EATONVILLE LANDFILL

SITE INVESTIGATION AND PRELIMINARY ECONOMIC ANALYSIS FOR CORRECTIVE ACTION ALTERNATIVES

DRAFT

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CERTIFICATE OF ENGINEER

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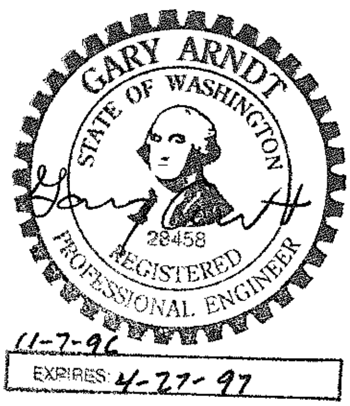

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LIST OF ACRONYMS AND ABBREVIATIONS

2H:1V	2 feet Horizontal: 1 foot Vertical (grade)
BGS	Below Ground Surface
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DWS	Drinking Water Standards
Ecology	Washington State Department of Ecology
GWQS	Groundwater Quality Standards
JARPA	Joint Aquatic Resource Permits Application
MFS	Minimum Functional Standards
O & M	Operation and Maintenance
SWQS	Surface Water Quality Standards
TPCHD	Tacoma-Pierce County Health District
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
yd^3	cubic yards

EXECUTIVE SUMMARY

The Eatonville Landfill is a 2.25-acre solid waste landfill, located approximately 3.5 miles west of the Town of Eatonville. The landfill stopped accepting waste on March 1, 1980. Prior to that date the landfill was operated by the Town of Eatonville under a separate property lease agreement with Weyerhaeuser.

The site topography includes a steep, 1.5 horizontal to 1.0 vertical (1.5H:1V) or greater, slope that drains toward the Mashel River, approximately 400 feet away. The steep landfill slope limited closure activities performed by the Town of Eatonville. As a result, the site does not comply with applicable regulations.

A Category II wetland exists near the base of the landfill. The wetland is supported by at least one spring that emerges along the western boundary of the landfill and infiltrates into the refuse at the midpoint of the landfill slope. The wetland is contiguous with the Mashel River and is therefore considered inclusive of the Mashel River shoreline.

A barrier of tree stumps and snags along the access road restricts vehicle access to the landfill slope; however, illegal dumping still occurs in the immediate vicinity. The steep slope of the site inhibited previous compaction of the deposited refuse. Cover soil is evident only in the flat upper portion of the site and as a result vegetation is sparse. Exposed refuse and debris is evident across the site that poses physical hazards, contributes to slope instability, and is not aesthetically compatible with the surroundings.

Four alternatives were considered for corrective actions at the landfill. Each alternative was evaluated according to the available historical information, field observations, and analytical results of a site investigation. An economic analysis was also performed on each alternative.

The primary objectives of the corrective actions are to significantly reduce or eliminate the potential for adverse environmental or human health and safety impacts, in a cost-effective manner. Accordingly, Parametrix recommends the landfill surface be graded to a non-uniform slope (1.75H:1V maximum) and covered with 2 feet of cover soil obtained from the nearby gravel pit (Alternative 3 in the report text). The grading would be accomplished within the landfill footprint by first recompacting the unconsolidated refuse, thereby avoiding significant impacts to the adjacent wetland.

The site would be revegetated with native plant species. This approach also includes installation of surface water controls to divert the emerging spring away from the refuse, and installation of a perimeter fence to restrict access.

The approach is cost effective in that it addresses all the corrective action objectives while minimizing permit requirements by avoiding significant wetland impacts outside the landfill footprint.

1. INTRODUCTION

1.1 PURPOSE

Parametrix was retained by Weyerhaeuser's Office of the Environment to conduct a Landfill Site Investigation and Preliminary Economic Analysis for Corrective Action Alternatives at the Eatonville Landfill. This work was authorized by Contract Number 70694-021 on May 30, 1996. The report was prepared at the request of Mr. Peter H.F. Malsch, P.E., Senior Remediation Manager.

This report presents the results of our analysis, establishes current site conditions, examines the environmental impacts of alternative corrective actions, and provides a preliminary cost analysis for evaluating each alternative.

Based on the site investigation, recommendations are presented here for the most appropriate corrective actions needed for the Eatonville Landfill. The recommendations consider both environmental and economic impacts to the surrounding area and community.

1.2 SITE DESCRIPTION

The Eatonville Landfill, located in Township 16N, Range 4E, Section 20, is approximately 3.5 miles west of the Town of Eatonville (Figure 1). This site is accessed by an unpaved road extending approximately 0.6 miles off State Highway 7. The landfill footprint covers an area of approximately 2.25 acres including a steep, 1.5H:1V or greater, slope.

The Eatonville Landfill began operation on November 1, 1950 through a property lease agreement between the Town of Eatonville and Weyerhaeuser. To comply with the Pierce County Solid Waste Management Plan the site was originally designated for closure in 1976. The landfill was allowed to remain open for four additional years under "sanitary landfill" operating conditions and stopped accepting waste on March 1, 1980.

During the 30 years of waste deposition, the site was operated and maintained by the Town of Eatonville. From 1950 to 1976 the landfill was operated as an open dump and burn site that was not closely monitored. As a result, only limited information is available on the nature and contents of refuse materials deposited at the site.

To reduce illegal dumping after landfill closure, a barrier of tree stumps, root wads and snags was placed along the roadside edge of the landfill. This measure effectively prevents vehicles from reaching the slope face of the landfill.

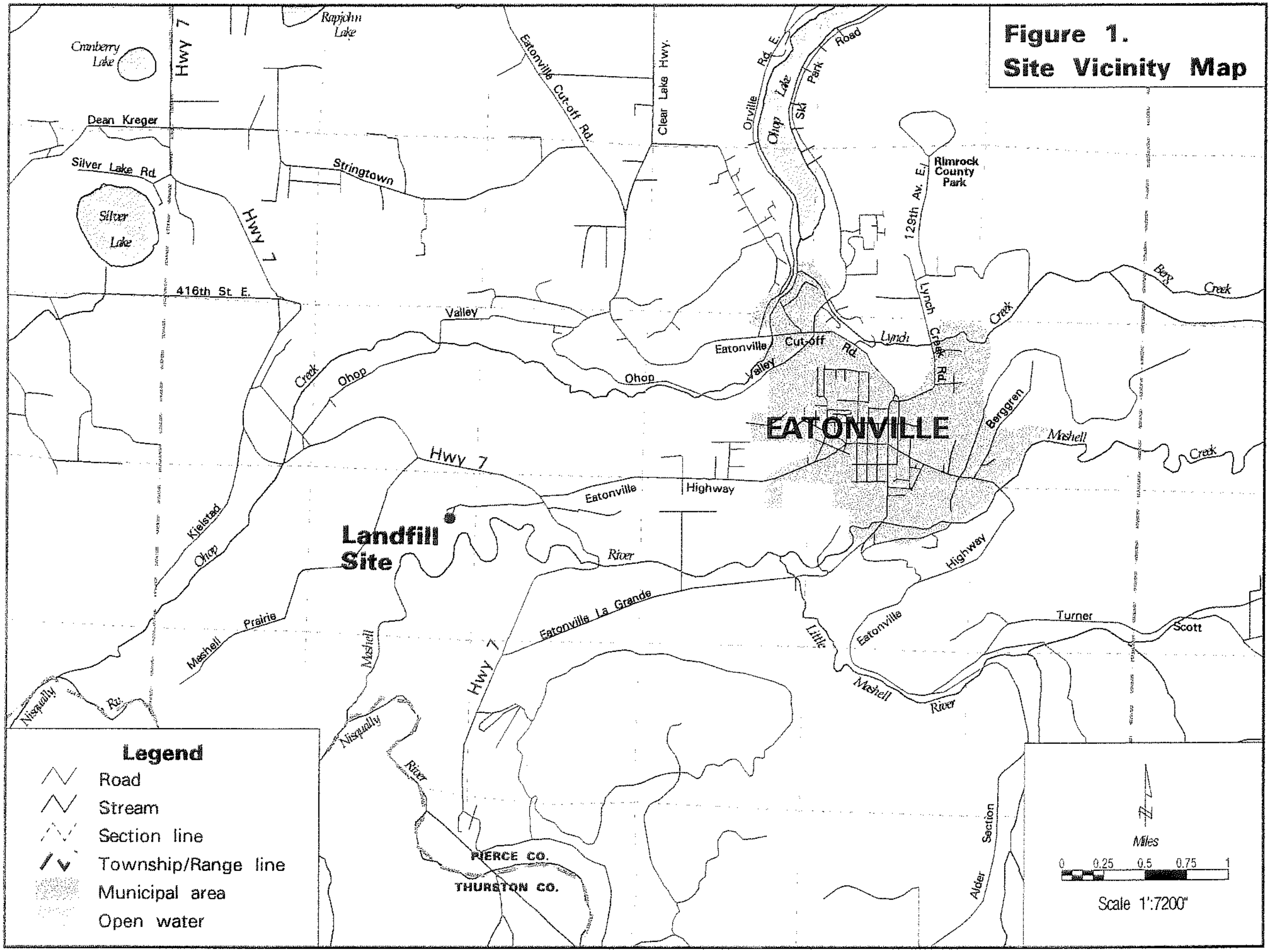


Figure 1.
Site Vicinity Map
Rapjohn Lake
Cranberry Lake
Hwy 7
Eatonville Cut-off Rd.
Clear Lake Hwy.
Orville Rd. E.
Ohop Lake
Ski Park Road
Dean Kreger
Silver Lake Rd.
Stringtown
Silver Lake
Rimrock County Park
129th Av. E.
416th St. E.
Valley
Lynch Creek Rd.
Berg Creek
Lynch Creek
Eatonville Cut-off Rd.
Ohop Valley
Ohop Creek
EATONVILLE
Berggren
Mashell Creek
Hwy 7
Eatonville Highway
Kielsted
Landfill Site
River
Highway
Eatonville La Grande
Prairie
Mashell
Little Mashell River
Eatonville
Turner
Scott
Nisqually Rv.
Nisqually River
PIERCE CO.
THURSTON CO.
Alder Section
Legend
Road
Stream
Section line
Township/Range line
Municipal area
Open water
Miles
0
0.25
0.5
0.75
1
Scale 1':7200"

Figure 2 shows the approximate landfill footprint, and surrounding site features. A natural spring emerges along the west edge of the footprint, infiltrates the refuse near the midpoint of the slope, and filters back out to the wetland region at the base of the landfill.

A gravel borrow pit is located approximately 300 feet north of the site, directly across the site access road. Materials from the borrow pit were used to cover deposited wastes during the active years of landfill operation. The steep condition of the landfill face limited efforts to effectively cover and compact the refuse.

The landfill topography is very uneven with appliances, automobile parts, and other large debris items visible throughout. Photographs taken of the landfill on May 1, 1996 are presented in Figure 3 to depict the landfill's condition.

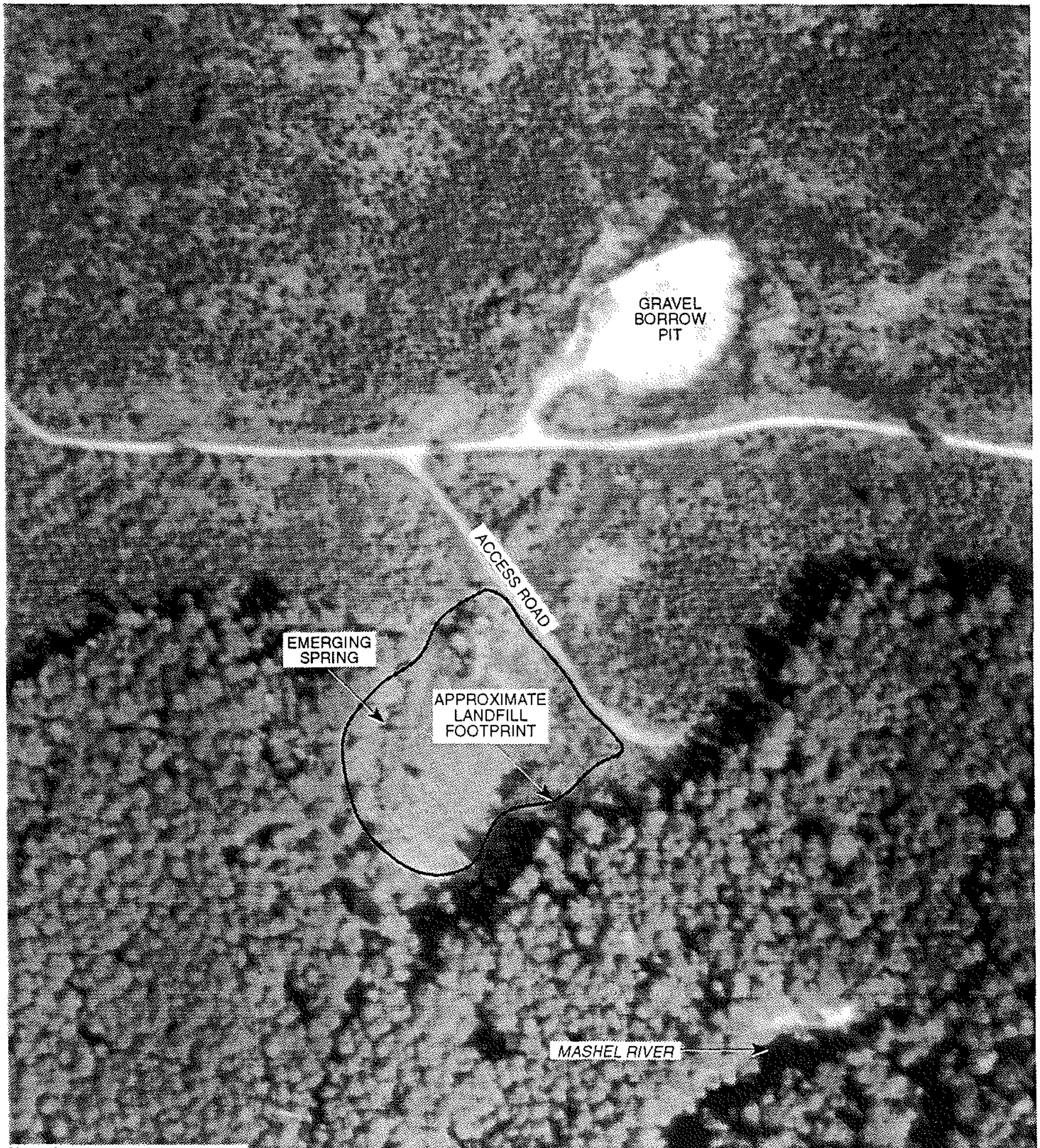
1.3 CORRECTIVE ACTION EVALUATION CRITERIA

The primary corrective action objective is to develop a corrective action approach that significantly reduces or eliminates the potential for adverse safety and environmental impacts by the solid waste disposal site. Each alternative is evaluated to ensure the corrective action addresses five evaluation criteria. The evaluation criteria include determining whether the corrective action effectively:

- Reduces potential environmental impacts
- Reduces potential health and safety risks
- Reduces potential impacts to the adjacent wetlands
- Creates an aesthetically compatible site
- Creates a site that is cost effective to build and maintain

Areas of potential adverse environmental impacts that are considered include:

- Site physical hazards
- Slope stability
- Surface water quality
- Groundwater quality
- Wetlands
- Wildlife habitat
- Air quality
- Aesthetics



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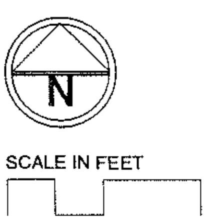

Figure 2.
Landfill Footprint and Immediate Surroundings

Looking Down at Base of Landfill and Scattered Debris

Looking West at Slope, Exposed Refuse, and Sparse Vegetation

Figure 3.
Landfill Photos

2. SITE INVESTIGATIONS

2.1 TOPOGRAPHY AND LANDFILL SURFACE CHARACTERISTICS

A topographic survey performed on the site by Weyerhaeuser on October 18, 1994, indicates that the landfill footprint measures 2.25 acres, as shown on Figure 2. Cross-sections generated from the survey estimate approximately 23,000 cubic-yards (yd^3) of refuse in-place at the time of survey. However, based on the 30-year site life, decomposition, and consolidation of refuse since closure, the actual deposited refuse is estimated at over 40,000 yd^3 (Weyerhaeuser 1994).

Parametrix review of annual inspections by the Tacoma-Pierce County Health Department (TPCHD) and a site visit by Parametrix personnel on July 1, 1996, reached similar conclusions about the physical condition and stability of the site. The decomposable refuse has settled through the years, further exposing large durable materials such as household appliances and automobile parts.

Cover soil and refuse compaction are evident only in the upper portion of the landfill. Large bulky objects that were discarded have settled at the base of the landfill slope. Most of the slope is covered with some vegetation which improves slope stability, and there appears to be no indication of severe erosion problems. However, the relatively steep slope, protruding bulky wastes, and the exposed, uncompacted condition of the refuse are both a physical hazard and aesthetically incompatible with the surrounding environment.

2.2 SURFACE WATER

2.2.1 Surface Water Occurrence

Surface waters in the immediate vicinity of the landfill were observed and sampled during the July 1, 1996, site visit. No water was observed on the surface of the landfill or along the southeastern edge of the landfill. A spring was observed that originates in the wooded area northwest of the upper portion of the landfill (see Figure 2). The spring discharged at a visually estimated rate of approximately 30 to 50 gallons-per-minute (gpm), flows southwesterly through undisturbed areas, then infiltrates through the midslope portion of the refuse.

Marshy areas and flowing surface water were observed along the northwestern to central portions of the landfill toe. This water appeared to be derived in part from water originating at the spring, and also from other seeps emerging along the base of the landfill. Wetland areas were walked and observed between the toe of the landfill and the Mashel River (see Section 2.6).

2.2.2 Surface Water Sampling

Six surface water samples were collected on July 1, 1996, at the approximate locations shown on Figure 4. A summary description of the surface water locations is presented in Table 1. The samples consisted of the following:

- Two seep samples (SEEP-1 and SEEP-2) were collected along the respective central and northwestern portions of the landfill toe,
- Two spring samples (SPRING-1 and SPRING-2) were collected from the spring originating near the top of slope along the western side of the landfill. SPRING-1 was collected at the point where the spring originated; it represents background conditions unaffected by the landfill. SPRING-2 was collected at the midpoint of the landfill where the spring flows into and through debris at the northwest edge of the landfill.
- Two wetlands samples (WET-1 and WET-2) were collected from the wetlands adjacent to the landfill. WET-1 was collected near the point where another small spring flowed into the wetland approximately 200 feet west of the landfill; it represents background conditions unaffected by the landfill. WET-2 was collected near the wetland outlet into the Mashel River, approximately 1,000 feet from the toe of the landfill.

Table 1. Description of surface water sample locations, Eatonville Landfill, July 1, 1996.

Sample Number	Location	Position Relative to Landfill	Estimated Flow
SEEP-1	Toe of landfill, central	Downstream	5 gpm
SEEP-2	Toe of landfill, northwestern	Downstream	5 gpm
SPRING-1	Northwest of landfill, about 50 feet down from top of slope	Upstream	30 - 50 gpm
SPRING-2	Northwest edge, midpoint of landfill slope	Edge	10 gpm
WET-1	Northern edge of wetland, 200 feet west of landfill, near inflow of another spring	Upstream	NA
WET-2	Outlet of wetland into Mashel River	Downstream	5 gpm

All samples were analyzed by Weyerhaeuser Analytical and Testing Services in Federal Way, Washington. The complete laboratory data is presented in Appendix A. The samples were analyzed for the following typical leachate indicator parameters:

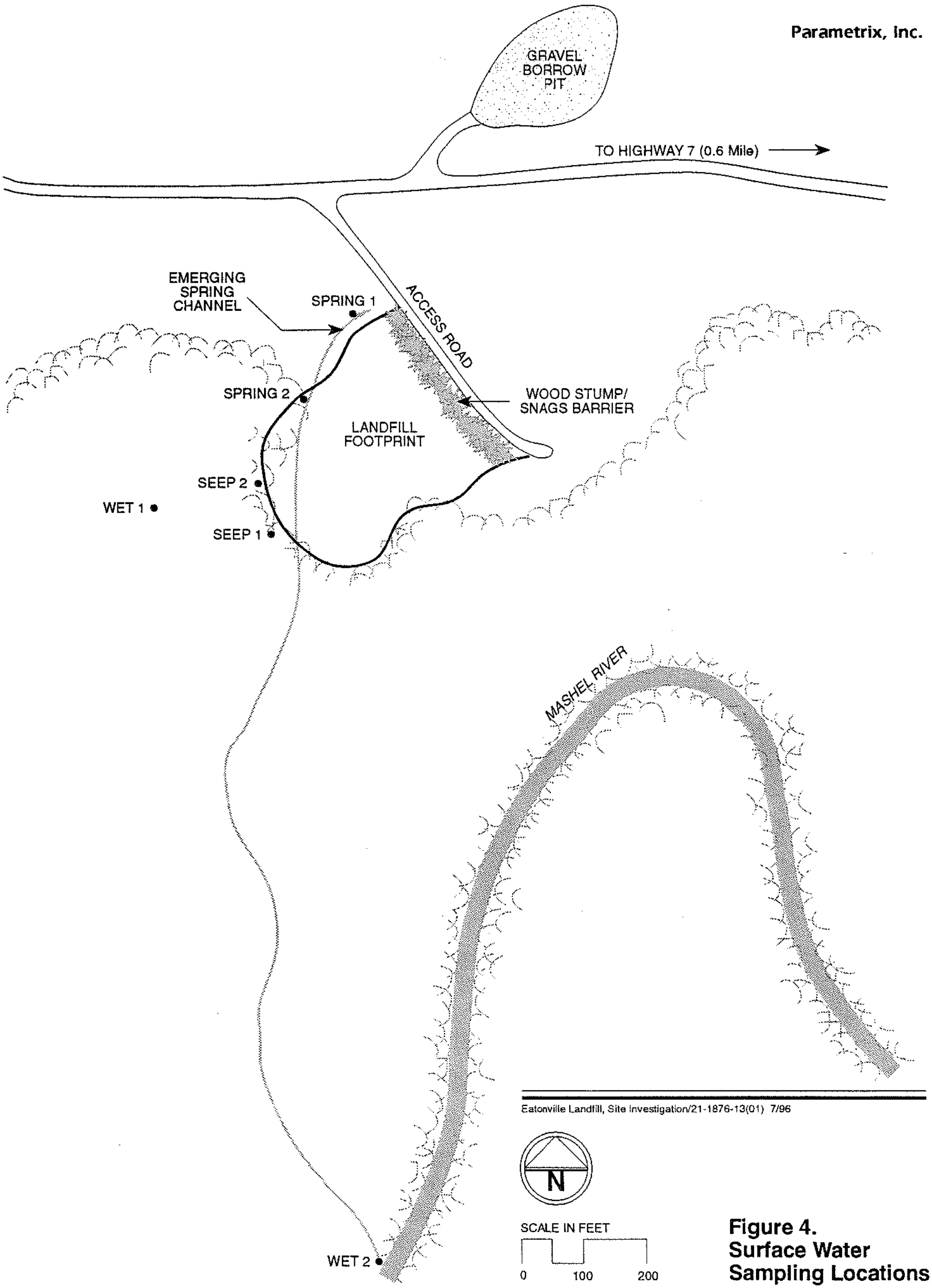

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Figure 4.
Surface Water Sampling Locations

- pH
- Specific conductivity
- Ammonia
- Chloride
- Sulfate
- Iron, total
- Manganese, total
- Zinc, total
- Chemical Oxygen Demand (COD)

Temperature, pH, and specific conductivity were also measured in the field.

2.2.3 Surface Water Analytical Results

The analytical data results, presented in Table 2, were compared to established state surface water quality standards (SWQSs; WAC 173-201A). These standards are appropriate to evaluate impacts to receiving waters for aquatic habitat.

All concentrations met water quality criteria with the following exceptions:

- Zinc in SEEP-1 (0.490 mg/L) and SEEP-2 (0.090 mg/L) exceeded the SWQS of 0.052 mg/L (assuming a hardness of 50 mg/L),

- Laboratory-measured pH in SPRING-1 (6.4) was slightly below the acceptable range of the SWQS.

The central seep sample (SEEP-1) had slightly elevated levels of COD, iron, manganese, and zinc compared to the spring samples and to the northwestern seep sample (SEEP-2). With the exception of zinc, the northwestern seep sample (SEEP-2) had concentrations that were similar to the two spring samples (SPRING-1 and -2).

The SWQS for zinc which is established based on impacts to aquatic organisms, is hardness dependent. If a relatively low hardness of 50 mg/L is assumed, based on the measured specific conductivities and low concentrations of other indicator parameters, the SWQS for zinc is 0.052 mg/L.

Levels of COD (108 mg/l) and zinc (2.1 mg/l) were previously reported in a lower spring sample collected at the Eatonville Landfill by Ecology in 1976. The highest levels of COD and zinc (23 mg/l and 0.490 mg/L) measured in the seep samples collected during this present investigation were substantially lower than the 1976 concentrations.

The concentrations of leachate indicator parameters in the downstream spring sample (SPRING-2) were similar to concentrations measured in the upstream spring sample (SPRING-1).

Table 2. Surface water quality data, Eatonville Landfill, July 1, 1996.

SAMPLE NUMBER:			SEEP-1	SEEP-2	SPRING-1	SPRING-2	WET-1	WET-2
PARAMETERS	UNITS	SWQS						
FIELD								
pH	NA	6.5-8.5	7.93	7.67	7.17	7.54	6.98	7.15
Specific Conductivity	µmhos/cm		144.1	100.8	71.3	98.4	76.3	79.20
Temperature (C)	DegC		11.3	11.3	11.8	13.3	14.8	14.20
CONVENTIONALS								
pH	NA	6.5-8.5	7.3	7.2	6.4	7.6	7.3	7.5
Specific Conductivity	µmhos/cm		96	87	78	77	78	78
COD	mg/L		23	< 5 U	< 5 U	< 5 U	12	15
N-Ammonia	mg/L	*	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
Chloride	mg/L		2.7	2.4	2.2	2.2	2.2	2.2
Sulfate	mg/L		9	6	4	4	5	5
METALS (total)								
Iron	mg/L		0.690	< 0.05 U	< 0.05 U	0.060	0.290	0.230
Manganese	mg/L		0.038	< 0.005 U	< 0.005 U	< 0.005 U	0.010	0.007
Zinc	mg/L	*0.052	0.490	0.090	< 0.010 U	0.010	0.040	0.040

* = Hardness dependent; SWQS for zinc calculated assuming a hardness of 50 mg/L (173-201A WAC)

U = Compound undetected at the specified detection limit

123 Does not meet criteria

NA = Not applicable

Likewise, the concentrations of leachate indicator parameters in the downstream wetland sample (WET-2) were similar to concentrations measured in the upstream wetland sample (WET-1).

The data indicate no appreciable impacts from the landfill on the water quality in the wetland. Slightly elevated levels of iron, zinc, and COD measured in the central seep sample (SEEP-1) may be attributable to leachate-impacted groundwater. However, the levels are substantially lower than those measured in 1976.

2.3 GEOLOGY AND HYDROGEOLOGY

The geology and hydrogeology in the vicinity of the Eatonville Landfill are described in Walters and Kimmel (1968) and Schasse (1987). The landfill is situated on the north bluff of the Mashel River, which meanders within a valley approximately 1,000 feet across and 150 feet below the surrounding uplands. Unconsolidated Vashon glacial drift deposits of Quaternary age outcrop in upland areas on both sides of the river valley. The glacial drift consists of outwash sands and gravels, as exposed in the borrow area approximately 300 feet north of the landfill.

Unconsolidated fluvial and lacustrine deposits of the Tertiary-age Mashel Formation are exposed on the steep slopes of the Mashel River valley and underlie the landfill. Based on a measured section of the Mashel Formation, which occurs approximately ¼ mile from the landfill (center of Section 20, T16N R4E), the landfill is situated primarily over the upper part of the Mashel formation. The upper part of the formation is composed mostly of clay, sand, and lignite.

Groundwater recharge occurs when precipitation percolates through coarse-grained surficial materials into underlying aquifers. Regionally, deeper groundwater flow is northwestward toward Puget Sound or the Nisqually River (Sceva et al. 1955). In shallow aquifers, however, local flow direction is typically controlled by topography and local drainage basins. Considering the local topography, shallow groundwater in the landfill area would be expected to flow toward the southwest in the direction of the Mashel River.

The occurrence of low-permeability materials within the Mashel Formation may perch groundwater and influence local groundwater occurrence. The spring water discharging near the landfill likely originates from infiltration through glacial outwash in the upland areas north of the landfill. The groundwater moves through coarser-grained units of the Mashel Formation and discharges as springs where lower-permeability units outcrop along the bluff above the river.

2.4 BENEFICIAL GROUNDWATER USE

To evaluate whether the landfill could have potentially impacted beneficial uses of groundwater, well logs on file for water wells within approximately 1 mile of the landfill were obtained from Ecology. Information for these wells is provided in Table 3.

Table 3. Information for water wells within 1 mile of the Eatonville Landfill.

	Well Number	Owner	Well Depth (ft)	Water Level (ft BGS)	Use	Completion Date	Approximate Distance and Direction from Landfill
*	T16N/R4W-16N1	A. Ludwig	29	20	Domestic	10/20/54	2,000 ft NE
*	T16N/R4W-16N2	A. Ludwig	37	32	Domestic	07/19/60	2,000 ft NE
	T16N/R4W-16P1	D. Boston	130	93	Domestic	08/17/94	3,000 ft NE
	T16N/R4W-17L1	J. Dolman	153	100	Domestic	09/18/79	4,000 ft NW
	T16N/R4W-17M1	R. Pruitt	79	38	Domestic	12/20/91	5,000 ft NW
	T16N/R4W-17N1	D. Wallower	66	10	Domestic	09/30/76	4,000 ft NW
*	T16N/R4W-20A1	F. Milward	101	49	Domestic	01/24/92	1,000 ft N
	T16N/R4W-20F1	F. McMann	236	179	Domestic	07/27/93	3,000 ft W
	T16N/R4W-20F2	M. Miller	173	70	Domestic	05/26/94	3,000 ft W
*	T16N/R4W-21C1	I. Swanson	202	106	Domestic	08/07/70	2,500 ft NE
	T16N/R4W-21H1	H. Highman	30	9	Domestic	09/30/93	4,500 ft E
	T16N/R4W-21H2	T. Wagner	146	96	Domestic	04/01/96	4,500 ft E
	T16N/R4W-21J1	A. Baskett	40	4	Domestic	01/02/79	5,000 ft E
*	T16N/R4W-21M1	M. Hammond	67	20	Domestic	10/11/84	2,000 ft SE

Source: Department of Ecology, Southwest Region files
Walters and Kimmel 1968.
* Located within 1/2 mile of landfill.
BGS = below ground surface.

A total of 14 domestic water supply wells are located within approximately 1 mile of the landfill, with five wells located within one-half mile of the landfill. Of the five wells located within one-half mile of the site, four are located in an upgradient direction and one is on the opposite side of the Mashel River. There appears to be no likelihood the landfill has impacted these groundwater supplies.

2.5 ADJACENT WETLAND/SHORELINE BOUNDARY

The area at the foot of the landfill is a natural wetland that is dominated by giant horsetail. Approximately 75 to 100 feet from the toe of the slope the wetland is forested and dominated by second-growth red alder. Scattered individuals of western red cedar, western hemlock, and big-leaf maple are also present. A shrub understory is comprised of vine maple, salmonberry, Indian plum, and devil's club. A herbaceous ground cover includes false lily-of-the-valley, skunk cabbage, water parsley, waterleaf, lady fern, and horsetail.

The soils within the wetland are a dark organic muck overlying a gravelly substrate. Stream channels and pools of standing water (1-12 inches deep during field investigations on July 1, 1996) are prevalent throughout the wetland and receive water from several seeps and springs that discharge near the base of the upland slopes. The wetland extends west and is connected to the Mashel River.

2.6 WILDLIFE HABITAT

The forested wetland at the base of the Eatonville Landfill meets the criteria for priority riparian habitat (Washington Department of Fish and Wildlife, 1996). The riparian area includes the entirety of wetland areas that are directly connected to stream courses. Riparian areas are considered important fish and wildlife breeding habitat, wildlife movement corridors, and seasonal wildlife range.

Elk and mule deer winter range is identified by the Washington Department of Fish and Wildlife as occurring downstream of the study area (elk use of the area was evident during field investigations). Other wildlife species observed or detected include: black bear, black-tailed deer, osprey, spruce grouse, pileated woodpecker, western tanager, and western flycatcher.

Important habitat features present at the site include very dense snags within the forested wetland. Snags are important for cavity-nesting species, and the proximity to open water increases their value to raptors.

2.7 METHANE EMISSIONS

TPCHD conducts annual methane monitoring of the landfill surface; only trace amounts of methane emissions are detectable at the site (0-780 parts-per-million). The reported low concentrations of methane gas can easily be attributed to degradation of native vegetation and wildlife. This indicates that most organic waste materials disposed at the site are fully decomposed and are not contributing significant quantities of methane or other landfill gases.

3. DISCUSSION AND EVALUATION OF CORRECTIVE ACTION ALTERNATIVES

The selected corrective action for the Eatonville Landfill must significantly reduce or eliminate the potential for adverse environmental impacts at the site, in a way that is aesthetically compatible with the surroundings. Each alternative considers the results of the site investigations and potential impacts. In order to objectively evaluate the technical feasibility of each alternative, the following criteria have been addressed:

- Reduces potential environmental impacts.
- Reduces potential health and safety risks.
- Reduces potential impacts to the adjacent wetlands.
- Creates an aesthetically compatible site.
- Creates a site that is cost effective to build and maintain.

Groundwater that emerges as a seep from the steep slope of the terrain is evaluated as part of the surface water control issue. The low methane concentrations at the landfill surface are not significant impacts to consider. Because rigorous permit approvals and substantial resources are needed for any wetland mitigation project, the evaluations concentrate on the impacts each corrective action has on the adjacent wetland.

The costs presented in this report are for construction costs only, which assumes a third party contractor performs the work. These costs are "predesign" budgetary estimates; actual cost can be expected to be within +30% to -15% of the estimated cost. The costs are based on very rough information that is incomplete and requires some assumptions about how the work is accomplished.

Based on all the site investigation results, and review of all the information available, four corrective action alternatives are presented for consideration.

3.1 ALTERNATIVE 1 - EXTEND FOOTPRINT, REGRADE DOWNSLOPE (2H:1V) AND PLACE FINAL COVER

3.1.1 Description

This alternative includes a vehicle gate and perimeter security fence placed along the upper edge of the site. No trespassing/ no dumping signs are also included.

The site would be graded and compacted to uniform slopes (approximately 2H:1V), working the material down the toe of the slope. This grading approach results in extending the landfill footprint approximately 40 feet beyond the existing limits, thereby impacting the adjacent wetland. A typical cross-section for the Alternative 1 Grading Plan is presented on Figure 5.

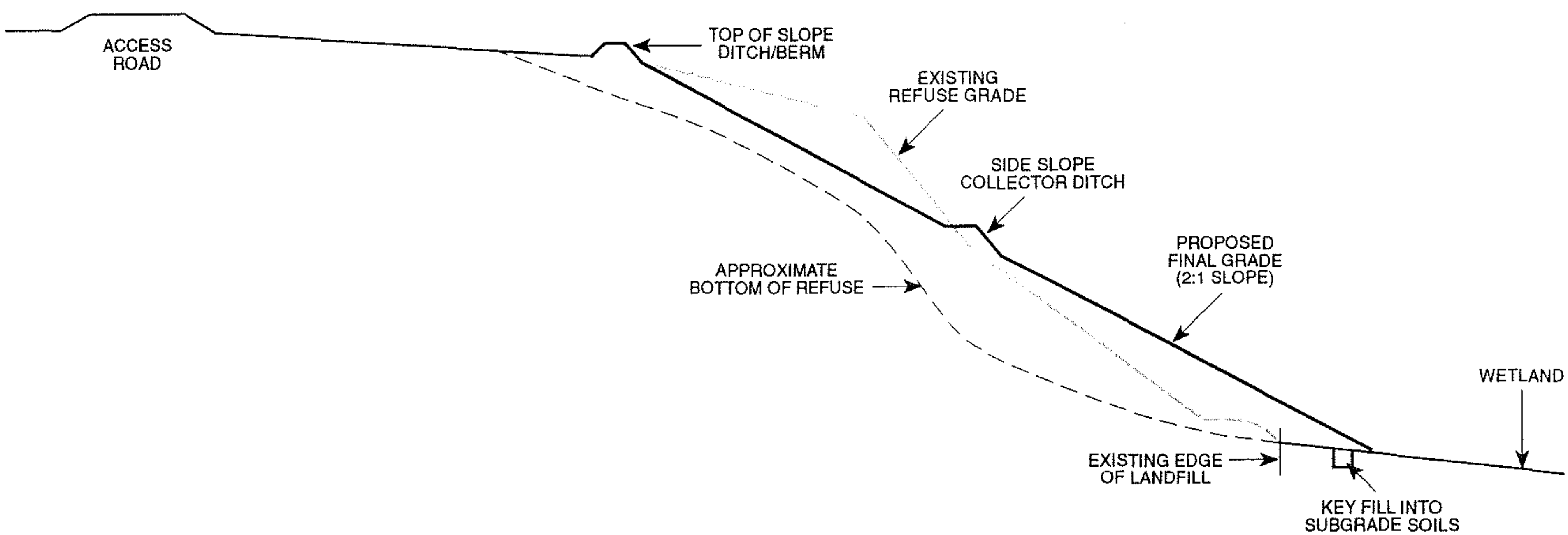


Figure 5.
Alternative 1
Cross-Sectional Grading Plan

NOT TO SCALE

To consolidate the refuse, large-sized debris that have fallen outside the footprint would be retrieved, with minimum disturbance to the surroundings, and placed with the other refuse. Other bulky items within the footprint would be compacted or relocated to achieve the desired grade. The toe of the 2H:1V slope would be keyed into native soils to provide additional stability. Drain rock from the gravel pit would be placed at the toe to prevent a point source of surface water from developing.

A minimum of 2 feet of cover soil would be placed over the entire landfill. The material would be obtained from the nearby gravel borrow pit. The top six inches of cover soil would be placed to support the new vegetation.

The west edge of the landfill would be graded to divert the emerging spring away from the landfill. A side slope collector ditch would be installed to intercept surface water near the midpoint of the slope and prevent erosion. The landfill surface and side slope collector ditch would be graded to route all water toward the spring and drain into the adjacent wetland. The new surface water controls would be armored as necessary to prevent erosion.

The new final cover would be vegetated with appropriate native species that are compatible with the surroundings. The vegetation would improve slope stability and would be aesthetically appealing.

3.1.2 Technical Evaluation

This alternative addresses all corrective action objectives. However, by regrading down the slope, the landfill footprint could be extended up to 40 feet beyond the existing boundary. This results in impacting up to one-half acre of the adjacent wetland.

Extending the landfill footprint into the wetland will require an individual 404 permit. Obtaining the permit will require a wetland delineation report, U.S. Army Corps of Engineers review, and other agency review. A compensatory mitigation plan will have to be prepared to compensate for wetland loss. While this alternative stabilizes the refuse and improves the wildlife habitat on the face of the landfill, the wetland impacts associated with increasing the landfill footprint prevent this alternative from meeting the wetland protection criteria.

Regrading the slope and placing cover soil would also reduce the physical hazards. The discovery of hazardous or dangerous wastes in the refuse is possible during excavation and grading of the site. Special handling procedures would need to be developed in the event hazardous or dangerous wastes are discovered.

The surface water controls and revegetation would reduce the adverse environmental impacts by minimizing the amount of landfill leachate entering the wetland. Aesthetics and wildlife habitat would be greatly improved by the revegetation effort.

3.1.3 Economic Analysis

The estimated cost of the Alternative 1 corrective action is presented in Table 4 with the assumptions made included as footnotes to the table. A health and safety program is required as a line item to perform this alternative because the work is done within the limits of refuse. The quantity of some items have been increased to reflect the increase in affected area from the original 2.25 acre footprint area to a 2.75 acre footprint area as a result of regrading down the slope. The compensatory wetland mitigation was added to account for the anticipated extra work that could be required for permit approval.

Obtaining permit approval for filling in one-half acre of wetland at the base of the landfill would be a lengthy process. These matters are negotiated with regulators on a case-by-case basis and cannot be reasonably estimated without more detailed evaluations from the appropriate agencies. The cost of resources needed to oversee the permitting process, along with the cost of delaying the corrective action, would appreciably increase the total project cost.

3.2 ALTERNATIVE 2 - MAINTAIN FOOTPRINT, REGRADE UPSLOPE (2H:1V) AND PLACE FINAL COVER

3.2.1 Description

This alternative is similar to Alternative 1, with the exception that grading would move the refuse material up the slope, thereby maintaining the existing landfill footprint. The uniform slope is again approximately 2H:1V with a typical cross-section of the Alternative 2 Grading Plan presented on Figure 6.

Additional effort would be required to work some of the refuse material upslope, but with the significant benefit of not impacting the adjacent wetland. It is expected that during the compaction and regrading process, significant consolidation of refuse will be realized. As a result, only 10% of the refuse may need to be worked upslope. Final grades may be less than a 2H:1V slope with the extent of the landfill footprint reduced. This avoids the complicated regulatory approval process of a potential wetland mitigation project.

To consolidate the refuse, large-sized debris that have fallen outside the footprint would be retrieved, with minimum disturbance to the surroundings, and placed with the other refuse. Other bulky items within the footprint would be compacted or relocated to achieve the desired

Table 4. Alternative 1 Cost Analysis - extend footprint, regrade downslope and place final cover.

Items		Quantity	Unit	Unit Price ($)	Total ($)
1	Health and Safety	1	LS	5,000	5,000
2	Access Gate	1	LS	1,500	1,500
3	Signs	1	LS	200	200
4	Perimeter Fence	400	LF	30	12,000
5	Refuse Excavation and Placement	3,450	CY	15	51,750
6	Compact and Regrade Refuse (Downslope 2H:1V)	2.75	AC	6,000	16,500
7	Cover Soil	8,900	CY	5	44,500
8	Surface Water Controls	600	LF	20	12,000
9	Revegetation	2.75	AC	2,900	7,980
10	Compensatory Wetland Mitigation	1	AC	70,000	70,000
					221,430
	Mobilization and General Requirements	10%			22,140
	Construction Contingency	15%			33,210
	Design and Construction Engineering	12%			26,570
11	Post-Closure O & M (annual)				4,000
	Sales Tax	8%			17,710
	TOTAL - ALTERNATIVE 1				**325,060**

Notes:

1. Health and Safety Plan/Site Monitoring required for work within limits of refuse.
2. Typical Weyerhaeuser swing gate, entire width of access road.
3. Four each, No Trespassing/No Dumping Signs.
4. 6-foot access control fence around top boundary.
5. Assumes 15% of refuse material must be relocated to achieve grade.
6. Original 2.25 acre landfill area plus 0.5-acre extended footprint at base of slope.
7. 2-foot depth for entire 2.75 acres. Material from nearby gravel borrow pit.
8. 300-foot interceptor ditch at midpoint of slope and 300 foot spring diversion ditch along west edge.
9. Includes Hydroseeding ($1,500/acre), trees 15 ft on center ($350/acre), and labor @ 3x plant costs ($1,050/acre).
10. Includes Compensatory Mitigation Plan ($20,000) and additional mitigation improvements to 1 acre of adjacent wetland.
11. Includes semiannual surface water monitoring at two locations, including analysis and an annual site inspection. Increase by inflation rate for future costs.

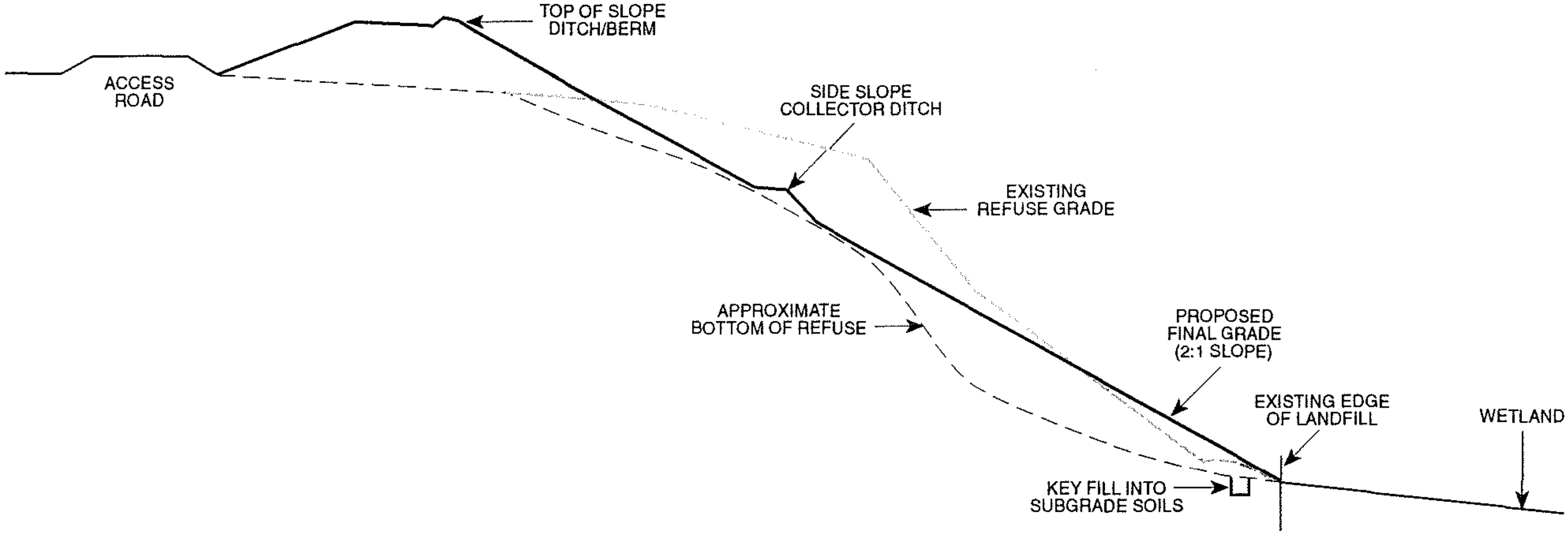


Figure 6.
Alternative 2
Cross-Sectional Grading Plan

NOT TO SCALE

grade. The toe of the 2H:1V slope would be keyed into native soils to provide additional stability. Drain rock from the gravel pit would be placed at the toe to prevent a point source of surface water from developing.

A minimum of 2 feet of cover soil would be placed over the entire landfill. The material would be obtained from the nearby gravel borrow pit. The top six inches of cover soil would be placed to support the new vegetation.

The west edge of the landfill would be graded to divert the emerging spring away from the landfill. A side slope collector ditch would be installed to intercept surface water near the midpoint of the slope and prevent erosion. The landfill surface and side slope collector ditch would be graded to route all water toward the spring and drain into the adjacent wetland. The new surface water controls would be armored as necessary to prevent erosion.

The new final cover would be vegetated with appropriate native species that are compatible with the surroundings. The vegetation would improve slope stability and would be aesthetically appealing.

Compensatory wetland mitigation would not be required because the landfill would be closed within the existing landfill footprint with only beneficial impacts to the adjacent wetland. Some wetland restoration could be required in isolated spots where large debris has been removed at the base of the landfill and to mitigate temporary construction-related impacts.

3.2.2 Technical Evaluation

This alternative addresses all corrective action objectives. In contrast to Alternative 1, this approach does not require waste disposal outside the existing landfill footprint, thereby avoiding impacts to the adjacent wetland and associated regulatory requirements.

This alternative would stabilize the landfill slope and minimize the likelihood of future slope failure impacts to the wetland. The surface water controls and revegetation would minimize the amount of landfill leachate entering the wetland.

Regrading the slope and placing cover soil would also reduce the physical hazards. The discovery of hazardous or dangerous wastes in the refuse is possible during excavation and grading of the site. Special handling procedures would need to be developed in the event hazardous or dangerous wastes are discovered.

The vegetation on the slope would decrease the habitat fragmentation across the entire slope, improving habitat quality. Aesthetics would also be greatly improved by the revegetation effort.

3.2.3 Economic Evaluation

The estimated cost of the Alternative 2 corrective action is presented in Table 5 with the assumptions made included as footnotes to the table. A health and safety program is required as a line item to perform this alternative because the work is done within the limits of refuse.

Table 5. Alternative 2 Cost Analysis - maintain footprint, regrade upslope and place final cover.

Items		Quantity	Unit	Unit Price ($)	Total ($)
1	Health and Safety	1	LS	5,000	5,000
2	Access Gate	1	LS	1,500	1,500
3	Signs	1	LS	200	200
4	Perimeter Fence	400	LF	30	12,000
5	Refuse Excavation and Placement	2,300	CY	15	34,500
6	Compact and Regrade Refuse (Upslope 2H:1V)	2.25	AC	9,000	20,250
7	Cover Soil	7,300	CY	5	36,500
8	Surface Water Controls	600	LF	20	12,000
9	Revegetation	2.25	AC	2,900	6,530
					128,480
	Mobilization and General Requirements	10%			12,850
	Construction Contingency	15%			19,270
	Design and Construction Engineering	12%			15,420
10	Post-Closure O & M (annual)				4,000
	Sales Tax	8%			10,280
	TOTAL - ALTERNATIVE 2				**190,300**

Notes:

1 Health and Safety Plan/Site Monitoring required for work within limits of refuse.
2 Typical Weyerhaeuser swing gate, entire width of access road.
3 Four each, No Trespassing/No Dumping Signs.
4 -foot access control fence around top boundary.
5 Assumes 10% of refuse material must be relocated to achieve grade.
6 Original 2.25 acre landfill area only.
7 2-foot depth for entire 2.25 acres. Material from nearby gravel borrow pit.
8 300-foot interceptor ditch at midpoint of slope and 300-foot spring diversion ditch along west edge.
9 Includes Hydroseeding ($1,500/acre), trees 15 ft on center ($350/acre), and labor @ 3x plant costs ($1,050).
10 Includes semiannual surface water monitoring at two locations, including analysis and an annual site inspection. Increase by inflation rate for future costs.

3.3 ALTERNATIVE 3 - MAINTAIN FOOTPRINT, REGRADE SLOPE (MAXIMUM 1.75H:1V) AND PLACE FINAL COVER

3.3.1 Description

This alternative is a modification of Alternative 2, with the landfill surface graded to a non-uniform slope, which may be as steep as 1.75H:1V in localized areas, as opposed to a uniform 2H:1V slope. The existing landfill footprint would be maintained with a typical cross-section of the Alternative 3 Grading Plan presented on Figure 7.

Significant consolidation of refuse is expected during the compaction and grading process. The localized 1.75H:1V slopes avoid the additional effort required to work refuse material upslope (see Alternative 2), without impacting the adjacent wetland. The slope would be stabilized by focusing grading efforts on areas of the landfill where abrupt non-uniform slope conditions exist. Final grades may be less than a 1.75H:1V slope, particularly along the existing footprint boundary. This avoids the complicated regulatory approval process of a potential wetland mitigation project.

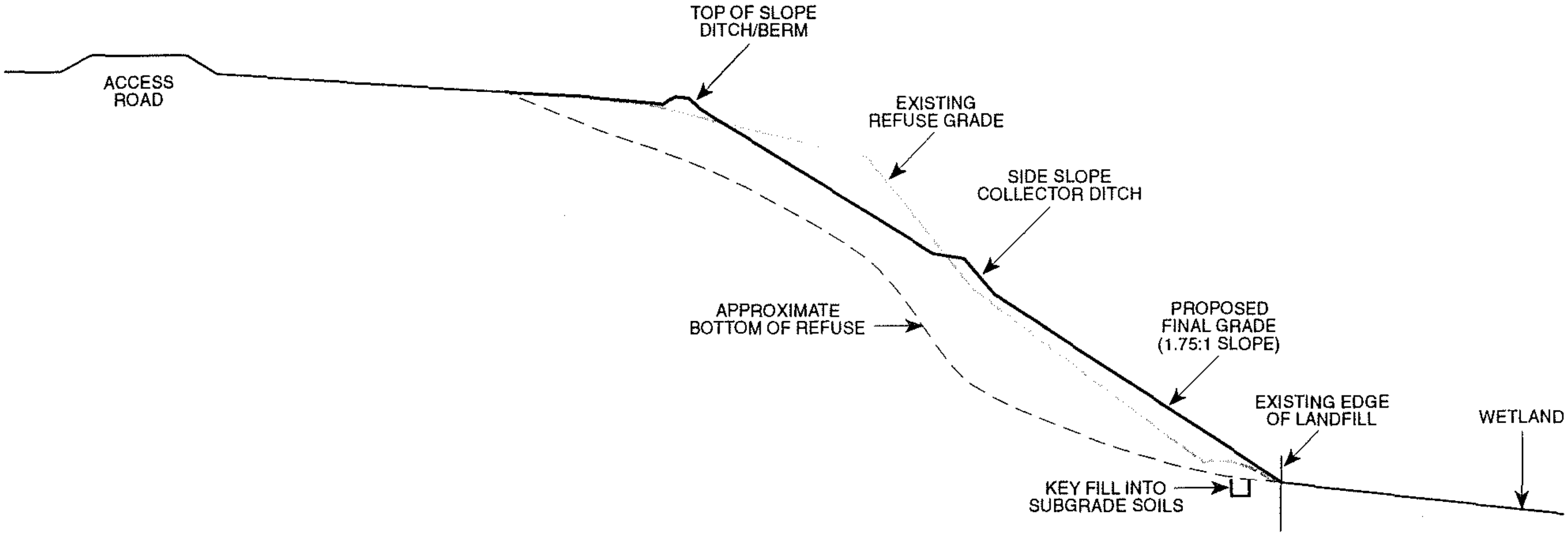
To consolidate the refuse, large-sized debris that have fallen outside the footprint would be retrieved, with minimum disturbance to the surroundings, and placed with the other refuse. Other bulky items within the footprint would be compacted or relocated to achieve the desired grade. The toe of the slope would be keyed into native soils to provide additional stability. Drain rock from the gravel pit would be placed at the toe to prevent a point source of surface water from developing.

A minimum of 2 feet of cover soil would be placed over the entire landfill. The material would be obtained from the nearby gravel borrow pit. The top six inches of cover soil would be placed to support the new vegetation.

The west edge of the landfill would be graded to divert the emerging spring away from the landfill. A side slope collector ditch would be installed to intercept surface water near the midpoint of the slope and prevent erosion. The increased 1.75H:1V slope may require an additional interceptor ditch to ensure slope stability. The landfill surface and side slope collector ditches would be graded to route all water toward the spring and drain into the adjacent wetland. The new surface water controls would be armored as necessary to prevent erosion.

The new final cover would be vegetated with appropriate native species that are compatible with the surroundings. The vegetation and would be aesthetically appealing and improve stability.

Compensatory wetland mitigation would not be required because the landfill would be closed within the existing landfill footprint with only beneficial impacts to the adjacent wetland. Some wetland restoration could be required in isolated spots where large debris has been removed at the base of the landfill and to mitigate temporary construction-related impacts.



NOT TO SCALE

Figure 7.
Alternative 3
Cross-Sectional Grading Plan

3.3.2 Technical Evaluation

This alternative addresses all corrective action objectives. This approach does not require any waste disposal outside the existing landfill footprint. Impacts to the adjacent wetland and associated regulatory requirements are avoided.

Based on the existing site conditions and surrounding grades, a stable non-uniform slope with grades up to 1.75H:1V slope could be achieved at the landfill. Refuse compaction and revegetation efforts would stabilize the landfill slope and minimize the likelihood of future slope failure impacts to the wetland. The surface water controls and revegetation would reduce the adverse environmental impacts by minimizing the amount of landfill leachate entering the wetland.

Regrading the slope and placing cover soil would reduce the physical hazards. The minimum grading approach of this alternative would also reduce the potential exposure to hazardous or dangerous wastes in the refuse. However, special handling procedures would need to be developed in the event hazardous or dangerous wastes are discovered.

The vegetation on the slope would decrease the habitat fragmentation across the entire slope, improving habitat quality. Aesthetics would also be greatly improved by the revegetation effort.

3.3.3 Economic Evaluation

The estimated cost of the Alternative 3 corrective action is presented in Table 6 with the assumptions made included as footnotes to the table. A health and safety program is required as a line item to perform this alternative because the work is done within the limits of refuse.

3.4 ALTERNATIVE 4 - LANDFILL MINING

3.4.1 Description

Landfill mining would require removing all deposited refuse and hauling the material to an approved waste disposal facility. Refuse would be excavated to the full depth of refuse, exposing the native soil subgrade. Where native soil grade is not apparent, field testing would be performed to determine the proper extent of refuse excavation. Scattered debris outside the footprint also would be collected, in a manner that least impacts the surroundings.

The exposed surface would be regraded to match the surrounding terrain. Surface water controls would be implemented, according to the condition of the new slope and the discovery of additional emerging springs or other features. Two collector ditches would be installed to prevent slope erosion and ensure surface water is diverted toward the adjacent wetland.

Table 6. Alternative 3 Cost Analysis - maintain footprint, regrade upslope and place final cover.

Items		Quantity	Unit	Unit Price ($)	Total ($)
1	Health and Safety	1	LS	5,000	5,000
2	Access Gate	1	LS	1,500	1,500
3	Signs	1	LS	200	200
4	Perimeter Fence	400	LF	30	12,000
5	Compact and Regrade Refuse	2.25	AC	7,500	16,900
6	Cover Soil	7,300	CY	5	36,500
7	Surface Water Controls	750	LF	20	15,000
8	Revegetation	2.25	AC	2,900	6,500
					93,610
	Mobilization and General Requirements	10%			9,360
	Construction Contingency	15%			14,040
	Design and Construction Engineering	12%			11,230
9	Post-Closure O & M (annual)				4,000
	Sales Tax	8%			7,490
	TOTAL - ALTERNATIVE 3				**139,730**

Notes:

1. Health and Safety Plan/Site Monitoring required for work within limits of refuse.
2. Typical Weyerhaeuser swing gate, entire width of access road.
3. Four each, No Trespassing/No Dumping Signs.
4. 6-foot access control fence around top boundary.
5. Original 2.25 acre landfill area only.
6. 2-foot depth for entire 2.25 acres. Material from nearby gravel borrow pit.
7. 450 feet of interceptor ditches across the slope and 300-foot spring diversion ditch along west edge.
8. Includes hydroseeding ($1,500/acre), trees 15 ft on center ($350/acre), and labor @ 3x plant costs ($1,050).
9. Includes semiannual surface water monitoring at two locations, including analysis and an annual site inspection. Increase by inflation rate for future costs.

A minimum of six inches of material would be placed on the slope surface to support the revegetation. The area would be vegetated with appropriate native species that are compatible with the surroundings.

3.4.2 Technical Evaluation

This alternative addresses all corrective action objectives. The approach does not require any grading outside the existing landfill footprint, thereby avoiding impacts to the adjacent wetland and associated regulatory requirements.

The graded slope of native soil would improve stability and reduce physical hazards. The vegetation would also improve slope stability. Alternative 4 would eliminate the likelihood of landfill slope failure into the wetland.

The alternative eliminates the potential for wetland impacts caused by surface waters discharging out of waste material. The surface water controls would also mitigate erosion impacts.

The vegetation on the slope would decrease the habitat fragmentation across the entire slope, improving habitat quality. Aesthetics would also be greatly improved by the revegetation effort.

The revealed condition of the slope and native material may warrant expanded slope stability measures beyond those described in this report.

3.4.3 Economic Analysis

The estimated cost of the Alternative 4 corrective action is presented in Table 7 with the assumptions made included as footnotes to the table. A health and safety program is required as a line item to perform this alternative because the work is done within the limits of refuse.

Table 7. Alternative 4 Cost Analysis - landfill mining.

Items		Quantity	Unit	Unit Price ($)	Total ($)
1	Health and Safety	1	LS	10,000	10,000
2	Access Gate	1	LS	1,500	1,500
3	Signs	1	LS	200	200
4	Perimeter Fence	400	LF	30	12,000
5	Refuse Excavation	23,000	CY	15	345,000
6	Refuse Disposal	11,500	TN	40	460,000
7	Vegetation Soil	1,800	CY	6	10,800
8	Surface Water Controls	600	LF	20	12,000
9	Revegetation	2.25	AC	2,900	6,520
					858,020
	Mobilization and General Requirements	10%			85,800
	Construction Contingency	15%			128,700
	Engineering Design	12%			102,960
10	Post-Closure O & M (annual)				4,000
	Sales Tax	8%			68,640
	TOTAL - ALTERNATIVE 4				**1,248,120**

Notes:

1 Health and Safety Plan/Site Monitoring required for entire landfill mining work.
2 Typical Weyerhaeuser swing gate, entire width of access road.
3 Four each, No Trespassing/No Dumping Signs.
4 4-foot access control fence around top boundary.
5 Quantity based on Weyerhaeuser site survey (10/18/94).
6 1,000 lb/cy density. Actual refuse density may vary depending on metal salvage efforts.
7 6-inch depth for entire 2.25 acres. Material imported from offsite.
8 300-foot interceptor ditch at midpoint of slope and 300-foot spring diversion ditch along west edge.
9 Includes Hydroseeding ($1,500/acre), trees 15 ft on center ($350/acre), and labor @ 3x plant costs ($1,050/acre).
10 Includes semiannual surface water monitoring at two locations, including analysis and an annual site inspection. Increase by inflation rate for future costs.

4. RECOMMENDATIONS

4.1 RECOMMENDED CORRECTIVE ACTION

Based on the information presented in this report, Parametrix recommends the Eatonville Landfill Corrective Action be performed as described in Alternative 3 - Maintain Footprint, Regrade Slope (maximum 1.75H:1V) and Place Final Cover. This alternative is the most cost-effective approach that satisfies the evaluation criteria and meets all project objectives. Because the existing refuse is relatively unconsolidated, significant compaction of the material is expected to occur during the grading process. This will potentially result in a smaller landfill footprint at a slope less than 1.75H:1V.

The primary advantage to selecting this alternative over Alternative 1 is that all the work is performed within the limits of the landfill footprint. This allows the project to be completed with fewer permit requirements, and it avoids the extended costs of a wetland mitigation project. See below for detailed information on possible permit requirements of each alternative.

Alternative 2 addresses all of the corrective action objectives. The physical hazards are removed and slope stability is established. Surface water is effectively diverted away from the refuse, and native vegetation is re-established. However, the 2H:1V grading plan calls for relocating upslope approximately 10% of the refuse. Based on the existing slope stability and expected compaction of the unconsolidated refuse, the additional expense of relocating refuse is not warranted.

Alternative 4 also addresses all the corrective action objectives. However, this level of effort is not warranted by the analytical results and field observations of this investigation, and is very cost prohibitive.

4.2 PERMIT REQUIREMENTS

The range of possible permit requirements to perform corrective actions is presented below. The scope and magnitude of each permit depends on the selected alternative. The corrective action must consider the following permits:

- **Section 401 and 404 Individual Permits, Clean Water Act (CWA).**
  Placing fill into the wetland would likely require a Section 404 Individual Permit. A determination would be necessary that the wetland is adjacent to the Mashel River to confirm this result. Obtaining an Individual Permit requires complying with the **CWA, Section 404(b)(1)** guidelines. These guidelines require a demonstration that the proposed alternative generates the least adverse impact to the wetlands and the environment.

A Water Quality Certification (Section 401) is required for discharge into any surface waters of the state when a federal 404 Individual Permit is necessary. Section 401 is administered by the Washington State Department of Ecology (Ecology). A Joint Aquatic Resource Permits Application (JARPA) would include both the 404 and 401 permits.

- **Washington State Shoreline Permit (Chapter 90.58 RCW)**
  Ecology has jurisdiction over any proposed activity within 200 ft of the ordinary high water mark of a Shoreline of the State (the Mashel River). Although the landfill is not within 200 ft of the river, shoreline management jurisdiction is extended to include the entirety of a wetland that is contiguous with the Mashel River. The implementing agency for the Shoreline Management Act is Pierce County. The proposed action must comply with the **Pierce County Shoreline Master Program.**

  Under Title 20 (Shoreline Management Use Regulations), Section 20.44.020, Paragraph D, *Landfills are prohibited in marshes, bogs, and swamps except in committed industrial areas, having an adopted comprehensive plan and when there is a demonstrated public benefit as determined by the County and when no significant loss of habitat will result. In other water retention or groundwater recharge areas, the need for fill in such a site must be demonstrated by the applicant.*

  Section 20.68.020, Paragraph B, states that *Existing shoreline solid waste disposal and transfer facilities shall be expeditiously phased out and rehabilitated.*

- **Pierce County Wetland Management Regulations (ORD No. 91-128S3)**
  Pierce County Wetland Management Regulations provide guidelines to regulate activities within wetlands and wetland buffers. Under the Pierce County Wetland Rating System, the wetland adjacent to the Mashel River is a Category II wetland with a 100-ft buffer requirement.

  Any work performed in Category I or II wetlands or buffers will require a **Reasonable Use Exception** (Section 17.12.080, Paragraph D) that states *Regulated activities in Category I and II wetlands and/or buffers for Category I and II wetlands may be allowed if, <u>following a public hearing</u>,...the Hearing Examiner determines that the proposed action meets eight criteria: it causes minimal disturbance, is the best alternative, causes minimal alteration of wetland functions, allows minimal activity in the wetland, jeopardizes no endangered, threatened, or sensitive species or habitats, protects groundwater, complies with all applicable state and federal laws, and mitigates impacts.*

  No property damage or endangerment can occur, and no reasonable economic use of the property can be derived without the action. A Reasonable Use Exception may be difficult to obtain, and depends upon the County's interpretation of reasonable economic use. Section 17.12.090, Paragraph A, discusses mitigation and provides preferred alternatives that include impact avoidance, impact reduction, rehabilitation, and compensation. Compensatory mitigation is required for filling wetlands and requires a **Compensatory Mitigation Plan.**

Based on the procedures and permit requirements of the regulations mentioned above, any reasonable alternative that reduces wetland impacts to a minimum would be preferred over an alternative with greater wetland impacts. The cost of the protracted permitting process to obtain permits for a more impacting alternative may not be warranted.

- **Pierce County Grading Permit**
  A grading permit is required for any significant earth fill or grading operation. No special requirements are expected for a grading permit within the landfill footprint.

5. REFERENCES

Sceva, J.E., D.E. Wegner, et al. 1955. Records of Wells and Springs, Water Levels, and Quality of Ground Water in Central Pierce County, Washington. U.G. Geological Survey, Open-File Report.

Schasse, H.W. 1987. Geologic Map of the Centralia Quadrangle, Washington. Washington Division of Geology and Earth Resources, Open File Report 87-11.

Walters, K.L., and G.E. Kimmel. 1968. Ground-water Occurrence and Stratigraphy of Unconsolidated Deposits, Central Pierce County, Washington. Department of Water Resources, Water Supply Bulletin No. 22.

Washington Department of Fish and Wildlife (WDFW). 1996. Priority Habitats and Species List. Washington Department of Fish and Wildlife, Habitat Program. Olympia, Washington.

Weyerhaeuser. 1994. Site topographic and boundary survey, including estimated cut/fill quantities, Tacoma Washington.

APPENDIX A

WEYERHAEUSER ANALYTICAL LABORATORY REPORT

Weyerhaeuser

32901 Weyerhaeuser Way South
Federal Way, Washington 98003
Analytical Chemistry Laboratories
Tacoma, Washington 98477
Tel (206) 924 6872
Fax (206) 924 6654

July 18, 1996

Ms. Lisa Gilbert
Parametrix
5808 Lake Washington Blvd. NE
Kirkland, WA 98053

Dear Lisa:

Attached is a copy of our final report for the samples you requested we analyze for Eatonville Landfill (#21-1876-13(01)). These are from our service request number 01347. Invoicing for this work will be directly to Weyerhaeuser. If you have any questions concerning this report, please feel free to contact me at (206) 924-6242.

Thank you for using our laboratory for this analysis and we look forward to working with you on future projects.

Sincerely,

Dennis Catalano, Project Manager
Weyerhaeuser Analytical and Testing Services

Attachments

Weyerhaeuser

Analytical & Testing Services

Sample Analysis Request/Chain of Custody Form

Date 7-1-96

Page 1 of 1

Facility: Eatonville Landfill

Sampler's Project No.: 21-1876-13 (01)

Weyerhaeuser Account No.:

Project Manager (print): Pete Malsch

Sampled by: ☐ Facility ☐ E&AS/WTC ☐ E&AS/NB

Consultant: Parametrix, Inc.

Address: 5808 Lake Washington Blvd NE Kirkland WA 98053

Phone No. (206) 822-8880 FAX

Sampler Name (print): L. Gilbert

Recorded By (signed): L. Gilbert

Analyses Requested (circle or write in parameters): pH Cond TDS TSS Color Tannins; Volatile Organics / BTEX; Semi-volatile Organics; TPH: 418.1 TPH-G TPH-D; Ca Mg Na K Fe Mn Zn; Metals (list below); NH3 HCO3 CO3 Cl F NO3 SO4; AOX; TCLP: Metals VOA SVOA Pest Herb PCBs; Dioxin: Total / 2,3,7,8-TCDD / 2,3,7,8-TCDF; CN; BOD P-ortho; TKN P-total TOC COD

Method	Field Sample ID (15 characters max.)	Date (m/d/y)	Time (hh:mm)	Depth (ft / m)	Matrix	Preservative	Number of Containers	Analyses / Notes
	ELF SEEP 1	7-1-96	12:00		Water X	H_2SO_4, HNO_3, unpres.	3	
	ELF SEEP 2	↓	12:20		X	↓	3	
	ELF WET 1	↓	13:00		X	↓	3	
	ELF WET 2	↓	13:00		X	↓	3	
	ELF SPRING 1	↓	13:00		X	↓	3	→ used unpreserved metals bottle for PLN *
	ELF SPRING 2	↓	13:20		X	↓	3	**

Method: G, grab; D, depth composite; T, time composite. Depth required for soil or sediment samples.

☒ Samples on Ice or Blue Ice

Lab Turn-Around Time

☐ 24 Hr ☐ 48 Hr ☐ 7 Day ☒ 2-3 wk Date Due:

Reporting and QA/QC Requirements

RESULTS TO: Lisa Gilbert, Parametrix, Inc.

CC: Pete Malsch

☐ CLP Package ☐ NPDES Permit ☐ Other: ☐ Electronic Report

Remarks/Detection Limit Requirements

HNO3 added in field to metals bottles

* bottle time = 1:20
** bottle time = 1:00
and are correct per client 7/2/96 cr

Laboratory

☐ WATS/WTC ☐ WATS/NB ☐ Other:

Lab SR#:

Case ID:

SDG ID:

Sample Chain of Custody and Shipping Method Record

Relinquished By	Date	Time	Received By	Shipping Method
Relinquished By Sampler (signature): Lisa A. Gilbert	7-1-96	4:22	Received By (signature): [signature]	
Relinquished By (signature):	Date	Time	Received By (signature):	Airbill No.
Relinquished By (signature):	7-1-96	1630	Received For Laboratory By (signature): Bonnie Chappel; Samples Received Intact: yes	Cooler Temp: 6 °C

3307 Printing Services Tacoma

Service Request 01347

Weyerhaeuser Technology Center
Analytical Laboratories
Report

Eatonville Landfill
07/01/96

Sample Designation		Analytical Lab Code	pH	Spec. Cond. uS/cm	COD mg/L	NH_3-N mg/L	Cl mg/L	SO_4 mg/L
ELF Seep 1	1200	67401	7.3	96	23	< 0.05	2.7	9
ELF Seep 1	1200	67401D	-	97	24	< 0.05	2.5	9
ELF Seep 2	1220	67402	7.2	87	< 5	< 0.05	2.4	6
ELF Spring 1	1320	67403	6.4	78	< 5	< 0.05	2.2	4
ELF Spring 2	1300	67404	7.6	77	< 5	< 0.05	2.2	4
ELF Wet 1	1300	67405	7.3	78	12	< 0.05	2.2	5
ELF Wet 1	1300	67405D	7.3	-	-	-	-	-
ELF Wet 2	1300	67406	7.5	78	15	< 0.05	2.2	5

	pH	Spec. Cond.	COD	NH_3-N	Cl	SO_4
Date Analyzed :	07/01/96	07/02/96	07/17/96	07/12/96	07/16/96	07/16/96
QL:	-	-	5	0.05	0.2	2
Method used :	EPA 151.0	SM2510B	EPA 410.0	AM1-350.1	EPA425.1	EPA 375.4

H:\CONV\RANTA\01347.XLS

Approved Maxine Rantz Date 7/18/96

Service Request 01347

Weyerhaeuser Technology Center
Analytical Laboratories
Report

Eatonville Landfill

SPIKES

Compound	Matrix	Sample Designation	Lab Code	Units	Sample + Spike Value	Sample Value	Spike Added	% Recovery
NH_3-N	Water	ELF Seep 1	67401	mg/L	1.11	0.00	1.0	111
Cl	Water	ELF Seep 1	67401	mg/L	7.43	2.72	5.0	94

DUPLICATES

Compound	Matrix	Sample Designation	Lab Code	Units	Sample Value	Duplicate Value	RPD
pH	Water	ELF Wet 1	67405		7.33	7.33	0.0
Spec. Cond.	Water	ELF Seep 1	67401	uS/cm	96.4	96.5	0.1
COD	Water	ELF Seep 1	67401	mg/L	23.4	24.3	3.8
NH_3-N	Water	ELF Seep 1	67401	mg/L	< 0.05	< 0.05	NC
Cl	Water	ELF Seep 1	67401	mg/L	2.72	2.54	6.8
SO_4	Water	ELF Seep 1	67401	mg/L	8.8	8.8	0.0

CONTROL SAMPLES

Compound	Matrix	Source of LCS	Units	Measured Value	Known Value	% Recovery
Spec. Cond.	Water	Spex Min. 04/29/96	uS/cm	271	280	96.8
COD	Water	KHP 06/18/96	mg/L	481	500	96
NH_3-N	Water	HP591222	mg/L	79.5	77.7	102
Cl	Water	Dionex Lot 960401	mg/L	30.7	30.1	102
SO_4	Water	Spex Min. 05/15/96	mg/L	18.1	20.0	90.5

BLANKS

Compound	Matrix	Type of Blank	Units	Measured Value
NH_3-N	Water	Laboratory DI Water	mg/L	< 0.05
Cl	Water	Laboratory DI Water	mg/L	< 0.2
SO_4	Water	Laboratory DI Water	mg/L	< 2

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Approved Marine Rante Date 7/18/96

WEYERHAEUSER COMPANY
ANALYTICAL LABORATORIES
ATOMIC SPECTROSCOPY
Tacoma, WA

Eatonville Landfill Water Samples - Parametrix
SR 01347
Total Metals Analysis

Analytical Lab Code	Sample Designation			Fe	Mn (µg/L)	Zn
67401	ELF	Seep 1	07/01/96 1200	690	38	490
67402	ELF	Seep 2	07/01/96 1220	< 50	< 5	90
67403	ELF	Spring 1	07/01/96 1320	< 50	< 5	< 10
67404	ELF	Spring 2	07/01/96 1300	60	< 5	10
67405	ELF	Wet 1	07/01/96 1300	290	10	40
67406	ELF	Wet 2	07/01/96 1300	230	7	40
Method Blank				< 50	< 5	< 10
			Quantitation Limit:	**50**	**5**	**10**
			Method Number:	**AM1-3010/6010**	**AM1-3010/6010**	**AM1-3010/6010**

Approved Julie Perine

Report Date 07/16/96

WEYERHAEUSER COMPANY
ANALYTICAL LABORATORIES
ATOMIC SPECTROSCOPY
Tacoma, WA

Eatonville Landfill Water Samples - Parametrix
SR 01347
Total Metals Analysis

Duplicate Report

Element	Sample 67401 Found	Duplicate 67401 Found	RPD
	(µg/L)		
Fe	690	730	6
Mn	38	38	0
Zn	490	500	2

Spike Recovery Report

Element	Sample 67402 Found	Spike 67402 Found	Net Spike	Spike Level	% Recovery
		(µg/L)			
Fe	30.7	518	487	500	97
Mn	1.8	245	244	250	97
Zn	90.7	337	247	250	99

Water Laboratory Control Sample Report

Element	Sample Found	True Value	Lower Limit	Upper Limit	% Recovery
		(µg/L)			
Fe	1030	1000	922	1085	103
Mn	104	100	91	107	104
Zn	102	100	91	110	102

Approved Julie Reimer

Report Date 07/15/96