

University of Washington
Montlake Landfill Oversight Committee

Montlake Landfill Project Guide

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This document is maintained by the University of Washington Environmental Health and Safety Department with the review and approval of the Montlake Landfill Oversight Committee.

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I. Introduction

The Montlake Landfill, part of the University's East Campus, is a unique environment containing the Union Bay Natural Area, shorelines, wetlands and a riparian corridor. The area is currently used for vehicle parking, teaching and research, and bird watching. Sports facilities, a golf driving range, and a helipad also occupy the site. Boundaries of the East Campus area are delineated in the UW Seattle Campus Master Plan, dated January 2003. No changes are anticipated to these boundaries

This document identifies key issues and regulations applicable to the Montlake Landfill and immediate vicinity. It presents guidelines for maintenance and construction activities on the landfill area. It is based on the 1993 East Campus Maintenance Plan and supplements the Management Plan for the Union Bay Shoreline and Natural Area owned by the University of Washington as amended, which can be obtained from the Center for Urban Horticulture. In addition, it incorporates recommendations made by the Montlake Landfill Oversight Committee (MLOC) presented in the 1999 Montlake Landfill Information Summary.

History

The old Montlake Landfill, sometimes known as the Ravenna Landfill, was operated as a burn dump and eventually a landfill by the City of Seattle from about 1926 to 1966. Municipal solid waste, primarily consisting of residential wastes, was disposed in the landfill. Some limited amounts of industrial waste that could be considered hazardous were also disposed there.

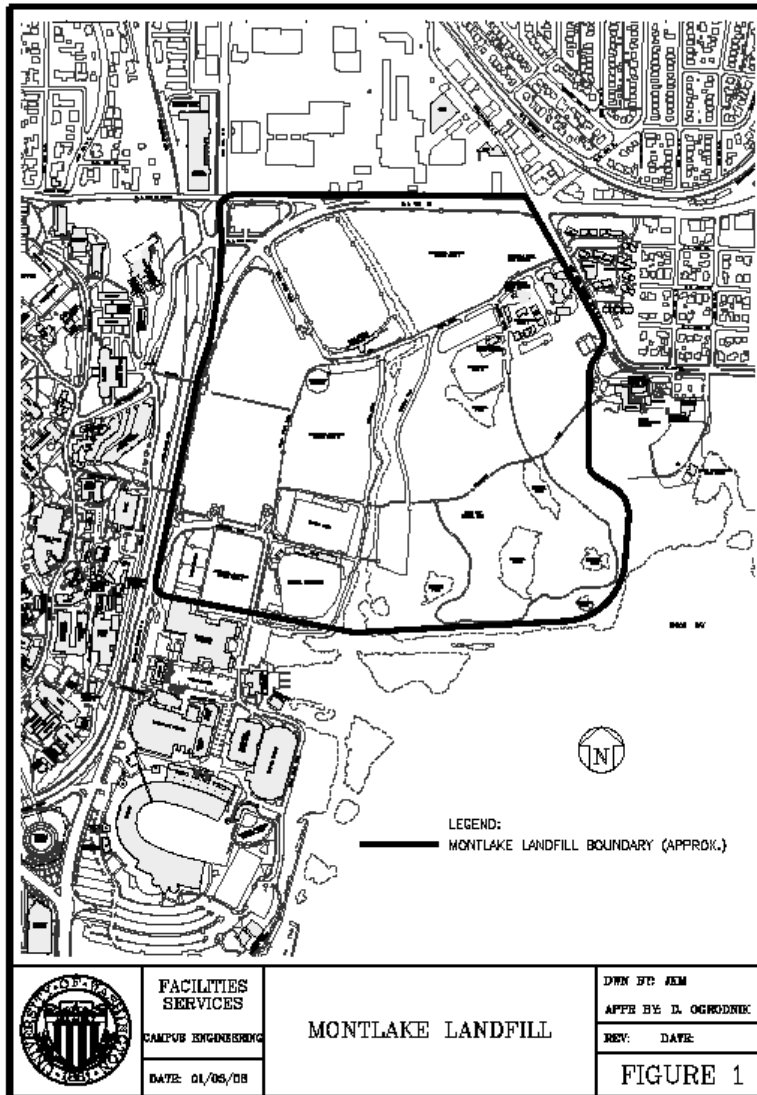
Figure 1 is a map of the Montlake Landfill area. The exact boundaries of the Montlake Landfill are not definitively known. However, available documentation suggests that the landfill is bounded by Montlake Boulevard NE to the west; NE 45th Street to the north; Laurel Village and the Douglas Research Conservatory to the east; and Canal Road, the Intramural Activities Building, and Union Bay to the south.

The landfill was closed in 1971 following the landfill standards in place at that time and was capped with approximately two feet of clean soil. Landscaped areas were to receive an additional six inches of topsoil. Based upon trenching, borings, and excavations on previous projects, the cap is less than two feet thick in some locations and solid waste may be directly under the asphalt in other locations. A protective 3-foot clean soil cap is currently required by the University.

The landfill consists of varying depths of fill, refuse and peat and has therefore experienced drainage problems due to differential settlement. Clean fill has been added and minor repair work done on the roads, parking areas and sports fields to maintain site usability.

Methane gas is produced in varying concentrations both from the large underlying peat deposit and from decomposing landfill debris.

Figure 1 – Approximate Boundaries of the Montlake Landfill



Oversight

In 1999, UW Executive Vice President Weldon Ihrig established the Montlake Landfill Oversight Committee (MLOC) to help ensure that “landfill issues are not forgotten and that appropriate use and protection of the site is ensured in perpetuity.” The MLOC meets each calendar quarter to assess current and proposed activities in and near the landfill area and evaluate new information and regulations associated with the landfill.

In 2000, the departments of Public Health - Seattle & King County (Public Health) and Ecology conducted a site hazard assessment of the Montlake Landfill. While their assessment did not allow the landfill to be taken off the list of hazardous sites, results indicated that if the Montlake Landfill were left *undisturbed*, the risk of adverse impacts to human health and the environment would be low, and they did not require any remedial cleanup of the existing landfill area. However, some maintenance, renovation, and construction activities could disturb the Montlake Landfill. Because of the compliance risks, EH&S

must be contacted at 206.616.0585 prior to any activities having the potential to penetrate the landfill cap.

Regulatory Requirements

Title 10 - King County Solid Waste Regulations, administered by Public Health - Seattle & King County, impact the UW's use of the Montlake Landfill area. Among other requirements, UW must provide adequate venting of gases generated by solid waste, prevent migration of methane, and protect enclosed structures from methane migration. The UW conducts quarterly methane gas monitoring and has developed a [Methane Action Plan](#) to implement methane mitigation measures whenever methane monitoring results consistently exceed regulatory actions levels.

The UW complies with other requirements by working closely with Public Health. The UW provides work plans, site plans, and specifications for all structures and major site improvements proposed on the footprint of the Montlake Landfill. Public Health reviews the submittals to determine if public health risks have been adequately addressed. After review, Public Health will provide comments, recommendations, and/or approval to the UW for the proposed structure or improvement project.

II. Project Planning

Construction and maintenance projects within the Montlake Landfill boundary usually have longer timelines and higher costs due to structure requirements and disposal costs. The UW Project Manager must plan ahead as much as possible to shorten timelines and minimize costs.

Project Managers and EH&S staff must coordinate closely whenever construction or excavation occurs on the landfill. EH&S reviews activities having the potential to penetrate the landfill cap and disturb landfill debris. EH&S will determine and arrange for proper disposal of excavated materials based upon sampling performed by the environmental consultant. EH&S will also provide hazardous waste manifests if contaminants are detected above regulatory limits.

The following are general landfill project planning recommendations based on experience with previous projects:

- Investigate all available records for information on the specific location and landfill materials placed in that vicinity. Municipal solid waste (MSW) was disposed of in the landfill and includes waste that could be regulated dangerous waste. The area of the landfill is generally known, but the boundaries are not entirely clear. The Facilities Records Office has aerial photographs of the landfill that may help locate the extent and age of the landfill material.
- If a site is more contaminated than assumed, consider alternative designs or methods.
- Keep maintenance activities that generate landfill waste to a minimum. Certain maintenance activities such as fence pole installations and utility line repairs may be shallow enough to avoid landfill debris. Nonetheless, soils removed must be evaluated prior to disposal or reuse on site.
- EH&S provides regulatory and technical assistance, and in most cases, is the liaison to regulatory agencies for the UW. However, the project manager may need to acquire the services of consultants to assist in environmental planning, design, and the collection of environmental samples.

III. Environmental Requirements and MLOC Guidelines

UW administrative policy (Administrative Policy Statement 11.3 Pollution Control) requires the UW to comply with all applicable environmental regulations. In addition, requirements and guidelines for the UW landfill in this document and the *Methane Action Plan*, both available on the EH&S Web site, must be followed.

Brief descriptions of environmental issues as they relate to the landfill and applicable regulations are listed below. The applicability of these regulations to a particular activity depends on project scope. Applicability should be determined in advance as opposed to after the fact.

A. Landfill Settlement and Displacement

To determine the extent of settlement and possible migration of the landfill toward Union Bay, UW Campus Engineering, with assistance from the Capital Projects Office, monitors settlement and horizontal displacement in the landfill. Settlement is measured at twenty sites located throughout the landfill. Horizontal displacement at various vertical depths is measured using ten inclinometer wells located along the waterfront. All measurements are taken at least annually. The monitoring results help the UW appropriately manage the landfill. Monitoring results are documented in the *Montlake Landfill Long-Term Movement Study* reports available from UW Campus Engineering.

The UW may implement additional field-testing or monitoring during projects to gather information concerning soil settlement.

B. Grading

Where possible, areas may be graded to acceptable elevations and slopes using cut and fill. In some areas, it may be necessary to raise grades to accommodate underground drainage for improvements to sports activity areas and to maintain a protective 3-foot cap on the landfill. A Washington State licensed civil engineer must prepare all grading plans. The site must also be inspected to determine that the grading work is done according to this plan. See page 9 “**Landfill Media Disposal**” for further guidance on managing landfill cap materials.

Most maintenance activities on East Campus parking lots, sports fields, and roads are exempt from SEPA (WAC 197-11-800(3)). Maintenance practices are described in this document. Check with the UW CPO Environmental Planner (206.543.5200) to determine if activities are SEPA exempt.

C. Drainage

The following criteria are considered the minimum slope for positive surface drainage.

Seeded Areas	0.5% - 3%
Road/Walkways	0.5% longitudinal, 2% transverse
Roadside Drainage	0.5% longitudinal
Parking Areas	0.5%

When differential settlement has reduced the above slopes by 50% or more, the UW intends to maintain minimum slope as suitable material becomes available.

D. Stockpiling

Because of concerns that surcharging the landfill could cause an adverse impact to Union Bay, the UW limits stockpiling on the landfill. Contractors are not allowed to stockpile materials from projects located elsewhere on campus on the landfill.

The Outside Maintenance Zone, Recreational Sports Programs and Intercollegiate Athletics are allowed to stockpile materials on the landfill for use in general operation and maintenance of campus grounds, but must keep volumes to a minimum.

Materials excavated from the landfill during landfill construction projects may be temporarily stockpiled on visqueen and covered with visqueen pending an EH&S review of the analytical results and proper waste disposal through a UW approved disposal site. See more on soil and water disposal in section III.I of this document.

E. Resurfacing Roads and Parking Areas

Roads and parking areas should be well-surfaced and in safe and usable condition year round. Maintenance activities include restoring sub-grades using excavated earth to provide positive drainage to catch basins and drainage ditches. During the winter months, some of the roads and adjacent walks may become partly submerged due to differential settlement. Facility Services is responsible for coordinating the maintenance of the roads addressed by this document.

The existing roads and parking areas are primarily paved with asphaltic concrete; only a small portion is gravel surfaced. Because of concerns with methane accumulation underneath paved surfaces, installation of gas permeable surfacing materials is generally required. The Montlake Landfill Oversight Committee will review this issue on a case-by-case basis.

Road and parking lot maintenance should occur primarily between April and October to minimize disruption to users and maximize favorable weather conditions. All resurfacing and paving projects will take into account protection of nearby wetlands and wildlife habitats. Stormwater sediment control measures will also be implemented as outlined in this document.

Projects involving the expansion of roads, paved areas and parking lots must be reviewed and approved by the MLOC and comply with the Campus Master Plan.

F. Methane Gas

The hazards of methane include fire and explosion in confined or enclosed spaces; oxygen deficiency in underground trench vaults, conduits, and structures; and the presence of hydrogen sulfide gas, which is toxic and flammable.

New projects within 1,000 feet of the landfill need methane mitigation or a demonstration through geotechnical engineering that the project does not need a methane mitigation system. The geotechnical information will need to be part of the permit application. If a methane mitigation system is necessary, it may be a passive or active system. If it is an active system, it should be on emergency power and connected to the control system to alert technicians if the system needs service.

Section 10.09.060 of Title 10, King-County Solid Waste regulations, requires all enclosed structures that are constructed on or within 1,000 feet of an active, closed, or abandoned landfill be protected from potential methane gas migration from the landfill. The method for ensuring protection must be addressed in a report submitted by a licensed professional engineer to the local health department and the local building department for approval.

Consult with an EH&S fire protection engineer to determine if a building or room needs methane gas detection. If detection is required, connect the gas detector to a trouble signal for service or the building fire alarm to signal a building evacuation if gas is detected at a predetermined level. A

methane alarm system is not required by code for occupied facilities.

Health and safety plans must be prepared for all facility and construction projects and should include the following precautions:

- No smoking within the construction site
- Wear non-sparking shoes and use explosion-proof tools in manholes, trenches, vaults, or other enclosed areas
- Use construction equipment equipped with vertical exhausts and spark arrestors
- Conduct methane monitoring during all excavation activities
- Restrict the use of blowtorches to melt ice around manholes, instead substituting the use hot air, water or steam
- Require Confined Space Awareness and Confined Space Entry training for workers where applicable. Employees who may be exposed to a hazardous environment should not work alone. Confined space workers must have rescue equipment readily available.

Methane has been detected at explosive levels in some areas of the landfill. Therefore, any construction, especially of conduits, vaults and utility lines, must make allowances for encountering the gas. Design and construction of underground utilities must be such as to preclude their serving as conduits for conducting methane gas away from the landfill and into the structures that they serve. Every effort must be made to design and construct structures in compliance with appropriate fire and electrical codes and in a manner that will not allow the accumulation of the lighter-than-air methane in enclosed spaces and along electrical lines.

The UW currently conducts quarterly methane monitoring surveys at methane wells in and around the perimeter of the landfill, at parking lot methane vents, and at UW structures on and off of the landfill. Contact EH&S at 206-616-0585 to request a copy of the most recent methane monitoring data. Report any independent methane monitoring results to EH&S at 206.685.0585.

G. Stormwater Control

If not properly managed, storm water runoff associated with maintenance, renovation, and construction activities may negatively impact Union Bay water quality. The City of Seattle, State Department of Ecology, and EPA regulate storm water runoff within the Montlake Landfill. For more information, see the [Site Contamination Design Guide](#).

H. Critical Areas, Wetlands and Shorelines

The UW complies with applicable critical area regulations for development on an abandoned landfill (Seattle Municipal Code 25.09.220). Work plans must address liquefaction and methane mitigation.

Federal, State, and local laws protect wetlands. In 1992, the City of Seattle delineated 12 wetlands on the Union Bay Natural Area as well as a large shoreline area, and a riparian corridor designation along the banks of the University Slough. The University has updated wetland mapping and will continue to delineate wetlands as projects are proposed.

The Center for Urban Horticulture (CUH) has responsibility for managing the Union Bay Natural Area (UBNA), wetlands and all University shorelines, including the University Slough. CUH

maintains guidelines such as the Management Plan for the Union Bay Shoreline and Natural Area Owned by the University of Washington, published in 1994, which specifies how these areas will be managed to preserve their habitat value and research and teaching potential. CUH plans to update this guidance document in 2008.

The State Shoreline Management Act of 1971 requires Shoreline Management Permits when undertaking “substantial development” on State shorelines (WAC 173-018).

Projects involving impacts to wetlands or wildlife habitats will require Montlake Committee review prior to implementation. CUH and Facility Services will work together to ensure maintenance activities on the Montlake Landfill are appropriate.

I. Landfill Media Disposal (Cap Soil, Debris, Leachate, Stormwater and Groundwater)

The Montlake Landfill site is on the Washington State Contaminated Site list. Activities disturbing the landfill are regulated under Department of Ecology Solid Waste (WAC 173-350), Model Toxics Control Act (MTCA) (WAC173-340) and Dangerous Waste (WAC173-303), and Seattle King County Health Solid Waste (Chapter 10.04) regulations.

Environmental Plan - If a project is going to excavate into the landfill, an environmental plan is required that addresses procedures for collecting representative samples, laboratory analysis (see Table 1), containment and proper disposal of landfill media. Contact EH&S at 206.616.0585 to confirm the approved approach for each excavation project.

Debris and Contaminated Media Disposal - All landfill debris and contaminated media must go to a [UW approved disposal site](#). If any landfill media has contaminant levels that cause it to be designated a hazardous waste, EH&S will manage the containment, transport and disposal of that waste through the state hazardous waste contract. For assistance with management and disposal of landfill media please contact EH&S at 206.616.0595.

Cap Soil - Seattle King County Health restricts the reuse of cap soil. Cap soil within 3 feet of debris cannot be reused and must be disposed at a UW approved facility. Cap soil more than 3 feet above the top of the landfill debris may be reused as “clean soil” fill on the landfill site if representative samples do not exceed MTCA cleanup levels (see Table 1).

Costs - Project budgets pay environmental costs and are normally recharged the final hazardous waste disposal costs. Pre-planning and addressing the costs in contract documents saves time and money. EH&S can help estimate disposal costs.

Planning - To minimize time and costs associated with excavation projects on the landfill, do the following:

- Design projects so that activities do not unnecessarily disturb landfill debris.
- Design projects so that clean soils are added to "low" areas where the cap is relatively thin, and soils are removed only from "high" areas where the cap is greater than 3-feet thick. A 3-foot minimum soil cap must be maintained.
- Segregate “clean” cap soil, as defined above, from landfill debris whenever possible for testing, disposal and/or reuse purposes.
- Pre-characterize landfill media for disposal cost estimation.
- Perform non-destructive testing of the site, such as ground penetrating radar or electro-magnetic imaging. They can identify metallic objects such as barrels or other large obstructions above the water table.

J. Asbestos-Containing Material

Asbestos-containing (ACM) material was encountered during renovation of the E1 parking lot located within the limits of the Montlake Landfill. ACM may also be encountered at other locations within the boundary of the Montlake landfill. Anticipate the costs to handle and dispose of ACM and budget accordingly. Contact EH&S (206-616-0585) for handling and disposal requirements if suspected ACM debris is encountered during excavation activities. Workers must be appropriately informed and trained regarding asbestos handling procedures.

K. Worker Safety

Physical contact with landfill debris and groundwater may negatively impact human health. Therefore, the following tasks should be completed:

- Inform all UW and contract employees who may contact landfill debris of the potential health hazards associated with landfill debris and groundwater. Worker exposure concerns include methane, hazardous materials exposure, and physical hazards. All employees must be trained to take the appropriate health and safety precautions.
- A site-specific health and safety plan must be drafted by the contractor and implemented during maintenance, renovation, and/or construction activities.
- Consider hiring a consultant familiar with worker protection issues if this capability is not with the environmental consultants. Some environmental consultants are geotechnical firms but lack worker protection capability.
- Be sure the contractor and its subcontractors are performing the work in a safe manner. Contractors are responsible for protecting their workers from exposures to hazardous materials, and should ensure all workers are protected and HAZWOPER (hazardous work operations and emergency response) trained.

L. Fencing

The East Campus area is partly fenced. Fencing may be installed in the future for safety or security reasons.

M. Sports Fields

Sports fields and other athletic facilities should be safe in order to maximize usage by UW students, faculty and staff. Necessary safety maintenance may involve fill, grading, topsoil, reseeding, landscaping, etc. Any maintenance of sports fields or Intercollegiate Athletic Facilities cannot negatively impact wetlands or shorelines. The amount of soil needed to level the fields is generally less than 500 cubic yards per year. Contact the Capital Projects Office Environmental/Land Use Compliance Officer to determine permit requirements.

The Directors of Recreational Sports Programs and Intercollegiate Athletics will be responsible for coordinating the maintenance of the three recreational fields, golf driving range, and competitive soccer fields and baseball facilities found in the landfill area.

N. Corrosion Protection

Consider performing a corrosivity test on the soils to determine if corrosion protection is necessary for underground utilities or foundation systems. If using steel pipe piles, consider increasing the wall thickness to achieve sufficient corrosion protection. On the IMA Expansion project, it was

determined that an additional ¼ inch wall thickness of steel pile created foundations which would last in excess of 100 years.

O. Structure Foundations

The Montlake Landfill area contains a wide variety of subsurface layers. The layers generally consist of a landfill cap, mixed refuse and wood waste fill, spongy peat deposits, and soft clay over dense glacial deposits. The thickness of each layer varies greatly across the Montlake Landfill area. Due to this complicated subsurface layering, it is essential that every new structure proposed include a geotechnical engineer and structural design engineer.

Pile Foundations

In general, new structures must be pile supported with the piles installed through the fill, refuse, and peat layers into the underlying dense glacial deposits. Auger cast piles and batter piles are not recommended. The design must account for the future settlement around new pile supported structures. Design items that must be considered include the hinging of approach sidewalks, ramps or stairs as well as providing flexible connections for all the utilities

Alternative Foundations

Consideration will be given on a case by case basis for the use of alternative foundation types if it can be adequately demonstrated that the total and differential settlements are within acceptable limits for the type of building. The UW Project Review Board and the user of the building and associated site needs to be informed of the settlement risks and subsequent long term repair costs. The alternative foundation proposed must thoroughly consider all the potential geotechnical issues including long term and differential settlement and must result in a safe stable building. The effect of settlement must consider the effect on surrounding surface features including roadways, fields, pathways, utilities etc. The existing soil cap over the refuse must be of sufficient thickness so that a minimum 3-foot clean soil cap remains below the construction of the proposed alternative foundation type and necessary sub grade treatment. In no case will conventional shallow footings be allowed except for the case of lightweight structures as described below. Preload of a site is not an allowable alternative method. Leveling methods such as jacks should be included in the design to facilitate periodic adjustment of the structure if and when differential settlement occurs.

Lightweight Structures

Shallow foundations may be used to support lightweight structures on a case by case basis. The geotechnical engineer will determine if over excavation and structural fill is needed. Such lightweight structures may include sheds, greenhouses, etc. A lightweight structure must not weigh over 50 PSF (pounds per square foot) dead load over the footprint of the structure. This 50 PSF dead load is to include the weight of any material stored for long periods (over 3 months).

General

All foundation and building designs must consider and resolve the effect of potential soil liquefaction due to seismic movement. All foundations must maintain the minimum 3-foot clean soil cap thickness over the refuse layer. Basement construction is prohibited.

A geotechnical report must be submitted for all proposed structures. The geotechnical engineer must utilize existing geotechnical records and borings as well as perform any additional field exploration necessary to formulate their recommendations.

For all structures, refer to the Methane Gas section for requirements to ensure protection from methane gas.

Table 1 – Montlake Landfill Water and Debris Analytical Requirements				
Contaminant	EPA Test Method	Approximate Cost (ea.)*	Collection Containers	Analysis Time
Metals (Total) <ul style="list-style-type: none"> • Arsenic • Chromium • Lead TCLP analysis may also be required to meet disposal requirements depending on results of Totals test.	EPA 200.7 6010 & 7000 series	\$25 per metal for Totals analysis	Liquids: 1 liter glass (with HNO ₃) Solids: 8 oz glass jar	10 days
Gasoline range hydrocarbons and volatile organic compounds (BTEX)	NWTPH-G and BTEX EPA 8015 mod/8021B	\$75	Liquids: Two glass VOA vials (40 ml with HCl, no head space) Solids: 8 oz soil	5 days
Diesel fuel/heavy oil range hydrocarbons	NWTPH-DX via EPA 8015 mod.	\$95	Liquids: 1 liter amber glass with PTFE seal Solids: 8 oz glass jar	5 days
Polychlorinated Biphenyls (PCBs) Required for disposal purposes when heavy oil range hydrocarbons are present	EPA 8082	\$95	Liquids: 1 liter amber Solids: 8 oz glass jar	10 days
Polynuclear aromatic hydrocarbons (PAHs)	EPA 8100 or 8270C	\$215	Liquids: Two 1 liter amber glass Solids: 8 oz glass jar	10 days
Total settleable solids (TSS)	160.5	\$18	Liquids: 1 liter glass or plastic	10 days
Total dissolved solids (TDS)	160.1	\$18	Liquids: 250 ml glass or plastic	10 days
Turbidity	180.1	\$18	Liquids: 250 ml glass or plastic	10 days
pH	9045B, 150.1	\$18	Liquids: 100 ml glass or plastic	10 days
Dissolved oxygen	360.1	\$18	Liquids: 250 ml BOD bottle	10 days

Sampling shall be done so as to be representative of the media in question with a minimum of one composite sample per 250 cubic yards. Each composite shall include at least 10 randomly selected components. WAC173-340-900

*Fees are estimated and will change substantially over time and between analytical laboratories.