMU	3	0	95.00	180.00	128.33	45.37
299	DO	MG/L	3	0	8.30	11.20	9.77	1.45
310	BOD(5)	MG/L	3	0	2.10	6.90	3.77	2.72
340	T-COD	MG/L	1.	0	17.20	17.20	17.20	0.00
403	PH-GRAB	PH	3	0	7.11	7.80	7.37	0.38
410	OH-CACO3	MG/L	1	0	51.20	51.20	51.20	0.00
440	HCO3-ION	MG/L	1	٥	59.15	59.15	59.15	0.00
500	TR	MG/L	3	0	106.00	143.00	128.33	19.66
515	TFR(TDS)	MG/L	3	0	94.00	132.00	110.00	19.70
530	TNFR(SS)	MG/L	3	0	11.50	31.60	19.07	10.93
610	инз-и	MG/L	3	0	0.24	0.48	0+34	0.13
625	TKN-N	MG/L	3	0	0.90	1.68	1.33	0.40
630	N02N03-N	MG/L	3	٥	0.98	2.32	1.60	0.67
665	TF'04-F	MG/L	3	0	0.16	0.31	0.23	0.08
680	тос	MG/L	1	0	5.80	5.80	5.80	0.00
720	TCYANIDE	MG/L	1	1	0.00	0.00	0.00	0.00
745	T-S COMP	MG/L	1	0	0.30	0.30	0.30	0.00
940	CHLORIDE	MG/L	1	0	11.40	11.40	11.40	0.00
951	T-F(-)	MG/L	3	1	0.15	0.58	0.37	0.30
1002	T-AS	MG/L	3	0	0.00	0.00	0.00	0.00
1007	T-BA	MG/L	1	1	0.00	0.00	0.00	0.00
1022	T-B	MG/L	3	0	0.13	0.15	0.14	0.01

# UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN79 TO 20JUL79 TUALATIN R-HWY 212 BR

20-JUL-79			IOMEHIII	4 K-riwi	ALA DR		PAGE	2
PARAMETER	UNITS	мим	ZEROS	MIM	RANGE MAX	MEAN	STANI DEVIA	
1027 T-CD	MG/L	3	2	0.00	0.00	0.00		0.00
1034 T-CR	MG/L	1	1	0.00	0.00	0.00		0.00
1042 T-CU	MG/L	3	0	0.01	0.03	0.02		0.01
1045 T-FE	MG/L	1	0	0.35	0.35	0.35		0.00
1051 T-FB	MG/L	3	2	0.01	0.01	0.01		0.00
1055 T-MN	MG/L	3	0	0.08	0.12	0.10		0.02
1067 T-NI	MG/L	1	1	0.00	0.00	0.00		0.00
1092 T-ZN	MG/L	3	0	0.01	0.02	0.02		0.00
31400 ATP	UG/L	3	0	0.11	2.60	0.96		1.42
31503 TOT-COL	I /100	3	0	20.00	230.00	126.67	10	)5.04
31616 FEC-COL	I /100	3	0	3.40	190.00	67.13	10	06.43
32230 CHLFYL	A UG/L	2	0	2.75	7.55	5.15		3.39
32231 CHLPHL	B UG/L	2	0	0.89	1.00	0.94		0.08
32232 CHLPYL	C UG/L	2	0	0.67	1.45	1.06		0.55
32234 T-CHLFY	L UG/L	2	0	5.09	9+22	7.15		2.92
71900 T-HG	UG/L	3	3	0.00	0.00	0.00		0.00

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#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN78 TO 31DEC78 FANNO CREEK

<b>7</b> /2 11 11	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		r	י שאאט ו	ELACE 4			
50-7N	/9							PAGE 1
FARAM	TER	UNTTS	NIIM	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
10		DEG	2	0	17.00	18.00	17.50	0.71
76	TURB	UTK	2	0	7.20	9.60	8.40	1.70
80	TRUCOLOR	UNIT	2	0	25.00	25.00	25.00	0.00
81	AFFCOLOR	UNIT	2	0	35.00	45.00	40.00	7.07
95	COND-LAB	OHMU	2	0	220.00	270.00	245.00	35.36
299	rio	MG/L	2	0	5.50	7.30	6.40	1.27
310	BOD(5)	MG/L	2	0	1.40	2.60	2.00	0.85
340	T-cop	MG/L	2	0	18.00	24.00	21.00	4.24
403	PH-GRAB	PΉ	2	0	7.43	7.65	7.54	0.16
410	OH-CACO3	MG/L	2	0	100.20	110.00	105.10	6.93
440	HC03-ION	MG/L	2	0	123.20	133.10	128.15	7.00
500	TR	MG/L	2	0	198.60	221.00	209.80	15.84
515	TFR(TDS)	MG/L	2	0	187.50	210.00	198.75	15.91
530	TNFR(SS)	MG/L	2	0	10.80	11.10	10.95	0,21
610	и-ени	MG/L	2	0	0.15	0.21	0.18	0.04
625	TKN-N	MG/L	2	0	1.29	1.47	1.38	0.13
630	N02N03-N	MG/L	2	0	0.65	0.80	0.72	0.10
665	TFO4-F	MG/L	2	0	0.45	0.60	0.53	0.11
680	TOC	MG/L	2	0	5.80	11.20	8.50	3.82
720	TCYANIDE	MG/L	2	1	0.02	0.02	0.02	0.00
745	T-S COMP	MG/L	2	0	0.30	0.45	0.37	0.11
940	CHLORIDE	MG/L	2	0	13.44	15.70	14.57	1.60
951	T-F(-)	MG/L	2	0	0.19	0.27	0.23	0.06
1002	T-AS	MG/L	2	2	0.00	0.00	0.00	0.00

### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN78 TO 31DEC78 FANNO CREEK

50-JUL	79		'	- HINNU (	JREEN			PAGE	2
FARAME	ETER	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STAN DEVI	DARD ATION
1007	T-BA	MG/L	2	2	0.00	0.00	0.00		0.00
1027	T-CD	MG/L	2	2	0.00	0.00	0.00		0.00
1034	T-CR	MG/L	2	2	0.00	0.00	0.00		0.00
1042	T-CU	MG/L	2	0	0.00	0.05	0.02		0.03
1045	T-FE	MG/L	2	0	0.49	0.94	0.72		0.32
1051	T-PB	MG/L	2	1	0.01	0.01	0.01		0.00
1055	T-MN	MG/L	2	0	0.31	0.34	0,+33		0.02
1067	IN-T	MG/L	2	2	0.00	0.00	0.00		0.00
1092	T-ZN	MG/L	2	0	0.02	0.03	0.03		0.00
31503	TOT-COLI	/100	2	0	460.00	3100.00	1780.00	18	66.76
31616	FEC-COLI	/100	2	0	280.00	500.00	390.00	1	55.56
32230	CHLFYL A	UG/L	1.	0	28.27	28.27	28.27		0.00
32231	CHLPHL B	UG/L	1	0	5.33	5.33	5.33		0.00
32232	CHLFYL C	UG/L	1.	0	4.74	4.74	4.74		0.00
32234	T-CHLFYL	UG/L	2	0	38.34	53.30	45.82		10.58
32730	PHENOL	MG/L	2	2	0.00	0.00	0.00		0.00
50060	CL(2)RES	MG/L	2	2	0.00	0.00	0.00		0.00

20-JUI	L-79		ï	TUALATIN	( R-ELSI	NEK KIL BK		PAGE 1
						RANGE		STANDARD
PARAM	ETER	UNITS	NUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP'-C	DEG	5	0	8.00	22.00	16.30	5.12
76	TURB	UTN	5	<b>O</b>	5.70	38.00	13.82	13.70
80	TRUCOLOR	UNIT	3	O	15.00	25.00	18.33	5.77
81	APPCOLOR	UNIT	4	0	20.00	35.00	27.50	6.45
95	COND-LAB	ОНМО	5	0	98.00	145.00	121.60	18.85
299	no	MG/L	5	0	4.90	9.80	6.94	1.97
310	BOD(5)	MG/L	5	0	1.50	1.90	1.74	0.19
340	T-COD	MG/L	5	0	8.70	15.00	10.44	2.61
403	PH-GRAB	PΗ	5	0	6.85	7.40	7.15	0.21
410	OH-CACO3	MG/L	5	0	40.00	52.40	49.32	5.30
440	HC03-ION	MG/L	5	0	49.29	59.64	54.80	4.54
500	TR	MG/L	5	0	102.00	128,40	118.78	11.10
515	TFR(TDS)	MG/L	5	0	92.10	115.30	107.78	9.34
530	TNFR(SS)	MG/L	5	0	6.80	16.40	10.92	3.56
610	и-ени	MG/L	5	1	0.21	0.40	0.34	0.09
625	TKN-N	MG/L	5	0	1.23	2.31	1.65	0.41
630	NO2NO3-N	MG/L	5	0	0.76	1.44	0.98	0.31
665	TPO4-P	MG/L	5	0	0.27	0.71	0.42	0.17
680	TOC	MG/L	5	0	3.10	5.80	4.44	1.25
720	TCYANIDE	MG/L	5	3	0.01	0.02	0.02	0.00
745	T-S COMP	MG/L	5	0	0.10	0.70	0.29	0.24
940	CHLORIDE	MG/L	5	0	4.89	8.29	6.53	1.34
951	T-F(-)	MG/L	5	0	0.08	0.15	0.12	0.04
1002	T-AS	MG/L	4	3	0.00	0.00	0.00	0.00

30-70F	-79			IUMLAI.	IN WEED	AEK KN BK		PAGE 2
PARAME	TER L	UNITS	MUM	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
1007	T-BA	MG/L	5	5	0.00	0.00	0.00	0.00
1027	r-co	MG/L	5	4	0.00	0.00	0.00	0.00
1034	T-CR	MG/L	5	4	0.01	0.01	0.01	0.00
1042	T-CU	MG/L	5	0	0.00	0.04	0.02	0.01
1045	T-FE	MG/L	5	0	0.44	1.24	0.73	0.31
1051	T-PB	MG/L	5	3	0.02	0.02	0.02	0.00
1055	T-MN	MG/L	5	0	0.09	0.17	0.12	0+03
1067	IN-T	MG/L	5	4	0.02	0.02	0.02	0.00
1092	T-ZN	MG/L	5	0	0.03	0.06	0.04	0.02
31400	ATP	UG/L	3	0	0.04	0.46	0.28	0.21
31503	TOT-COLI	/100	5	0	110.00	330.00	200.00	91.92
31616	FEC-COLI	/100	5	0	16.00	52.00	30.00	14.27
32230	CHLFYL A	UG/L	3	0	7.80	31.80	16.24	13.49
32231	CHLPHL B	UG/L	3	0	2.16	5.60	3.66	1.76
32232	CHLPYL C	UG/L	3	0	4.88	9.10	7.57	2.33
32234	T-CHLFYL	UG/L	5	o	14.80	46.50	22.52	13.66
32730	PHENOL	MG/L	5	5	0.00	0.00	0.00	0.00
50060	CL(2)RES	MG/L	5	5	0.00	0.00	0.00	0.00

UNIFIED SEWERAGE AGENCY
WATER QUALITY LABORATORY
DATA STATISTICS 1JAN78 TO 31DEC78
TUALATIN R-TUALATIN PARK

20-JUI	79		•	IUALAII	IN K-TUHL	WHITN LUKK		PAGE 1
<b>17</b> 1. A 471. A 4 4 4 4 4				mm see see. 200 an		RANGE	\/ m \ \ \	STANDARD
FARAM			MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP-C	DEG	4	Ō	17.00	22.50	19.00	2.48
76	TURB	NTU	4	0	4.80	54.00	18.75	23,56
80	TRUCOLOR	UNIT	2	0	10.00	15.00	12.50	3.54
81	APPCOLOR	UNIT	3	0	25.00	30.00	26.67	2.89
95	COND-LAB	UMHO	4	0	140.00	175.00	155.00	14.72
299	DO	MG/L	4	0	5+30	9.70	7.33	1.97
310	BOD(5)	MG/L	4	0	1.83	2.20	2.06	0.18
340	T-COD	MG/L	4	0	8.70	14.20	11.65	2.41
403	PH-GRAB	PΗ	4	0	6.85	7.48	7.17	0.28
410	OH-CACO3	MG/L	4	0	50.90	58,00	53.86	3.45
440	HC03-I0N	MG/L	4	0	59.14	64.07	61.92	2.54
500	TR	MG/L	4	0	130.00	140.70	134.30	4.99
515	TFR(TDS)	MG/L	4	0	119.80	130.80	123.15	5.20
530	TNFR(SS)	MG/L	4	0	7.90	15.80	11.13	3.36
610	и-ени	MG/L	4	0	0.35	1.65	0.92	0.55
625	TKN-N	MG/L	4	0	1.32	2.70	2.21	0.61
630	NO2NO3-N	MG/L	4	0	0.79	1.28	0.94	0.23
665	TP:04-P	MG/L	4	0	0.25	0.51	0.36	0.11
680	TOC	MG/L	4	0	3.40	7.60	5.00	1.95
720	TCYANIDE	MG/L	4	2	0.01	0.01	0.01	0.00
745	T-S COMP	MG/L	4	0	0.10	0.80	0.39	0.30
940	CHLORIDE	MG/L	4	0	7.98	10.80	9.35	1.28
951	T-F(-)	MG/L	4	0	0.10	0.19	0.14	0.04
1002	T-AS	MG/L	3	2	0.00	0.00	0.00	0.00

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN78 TO 31DEC78 TUALATIN R-TUALATIN PARK

20-JUL	79			IUALAI.	IN K-IUAL	AIIN PAKK		PAGE	2
PARAME	ETER (	STINL	мим	ZEROS	MIN	RANGE MAX	MEAN	STANI DEVIA	
1007	T-BA	MG/L	4	4	0.00	0.00	0.00		0.00
1027	T-CD	MG/L	4	4	0.00	0.00	0.00		0.00
1034	T-CR	MG/L	4	3	0.01	0.01	0.01		0.00
1042	T-CU	MG/L	4	0	0.01	0.02	0.01		0.00
1045	T-FE	MG/L	4	0	0.35	1.06	0.61		0.32
1051	T-PB	MG/L	4	3	0.03	0.03	0.03		0.00
1055	T-MN	MG/L	4	0	0.08	0.21	0.13		0.06
1067	T-NI	MG/L	4	4	0.00	0.00	0.00		0.00
1092	T-ZN	MG/L	4	0	0.03	0.05	0.04		0.01
31400	ATP	UG/L	2	0	0.06	0.45	0.25		0.28
31503	TOT-COLI	/100	4	0	160.00	1100.00	545.00	35	7.45
31616	FEC-COLI	/100	4	0	2.00	480.00	144.25	22	25.75
32230	CHLFYL A	UG/L	3	0	12.50	23.29	16.73		5.76
32231	CHLPHL B	UG/L	3	O	1.89	3.96	3.05		1.06
32232	CHLFYL C	UG/L	3	0	0.57	9.25	6.07		4.78
32234	T-CHLPYL	UG/L	4	0	25.00	26.10	25.64		0.46
32730	FHENOL	MG/L	4	4	0.00	0.00	0.00		0.00
50060	CL(2)RES	MG/L	4	4	0.00	0.00	0.00		0.00

# UNIFIED SEWERAGE AGENCY 0 WATER QUALITY LABORATORY DATA STATISTICS 1JAN78 TO 31DEC78 TUALATINE-HWY 212 BR

20-JUI	L-79			TUALAT	PAGE 1			
						RANGE		STANDARD
PARAM	ETER	UNITS	MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMF'-C	DEG	6	0	8.50	23.50	15.92	5.94
59	FLOW	FEET	1	0	2.25	2.25	2.25	0.00
76	TURB	NTU	6	0	3.50	33.00	13.37	12.15
80	TRUCOLOR	UNIT	4	0	15.00	20.00	16.25	2.50
81	APPCOLOR	UNIT	5	0	15.00	60.00	36.00	17.46
95	COND-LAB	UMHO	6	0	120.00	195.00	150.50	30.69
299	DO	MG/L	6	0	5.60	11.40	8.28	2.07
310	BOD(5)	MG/L	6	0	1.20	4.43	2.71	1.05
340	T-COD	MG/L	6	0	8.40	64+80	21.80	21.34
403	FH-GRAB	PH	6	0	6.70	7.30	7.07	0.23
410	OH-CACO3	MG/L	6	0	37.89	55.38	48.86	7.68
440	HCO3-ION	MG/L	6	0	44.36	64.07	55.23	6.54
500	TR	MG/L	6	0	126.20	150.00	138.63	10.02
515	TFR(TDS)	MG/L	6	0	116.40	144.80	129.27	11.07
530	TNFR(SS)	MG/L	6	0	3.20	14.20	9.40	4.18
610	инз-и	MG/L	6	0	0.44	1.03	0.64	0.22
625	TKN-N	MG/L	6	0	1.56	2.55	1.99	0.37
630	NO2NO3-N	MG/L	6	0	0.83	1.82	1.34	0.40
665	TF'04-F'	MG/L	6	0	0.27	0.55	0.35	0.11
680	TOC	MG/L	6	0	2.00	8.40	5.48	2.50
720	TCYANIDE	MG/L	6	4	0.02	0.02	0.02	0.00
745	T-S COMP	MG/L	6	0	0.12	0.80	0.38	0.26
940	CHLORIDE	MG/L	6	0	5.78	13.00	9.58	2.64
951	T-F(-)	MG/L	6	ø	0.09	0.20	0.13	0.05

### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN78 TO 31DEC78 TUALATINE-HWY 212 BR

20-JUL-79			IUALA I.	INK-HWI ZIZ	י מית		PAGE	2
PARAMETER	UNITS	MUM	ZEROS	RA Min	NGE MAX	MEAN	STAND DEVIA	
1002 T-AS	MG/L	4	3	0.00	0.00	0.00	(	0.00
1007 T-BA	MG/L	6	6	0.00	0.00	0.00	(	0.00
1027 T-CD	MG/L	6	5	0.00	0.00	0.00	(	0.00
1034 T-CR	MG/L	6	5	0.01	0.01	0.01	(	0.00
1042 T-CU	MG/L	6	1	0.01	0.02	0.02	(	0.01
1045 T-FE	MG/L	6	0	0.17	1.26	0.63	(	0.42
1051 T-FB	MG/L	6	4	0.03	0.03	0.03	(	0.00
1055 T-MN	MG/L	6	0	0+08	0.19	0.12	(	0.05
1067 T-NI	MG/L	6	4	0.01	0.01	0.01	(	0.00
1092 T-ZN	MG/L	6	0	0.02	0.05	0.04	(	0.01
31400 ATP	UG/L	4	0	0.15	0.93	0.41	(	0.35
31503 TOT-COL	.I /100	6	0	130.00	1000.00	416.67	30	7.81
31616 FEC-COL	T /100	6	0	22.00	160.00	60.67	5	6.06
32230 CHLPYL	A UG/L	4	0	4.90	21.73	15.41	•	7.68
32231 CHLPHL	B UG/L	4	0	2.70	5.64	4.05	:	1.30
32232 CHLPYL	C UG/L	4	0	1.88	17.68	8.32	(	6.73
32234 T-CHLFY	'L UG/L	6	0	19.00	33.10	26.70	;	5.06
32730 PHENOL	MG/L	6	6	0.00	0.00	0.00	(	0.00
50060 CL(2)RE	S MG/L	6	5	0.25	0.25	0.25	(	0.00
71900 T-HG	UG/L	1	1	0.00	0.00	0.00	(	0.00

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### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN77 TO 31DEC77 TUALATIN R-ELSNER RD BR

20-JUL	79		1	rualat	IN R-ELS	ER RD BR		PAGE 1
						RANGE		STANDARD
PARAME	ETER	UNITS	MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP-C	DEG	4	0	15.00	20.00	18.43	2.31
76	TURB	NTU	4	0	3.50	5.50	4.53	1.13
80	TRUCOLOR	UNIT	2	0	10.00	10.00	10.00	0.00
81	APPCOLOR	TINU	2	0	20.00	50.00	35.00	21.21
95	COND-LAB	OHMU	4	0	112.00	145.00	128.50	13.77
299	100	MG/L	4	0	7.80	9.20	8.43	0.68
310	BOD(5)	MG/L	4	0	0.92	3.45	1.99	1.06
340	T-COD	MG/L	3	0	9.80	16.80	12.27	3.93
401	PH-GRAB	FΉ	4	0	6.79	7.38	7.09	0.25
410	OH-CACO3	MG/L	4	0	46.50	56.00	49.63	4.39
440	HC03-I0N	MG/L	1	0	48.68	48.68	48.68	0.00
500	TR	MG/L	3	0	111.60	122.20	117.27	5.34
515	TFR(TDS)	MG/L	4	0	104.00	113.90	109.63	4.34
530	TNFR(SS)	MG/L	4	0	3.00	14.00	9.32	4.83
610	и-сни	MG/L	4	0	0.05	0.37	0.17	0.14
625	TKN-N	MG/L	4	0	1.50	2.67	2.14	0.59
630	N02N03-N	MG/L	4	0	0.72	1.30	1.07	0.25
665	TPO4-P	MG/L	4	0	0.36	1.22	0.75	0.38
680	TOC	MG/L	3	0	3.70	7.00	5.57	1.69
720	TCYANIDE	MG/L	3	0	0.02	0.03	0.02	0.01
745	T-S COMP	MG/L	2	1	0.08	0.08	0.08	0.00
940	CHLORIDE	MG/L	4	o	6.56	11.12	8.73	1.89
951	T-F(-)	MG/L	2	0	0.06	0.08	0.07	0.02
1002	T-AS	MG/L	4	4	0.00	0.00	0.00	0.00

20-JUL	79			i Charlet T	14 LV Pri Pri 25 LA Pri LV	IVED ENV		PAGE	2
FARAME	ETER (	UNITS	мим	ZEROS	RA Min	NGE MAX	MEAN	STAND DEVIA	
1007	T-BA	MG/L	3	3	0.00	0.00	0.00		0.00
1022	T-B	MG/L	1	0	0.18	0.18	0.18		0.00
1027	T-CD	MG/L	4	4	0.00	0.00	0.00		0.00
1034	T-CR	MG/L	4	3	1.93	1.93	1.93		0.00
1042	T-CU	MG/L	4	3	0.04	0.04	0.04		0.00
1045	T-FE	MG/L	4	0	0.32	12.60	3.51		6.06
1051	T-PB	MG/L	4	4	0.00	0.00	0.00		0.00
1055	T-MN	MG/L	4	0	0.15	0.23	0.19		0.03
1092	T-ZN	MG/L	4	2	0.02	0.15	0.09		0.09
1102	T-SN	MG/L	1	1	0.00	0.00	0.00		0.00
31400	ATP	UG/L	3	0	0.70	15.00	5.78		8.00
31503	TOT-COLI	/100	4	0	55.00	900.00	361.50	35	70.97
31616	FEC-COLI	/100	4	0	10.00	17.00	12.25		3.30
50060	CL(2)RES	MG/L	4	4	0.00	0.00	0.00		0.00

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN77 TO 31DEC77 TUALATING-HWY 212 BR

20-JUL	79		i	IUALAII	I WK-HWY	212 BK		PAGE 1
						RANGE		STANDARD
PARAME	ETER	UNITS	MUM	ZEROS	MIN	MAX	MEAN	DEVIATION
10	TEMP-C	DEG	4	0	19.00	23.50	20.53	2.03
59	FLOW	FEET	1	0	2.20	2.20	2.20	0.00
76	TURB	UTN	4	0	3.60	5.00	4.37	0.68
80	TRUCOLOR	TINU	2	0	10.00	15.00	12.50	3.54
18	APPCOLOR	UNIT	2	0	30.00	45.00	37.50	10.61
95	COND-LAB	имно	4	0	140.00	190.00	165.00	20.82
299	DO.	MG/L	4	0	7.40	10.20	8.75	1.14
310	BOD(5)	MG/L	4	0	3.67	5.28	4.40	0.48
340	T-COD	MG/L	3	0	12.40	28.50	18.30	8.87
401.	PH-GRAB	PH	4	0	6.70	7.50	7+03	0.34
410	OH-CACO3	MG/L	4	O	50.00	67.00	55.88	7.60
440	HC03-I0N	MG/L	1	0	56.00	56.00	56.00	0.00
500	TR	MG/L	3	0	135.00	172.60	150.67	19.57
515	TFR(TDS)	MG/L	3	0	125.00	164.80	141.93	20.55
530	TNFR(SS)	MG/L	4	0	8.00	11.40	9.45	1.56
610	NH3-N	MG/L	4	0	0.37	0.82	0.54	0.20
625	TKN-N	MG/L	4	0	2.43	3.45	2.84	0.46
630	N02N03-N	MG/L	4	0	1.37	2.20	1.82	0.34
665	TPO4-P	MG/L	4	0	0.30	1.45	0.79	0.56
680	TOC	MG/L	4	O	3.00	16.00	7.65	5.83
720	TCYANIDE	MG/L	3	0	0.02	0.03	0.02	0.01
745	T-S COMP	MG/L	2	1	0.04	0.04	0.04	0.00
940	CHLORIDE	MG/L	4	0	10.30	14.64	12.32	1.78
951	T-F(-)	MG/L	2	0	0.07	0.12	0.10	0.04

20-JUL-7	79		IUALAII	.NK-HWT 2.	IZ BK		PAGE	2
PARAMETE	ER UNIT	MUN E	ZEROS	MIN	RANGE MAX	MEAN	STANI DEVI	
1002 T-	-AS MG/	4	2	0.00	0.02	0.01		0.01
1007 T-	-BA MG/	_ 3	3	0.00	0.00	0.00		0.00
1022 T-	-B MG/I	. 1	0	0.27	0.27	0.27		0.00
1027 T-	-CD MG/I	_ 4	4	0.00	0.00	0.00		0.00
1034 T-	-CR MG/	. 4	4	0.00	0.00	0.00		0.00
1042 T-	-CU MG/	4	4	0.00	0.00	0.00		0.00
1045 T-	-FE MG/	4	0	0.19	0.47	0.31		0.12
1051 T-	-PB MG/	4	4	0.00	0.00	0.00		0.00
1055 T-	-MN MG/I	_ 4	0	0.10	0.19	0.14		0.04
1092 T-	-ZN MG/	_ 4	2	0.02	0.03	0.03		0.01
1102 T-	-SN MG/	1	1	0.00	0.00	0.00		0.00
31400 AT	rp UG/I	3	0	1.83	4.10	2.65		1.26
31503 TO	T-COLI /10	) 4	0	400,00	700.00	550.00	17	73.21
31616 FE	EC-COLI /10	4	0	20.00	70.00	39.75	, 2	21.30
50060 CL	(2)RES MG/	3	3	0.00	0.00	0.00		0.00

UNIFIED SEWERAGE AGENCY OKWATER QUALITY LABORATORY DATA STATISTICS 1JAN77 TO 31DEC77 FANNO CREEK

23-JUL-79			. ,				FAGE 1	
PARAME	ETER	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
10	TEMP-C	DEG	1	O	17.00	17.00	17.00	0.00
76	TURB	NTU	1	O	4.80	4.80	4.80	0.00
84	TRUCOLOR	UNIT	1	o	15.00	15.00	15.00	0.00
85	APPCOLOR	UNIT	1	0	25.00	25.00	25.00	0.00
95	COND/CM	онми	1	ø	260.00	260.00	240.00	0.00
299	po	MG/L	1	0	5.50	5.50	5.50	0.00
310	BOD(5)	MG/L	1	0	2.14	2,14	2.14	0.00
340	T-COD-HI	MG/L	1	0	13.60	13.60	13.60	0.00
401	PH-GRAB	PΗ	1	0	7.30	7.30	7.30	0.00
410	OH-CACO3	MG/L	1	0	114.00	114.00	114.00	0.00
500	TR	MG/L	1	0	215.00	215.00	215.00	0.00
515	TFR	MG/L	1	o	209.00	209.00	209.00	0.00
530	TNFR	MG/L	1	0	5.00	5.00	5.00	0.00
610	N-EHN	MG/L	1	0	0.24	0.24	0.24	0.00
625	TKN-N	MG/L	1	0	1.68	1.68	1.68	0.00
630	NO2NO3-N	MG/L	1	0	1.02	1.02	1.02	0.00
665	TPO4-F	MG/L	1	0	0.82	0.82	0.82	0.00
680	TOC	MG/L	1	0	4.00	4.00	4.00	0.00
720	TCYANIDE	MG/L	1	0	0.02	0.02	0.02	0.00
940	CHLORIDE	MG/L	1	0	15.50	15.50	15.50	0.00
1002	T-AS	MG/L	1	1	0.00	0.00	0.00	0.00
1007	T-BARIUM	MG/L	1	1	0.00	0.00	0.00	0.00
1027	T-CD	MG/L	1	1	0.00	0.00	0.00	0.00
1034	T-CR	MG/L	1	1	0.00	0.00	0.00	0.00

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN77 TO 31DEC77 FANNO CREEK

23-JUL	79							PAGE	2
PARAME	ETER	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STAND DEVIA	
1045	T-FE	MG/L	1	0	0.70	0.70	0.70		0.00
1051	T-PB	MG/L	1	1	0.00	0.00	0.00		0.00
1055	T-MN	MG/L	1	0	0+27	0.27	0.27		0.00
1092	T-ZN	MG/L	1	1	0.00	0.00	0.00		0.00
31503	TOT-COLI	/100	1	0	1600.00	1600.00	1600.00		0.00
31616	FEC-COLI	/100	1	0	430.00	430.00	430.00		0.00
50060	CL(2)	MG/L	1	1	0.00	0.00	0.00		0.00

53-100	79			IUHLHI.	TIA K-HMI	77W DR		PAGE	1
PARAME	ETER	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STAN! DEVI	DARD ATION
10	TEMP-C	DEG	2	0	10.50	17.50	14.00		4.95
76	TURB	טדא	2	0	4.25	6.70	5.47		1.73
95	COND/CM	ОМНО	2	O	100.00	101.00	100.50		0.71
299	DO	MG/L	2	0	6.60	6.80	6.70		0.14
310	BOD(5)	MG/L	2	0	1.13	1.26	1.20		0.09
401	PH-GRAB	FH	2	0	6.94	7.20	7.07		0.18
410	OH-CACO3	MG/L	2	0	42.44	48.00	45.22		3.93
500	TR	MG/L	2	0	110.80	117.00	113.90		4.38
530	TNFR	MG/L	2	0	7.40	14.60	11.00		5.09
610	и-сни	MG/L	. 2	O	0.08	0.26	0.17		0.12
620	N03-N	MG/L	2	0	0.80	0.95	0.88		0.11
665	TF04-F	MG/L	1	0	0.12	0.12	0.12		0.00
929	T-NA	MG/L	2	0	3.00	4.45	3.72		1.03
937	T-K	MG/L	2	0	2.90	2,99	2.95		0.06
940	CHLORIDE	MG/L	2	0	7.16	9.62	8.39		1.74
945	504	MG/L	2	0	4.43	4.49	4.45		0.04
31503	TOT-COLI	/100	2	0	330.00	1200.00	765.00	6	15.18
31616	FEC-COLI	/100	2	0	22.00	68.00	45.00	;	32.53
50060	CL(2)	MG/L	2	1	0.20	0.20	0.20		0.00
70507	0F04-F	MG/L	2	0	0.10	0.39	0.24		0.20

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UNIFIED SEWERAGE AGENCY
WATER QUALITY LABORATORY
DATA STATISTICS 1JAN76 TO 31DEC76
TUALATIN R-HWY 212 BR

23-JUL-79								PAGE 1
						RANGE		STANDARD
PARAM	ETER	UNITS	MUM	ZEROS	MIN	XAM	MEAN	DEVIATION
10	TEMP-C	DEG	2	0	11.50	18.00	14.75	4.60
76	TURB	UTM	2	0	4.00	7.50	6.75	1.06
95	CONDICM	имно	2	0	118.00	128.00	123.00	7.07
299	DO	MG/L	2	0	7.80	11.60	9.70	2.69
310	BOD(5)	MG/L	2	0	2.15	2.36	2.26	0.15
401	FH-GRAB	FΉ	1	O	7.19	7.19	7.19	0.00
410	OH-CACO3	MG/L	1	0	45.54	45.54	45.54	0.00
500	TR	MG/L	2	0	127.00	132.20	129.60	3.68
530	TNFR	MG/L	2	O	5.70	9.30	7.50	2.55
610	и-ени	MG/L	2	0	0.29	0.61	0.45	0.23
620	N-20N	MG/L	2	0	1.45	1.94	1.70	0.35
665	TFO4-F	MG/L	1	0	0.23	0.23	0.23	0.00
929	T-NA	MG/L	2	0	3.25	5.40	4.33	1.52
937	T-K	MG/L	2	0	3.40	3.67	3.54	0.19
940	CHLORIDE	MG/L	2	0	10.10	11.65	10.88	1.10
945	S04	MG/L	1	0	5.22	5.22	5.22	0.00
31503	TOT-COLI	/100	2	0	2400.00	5700.00	4050.00	2333.45
31616	FEC-COLI	/100	2	0	40.00	180.00	110.00	98.99
50060	CL(2)	MG/L	2	2	0.00	0.00	0.00	0.00
70507	0P04-P	MG/L	2	0	0.22	0.40	0.41	0.27

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### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN75 TO 31DEC75 TUALATIN R-HWY 212 BR

24-JUI	79			IUHLHIIN	K-13W1	ZIZ BR		FAGE 1
FARAME	ETER	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
10	TEMP-C	DEG	5	0	16.50	21.00	19.30	1.72
60	FLOW	MGD	5	0	87.19	212.00	141.32	46.63
299	DO	MG/L	5	0	7.20	10.20	8.62	1.15
310	BOD(5)	MG/L	4	0	2.05	4.95	2.94	1.35
340	T-COD-HI	MG/L	5	0	7.56	17.50	10.79	3.97
401	PH-GRAB	PH	5	0	6.95	7+40	7.13	0.18
410	OH-CACO3	MG/L	5	0	36.40	46.00	41.52	3.41
530	TNFR	MG/L	5	0	7.80	11.50	10.12	1.60
605	ORG-N	MG/L	5	0	0.59	0.79	0.69	0.08
610	и-ени	MG/L	5	4	0.58	0.58	0.58	0.00
615	N02-N	MG/L	5	1	0.02	0.05	0.03	0.01
620	N03-N	MG/L	5	1	0.67	6.20	2.10	2.74
665	TPO4-F	MG/L	5	0	0.40	0.56	0.46	0.07
740	803	MG/L	5	0	1.00	1.50	1.10	0.22
745	T-S(-2)	MG/L	5	1	0.04	0.16	0.11	0.05
940	CHLORIDE	MG/L	5	0	7.07	9.98	8.21	1.13
945	S04	MG/L	5	0	4.74	8.20	6+06	1.39
31503	TOT-COLI	/100	2	0 5	900.00	6800.00	6350.00	636.40
31616	FEC-COLI	/100	2	0	30.00	60.00	45.00	21.21
70509	H+/CACO3	MG/L	5	0	2.60	8.57	5.06	2.27

### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN75 TO 31DEC75 FANNO CREEK

23-JU	79		'	- ANNU	UKEEN		PAGE	1	
						RANGE		STAN	
PARAM	ETER	UNITS	MUM	ZERO9	S MIN	MAX	MEAN	DEVI	ATION
10	TEMP-C	DEG	4	0	17.00	19.00	18.00		0.82
60	FLOW	MGD	3	0	5.36	7.30	6.01		1.12
299	DO	MG/L	4	0	2.80	3.90	3.44		0+46
310	BOD(5)	MG/L	3	0	4.55	6.40	5.72		1.02
340	T-COD-HI	MG/L	4	0	25.18	44.44	32.92		8.33
401	PH-GRAB	PH	4	0	7.01	7.16	7.10		0.06
410	OH-CACO3	MG/L	4	0	87.80	113.60	104.13	:	11.85
530	TNFR	MG/L	4	0	3.54	26.30	11.43	:	10.14
605	ORG-N	MG/L	4	0	10.92	14.41	12.32		1.60
610	N-2HN	MG/L	4	0	0.41	14.00	8.36		5.78
615	N02-N	MG/L	4	0	0.26	0.33	0.29		0.03
620	N-20N	MG/L	4	4	0.00	0.00	0.00		0.00
665	TF04-F	MG/L	4	0	2.65	7.85	5.53		2.19
740	503	MG/L	4	1	0.90	1.50	1.30		0.35
745	T-S(-2)	MG/L	4	1	0.08	0.16	0.12		0.04
940	CHLORIDE	MG/L	4	0	21.50	34.40	30.72		6,19
945	504	MG/L	4	0	16,30	25.50	19.73		4.00
31503	TOT-COLI	/100	1	0 9	710000.00	910000.00	910000.00		0.00
31616	FEC-COLI	/100	1	0	7100.00	7100.00	7100.00		0.00
70509	H+/CACO3	MG/L	4	0	15.40	21.00	17.68		2.68



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PARAM	ETER	UNITS	MUM	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION
10	TEMF-C	DEG	2	0	19.00	19.00	19.00	0.00
299	DO	MG/L	2	0	7.80	10.00	8.90	1.56
310	BOD(5)	MG/L	2	0	4.18	7.89	6.03	2.62
340	T-COD-HI	MG/L	2	0	12.56	25.02	18.79	8.81
401	FH-GRAB	PΗ	2	0	7.70	7.70	7.70	0.00
410	OH-CACO3	MG/L	2	0	44.00	51.00	47.50	4.95
530	TNFR	MG/L	2	0	12.85	14.70	13.78	1.31
605	ORG-N	MG/L	2	0	0.43	0.76	0.60	0.23
610	и-сни	MG/L	2	2	0.00	0.00	0.00	0.00
615	N02-N	MG/L	2	1	0.04	0.04	0.04	0.00
620	N03-N	MG/L	1	1	0.00	0.00	0.00	0.00
665	TF:04-P	MG/L	2	1	0.40	0.40	0.40	0.00
740	S03	MG/L	2	0	1.00	1.00	1.00	0.00
745	T-S(-2)	MG/L	1	0	0.12	0.12	0.12	0.00
945	S04	MG/L	2	0	10.50	10.50	10.50	0.00
31503	TOT-COLI	/100	1	0	6000.00	6000.00	4000.00	0.00
31679	FEC-STRP	/100	1	0	20.00	20.00	20.00	0.00
70509	H+/CACO3	MG/L	2	0	2.50	3.00	2.75	0.35

53-Jul	L-79			IOHTHIIM	K-ELS!	AEK KD	ÞΚ		PAGE	1
PARAM	ETER	UNITS	мим	ZEROS	MIN	RANGE	MAX	MEAN	STAND DEVIA	
10	TEMP-C	DEG	2	0	19.00		19.00	19.00		0.00
299	DO	MG/L	2	0	7.80		10.00	8.90		1.56
310	BOD(5)	MG/L	2	0	4.18		7.89	6.03		2.62
340	T-COD-HI	MG/L	2	0	12.56		25.02	18.79		8.81
401	FH-GRAB	PH	2	0	7.70		7.70	7.70		0.00
410	OH-CACO3	MG/L	2	0	44.00		51.00	47.50		4.95
530	TNFR	MG/L	2	0	12.85		14.70	13.79		1.31
605	ORG-N	MG/L	2	0	0.43		0.76	0.60		0.23
610	и-ени	MG/L	2	2	0.00		0.00	0.00		0.00
615	NO2-N	MG/L	2	1	0.04		0.04	0.04		0.00
620	N-20N	MG/L	1	1	0.00		0.00	0.00		0.00
665	TP04-F	MG/L	2	1	0.40		0.40	0.40		0.00
740	S03	MG/L	2	0	1.00		1.00	1.00		0.00
745	T-S(-2)	MG/L	1	0	0.12		0.12	0.12		0.00
945	S04	MG/L	2	0	10.50		10.50	10.50		0.00
31503	TOT-COLI	/100	1	0 60	00.00	60	00.00	6000.00		0.00
31679	FEC-STRP	/100	1	0	20.00		20.00	20.00		0.00
70509	H+/CACO3	MG/L	2	0	2.50		3.00	2.75		0.35

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#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN74 TO 31DEC74 TUALATIN R-ELSNER RD BR

23-JUI	L-79			IOHLHIIN	N	CEN ND	DIX		PAGE	1
PARAMI	ETER	UNITS	NUM	ZEROS	MIN	RANGE	MAX	MEAN	STANI DEVI	DARD ATION
10	TEMP-C	DEG	2	0	19.00		19.00	19.00		0.00
299	DO	MG/L	2	0	7.80		10.00	8,90		1.56
310	BOD(5)	MG/L	2	0	4.18		7.89	6.03		2.62
340	T-COD-HI	MG/L	2	0	12.56		25.02	18.79		8.81
401	FH-GRAB	PH	2	0	7.70		7.70	7.70		0.00
410	OH-CACO3	MG/L	2	0	44.00		51.00	47.50		4.95
530	TNFR	MG/L	2	0	12.85		14.70	13.78		1.31
605	ORG-N	MG/L	2	0	0.43		0.76	0.60		0.23
610	инз-и	MG/L	2	2	0.00		0.00	0.00		0.00
615	N02-N	MG/L	2	1	0.04		0.04	0.04		0.00
620	N-20N	MG/L	1	1	0.00		0.00	0.00		0.00
665	TF'04-F'	MG/L	2	1	0.40		0.40	0.40		0.00
740	S03	MG/L	2	0	1.00		1.00	1.00		0.00
745	T-S(-2)	MG/L	1	0	0.12		0.12	0.12		0.00
945	504	MG/L	2	0	10.50		10.50	10.50		0.00
31503	TOT-COLI	/100	1	0 6	000.00	60	00.00	6000.00		0.00
31679	FEC-STRP	/100	1	0	20.00		20.00	20.00		0.00

70509 H+/CACO3 MG/L 2 0 2.50 3.00 2.75 0.35

PAGE 23-JUL-79 1 RANGE STANDARD PARAMETER UNITS NUM ZEROS MIN MAX MEAN DEVIATION 10 TEMP-C DEG 2 0 19.00 19.00 19.00 0.00 299 DO MG/L 2 7.80 10.00 8.90 1.56 Ø 310 BOD(5) 7.89 2.62 MG/L 4.18 6.03 340 T-COD-HI MG/L 2 0 12.56 25.02 18.79 8.81 7.70 7.70 7.70 401 PH-GRAB FΉ 2 0.00 0 410 DH-CACO3 MG/L 44.00 47.50 4.95 51.00 530 TNFR MG/L 2 0 12.85 14.70 13.78 1.31 605 DRG-N MG/L 2 O 0.43 0.76 0.23 0.40 610 NH3-N MG/L 2 0.00 0.00 0.00 0.00 615 NO2-N MG/L 2 1 0.04 0.04 0.04 0.00 620 NO3-N MG/L 0.00 0.00 0.00 0.00 1 1 665 TF:04-F MG/L 2 1 0.40 0.40 0.40 0.00 740 S03 MG/L 2 1.00 0.00 0 1.00 1.00 745 T-S(-2) MG/L 1 0.12 0.12 0.00 ٥ 0.12 MG/L 945 S04 2 0 10.50 10.50 10.50 0.00 31503 TOT-COLI /100 6000.00 4000.00 6000.00 0.00 31679 FEC-STRP /100 1 0 20.00 20.00 20.00 0.00

2.50

3.00

2.75

0.35

70509 H+/CACO3 MG/L

2 0



53-JN	L-79							PAGE 1
PARAM	UNITS	мим	ZEROS	MIN	RANGE MAX	MEAN	STANDARD DEVIATION	
10	TEMP-C	DEG	2	0	19.00	19.00	19.00	0.00
299	DO	MG/L	2	0	7.80	10.00	8,90	1.56
310	BOD(5)	MG/L	2	0	4.18	7.89	6.03	2.62
340	T-COD-HI	MG/L	2	0	12.56	25.02	18.79	8.81
401	PH-GRAB	PΗ	2	0	7.70	7.70	7.70	0.00
410	OH-CACO3	MG/L	2	0	44.00	51.00	47.50	4.95
530	TNFR	MG/L	2	0	12.85	14,70	13.78	1.31
605	ORG-N	MG/L	2	0	0.43	0.76	0.60	0.23
610	и-сни	MG/L	2	2	0.00	0.00	0.00	0.00
615	N02-N	MG/L	2	1	0.04	0.04	0.04	0.00
620	N-20N	MG/L	1	1	0.00	0.00	0.00	0.00
665	TPO4-P	MG/L	2	1	0.40	0.40	0.40	0.00
740	S03	MG/L	2	0	1.00	1.00	1.00	0.00
745	T-S(-2)	MG/L	1	0	0.12	0.12	0.12	0.00
945	S04	MG/L	2	0	10.50	10.50	10.50	0.00
31503	TOT-COLI	/100	1	0	6000.00	4000.00	6000.00	0.00
31679	FEC-STRP	/100	1	0	20.00	20.00	20.00	0.00
70509	H+/CACO3	MG/L	2	0	2.50	3.00	2.75	0.35



PAGE 23-JUL-79 1 RANGE STANDARD PARAMETER UNITS NUM ZEROS MIN MAX MEAN DEVIATION 10 TEMP-C DEG 2 0 19.00 19.00 19.00 0.00 8.90 299 DO MG/L 7.80 10.00 1.56 2 0 2.62 MG/L 0 4.18 7.89 6.03 310 BOD(5) 2 25.02 18.79 8.81 340 T-COD-HI MG/L 2 0 12.56 7.70 7.70 7.70 0.00 401 PH-GRAB PH 2 0 47.50 4.95 410 OH-CACO3 MG/L 2 44.00 51.00 0 **530 TNFR** MG/L 2 0 12.85 14.70 13.78 1.31 605 ORG-N MG/L 2 0.43 0.76 Ø 0.60 0.23 610 NH3-N MG/L 2 2 0.00 0.00 0.00 0.00 615 NO2-N MG/L 2 0.04 0.04 0.04 0.00 1 620 NO3-N MG/L 1 0.00 0.00 0.00 0.00 1 665 TP04-P MG/L 2 1 0.40 0.40 0.40 0.00 740 503 MG/L 2 0 1.00 1.00 1.00 0.00 745 T-5(-2) MG/L 1 0 0.12 0.12 0.12 0.00 945 504 MG/L 2 0 10.50 10.50 10.50 0.00 31503 TOT-COLI /100 1 6000.00 6000.00 0 6000.00 0.00 31679 FEC-STRF /100 1 0 20.00 20.00 20.00 0.00 70509 H+/CACO3 MG/L 2 0 2.50 3.00 2.75 0.35



23-JU	L-79			IOHEHIIK	K-ELSN	EK KD	מת		PAGE	1
PARAM	ETER	стіми	мим	ZEROS	MIN	RANGE	MAX	MEAN	STANI DEVIA	
10	TEMP-C	DEG	2	0	19.00		19.00	19.00		0.00
299	no	MG/L	2	0	7.80		10.00	8.90		1.56
310	BOD(5)	MG/L	2	0	4.18		7.89	6.03		2.62
340	T-COD-HI	MG/L	2	0	12.56		25.02	18.79		8.81
401	PH-GRAB	PH	2	0	7.70		7.70	7.70		0.00
410	OH-CACO3	MG/L	2	0	44.00		51.00	47.50		4.95
530	TNFR	MG/L	2	0	12.85		14.70	13.78		1.31
605	ORG-N	MG/L	2	0	0.43		0.76	0.60		0.23
610	и-ени	MG/L	2	2	0.00		0.00	0.00		0.00
615	N02-N	MG/L	2	1	0.04		0.04	0.04		0.00
620	N-50N	MG/L	1	1	0.00		0.00	0.00		0.00
665	TP04-P	MG/L	2	1	0.40		0.40	0.40		0.00
740	S03	MG/L	2	0	1.00		1.00	1.00		0.00
745	T-S(-2)	MG/L	1	0	0.12		0.12	0.12		0.00
945	S04	MG/L	2	0	10.50		10.50	10.50		0.00
31503	TOT-COLI	/100	1	0 60	00.00	60	00.00	6000.00		0.00
31679	FEC-STRP	/100	1	0	20.00		20.00	20.00		0.00
70509	H+/CACO3	MG/L	2	0	2.50		3.00	2.75		0.35



23-JU	L79			IUALAIIN	K-ELSN	IER RU	BK		PAGE	1
PARAMETER		UNITS	мим	ZEROS	MIN	RANGE	MAX	MEAN	STANI DEVIA	
10	TEMP-C	DEG	2	0	19.00		19.00	19.00		0.00
299	DO	MG/L	2	O	7.80		10.00	8,90		1.56
310	BOD(5)	MG/L	2	0	4.18		7.89	6.03		2.62
340	T-COD-HI	MG/L	2	o	12.56		25.02	18.79		8.81
401	PH-GRAB	PH	2	o	7.70		7.70	7.70		0.00
410	OH-CACO3	MG/L	2	0	44.00		51.00	47.50		4.95
530	TNFR	MG/L	2	0	12.85		14.70	13.78		1.31
605	ORG-N	MG/L	2	o	0.43		0.76	0.60		0.23
610	и-сни	MG/L	2	2	0.00		0.00	0.00		0.00
615	NO2-N	MG/L	2	1	0.04		0.04	0.04		0.00
620	N03-N	MG/L	1	1	0.00		0.00	0.00		0.00
665	TF:04-P	MG/L	2	1	0.40		0.40	0.40		0.00
740	S03	MG/L	2	0	1.00		1.00	1.00		0.00
745	T-S(-2)	MG/L	1	0	0.12		0.12	0.12		0.00
945	504	MG/L	2	o	10.50		10.50	10.50		0.00
31503	TOT-COLI	/100	1	0 60	00.00	60	00.00	6000.00		0.00
31679	FEC-STRF	/100	1	0	20.00		20.00	20.00		0.00
70509	H+/CACO3	MG/L	2	0	2.50		3.00	2.75		0.35

#### UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN73 TO 31DEC73

TUALATIN R-ELSNER RD BR PAGE 1 23-JUL-79 RANGE STANDARD PARAMETER UNITS NUM ZEROS MIN MAX MEAN DEVIATION 10 TEMP-C 17.00 19.00 18.13 DEG Ą 0 1.03 MG/L 0 4.85 10.20 8.49 2.47 299 DO 4 9.58 310 BOD(5) MG/L 0 1.90 23.80 10.29 340 T-COD-HI MG/L 4 0 11.45 30.90 23.10 9.51 401 PH-GRAB FH 4 Ö 6.80 7.60 7.28 0.36 410 DH-CACO3 MG/L 2 0 54.00 74.20 14.28 64.10 **530 TNFR** MG/L 4 7.90 0 77.30 27.35 33,36 605 DRG-N MG/L 0 0.14 1.78 1.13 0.70 4 0.25 0.19 610 NH3--N MG/L 4 1 0.63 0.45 615 NO2-N MG/L 2 0.72 1.10 0.91 0.27 0 MG/L 2 620 NO3-N 1 0.11 0.11 0.11 0.00 740 SO3 MG/L 2 0 2.00 6.60 4.30 3.25 745 T-S(-2) MG/L 2 0.00 2 0.00 0.00 0.00 945 SO4 MG/L 0 9.00 17.50 14.25 3.80 1034 T-CR MG/L 1 1 0.00 0.00 0.00 0.00 31503 TOT-COLI /100 10000.00 530000.00 Ö 164500.00 246717.80 31616 FEC-COLI /100 1 0 10.00 10.00 10.00 0.00 31679 FEC-STRF /100 3 0 6.00 340.00 125.33 186.29 50060 CL(2) MG/L 2 2 0.00 0.00 0.00 0.00

2.00

4.00

3.00

1.41

70509 H+/CACO3 MG/L

2

010

# UNIFIED SEWERAGE AGENCY WATER QUALITY LABORATORY DATA STATISTICS 1JAN73 TO 31DEC73 TUALATIN R-TUALATIN FARK

23-JU	L-79		•	TUALAT	IN R-TUAL	ATIN PARK		PAGE	1.
PARAM	ETER	UNITS	MUM	ZEROS	MIN	RANGE MAX	MEAN	STAN DEVI	DARD ATION
10	TEMP-C	DEG	3	0	18.00	19.00	18.67		0.58
299	DO	MG/L	3	0	5.90	10.70	7.53		2.74
310	BOD(5)	MG/L	3	0	5.70	5.85	5.75		0.09
340	т-сор-ні	MG/L	3	0	17.30	26.96	21.19		5.10
401	PH-GRAB	FΉ	3	0	7.20	7.40	7.27		0.12
410	OH-CACO3	MG/L	2	0	64.00	83.60	73.80		13.86
530	TNFR	MG/L	3	0	7.10	18.30	11.63		5.90
605	ORG-N	MG/L	3	0	1.35	1.51	1.41		0.09
610	и-сни	MG/L	3	0	0.23	4.06	1.80		2.00
615	N02-N	MG/L	2	1	1.10	1.10	1.10	•	0.00
620	N-20N	MG/L	2	0	0.34	0.37	0.36		0.02
740	S03	MG/L	2	0	1.50	6.60	4.05		3.61
745	T-S(-2)	MG/L	2	1	0.08	0.08	0.08		0.00
945	S04	MG/L	3	0	9.50	20.50	14.33		5.62
31503	TOT-COLI	/100	3	0 1	0400.00	33000.00	23800.00	118	70.98
31616	FEC-COLI	/100	1	0	16.00	16.00	16.00		0.00
31679	FEC-STRP	/100	2	0	130.00	200.00	165.00	•	49.50
50060	CL(2)	MG/L	2	1	0.20	0.20	0.20		0.00
70509	H+/CACO3	MG/L	2	0	4.00	6.00	5.00		1.41

#### APPENDIX E PARTIAL LIST OF SANITARY LANDFILL INSTALLATIONS

USING MEMBRANE LINERS

#### APPENDIX E

#### PARTIAL LIST OF SANITARY LANDFILL INSTALLATIONS

#### USING MEMBRANE LINERS

Year	Company	Location		rane kness mils
1971	Predmore Development Co.	Romeo MI	20	PVC
1972	Environmental Protection	Transfer when	20	ann
3070	Agency, Cincinnati, OH	Kentucky		CPE
1972	Town of Brookhaven	Patchogue NY		PVC
1972	Stauffer Chemical Co.	St. Gabriel LA		PVC
1973	Town of Merrimack	Merrimack NH		PVC
1973	Town of North Hempstead	Roslyn NY		PVC
1973	Town of Milford	Milford CT		PVC
1973	Palisades, Inc.	Waterbury VT		PVC
1974	U.S. Army	West Point NY		PVC
1975	Allied Chemical	Jamesville NY		PVC
1975	Volusia County	Deland FL		PVC
1976	Allied Chemical	Hopewell VA	20	PVC
1976	Metropolitan District of	The New Territories,		
	Hong Kong	Hong Kong	20	<b>BAC</b>
1976	Warren County Solid			
	Waste Authority			
	Grunderville Landfill	Pleasantownship PA	20	PVC
1976	Niagra Recycling	Niagra Falls NÝ	20	PVC
1976	Gulf Coast Landfill	Ft. Myers FL	20	PVC
1976	Kramer Sanitary Landfill	Clarksboro NJ	20	PVC
1976	Bureau of Sanitation	Clarkton MD		PVC
1977	Mount Holly Landfill	Mount Holly NJ		PVC
1977	City of Ormond Beach	Ormond Beach FL		PVC
1977	Modern Trash Removal of	ormond bedon th	220	# V C
20,,	York, Inc.	York PA	20	PVC
1977	Union Carbide	Rifle CO		PVC
1977	Kent County Dept. of	KILLE CO	2.0	T VC
1011	Public works	Grand Rapids MI	20	PVC
1977	Toms River Chemical Corp.	Toms River NJ		PVC
1977	Kinsley Landfill, Inc.	Scotch Plains NJ		PVC
1978	Dept. of Public Works	SCOTOR FIGHRS NO	20	FVC
1310	Clallam County	Dort Angolog WA	20	PVC
	Clairam County	Port Angeles WA	20	PVC