Technical Information Report

Reserve Inert Waste Landfill Expansion Project

Prepared for
Reserve Silica Corporation
28131 Black Diamond-Ravensdale Road Southeast
Ravensdale, Washington 98051

Prepared by
Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121

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DRAFT
February 28, 2025

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1. Project Overview

Reserve Silica Corporation (Reserve) operates an all-weather clean fill and inert waste dumpsite located at 28131 Black Diamond-Ravensdale Road Southeast, Ravensdale Washington (Site) that requires additional grading and drainage design to facilitate an expansion (Figure 1). Reclamation grading and inert waste fill operations are covered under King County clearing and grading permit number GRDE15-0011 and Inert Waste Landfill permit number PR0082027.

The Reserve property was initially composed of three legal parcels: 012106-9002 (now Lot 3), 362206-9065 (now Lot 1), and 352206-9018 (plant site), however in 2017, King County approved a further division of the property, creating four additional legal parcels: 012106-9010 (Lot 2), 012106-9011 (Lot 5), 012106-9012 (Lot 4), and 362206-9138 (Lot 6). Lot 6 is held by Ravensdale 6 LLC, a wholly owned subsidiary of Reserve. The inert waste landfill is informally divided into the "Fill Site" (Areas 1 through 6; Figure 2), which serves as the primary disposal and mine reclamation area, and the "Plant Site," which includes a processing and wash plant, as well an additional disposal area. This report primarily covers the proposed reclamation activities, and related stormwater management facilities in Areas 5 and 6 (Lots 1 and 2) (Figure 2). However, ongoing and previously completed grading and reclamation planting taking place at the Plant Site and in Areas 1, 2, 3, 3/4, and 4 as part of the 2014 Interim Reclamation Plan are documented for the purposes of record, determining applicability of design requirements, and for establishing stormwater drainage patterns impacts on the Site and downstream.

Herrera Environmental Consultants, Inc. (Herrera) has developed a Site Improvement Plan and a Reclamation Plan, refining the 2022 Reclamation Grading and Stormwater Plan prepared by Aspect Consulting. The plan primarily documents the proposed grading and reclamation planting plan for fill in Areas 5 and 6, and two stormwater ponds designed for detention and treatment of stormwater from both these areas under interim conditions. The plan will also document ongoing fill and grading in Areas 1, 2, 3, 3/4, 4, and the Plant Site, which is generally consistent with the 2014 Interim Reclamation Plan and proposes no new stormwater management facilities. This Technical Information Report (TIR) documents the information and analysis used to develop the stormwater design for Areas 5 and 6.

The proposed project requires a Full Drainage Review per Section 1.1.1 and Figure 1.1.2.A of the 2021 King County Stormwater Design Manual (KCSWDM or Manual; King County 2021a). A summary of requirements and proposed mitigation is provided in Appendix A: TIR Worksheet. The organization of this design report is consistent with the TIR format defined in the Manual.

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Figure 1.
Reserve Silica Ravensdale Facility Vicinity Map.

Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County (Aerial, 2023), NWI, WSDOT

0 0.25 0.5 1 Miles

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Author: zkleiner

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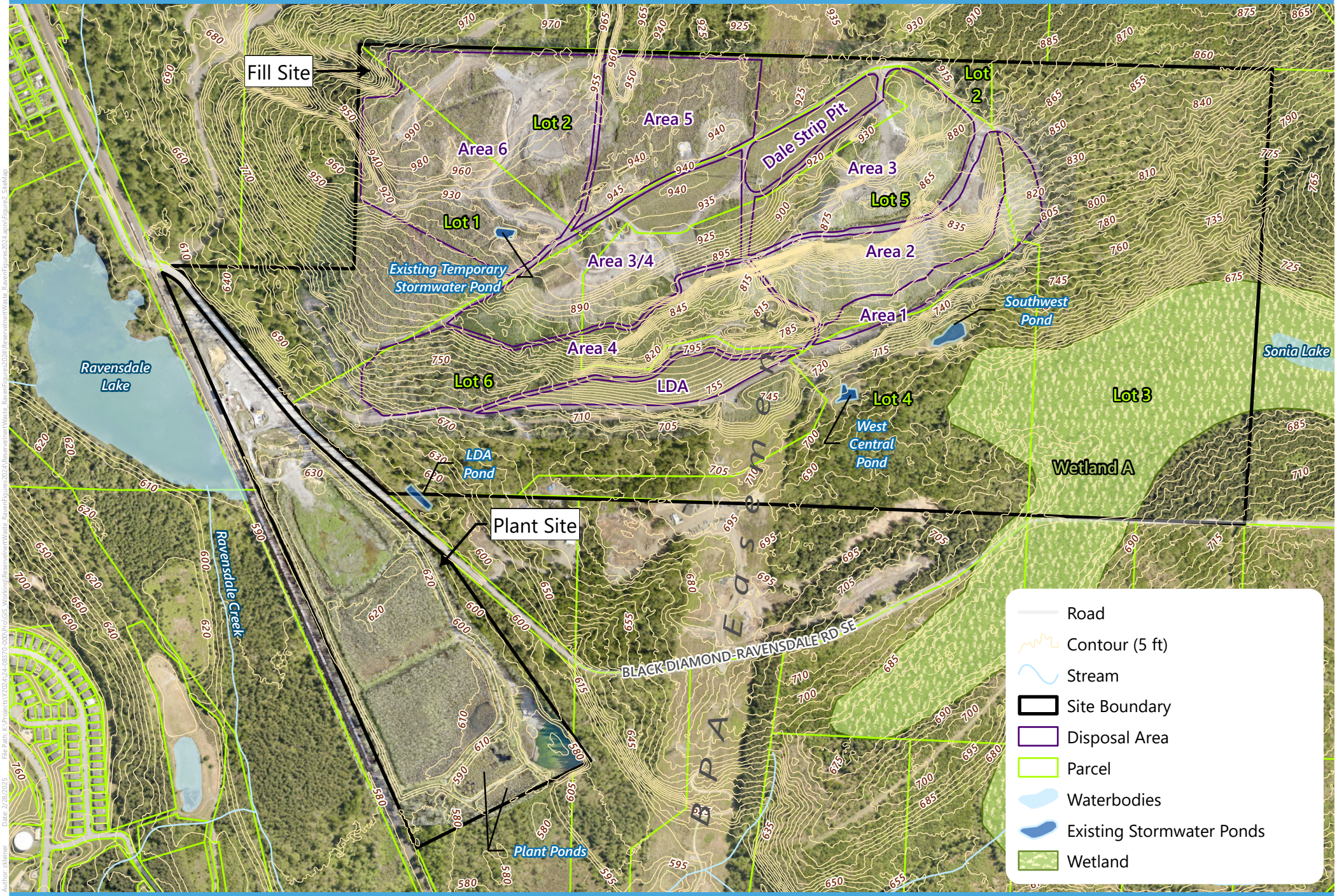
Figure 2.
Reserve Silica Ravensdale Facility Site Map.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County (Aerial, 2023)

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Author: zkleiner

1.1. Site Background

The Site has a long history of prior mining and fill activities. From 1924 to 1948, coal was mined at the Site by the Northwestern Improvement Company, a subsidiary of Northern Pacific Railway and their successor Burlington Northern using underground and surface strip mining methods. Surface strip mining for coal conducted between 1946 and 1950 created the Dale Strip Pit (DSP). The Plant Site was developed in 1924 to process coal from the Fill Site and was later decommissioned in 1955.

From 1967 to December 2007, sandstone was mined from the Site to produce high-quality silica sand. Sandstone mining created the Lower Disposal Area (LDA) starting in 1968. In 1970, Northern Pacific merged with Great Northern and several other railways to form Burlington Northern Railroad Company. Northern Pacific and Burlington Northern Railroad Company (now known as BNSF Railway) leased the Facility to several different operators for sand mining between 1967 and 1997. The Plant Site was redeveloped in the early 1970s to process the mined sandstone; the aggregate processing plant was later decommissioned in 2015.

From 1979 to 1989, Industrial Mineral Products, Inc. hauled cement kiln dust (CKD) generated at the Ideal Basic Industries, Inc. (Ideal) Seattle Cement Manufacturing Plant to the Facility for use as fill material at the LDA and DSP. These areas have been capped with a 2-foot-thick layer of clayey material and a 7-foot layer of overburden from the sand mining operations and revegetated with grass. Holcim (US), Inc. is the successor in interest to Ideal. Holcim US, Inc. and Reserve are parties to Agreed Order No. DE16052 with the Washington State Department of Ecology (Ecology) for remedial activities related to the closed landfills. The LDA and DSP comprise a Closed Limited Purpose Landfill regulated by Public Health – Seattle & King County (Public Health) under permit PR0015708, issued annually. The DSP and LDA are separate and distinct from the reclamation fill activities at the Facility. No reclamation fill is planned for these areas.

Reserve began sandstone mining operations in 1986 under lease from Burlington Northern, then purchased the Site in 1997. Mining ended in December 2007, and processing of remaining stockpiles of sandstone was completed in January 2010. Reclamation began in 2007 with the importation of fill to reclaim the surface excavations.

Mining activities were conducted under Surface Mining Permit #10346 issued by the Washington State Department of Natural Resources and grading permit L7061122 issued by King County. The mining permit was cancelled in 2010 in response to King County's request to regulate reclamation activities.

In 2012, Reserve obtained an inert waste landfill permit to allow for disposal of inert waste, particularly tunnel spoils from the State Route 99 tunnel project, in reclamation fill based on a Plan of Operation dated July 12, 2012. Public Health regulates the Site under Inert Waste Landfill Permit No. PR0082027, issued annually. The most recent permit was issued on February 29, 2024; it is effective from January 1, 2024, to December 31, 2024.

Currently, the inert waste landfill is permitted to accept up to 2.75 million cubic yards of inert waste and soil meeting acceptance criteria for contaminant concentrations. Reserve accepts inert wastes including loads of clean soil mixed with cured concrete, brick and masonry, ceramic materials, and asphaltic materials.

To reclaim past coal mining activities and maximize disposal capacity, Reserve aims to expand placement of inert waste fill in Areas 5 and 6. In May 2014, Reserve prepared and submitted an Interim Reclamation Plan to King County (Bennett Consulting 2014). The approved plan included a mine sequence map (Figure 5 of the Interim Reclamation Plan) that identified former mine pits designated for reclamation fill placement, including the Lower Pit (Areas 1 and 2), Eastern Pit (Area 3), and North Pit (Area 4).

Originally, fill placement areas were referenced by their former pit names (i.e., the Lower, Eastern, and North Pits). However, as filling progressed to the point where these pits were no longer useful visual landmarks, Reserve updated its nomenclature. Fill placement is now categorized by designated areas—1, 2, 3, 3/4, 4, 5, and 6—as shown in Figure 2.

After the original set of grading drawings that accompanied the 2014 Interim Reclamation Plan was lost, Reserve commissioned Aspect Consulting, LLC to produce replacement drawings, which included fill placement in portions of Areas 2, 3, 3/4, 4, 5, 6, and at the Plant Site. King County Permitting Division was unable to identify prior approval of fill/reclamation activities in Areas 5 and 6, and on July 22, 2024, King County issued an information request requiring that Reserve submit a Site Improvement Plan and Technical Information Report, among other submittals.

Prior to receipt of the information request, Reserve had contracted with Herrera to design an expansion of the inert waste landfill into Areas 5 and 6 and submit a permit modification for a Solid Waste Facility Permit under the Washington State Solid Waste Handling Standards, Washington Administrative Code (WAC) 173-350 and applicable provisions of the King County Board of Health solid waste regulations (KCBOH Title 10) from Public Health Seattle, King County (Public Health) and Ecology. In response to the information request, Reserve authorized an amendment to Herrera's original scope to include additional permitting support for environmental, land use, or construction permits and approvals necessary to excavate and grade within the landfill, manage stormwater, and protect critical areas near the proposed site. This TIR will be included with the Site Improvement Plan submittal.

1.2. Existing Site Conditions

The Site is located in the Puget Sound Lowland, a topographic and structural basin located between the Cascade Range and Olympic Mountains. The topography of the Site is located on glacially carved bedrock that rises to an elevation of approximately 1,000 feet. The current zoning classification of the Site is Mineral Resource-Related (M). King County has mapped most of the Site as a coal mine hazard area, defined as an area directly underlain by or adjacent to or affected by abandoned coal mine workings such as adits, drifts, tunnels, or air shafts.

Current topography of the Site, as of November 12, 2024, is shown on the existing topography plan sheet included with the Site Improvement Plan. Elevations within the Site rise to approximately 1,000 feet in the northeast, at the peak of what is locally referred to as "Ravensdale Hill" within Area 6, before transitioning into a moderately steep terrace at around 980 feet, which extends into Area 5. From there, the terrain slopes northwest within Area 6 to 600 feet at Black Diamond-Ravensdale Road Southeast and southward to 940 feet within Area 5 along the eastern haul road.

The predominant land cover on the Site consists of forest, recently logged forest, grassy areas, bare soil, and paved and gravel roads. The surrounding areas include forested lands to the east and south, Ravensdale Lake and King County Parks recreational open space to the north, and a mix of forested lands and recreational open space managed by King County Parks to the west. An east-to-west Bonneville Power Administration (BPA) easement for overhead powerlines bisects the Site.

1.2.1. Existing Land Cover and Drainage Patterns

The Site is situated within the Covington Creek drainage basin of the Duwamish-Green River Watershed (WRIA 9). Stormwater from the Site flows north to Ravensdale Lake and Creek or south to Sonia and Ginder Lakes, all of which ultimately drain into Lake Sawyer. Currently, stormwater runoff at the project site drains into four separate threshold discharge areas (TDAs), as shown in Figure 3 and Table 1. A TDA is a project site area that drains to a single natural discharge point or to multiple discharge points that converge within a 0.25 mile downstream, as determined by the shortest flow path. Project site areas are those subject to subject to land disturbing activity as described in the Manual. The TDAs were delineated according to the existing conditions topography mapped via drone survey conducted by Herrera in November 2024. Although Areas 5 and 6, which comprise TDAs 1 and 2, are the focus of this report, TDAs 3 and 4 which make up the ongoing fill and reclamation in portions of Areas 1, 2, 3, 3/4, 4, and the Plant Site were delineated for purposes of establishing drainage on the site and determining the applicability of KCSWDM requirements.

Table 1. Existing Land Cover Areas and Drainage Basins.

Subbasin/TDA ID	Pollution Generating Impervious Surface (acres)[a]	Grass Cover (acres)[b]	Native Vegetation (acres)[c]	Total (acres)
TDA 1 Total	10.38	16.45	0.66	27.49
TDA 2 Total	3.80	10.72	0.41	14.94
TDA 3 Total	21.24	3.01	0.00	24.26
TDA 4 Total	9.94	2.34	24.87	37.15
Project Site Total	45.36	32.53	25.95	103.84

[a] Pollution generating impervious surfaces include those such as gravel and paved trails and roads, and surfaces with compacted material (i.e., unvegetated fill areas).

[b] Grass cover areas include pervious surfaces such as vegetated fill areas, grassland, and pasture.

[c] Native vegetation is assumed to be non-pollution generating pervious area, comprising of tree canopies, non-landscaped vegetation, and water bodies.

TDAs 1 through 4 are described in more detail below; downstream discharge points are shown in Figure 3. The main TDA boundary at which stormwater is directed either north or south generally aligns with the BPA easement, as the natural topography of the site has been shaped by landfill reclamation work under the easement and ongoing timber harvesting for BPA vegetation management. East of the eastern haul road, the TDA boundary deviates from the BPA easement where drainage patterns are more influenced by the peak of Ravensdale Hill, and where fill placement and the construction of a haul road in Areas 5 and 6 may have slightly altered the historical drainage patterns, as discussed further in TDA 2.

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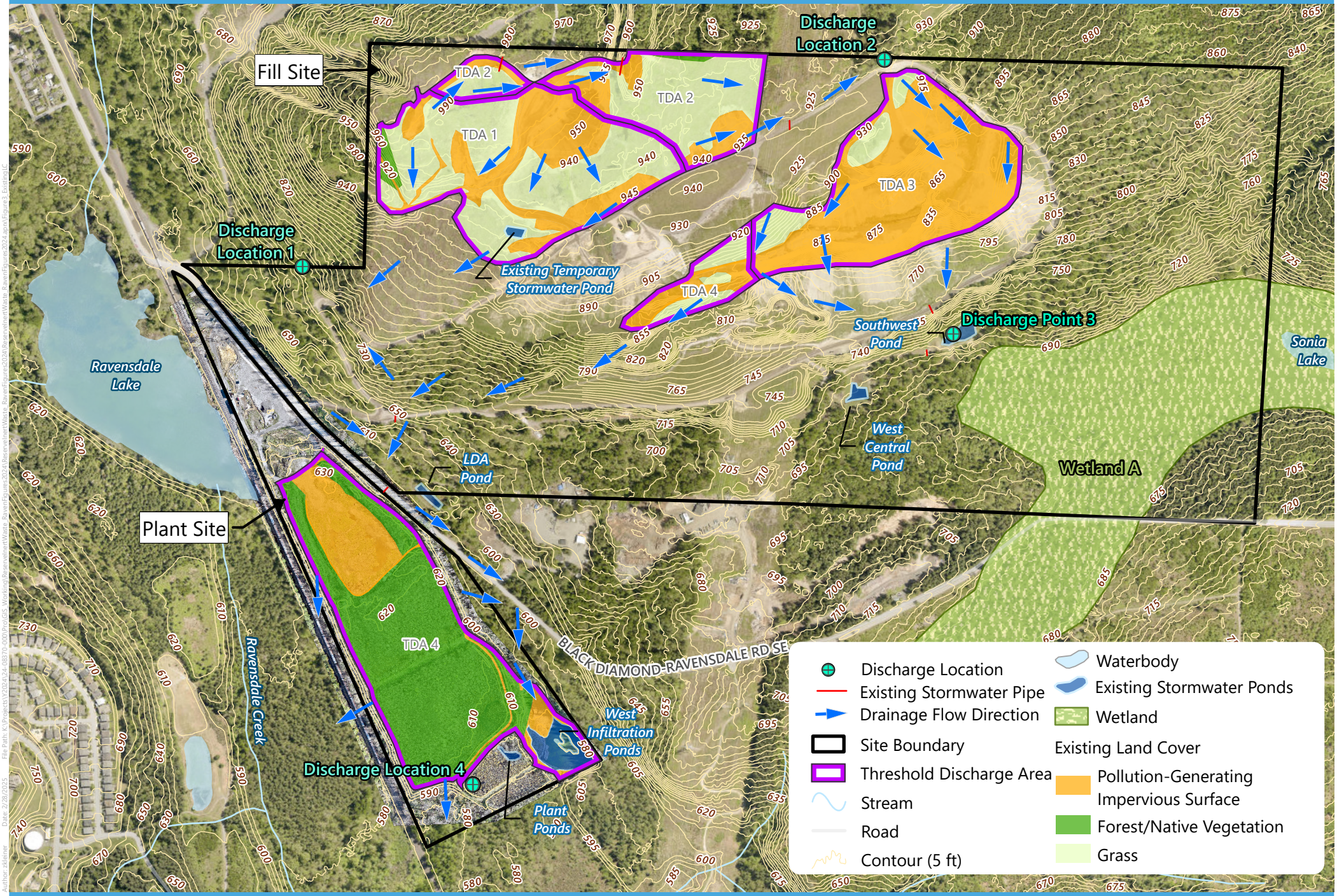
Figure 3.
Reserve Silica Ravensdale Facility Existing Land Cover and Drainage Patterns.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County GIS Portal Aerial Imagery

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TDA 1

TDA 1 receives runoff from the majority of Area 6 which drains to a newly constructed temporary stormwater pond below the west side of the eastern haul road. Sheet flow from Area 6 and overflow from the pond are collected in a ditch-culvert system along the eastern side of the main haul road. During a field reconnaissance, it was determined that runoff conveyed in this drainage system continues to drain east at the haul road switch back, indicating that water infiltrates into the forest, the majority of which is contained in the Lot 1 parcel. However, some Site stormwater may currently drain past the site boundary onto the eastern adjacent property before draining to Ravensdale Lake (Discharge Point 1) via the roadside ditches on Black Diamond-Ravensdale Road Southeast.

TDA 2

TDA 2 receives runoff from Area 5, and the remaining portion of Area 6. Stormwater from Area 5 sheet flows south bordered by the eastern haul road on the west and is collected in a ditch drainage system along the eastern side of the eastern haul road towards a low point located at the corner of Area 3 (Discharge Point 2). From here, runoff either infiltrates into the adjacent forested area or will continue around the haul road where it sheet flows southwest to Wetland A (Figure 3), subsequently draining to Sonia and Ginder Lake.

The portion of Area 6 within TDA 2 drains south along the eastern and western sides of the eastern haul road in roadside ditches. Runoff collected on the west side of the haul road to the lower portion of Area 5 is conveyed via one of two culverts toward a low point (elevation of 936 feet) formed in an old coal mine seam. A review of historical aerial and topographic information indicated that prior to fill placement and the construction of a haul road in Areas 5 and 6, more area would have drained north within TDA 1 than what is currently shown. As discharge to this mine feature alters the natural drainage pattern of the area, mitigation of the historical impacts will be discussed further Section 2.1.1 Core Requirement 1: Discharge at the Natural Location.

TDA 3

TDA 3 receives runoff from Areas 2 and 3 draining southwest via an 18-inch corrugated HDPE culvert under the lower haul road towards an existing interceptor swale. The swale extends for approximately 150 feet across forested cover before collecting in an existing infiltration pond (Southwest Pond). Overflow and seepage from the pond continue to flow south onto adjacent forest towards a Category 1 wetland (Wetland A), and subsequently Sonia and Ginder Lake (Discharge Point 3). A two-cell wet pond (West Central Pond) designed by Aspect Consulting and constructed in 2023 will manage a portion of the runoff from the lower haul road and Areas 1, 2, and 4. The West Central Pond will discharge to Wetland A.

TDA 4

TDA 4 receives runoff from Areas 3/4, 4, and the Plant Site. Runoff from Areas 3/4 and 4 sheet flows northwest towards the lower haul road and is conveyed in an 18-inch concrete culvert to a forested area where it is picked up in roadside ditches along the southern side of Black Diamond-Ravensdale Road Southeast. At this point, runoff either infiltrates within the ditches and forested area, or drains southwest until reaching an 18-inch culvert (managed by King County) under the roadway. This culvert directs flow into a roadside ditch on the northern side, where runoff continues toward the Plant Site. Efforts are in place at the landfill to keep stormwater runoff from these Areas separate from LDA runoff, which currently receives leachate and pH treatment.

The western portion of the Plant Site contains three settling ponds (Plant Ponds) used during sand processing activities for settling silts from aggregate washing. Discharge from the former wash plant was pumped up to the Plant Ponds, which now receive runoff from the fill areas at the Plant Site. On the southeast edge of the Plant Site stormwater has filled a depression from a gravel borrow area and a pond has formed as the result of low topography at this location and fill activities at the Plant Site. This depression receives stormwater from the portions of the Plant Site and roadside ditch drainage collected on both the northern and southern sides of Black Diamond-Ravensdale Road Southeast. Although, most stormwater will infiltrate, some surface runoff may collect in tributaries to Ravensdale Creek and Lake (Discharge Point 4).

1.2.2. Existing Soils and Groundwater Conditions

According to the Custom Soil Report generated from the Natural Resources Conservation Service (NCRS) Web Soil Survey, the geology of the Site is dominated by Pleistocene glacial outwash, glacial till, and Tertiary bedrock of the Puget Group, consisting of about 6,200 feet of nonmarine sedimentary rocks that range from early Eocene to early Oligocene. Three geologic units identified on site include sedimentary bedrocks from the Eocene Puget Group-Renton Formation, Vashon-age silty sand and gravel till, and Vashon recessional outwash gravel (SubTerra 2006).

Surficial soils in Area 5 are primarily composed of Alderwood gravelly sandy loam, 8 to 15 percent slopes, with traces of Alderwood gravelly loam 0 to 15 percent slopes near its northern border (Figure 4). Soils in Area 6 are primarily composed of Alderwood gravelly loam, 0 to 15 percent slopes, with gravelly loam in the upper 7 inches and very gravelly sandy loam below 7 inches of the soil profile. Limited amounts of Chuckanut gravelly ashy sandy loam, 15 to 30 percent slopes in northern portion of Area 6 and Alderwood gravelly loam, 15 to 30 percent slopes along the transition of Area 6 to eastern Reserve Silica parcels. The dominant hydrologic soil group in both Areas 5 and 6 is Group B, which typically exhibit moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep or deep, moderately well or well drained soils.

Three hydrogeologic units are identified near the Site: a shallow, unconfined aquifer in glacial recessional outwash deposits that is locally connected to surface water, a glacial till confining unit, and a bedrock aquifer that is generally low-yield and an unreliable source for domestic water supply (SubTerra 2006). Shallow and/or perched groundwater is present in localized areas within unconsolidated native soil and fill soil and generally flows following the slope of the bedrock or the till. This shallow and/or perched groundwater may discharge as surface water or to recessional outwash deposits that fill the Ravensdale Creek valley. There may be limited groundwater flow from south to north within the bedrock, along bedding planes, and within bedrock fractures, but this flow is likely disrupted on the north by the fault that generally crosscuts the subsurface geologic deposits in an east-west orientation on the north side of Ravensdale Hill.

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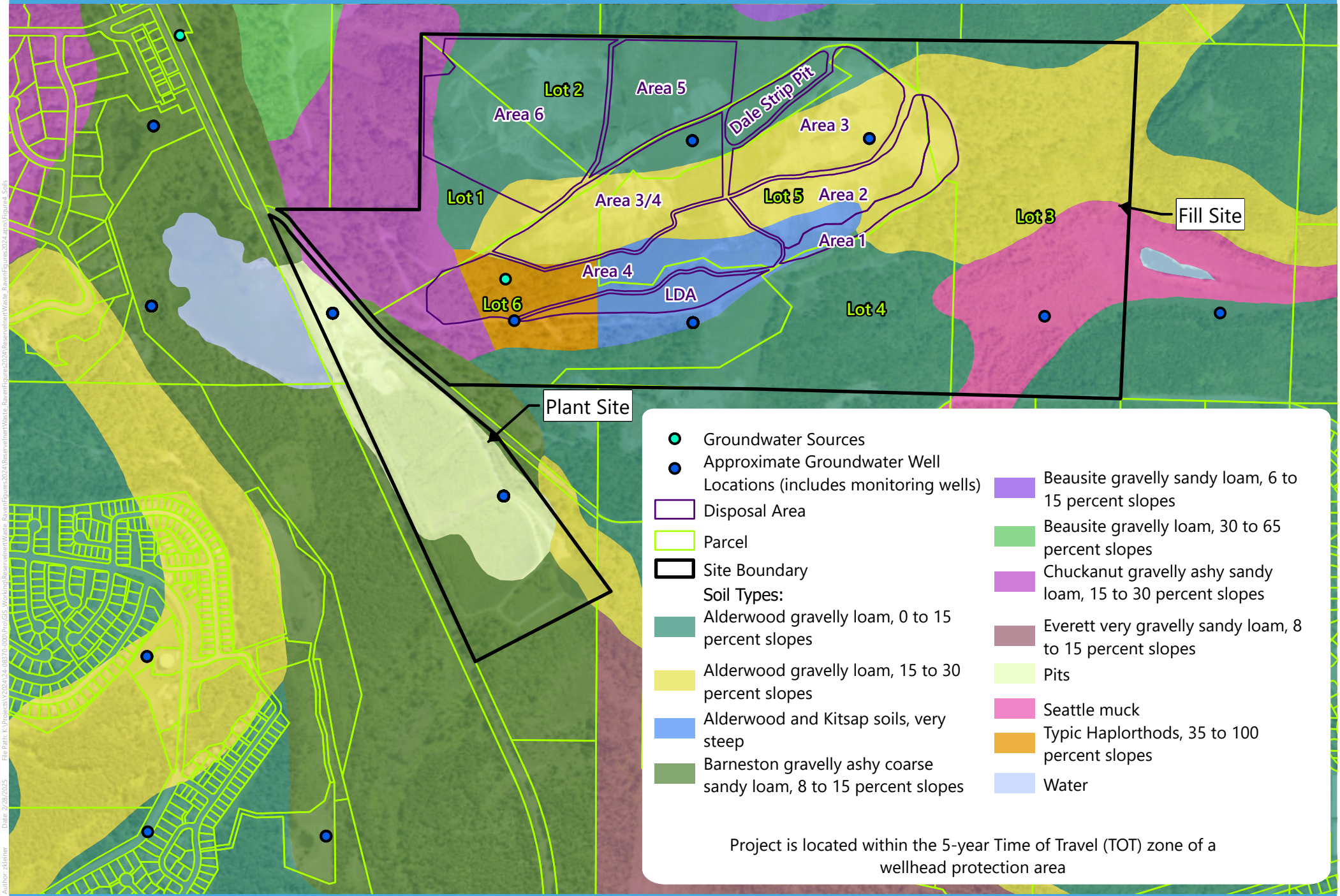
Figure 4.
Reserve Silica Ravensdale Soils and Groundwater Conditions.



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Date: 2/28/2025
Author: zkleiner

SubTerra presented a summary of domestic water supply wells within 1 mile upgradient and 2 miles downgradient of the Site in 2006 (SubTerra 2006). Recorded depths range from 74 to 209 feet below ground surface (bgs). A 2016 Site Hazard Assessment by Ecology identified 21 wells within a 2-mile radius of the Site, with depths between 36 and 360 feet, the closest of which serves Ravensdale Mobile Home Park, located approximately 4,500 feet northeast (Ecology 2016). The closest private water supply well is on an adjoining property (referred to as the Baja Property, tax parcel 352206-9046) located approximately 1,000 feet to the west from the edge of Lot 1. A well log from 1988 documents the construction of a test well somewhere in the vicinity of the Site, although its location is defined only by township, range, and section (SW 1/4 of the SW 1/4 of T22N, R6E, S36). The Washington State Department of Health has a record of this well as a Group B water supply well (Well ID GrpB_11121_01). However, the driller's well log, dated January 11, 1988, indicates "Test Well" as the proposed use of the 36-foot-deep well. This test well was not located and may have only been a temporary well. Two abandoned mine vents on Lot 1 are collecting surface runoff and could leach into groundwater. One 15-foot shaft and one mine vent on Lot 2 also have evidence of collecting surface water runoff. (Aspect 2023). The Project Site is also located within the 5- to 10-year Time of Travel zone of a wellhead protection area (Figure 4).

1.2.3. Existing Critical Areas

Critical areas of note on the Fill Site include a Category 1 wetland (Wetland A) southwest of Areas 1 and 2, potentially steep slope hazards particularly along the downhill side of Areas 1 through 4 and north along the main haul road downstream of Area 6, and a coal mine hazard that includes all or portions of Areas 2, 3, 3/4, 4, 5, and 6 (Figure 5).

Existing Critical Areas on the Plant Site include a Category 1 critical aquifer recharge area, and resource, conservancy, and natural shoreline designations associated with Ravensdale Lake. Freshwater emergent and forested/shrub wetlands were mapped in the 2024 National Wetland Inventory (NWI 2024) at the Plant Site in the three former silt pond cells, which are now used for additional disposal area.

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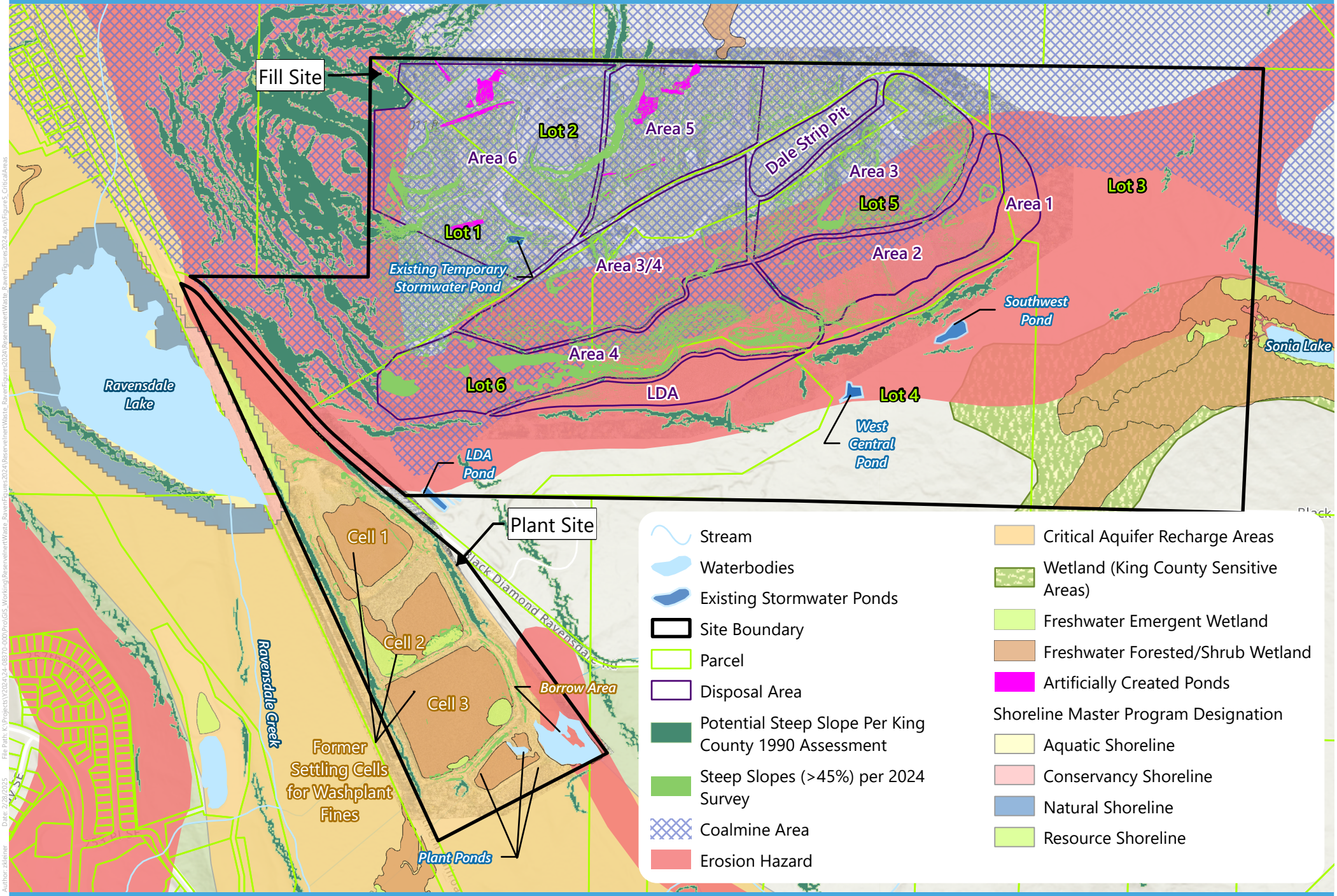
Figure 5.
Reserve Silica Ravensdale Facility Critical Areas.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County GIS Portal Aerial Imagery

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1.3. Proposed Site Conditions

Stormwater will be generated from filled areas and the access roads constructed in Areas 5 and 6. Under the proposed conditions, runoff will be conveyed through a series of stormwater pipes, ditches, and culverts and discharge to one of two stormwater management facilities that will be integrated into the proposed project design (Section 4.1) or will bypass the detention facilities and discharge at the same location as existing conditions.

1.3.1. Proposed Drainage Patterns

Under proposed conditions, stormwater runoff at the project site will continue to drain into four separate TDAs, as shown in Figure 6 and Table 2. The project will propose two new outfalls for TDAs 1 and 2, as shown in Figure 6. Existing drainage patterns are preserved to the maximum extent practicable. TDA boundaries were maintained with the exception of TDA 1 which increased in area under proposed conditions, as discussed further below and Section 2.1.

Table 2. Proposed Land Cover Areas and Drainage Basins.

Subbasin/TDA ID	Pollution Generating Impervious Surface (acres)[a]	Non-Pollution Generating Surface (acres)[b]	Grass Cover (acres)[c]	Total (acres)
TDA 1 Total	3.72	1.82	24.23	29.77
TDA 2 Total	1.06	1.06	10.51	12.64
TDA 3 Total	1.28	0.00	22.98	24.26
TDA 4 Total	2.18	0.00	34.97	37.15
Project Site Total	8.94	2.79	92.08	103.82

[a] Pollution-generating impervious surfaces include those such as gravel and paved trails and roads, and surfaces with compacted material (i.e., unvegetated fill areas)

[b] Pond surface area covered under non-pollution generating impervious surface.

[c] Grass cover areas include pervious surfaces such as vegetated fill areas, grassland, and pasture.

TDA 1

TDA 1 continues to receive runoff from the majority of Area 6 including the rerouted runoff, which currently is directed under the eastern haul road towards the old mine seam. Runoff will be collected in ditches on the downhill side of the proposed fill along the east side of the eastern haul road and routed to the Area 6 stormwater pond. The existing temporary stormwater pond located below the west side of the eastern haul road will be backfilled before grading on the Area 6 pond commences. The pond outfall is located east of the main haul road directing treated and detained runoff to the northwest onto a rock pad that will disperse flow before it ultimately drains into roadside ditches along the main haul road. Stormwater is then routed through a proposed culvert under the main haul road switchback discharging to the existing discharge location.

TDA 2

TDA 2 continues to receive runoff from Areas 5 and the remaining portion of Area 6. Stormwater from Area 5 will be collected in ditches along the eastern side of the main haul road and along the western side of the proposed pond access road and routed into the Area 5 pond. The pond outfall is located east of the main haul road in a reconstructed ditch-culvert system that directs runoff to the northwest onto a rock pad, which will disperse flow before it ultimately drains into roadside ditches along the main haul road. Runoff will be conveyed southeast towards the existing discharge point. Runoff that reaches the point will discharge onto a proposed rock pad to disperse flow while maintaining the existing downstream drainage flow path towards Wetland A.

TDA 3

No change in land cover or drainage patterns are proposed. Stormwater runoff from this TDA will receive stormwater management from the existing Southwest Pond.

TDA 4

No change in land cover or drainage patterns are proposed. Stormwater runoff from this TDA will receive stormwater management from the existing Plant Ponds. The depression on the southeast edge of the Plant Site will be backfilled, and stormwater currently draining to it will be redirected to the Plant Ponds.

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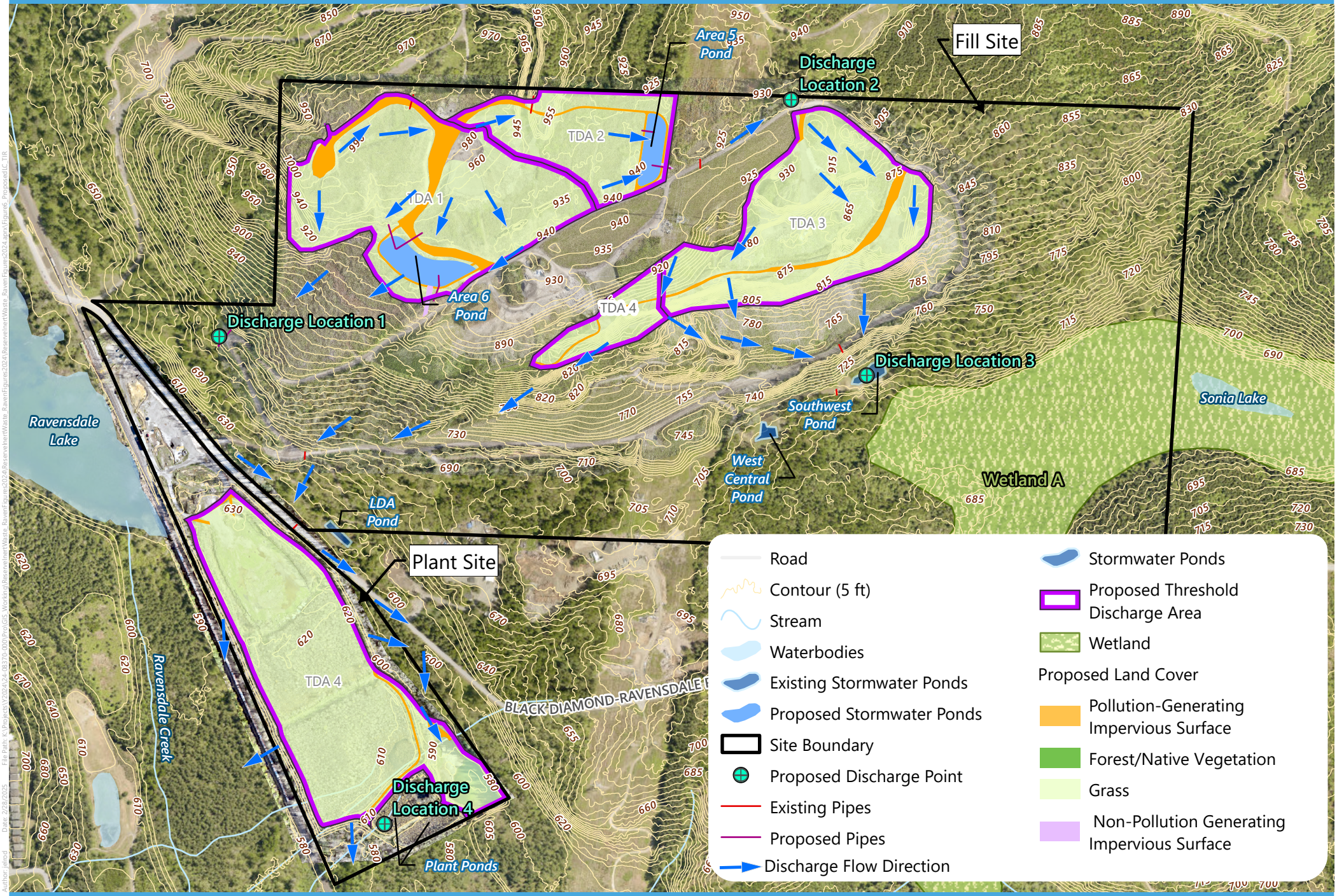
Figure 6.
Reserve Silica Ravensdale Facility Proposed Land Cover and Drainage Patterns.



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2. Conditions and Requirements Summary

This section describes the core requirements of the King County Surface Water Design Manual and the applicability of each core requirement to the proposed stormwater facility design for project TDAs. Since TDAs 3 and 4 are managed through the existing Southwest Pond and Plant Ponds, and the proposed work serves as a continuation of the 2014 Reclamation Plan, the core requirements evaluation will primarily focus on TDAs 1 and 2. The design is developed to satisfy the requirements associated with Full Drainage review—all nine Core Requirements and all five Special Requirements, including engineering plans and calculations stamped by a licensed professional engineer. The applicable requirements and related design criteria are listed below. Stormwater systems are designed to manage runoff under interim conditions.

2.1. Core Requirement 1: Discharge at the Natural Location

Stormwater runoff from the Site currently discharges via concentrated and unconcentrated flow to multiple locations including existing stormwater ponds (Southwest Pond, Plant Ponds), an offsite wetland (Wetland A), or to forested areas draining towards Sonia Lake, Ginder Lake, Ravensdale Creek and Lake, all of which eventually drain to Lake Sawyer. Although the project proposes two new outfalls, existing drainage patterns are maintained to the maximum extent practicable.

TDA boundaries will remain the same with the exception of drainage for Area 6, which currently drains to TDA 2. As discussed previously under Section 1.2.1, the portion of Area 6 within this TDA that drains south along the west side of the haul road is conveyed via one of two culverts toward a low point located in an old coal mine seam. Historical aerial and topographic analysis indicate that before fill placement and haul road construction began in Areas 5 and 6, more of this area originally drained north within TDA 1. To restore this flow direction, runoff previously routed across the haul road will now be directed north through a proposed conveyance ditch toward the Area 6 Pond. Additionally, as observed during a field reconnaissance on January 29, 2025, runoff from Area 6 within TDA 1, which is conveyed in an existing ditch-culvert system along the east side of the main haul road, continues to drain east at the haul road switch back, indicating that water infiltrates into the forest, the majority of which is contained in the Lot 1 parcel, but does extend into the adjacent property (Parcels: 3622069064 and 3622069009). To manage stormwater runoff from the proposed work in Areas 5 and 6, a culvert will direct runoff under the main haul road at the switchback, ensuring that runoff remains on Reserve's property while continuing to discharge in the same general location.

2.2. Core Requirement 2: Off-Site Analysis

A Level 1 Off-Site Analysis is required to evaluate the areas that are tributary to the Site and the areas up to 0.25 mile downstream to determine if any drainage problems exist. A Level 1 downstream analysis was conducted on January 29, 2025, finding no significant impacts. The Off-Site Analysis is documented in Section 3.0. An upstream analysis is not required as no offsite areas drain onto Areas 5 and 6.

The project triggers Problem Type #4: "Potential Impacts to Wetland Hydrology Problem," as a portion of Area 5 is tributary to a downstream Category 1 wetland (Wetland A). Under proposed conditions, TDAs 2 and 3 runoff will continue to drain south but will be detained in the Area 5 pond before discharging to the south. The KCSWDM requires areas draining to downstream wetlands that require a flow control facility per Core Requirement 3, to apply wetland hydroperiod protections according to Method 2 guidelines outlined in Reference 5 of KCSWDM. Method 2 applies to category III and IV wetlands that contain a breeding population of native amphibian species and uses a site discharge volume model to evaluate hydrologic changes in a wetland, with no monitoring requirement. Compliance with Method 2 guidelines must be verified by modeling to demonstrate that:

1. The total volume of water discharged into the wetlands, on a daily basis, is no more than a 20 percent difference, higher or lower, than the pre-project volumes
2. On a monthly basis, the water volume discharged to the wetlands is no more than a 15 percent difference, higher or lower, than the pre-project volumes.

Although a Level 2 Downstream Analysis has yet to be requested by King County, a hydroperiod analysis was performed to identify impacts to Wetland A. Model results indicated no adverse effect on the hydroperiod of Wetland A. This analysis is discussed further in Section 3.2 Level 2 Downstream Analysis.

2.3. Core Requirement 3: Flow Control

The project is required to meet the Conservation Flow Control requirements for all new stormwater management projects. The proposed stormwater flow control facilities (i.e., Area 5 and 6 Ponds) are designed to match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow and to match developed peak discharge rates to predeveloped peak discharge rates for the 2- and 10-year return periods. Hydrological modeling assumes historically forested site conditions for the Site. Two combined detention and large wetpond stormwater facilities (Area 5 and 6 Ponds) are proposed to treat and detain stormwater from Areas 5 and 6. Flow control facilities were analyzed and designed using MGS-Flood, an approved continuous flow simulation software based on the industry standard Hydrologic Simulation Program – FORTRAN (HSPF). Outflow control structures are designed as detailed in Section 5.1.4 of the KCSWDM.

The two proposed stormwater facilities will not impound more than 10 acre-feet of water. Therefore, the project will not be required to comply with the regulations of the Ecology's Dam Safety Office in Chapter 173-175 of the WAC.

2.4. Core Requirement 4: Conveyance System

All conveyance systems within the proposed project (i.e., pipes, outlet structures, ditches and spillways) will be analyzed and designed to meet the conveyance requirements of the KCSWDM. Pipe systems and open channels will be designed to convey and contain (at a minimum) the 25-year flow from the developed conditions and provide conveyance to accommodate the peak 100-year flow under surcharged conditions without causing flooding or erosion problems. New culverts will be designed with sufficient capacity to meet the headwater requirements and convey (at a minimum) the 25-year peak flow from developed conditions. The 100-year flow rates will also be evaluated for new culverts to ensure compliance with the KCSWDM.

Culverts are designed to match the following criteria:

- Provide conveyance to accomodate the peak flow for the 25-year design event using inlet control nomographs from KCSWDM with the following headwater requirements:
  - Depth above invert not to exceed 2.0 times the culvert diameter for culverts 18 inches in diameter and smaller
  - Depth above invert not to exceed 1.5 times culvert diameter for culverts larger than 18 inches in diameter
- Provide conveyance to accommodate the peak 100-year flow under surcharged conditions without causing flooding or erosion problems.

2.5. Core Requirement 5: Construction Stormwater Pollution Prevention

Erosion and Sediment Control (ESC) best management practices (BMPs) and Stormwater Pollution Prevention and Spill Control (SWPPS) measures that are appropriate to the project site will be applied through a comprehensive Construction Stormwater Pollution Prevention (CSWPP) Plan to address erosion and sediment control requirements, and the SWPPS Plan to aid effective management of onsite activities and materials.

A project specific CSWPP Plan for Areas 5 and 6 has been developed (Appendix E) to satisfy the requirements of the KCSWDM, which are explained further in Section 8.

2.6. Core Requirement 6: Maintenance and Operation

Maintenance and operation of Site drainage facilities is and will remain the responsibility of Reserve, except for the LDA infiltration pond, where Holcim has operation and maintenance responsibilities. None of the facilities will be maintained by King County. An Operation and Maintenance Manual for private

facilities has been prepared and is included in Appendix F. The Operation and Maintenance Manual was prepared based on the requirements for privately maintained facilities in Appendix A of the KCSWDM.

2.7. Core Requirement 7: Financial Guarantees and Liability

Site drainage facilities will be privately maintained by Reserve and are therefore exempt from the financial guarantee requirements outlined in King County Ordinance 12020 and the liability provisions of King County Code (Section 1.2.7 of the KCSWDM).

In response to King County's July 22, 2024, information request, a Landscape Bond Quantity Form has been completed (Appendix G).

2.8. Core Requirement 8: Water Quality

The Site must provide water quality (WQ) facilities to treat the runoff from new and replaced pollution-generating impervious surfaces (PGIS) and new pollution-generating pervious surfaces (PGPS) targeted for treatment in Section 1.2.8 of the KCSWDM. Existing PGIS on Site includes the paved and gravel haul and access road. The KCSWDM defines PGPS as non-impervious surface considered to be a significant source of pollutants in surface and storm water runoff including industrial activities or storage of erodible or leachable materials, wastes, or chemicals. Although the proposed filled areas will eventually be capped with 1- to 2-foot thickness of native soil and revegetated according to the Reclamation Planting Plan included in the Site Improvement Plan, stormwater facilities are designed for interim conditions at the landfill, assuming the potential for leachate from inert materials. Therefore, fill areas are considered to be pollution generating. Since TDAs 3 and 4 are managed through the existing Southwest Pond and Plant Ponds, and the proposed work does not increase impervious surfaces, Core Requirement 8 does not apply. However, TDAs 1 and 2, which currently lack stormwater management, will be targeted for basic treatment, aiming to achieve 80 percent total suspended solids (TSS) removal. Lake Sawyer, which is designated by King County as a sensitive water body as it is particularly prone to eutrophication is downstream of the Site, therefore TDAs 1 and 2 are also targeted for Sensitive Lake treatment, aiming for 50 percent annual average total phosphorus (TP). The Area 5 and 6 ponds are large combined wet pond and detention facilities designed to meet this criterion.

2.9. Core Requirement 9: Flow Control Best Management Practices

Per Section 1.2.9 of the KCSWDM, the proposed stormwater facilities must meet the requirements for flow control BMPs. Because the Site is outside of the Urban Growth Area and larger than 5 acres in size, the Site is required to meet the LID Performance Standard for which the designed stormwater system must match historical flow durations for a range of flows from 8 percent of the 2-year peak flow through 50 percent of the 2-year peak flow.

Full dispersion and limited and full infiltration are not viable options for managing treated and detained runoff from Areas 5 and 6, as a native vegetated flow path of at least 100 feet downstream of the TDA cannot be established and potential infiltration locations are limited to fill slopes and soils that do not meet the requirements as outlined in Appendix C.2 of the KCSWDM.

As an alternative, basic dispersion has been selected from the Large Lot BMP list for implementation. This approach will disperse treated and detained runoff from the Area 5 and 6 Ponds onto a proposed rock pad, which will then distribute runoff into the forested areas on site.

Flow Control BMP credits are not applicable to facilities that are privately maintained, as is the case at Reserve. Since the proposed stormwater ponds alone cannot meet the LID modeling standard, a design adjustment will be needed.

2.10. Special Requirement 1: Other Adopted Area Specific Requirements

The following types of documents were reviewed for area-specific requirements that applied to the Site:

Critical Drainage Areas (CDA): According to Reference 2 of the KCSWDM no CDAs have been adopted at time of publication.

Master Drainage Plans: None apply to the Site.

Basin Plans: Ecology adopted the Watershed Restoration and Enhancement Plan for WRIA 9 – Duwamish-Green Watershed in 2021 (Ecology 2021). The Site is located in the Covington Creek subbasin. The basin plan does not include any requirements applicable to stormwater management at the Site.

Salmon Conservation Plans: WRIA 9 has published the Salmon Habitat Plan 2021 Update for the Green/Duwamish and Central Puget Sound Watershed (WRIA 9 2021). The Site is located in the Middle Green River subwatershed of the plan. The plan includes policies under the Protect, Restore, and Enhance Sediment and Water Quality recovery strategy to promote low impact development green stormwater infrastructure (WQ1) and support local and regional stormwater management initiatives (WQ2), but does not include any stormwater management requirements applicable to the Site.

Stormwater Compliance Plans: None apply to the Site.

Lake Management Plans: There are no Lake Management Plans for Ravensdale, Sonia, or Ginder Lakes. The Lake Sawyer Management Plan (King County 2000) described mining activity at the Reserve Silica site, which has since ceased, and led to the adoption of the Lake Management Standard (now called the Sensitive Lake Treatment) for the Lake Sawyer drainage. In 2009, Ecology published the Lake Sawyer Total Phosphorus Total Maximum Daily Load Water Quality Implementation Plan (Lake Sawyer TMDL; Ecology 2009). These two documents emphasize the importance of phosphorus treatment for stormwater runoff entering the lake via surface flow, which has been incorporated into KCSWDM, but do not include additional requirements for new development or redevelopment applicable to the Reserve Site.

Flood Hazard Management Plans: None apply to the Site.

Shared Facility Drainage Plans: None apply to the Site.

2.11. Special Requirement 2: Flood Hazard Area Delineation

N/A: The project is not located in a flood hazard area.

2.12. Special Requirement 3: Flood Protection Facilities

N/A: The project does not lie within a 100-year floodplain.

2.13. Special Requirement 4: Source Control

The Site has a developed a Site Management Plan (SMP) to comply with the requirement of the issued Sand and Gravel General Permit. This plan includes a Stormwater Pollution Prevention Plan and a Spill Control Plan (Appendix E), ensuring adherence to Special Requirement 4 and King County's Stormwater Pollution Prevention Manual (King County 2021b).

2.14. Special Requirement 5: Oil Control

Fill activities within Areas 5 and 6 are not considered "high-use" as the land cover is not subject to the use, storage, or maintenance of a fleet of 25 or more 10-ton diesel vehicles.

3. Offsite Analysis

3.1. Level 1 Downstream Analysis

Projects that trigger Core Requirement 3 and/or Core Requirement 8 must conduct an offsite analysis that assesses potential offsite drainage and water quality impacts associated with development of the project site. The Level 1 analysis is composed of five tasks:

- Task 1: Definition and mapping of the study area extending 1 mile downstream (minimum flow path distance) from the proposed project discharge locations. An upstream analysis is not required as no offsite areas drain onto Areas 5 and 6.
- Task 2: A resource review extending 1 mile downstream of the Project Site to identify existing flooding, erosion, and water quality problems.
- Task 3: A field inspection of the existing onsite and offsite drainage systems of the study area for each discharge location drainage system within 0.25 mile downstream of the Project Site.
- Task 4: Documentation of drainage system components and problems identified during Tasks 2 and 3.
- Task 5: Demonstration that the proposed project neither aggravates (if existing) nor creates any flooding, erosion, or water quality problems described in Section 1.2.2.2 of the KCSWDM.

3.1.1. Task 1: Study Area Definition and Maps

See documentation in Section 1.2.1 Existing Site Conditions of this report.

3.1.2. Task 2: Resource Review

As part of Task 2, King County iMAP and Ecology's Water Quality Assessment and 303(d) list (Ecology, 2022) were primarily used for identifying existing and potential flooding, erosion, and water quality problems. Findings are listed below.

3.1.2.1. Drainage Complaints

Three drainage complaints are present within 1 mile of the Site, all of which were documented on the Plant Site within TDA 4. None of the complaints are relevant to the proposed project discharges, and all have since been resolved (Table 3).

Table 3. Drainage Complaints Available in King County iMAP.						
Activity ID	**Activity Type**	**Date Received**	**Date Closed**	**Resolution**	**Parcel Number and Address**	**Drainage Complaint**
2015-0895	Water quality inquiry	December 14, 2015	December 30, 2015	Closed	Parcel No. 3522069018 28131 Black Diamond-Ravensdale Road SE	Muddy runoff from filling operations clogging ditch and on ROW
SR-8799	Water quality inquiry	Water quality (investigation or inquiry)	August 1, 2023	Problem corrected	Parcel No. 3522069018 28131 Black Diamond-Ravensdale Road SE	Citizen observed large amount of road debris on Black Diamond-Ravensdale Road Southeast. Mixture of mud and silicon type materials coming off truck exiting a truck wash in that area. Reserve Silica operates an all-weather clean fill and inert waste dumpsite on the property. The trucks are leaving an onsite wheel wash near the road. Several trucks leave the wheel wash per hour. Refer to KC Roads. NPDES Sand and Gravel General Permit (WAG503029). Sweeper deployed, wheel wash maintenance.
SR-116	Water quality inquiry	May 20, 2019	November 22, 2019	Closed	Parcel No. 3522069018 28131 Black Diamond-Ravensdale Road SE	While out doing Fish Passage mapping, the team observed trucks on the parcel to the northwest of Black Diamond-Ravensdale Road Southeast at this location driving through a wheel wash before exiting the property. Water from this wheel wash overflowed the catchment and washed into the ROW ditch alongside Black Diamond-Ravensdale Road Southeast, impacting ditchwater upstream and downstream from the location. Water in the ditch was milky brown. Parcel looks to be associated with the Reserve Silica Corporation.

3.1.2.2. Downstream Drainage Problems Requiring Special Attention

The four categories of potential downstream drainage problems identified in Section 1.2.2.1.1 of the KCSWDM were evaluated based on the information identified in the Tasks 1 and 2.

Type 1. Conveyance System Nuisance Problem

No conveyance system nuisance problems were identified downstream of the Site during the resource review process or during the field reconnaissance. Some ditches on the Site have deteriorated due to vegetation overgrowth and sediment accumulation but are generally oversized and have sufficient capacity to convey the 100-year event. All existing culverts appear free flowing and non-obstructed. Off site, the ditches along Black Diamond-Ravensdale Road Southeast appear to have sufficient capacity based on visual inspection, but the 18-inch culvert (managed by King County) under Black Diamond – Ravensdale Road Southeast is reported to periodically cause minor flooding of the road. Runoff from the Areas 5 and 6 is not routed to this culvert.

Type 2. Severe Erosion Problem

The Fill Site is predominately classified as a potential steep slope hazard area, particularly along the downhill sides of Areas 1 through 4. During the downstream field analysis, no severe erosion issues were identified. However, steep slopes on the east (uphill) side of the main haul road could pose potential hazards to the haul road ditch at the toe of the slope, which will convey runoff from Area 6. In the event of a slope failure or landslide, these ditches could become obstructed. Mitigation strategies to prevent hillside impact are detailed in Section 4.1.5.

Type 3. Severe Flooding Problem

No severe flooding problems were identified on site. Project runoff in excess of the system capacity will not cause Severe Building or Roadway Flooding as existing and proposed conveyance systems have capacity to convey the 100-year event without overtopping.

Type 4. Potential Impacts to Wetland Hydrology Problem

The project triggers Problem Type #4: "Potential Impacts to Wetland Hydrology," as TDAs 2 and 3 drain to Wetland A. Under proposed conditions, runoff from Area 5 will continue flowing to the wetland, but will first be detained in the Area 5 pond. Runoff from portions of the existing facility in TDA 3 will continue to drain to the existing stormwater ponds before discharging south towards Wetland A.

The KCSWDM requires that areas draining to downstream wetlands that require a flow control facility per Core Requirement 3, apply wetland hydroperiod protections according to Method 2 guidelines outlined in Reference 5 of KCSWDM. Hydroperiod protections are discussed further in Section 6.1. Freshwater emergent and forested/shrub wetlands were mapped in the 2024 National Wetland Inventory (NWI 2024) at the Plant Site in the three former silt pond cells, which are now used for additional disposal area. According to King County Code 21A.06.1391.C, wetlands artificially created from upland sites for flow control facilities or wetponds are not considered wetlands. As such, these wetlands do not require protections.

3.1.2.3. Downstream Water Quality Problems Requiring Special Attention

The seven categories of potential downstream water quality problems identified in Section 1.2.2.1.2 of the KCSWDM were evaluated based on the information identified in the Tasks 1 and 2.

Type 1. Bacteria Problem

Lake Sawyer is designated by the state as a Category 2 water body due to exceedance of the State's numeric action standard for fecal coliform. Lake Sawyer is approximately 2 miles from the Site.

Type 2. Dissolved Oxygen Problem

Ravensdale Creek is designated by the state as a Category 2 water body due to exceedance of the State's numeric action standard for dissolved oxygen. Ravensdale Creek is adjacent to the Plant Site and receives runoff from TDAs 1 and 4.

Type 3. Temperature Problem

Ravensdale Creek is designated by the state as a Category 2 and 5 water body due to exceedance of the State's numeric action standard for temperature.

Type 4. Metals Problem

No downstream water bodies are designated by the state as a Category 5, 4, or 2 water body due to exceedance of the State's numeric action standard for metals.

Type 5. Phosphorus Problem

Lake Sawyer is designated by the state as a Category 2 water body due to exceedance of the State's numeric action standard for total phosphorous.

Type 6. Turbidity Problem

No downstream water bodies are designated by the state as a Category 5, 4, or 2 water body due to exceedance of the State's numeric action standard for turbidity.

Type 7. High pH Problem

No downstream water bodies are designated by the state as a Category 5, 4, or 2 water body due to exceedance of the State's numeric action standard for pH.

3.1.3. Task 3: Field Inspection

A Level 1 field inspection was conducted on January 29, 2025, by Owen Reese, PE and Jamie Elrod, EIT of Herrera, to determine potential offsite drainage and water quality problems associated with the proposed project. No significant impacts were identified upstream or downstream of the project TDAs. Appendix D includes field inspection documentation.

3.1.4. Task 4: Drainage System Description and Problem Descriptions

Appendix D includes a downstream analysis report for characterization of existing drainage systems.

The Site was designed to mitigate for existing erosion and potentially steep slope problem areas, potential wetland hydroperiod impacts, dissolved oxygen, and temperature water quality problems downstream in Ravensdale Creek. The project is not located within 0.25 mile of Lake Sawyer; therefore, no mitigations are required for phosphorus and fecal coliform problems at this water body.

3.1.5. Task 5: Mitigation of Existing or Potential Problems

Runoff from Areas 5 and 6 will be managed and directed into the ditch network to prevent hillside impact, mitigating slope failure concerns.

The dissolved oxygen and temperature problems identified at Ravensdale Creek will be mitigated according to the following KCSWDM requirements outlined in 1.2.2.3. The Area 6 Pond, which discharges north ultimately leading to Ravensdale Lake tributaries, was designed with a wetpool depth not exceeding 6 feet (excludes sediment storage) to mitigate for the existing dissolved oxygen problems. To mitigate for temperature problems identified in Ravensdale Creek, discharges from the Area 6 Pond will flow through 200 feet or more of open channel that is at least 50 percent shaded at midday in the summer before discharging to Ravensdale Creek tributaries. This measure also promotes additional aeration of outflow. Since the Site will not drain to Lake Sawyer within a 0.25 mile, mitigation of the bacteria problem is not required. Designs meet Sensitive Lake WQ requirements, which includes additional phosphorus treatment of project runoff, which will mitigate phosphorus impacts to Lake Sawyer.

3.2. Level 2 Downstream Analysis

Although King County has not yet requested a Level 2 Downstream Analysis, a hydroperiod analysis was conducted for Wetland A. Results showed no adverse impacts, as discussed further in Section 6.1.

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4. Flow Control, Low Impact Development (LID), and Water Quality Facility Analysis and Design

4.1. Flow Control Analysis and Design

4.1.1. Flow Control Criteria

As noted in Section 2, the proposed stormwater facilities will be designed to meet Level 2 Flow Control Standards, which require post-developed flows to match historical flow durations for a range of flows from 50 percent of 2-year peak flow through the 50-year peak flow and match historical 2- and 10-year peak flows. Historical (predeveloped) site conditions for the Site are forested conditions. Two combined detention and large wetpond facilities designed in accordance with KCSWDM Section 6.4.4 will be used to meet the Flow Control Performance Standard.

4.1.2. Methods

Simulation of the site hydrology was conducted with MGSFlood Version 4.58. MGSFlood is an Ecology-approved long-term, as opposed to event-based, hydrology model based on the industry standard Hydrologic Simulation Program – FORTRAN (HSPF). The meteorological inputs for the model, precipitation, and potential evaporation, are preloaded in the MGSFlood software package and chosen based on the user-specified project location. The proposed project site uses the Puget East 56-inch mean annual precipitation dataset. MGSFlood simulations were conducted using a 15-minute timestep (Appendix B).

All pervious areas and vegetated landfill covers were simulated as 50 percent grass/50 percent pasture (located outside the UGA) underlain by SCS hydrologic soil group C (till) type soil, and pollution-generating impervious surfaces were represented as roads. The land covers were further divided into slope categories: flat (0 to 5 percent), moderate (5 to 15 percent), and steep (15 percent+). Default land use parameters (PERLND and IMPLND parameters) were used. Groundwater flow connections in modeling were excluded from all pervious land types. The surface areas of the detention ponds were modeled as non-pollution generating impervious areas, per KCSWDM requirements.

4.1.3. Target Surfaces for Flow Control Design

Per Section 1.2.3 of the KCSWDM, all new and replaced impervious surfaces and new pervious surfaces within in each TDA must be mitigated. The KCSWDM also requires that existing impervious surface added after January 8, 2001, must also be mitigated, which includes the existing eastern haul road included within the boundaries of TDAs 1 and 2. The new pervious surface includes conversion of a native vegetated surface or other native surface to a nonnative pervious surface. All fill is assumed to convert existing vegetation. Flow control design is proposed only for TDAs 1 and 2 as TDAs 3 and 4 are managed through the existing stormwater. The proposed fill in Areas 5 and 6 will not increase impervious surfaces in those areas; therefore, no additional flow control mitigation of TDAs 3 and 4 is required.

4.1.4. Mitigation of Bypassed Target Surfaces

On the Site, topography makes it difficult to collect all target surface runoff for discharge to the onsite flow control facilities. Small areas of target surfaces will bypass the proposed ponds. Runoff bypassing the two proposed stormwater facilities (Area 5 and 6 Ponds) primarily occurs over impervious spillway surfaces and the downstream embankment of the ponds. To ensure compliance with Core Requirement 3, the project will meet the conditions outlined in Section 1.2.3.2.E of the KCSWDM. Detention facilities are sized to over detain to compensate for bypassed areas.

4.1.5. Area 5 and 6 Detention Pond Design

Proposed conditions were modeled with the slope, soil type, and land cover shown in Table 4. Table 5 provides details on size and depth of the corresponding detention facilities needed to meet Conservation Flow Control requirements.

Table 4. Land Cover and Basin Areas Used for Hydrologic Modeling.		
Project Area Subbasins (facility group name)	**Area 5 Pond**	**Area 6 Pond**
Detained Areas		
Facility Surface Area (acres)[a]	**1.04**	**1.75**
Till Lawn (acres)	**3.95**	**10.75**
Flat Slope (0 to 5 percent)	1.83	4.75
Moderate Slope (5 to 15 percent)	0.19	0.37
Steep Slope (15 percent-Vertical)	1.94	5.63
Till Pasture (acres)	**3.95**	**10.75**
Flat Slope (0 to 5 percent)	1.83	4.75
Moderate Slope (5 to 15 percent)	0.19	0.37
Steep Slope (15 percent-Vertical)	1.94	5.63
Pollution Generating Impervious (acres)	**1.06**	**3.72**
Flat Slope (0 to 5 percent)	0.70	2.28
Moderate Slope (5 to 15 percent)	0.32	1.29
Steep Slope (15 percent-Vertical)	0.05	0.15
Total Detained Area (acres)	**10.01**	**26.98**
Bypassed Areas		
Till Lawn (acres)	**1.30**	**1.36**
Flat Slope (0 to 5 percent)	0.25	0.05
Moderate Slope (5 to 15 percent)	0.31	0.25
Steep Slope (15 percent-Vertical)	0.75	1.06
Till Pasture (acres)	**1.30**	**1.36**
Flat Slope (0 to 5 percent)	0.25	0.05
Moderate Slope (5 to 15 percent)	0.31	0.25
Steep Slope (15 percent-Vertical)	0.75	1.06
Non-Pollution Generating Impervious (acres)	**0.02**	**0.07**
Steep Slope (15 percent-Vertical)	0.02	0.07
Total Bypassed Area (acres)	**2.62**	**2.79**

[a] Both ponds are modeled as non-pollution generating impervious areas, per KCSWDM requirements.

Table 5. Stormwater Detention Pond and Outlet Structure Dimensions.			
Area 5 Pond			
Bottom Elevation of Detention (feet)	932.00[a]		
Maximum Elevation (feet)	939.00[b]		
Volume of Detention at Maximum Elevation (cubic feet)	230,082		
Outlet Structure Configuration	**Type**	**Elevation (feet)**	**Diameter (inches)**
Orifice #1	Horizontal; No Elbow	930.00 (Bottom)[c]	0.667
Orifice #2	Horizontal; Elbow	932.5	2.5
Orifice #3	Horizontal; Elbow	934.75	2.5
Riser	Riser	937	30
Area 6 Pond			
Bottom Elevation of Detention (feet)	915.00 [a]		
Maximum Elevation (feet)	926.88[b]		
Volume of Detention at Maximum Elevation (cubic feet)	582,670		
Outlet Structure Configuration	**Type**	**Elevation (feet)**	**Diameter (inches)**
Orifice #1	Horizontal; No Elbow	913.00 (Bottom)[c]	1.00
Orifice #2	Horizontal; Elbow	915.25	1.00
Orifice #3	Horizontal; Elbow	916.00	2.75
Riser	Riser	925.00	30.0

[a] Maximum elevation of pond represents the berm height

[b] Represents an orifice plate located horizontally 2.0' below outlet invert elevation

[c] Orifice elevation of 'bottom' indicates orifice is on bottom of flow control tee (located 2.0' below the outlet invert.

4.2. Low Impact Development (LID) Analysis and Design

Per Section 1.2.9 of the KCSWDM, the proposed stormwater facilities must meet the requirements for flow control BMPs. Because the Site is outside of the Urban Growth Area and larger than 5 acres in size, the Site is required to meet the LID Performance Standard via modeling. The designed stormwater system must match historical flow durations for a range of flows from 8 percent of the 2-year peak flow through 50 percent of the 2-year peak flow. Due to the vast size of the Site, compliance with the LID modeling performance standard is not feasible. Flow Control BMP credits are not applicable to facilities that are privately maintained, as is the case at Reserve. Since the proposed stormwater ponds alone cannot meet the LID modeling standard, a design adjustment will be needed.

Full dispersion and limited and full infiltration are not viable options for managing treated and detained runoff from Areas 5 and 6, as a native vegetated flow path of at least 100 feet downstream of the TDA

cannot be established and potential infiltration locations are limited to fill slopes and soils that do not meet the requirements as outlined in Appendix C.2 of the KCSWDM. As an alternative, basic dispersion has been selected from the Large Lot BMP list for implementation. This approach will disperse treated and detained runoff from the Area 5 and 6 Ponds onto a proposed rock pad, which will then distribute runoff into the forested areas on site.

4.2.1. Rock Pad Dispersion

Pads of crushed rock will be used a dispersion device to discharge concentrated runoff from the proposed drainage ditches that convey outflow from the stormwater ponds. Per KCSWDM C.2.4.3, a single rock pad is 2 feet wide (perpendicular to flow) by 3 feet long by 6 inches deep and consists of crushed rock. As these dissipation devices also serve as additional outfall protection, they are designed with 2 feet of riprap. For every 700 square feet of impervious surface or 5,000 square feet of nonnative pervious surface, an additional rock pad is needed. Sizing of rock pads for TDAs 1 and 2 outflows are shown in Table 6.

Table 6. Rock Pad Dispersion Design Calculations.

Project TDA	TDA 1	TDA 2
Total Impervious Surface Area (square feet)	241,254	92,408
Total Nonnative Pervious Surface Area (square feet)	1,055,357	458,013
Number of Rock Pads	556	224
Total Rock Pad Area (square feet)	3,336	1,344

4.3. Water Quality Analysis and Design

4.3.1. Water Quality Criteria

As noted in Section 2, the proposed stormwater facilities will be targeted for basic treatment, aiming to achieve 80 percent total suspended solids (TSS) removal, and Sensitive Lake treatment, aiming at a 50 percent annual average total phosphorus (TP).

4.3.2. Methods

The same hydrologic modeling approach was used for water quality design as described for Flow Control in Section 4.1.2. MGSFlood simulation reports are provided in Appendix B.

4.3.3. Target Surfaces for Water Quality Design

Per Section 1.2.8 of the KCSWDM, all new and replaced PGIS surfaces and new PGPS as well as existing PGIS added after January 8, 2001, within in each TDA must be mitigated. Although the proposed fill areas will eventually be capped with a 1- to 2-foot thickness of native soil and revegetated according to the Reclamation Planting Plan included with this submittal, stormwater facilities are designed for interim conditions in Areas 5 and 6 assuming exposed fill activities. Therefore, fill and other converted vegetation

is modeled at pollution generating. Water quality design is proposed only for TDAs 1 and 2. Since TDAs 3 and 4 are managed through the existing stormwater ponds. The proposed fill in Areas 5 and 6 does not increase pollution generating surfaces in TDAs 3 and 4; therefore, no additional water quality mitigation of TDAs 3 and 4 is required.

4.3.4. Mitigation of Bypassed Target Surfaces

Runoff bypassing the two proposed stormwater facilities (Area 5 and 6 Ponds) primarily occurs over impervious spillway surfaces and vegetated areas altered by downstream ditch construction. These bypassed areas are not targeted for water quality treatment.

4.3.5. Water Quality Design – Basic and Sensitive Lake Treatment

A summary of the water quality design calculations for the Area 5 and Area 6 ponds is shown in Table 7. To achieve both Basic and Sensitive Lake water quality standards, a large wetpool with 1.5 times the volume of a basic wetpool is needed. Wetpools are typically divided into two cells, separated by a baffle or berm, with the first cell containing approximately 25 to 35 percent of the total wetpool volume. However, since the ponds are designed with a length-to-width ratio greater than 4:1, a dividing berm is unnecessary, and the ponds consist of a single cell rather than two. The wetpool portion of the ponds will be unlined. A depth of 1 foot will be provided at the bottom of each pond to account for sediment storage.

Table 7. Large Treatment Wetpond Design Calculations.

Facility Name (Project Area Subbasin)	Area 5 Pond	Area 6 Pond
Computed Large Wetpond Volume (cubic feet)[a]	38,229	109,568
Designed Large Wetpond Volume (square feet)	56,721	109,861

[a] The computed large wetpond volume is based on the model results in Appendix B. The basic wetpond volume is equal to the 91 percent water quality treatment volume, as estimated by an approved continuous runoff model with 15-minute time steps calibrated to site conditions. A large wetpond is 1.5 times the size of a basic wetpond.

5. Conveyance System Analysis and Design

All conveyance systems within the proposed project (i.e., pipes, culverts, ditches and outlet structures) are designed to convey the undetained 25-year peak design flow from the developed condition and convey the 100-year peak design flow under surcharged conditions without causing flooding or erosion problems. Pipe types and structures conform with the requirements of 2021 KCSWDM, Chapter 4. The 25-year and 100-year peak flows are simulated using MGS Flood for TDAs 1 and 2, as well as drainage areas tributary to proposed conveyance features (Table 8).

Table 8. Conveyance System Design Flows.

Modeled Facility Tributary Areas	25-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Area 5 Pond Inflow	4.06	6.93
Area 6 Pond Inflow	10.92	18.82
Area 5 Pond Interceptor Ditches	4.30	7.43
Area 6 Pond Interceptor Ditches	3.11	5.35
Area 5 Pond Outflow Ditches	6.40	10.70
Area 6 Pond Outflow Ditches	13.36	23.20

cfs = cubic feet per second

5.1. Pipe and Culvert Design

All proposed culverts are either 18-inch or 24-inch Corrugated Polyethylene Storm Sewer pipes, designed to convey both the 25-year and 100-year storm events. Outflow pipes from the ponds are sized assuming undetained flow. Headwater conditions of the culverts were evaluated to verify compliance with KCSWDM Core Requirement 4.

5.2. Ditch Design

Ditches are designed to convey and contain, at a minimum, the 25-year peak flow under developed conditions while also providing sufficient capacity to accommodate the 100-year peak flow under surcharged conditions without causing flooding or erosion issues. The 25-year and 100-year peak flows for the largest ditch drainage area for Areas 5 and 6 Pond interceptor and outflow ditches were simulated using MGSFlood and used to conservatively size all ditches. Table 8 includes the maximum drainage area and modeled flow values.

Ditches were designed with 3:1 side slopes and a downgradient of at least 0.5 percent. Vegetated ditches were selected for slopes under 5 percent. Rock check dams are proposed for ditches with slopes between 5 percent and 10 percent. For ditches exceeding 10 percent, rock lining is provided. Bottom widths range

from 3 feet for interceptor ditches to 5 feet for outflow ditches, which are sized assuming undetained flow from the proposed ponds or the greatest tributary area.

5.3. Outfall Protection

To ensure protection of natural drainage patterns and prevent erosion or scouring, the outflow velocity was determined for each outfall using the undetained 100-year flow. Following the King County guidelines for rock protection, all outfalls were designed with a 2-foot-thick riprap ditch lining extending at least 12 feet from the outlet, and 1 foot above the crown of the pipe.

5.4. Spillway Design

Stormwater detention ponds are both designed with overflow spillways, set with 1-foot vertical clearance from the riser rim to the bottom of spillway. The spillways are sized to convey and dissipate the undetained 100-year design peak flow with 6 inches of freeboard in an emergency overflow event. An energy dissipation pad is also provided for each spillway. Table 9 provides calculated spillway lengths.

Table 9. Emergency Spillway Design.

Stormwater Detention Pond	100-Year Peak Flow (cfs)	Spillway Length (feet)
Area 5 Pond	6.93	5
Area 6 Pond	18.92	15

5.5. Overflow Structure Design

All proposed overflow structures are designed with an internal riser and two downturned elbows to control outflow from each facility to meet the Level 2 flow control standard. Each riser has three orifices, one at the bottom of the riser, and one at the bottom of each elbow. The proposed structures for Area 5 and 6 Ponds are designed to provide for primary overflow of the developed 100-year peak flow assuming all orifices are plugged. Figure 5.1.4.H (p. 5-35) in the KCSWDM was used to calculate the head in feet above a riser of given diameter and flow.

6. Special Reports and Studies

6.1. Wetland Hydroperiod Analysis

The project triggers Problem Type #4: "Potential Impacts to Wetland Hydrology," as TDAs 2 and 3 drain to downstream Category 1 Wetland A. Under proposed conditions, runoff will continue flowing south but will first be detained in the Area 5 or Southwest Pond before discharging. Per Core Requirement 3 of the KCSWDM, wetlands requiring flow control must follow Method 2 hydroperiod protections discussed in the following subsections.

6.1.1. Hydroperiod Modeling Criteria

The project must apply wetland hydroperiod protections according to Method 2 guidelines outlined in Reference 5 of KCSWDM. Method 2 applies to category III and IV wetlands that contain a breeding population of native amphibian species and uses a site discharge volume model to evaluate hydrologic changes in a wetland. Compliance with Method 2 guidelines must be verified by modeling to demonstrate that:

1. The total volume of water discharged into the wetlands, on a daily basis, is no more than a 20 percent difference, higher or lower, than the pre-project volumes
2. On a monthly basis, the water volume discharged to the wetlands is no more than a 15 percent difference, higher or lower, than the pre-project volumes.

6.1.2. Methods

Simulation of the site hydrology was conducted with MGSFlood Version 4.58 using the same modeling assumptions as listed under Section 4.2.1, unless otherwise stated.

The drainage basin tributary to Wetland A was delineated at approximately 421 acres (Figure 7). While the full extent of Wetland A was not determined, it is estimated to be larger, as only areas draining toward the northern and eastern boundaries were assessed. The southern and western drainage areas were not evaluated, as the project runoff will not affect those flow patterns. Total basin area will remain the same under existing and proposed conditions, with the exception of the existing portion of TDA 2, which will drain to TDA 1 under proposed conditions (see Section 1.3.1 for additional discussion). Unlike flow duration modeling, the predeveloped scenario represents existing topography and land cover rather than historical forested conditions. Onsite areas contributing runoff to the Wetland include Areas 1, 2, 3, and 5 (Table 1, TDAs 2 and 3). During modeling, project site contributions were modeled with the land cover documented in Table 1 and Table 2, and under the same methods outlined in Section 4.1.2 (i.e., groundwater flow connected excluded). Modeled outflow from Area 5 Pond remains unchanged, apart from the inclusion of groundwater flow in connections to downstream pervious areas. Remaining downstream areas and corresponding land cover are shown in Table 10. The land covers were further

divided into slope categories: flat (0 to 5 percent), moderate (5 to 15 percent), and steep (15 percent+). Nonnative pervious areas are simulated as 50 percent grass/50 percent (located outside the UGA) underlain by SCS hydrologic soil group C (till) type soil. Native vegetation is modeled as forest underlain by till soils, and impervious surfaces were represented as roads. Default land use parameters (PERLND and IMPLND parameters) were used.

Table 10. Wetland A Tributary Basin.

Subbasin ID	Land Cover/Slope	Area (acres)
Onsite Areas		
TDA 2	See Table 2	12.63
TDA 3	See Table 2	24.26
Downstream Areas		
Till Forest (acres)		306.57
	Flat Slope (0 to 5 percent)	14.50
	Moderate Slope (5 to 15 percent)	25.20
	Steep Slope (15 percent-Vertical)	266.87
Till Lawn (acres)		3.52
	Flat Slope (0 to 5 percent)	0.17
	Moderate Slope (5 to 15 percent)	0.29
	Steep Slope (15 percent-Vertical)	3.07
Till Pasture (acres)		9.20
	Flat Slope (0 to 5 percent)	0.44
	Moderate Slope (5 to 15 percent)	0.76
	Steep Slope (15 percent-Vertical)	8.01
Impervious Surface (acres)		66.72
	Flat Slope (0 to 5 percent)	3.16
	Moderate Slope (5 to 15 percent)	5.48
	Steep Slope (15 percent-Vertical)	58.08

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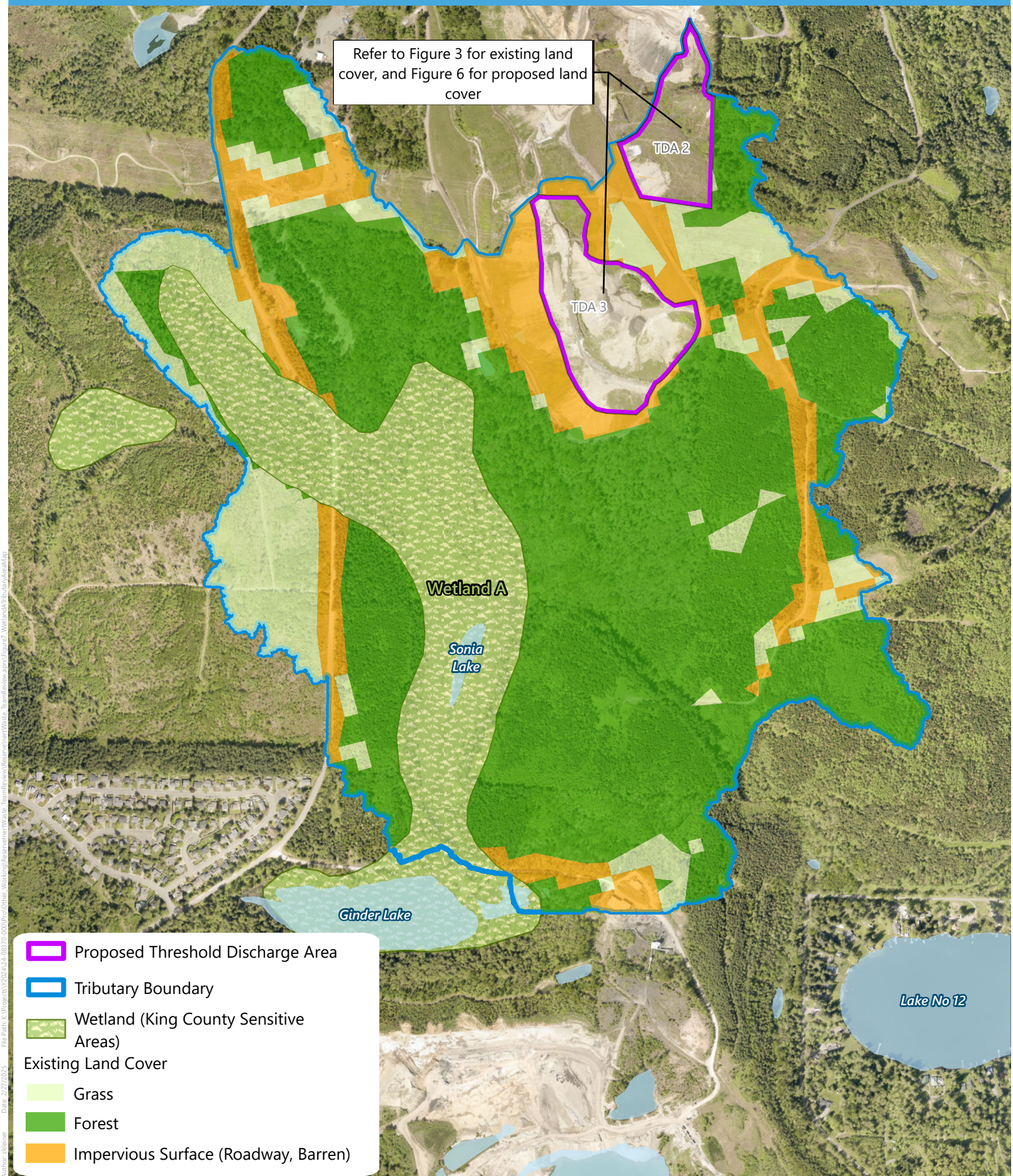
Figure 7.
Wetland A Tributary Area.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County Open Data Portal Aerial Imagery

0 250 500 1,000 Feet

File Path: K:\Projects\V2024\24-08370-000\Pro\Other_Working\ReservelnertWaste_TeamReview\ReservelnertWaste_TeamReview.aprx\Figure7_WetlandATributaryAreaMap
Date: 2/27/2025
Author: zkleiner

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7. Other Permits

Site currently operates under the following permits:

King County Department of Local Services (DLS)

Grading Permit No. GRDE15-0011 for the Reserve Silica fill site.

Public Health – Seattle & King County (Public Health)

Inert Waste Landfill Permit No. PR0082027 for disposal of inert waste in reclamation fill on Parcel No. 012106-9011 (Lot 5).

Washington State Department of Ecology (Ecology)

Sand and Gravel General Permit for the discharge of surface water at the mining Site. Ecology provides details for Permit No. WAG503029 on the PARIS database.

8. CSWPP Plan Analysis and Design

The Site design proposed a comprehensive Construction Stormwater Pollution Prevention (CSWPP) Plan in accordance with Appendix D of the KCSWDM. The CSWPP Plan is composed of:

- An erosion and sediment control plan per KCSWM Section D.2.1, which addresses prevention of sediment-laden discharges.
- A stormwater pollution prevention and spill (SWPPS) plan per KCSWDM Section D.2.2, which addresses prevention of pollutant discharge to onsite or adjacent stormwater systems from construction activities, including material delivery and storage, equipment fueling and maintenance, demolition and waste disposal, and concrete handling, washout, and disposal.

9. Bond Quantities, Facility Summaries, and Declaration of Covenant

A Landscape Bond Quantity worksheet is required as part of the revegetation plans related to site reclamation to verify the quantity of soils, seedlings, and vegetation that will be planted on the Site. Prior to permit issuance, a landscape bond and financial guarantee agreement will be required. This financial guarantee will remain open until reclamation of the site has been completed.

10.Operations and Maintenance Manual

An operations and maintenance manual consistent with the KCSWDM has been prepared and is included as Appendix E. The O&M Manual includes the following BMPs:

- No. 1: Detention Ponds
- No. 4: Control Structure/Flow Restrictor
- No. 6: Conveyance Pipes and Ditches
- No. 7: Debris Barriers (e.g., Trash Racks)
- No. 12: Access Roads
- No. 16: Wetponds
- BMP C.2.4: Basic Dispersion

11. Engineer's Stamp

This design report has been prepared under the supervision of a professional engineer registered in Washington State.

Owen G. Reese, PE

February 28, 2025
Date

12. References

Aspect. 2023. Draft Memorandum Re: Geotechnical Evaluation for Securing Mine Openings, Lots 1 & Reclamation Support. Prepared for Reserve Silica Corporation by Aspect Consulting, LLC. April 27.

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Ecology. 2021. Watershed Restoration and Enhancement Plan WRIA 9 – Duwamish-Green Watershed. Publication No. 21-11-009. Washington State Department of Ecology, Olympia, Washington. May.

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King County. 2000. Lake Sawyer Management Plan. Prepared by: King County Surface Water Management with assistance from Entranco. July.

King County. 2021a. King County Surface Water Design Manual. King County Department of Natural Resources and Parks. July 23.

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NWI. 2024. National Wetlands Inventory, U.S. Fish & Wildlife Service. <https://www.fws.gov/program/national-wetlands-inventory>.

SubTerra. 2006. Revised Geology and Ground Water Report, Reserve Silica Mine, Ravensdale, Washington. June 28.

WRIA 9. 2021. Green/Duwamish and Central Puget Sound Watershed Salmon Habitat Plan 2021 Update. Making Our Watershed Fit for a King. Water Resource Inventory Area 9. Approved by the Watershed Ecosystem Forum. February 11.

Appendix A

TIR Worksheet

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TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner: Reserve Silica Corporation
Phone: (425) 432-1241
Address: 28131 SE Ravensdale Way, Ravensdale, WA 98051

Project Engineer: Owen Reese
Company: Herrera Environmental Consultants
Phone: 206.441.9080

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name: Reserve Inert Waste Landfill Expansion Permitting
DLS-Permitting
Permit #: GRDE15-0011
Location Township: 21N & 22N
Range: 06E
Section: 36, 01
Site Address: 28131 SE Ravensdale Way, Ravensdale, WA 98051

Part 3 TYPE OF PERMIT APPLICATION

- ☐ Land use (e.g.,Subdivision / Short Subd. / UPD)
- ☐ Building (e.g.,M/F / Commercial / SFR)
- ☒ Clearing and Grading
- ☐ Right-of-Way Use
- ☐ Other _____

Part 4 OTHER REVIEWS AND PERMITS[1]

- ☐ DFW HPA
- ☐ COE CWA 404
- ☐ ECY Dam Safety
- ☐ FEMA Floodplain
- ☐ COE Wetlands
- ☐ Shoreline Management
- ☐ Structural Rockery/Vault/_____
- ☐ ESA Section 7
- ☒ Other Inert Waste Landfill Modification

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report

Type of Drainage Review (check one):
- ☒ Full
- ☐ Targeted
- ☐ Simplified
- ☐ Large Project
- ☐ Directed

Date (include revision dates): _____
Date of Final: _____

Site Improvement Plan (Engr. Plans)

Plan Type (check one):
- ☒ Full
- ☐ Modified
- ☐ Simplified

Date (include revision dates): _____
Date of Final: _____

Part 6 SWDM ADJUSTMENT APPROVALS

Type (circle one): Standard / Experimental / Blanket

Description: (include conditions in TIR Section 2)

_____

_____

_____

Approved Adjustment No. _____ Date of Approval: _____

[1] DFW: WA State Dept. of Fish and Wildlife. HPA: hydraulic project approval. COE: (Army) Corps of Engineers. CWA: Clean Water Act. ECY: WA State Dept. of Ecology. FEMA: Federal Emergency Management Agency. ESA: Endangered Species Act.

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS

Monitoring Required: Yes / (No)

Start Date: _____

Completion Date: _____

Describe: _____

Re: KCSWDM Adjustment No. _____

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan : _____

Special District Overlays: _____

Drainage Basin: Lake Sawyer drainage basin;Lower Green-Duwamish River Watershed (WRIA) 9.

Stormwater Requirements: Full Drainage Review

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

- ☒ River/Stream Ravensdale Creek
- ☒ Lake Ravensdale Lake, Lake Sawyer
- ☒ Wetlands Wetland A
- ☐ Closed Depression
- ☐ Floodplain
- ☐ Other

- ☒ Steep Slope Potentially steep slope hazard, some portions of site >40%
- ☒ Erosion Hazard
- ☐ Landslide Hazard
- ☒ Coal Mine Hazard
- ☐ Seismic Hazard
- ☐ Habitat Protection
- ☐

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
Alderwood Series/Till	Moderate to Steep	Yes

- ☐ High Groundwater Table (within 5 feet)
- ☐ Other
- ☐ Sole Source Aquifer
- ☐ Seeps/Springs

☐ Additional Sheets Attached

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 11 DRAINAGE DESIGN LIMITATIONS

REFERENCE	LIMITATION / SITE CONSTRAINT
☐ Core 2 – Offsite Analysis	
☐ Sensitive/Critical Areas	
☐ SEPA	
☒ LID Infeasibility	
☐ Other	
☐	

☐ Additional Sheets Attached

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)

Threshold Discharge Area: (name or description) Threshold Drainage Area #1

Core Requirements (all 8 apply):

Discharge at Natural Location	Number of Natural Discharge Locations: 2
Offsite Analysis	Level: (1) / 2 / 3 dated: 01/29/2025
Flow Control (include facility summary sheet)	Level: 1 / (2) / 3 or Exemption Number _____ Flow Control BMPs Detention Pond
Conveyance System	Spill containment located at: _____
Erosion and Sediment Control / Construction Stormwater Pollution Prevention	CSWPP/CESCL/ESC Site Supervisor: Reserve Silica Corp. Contact Phone: _____ After Hours Phone: _____
Maintenance and Operation	Responsibility (circle one): (Private) / Public If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: Yes / (No)
Water Quality (include facility summary sheet)	Type (circle one): (Basic) / (Sens. Lake) / Enhanced Basic / Bog or Exemption No. _____ Landscape Management Plan: Yes / No
For Entire Project: % of Target Impervious that had a feasible FCBMP implemented 0%	Total Replaced Impervious surfaces on the site 4.86 AC Total New Pervious Surfaces on the site 34.85 AC Repl. Imp. on site mitigated w/flow control facility 4.78 AC Repl. Imp. on site mitigated w/water quality facility 4.78 AC Repl. Imp. on site mitigated with FCBMP _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 11 DRAINAGE DESIGN LIMITATIONS

REFERENCE	LIMITATION / SITE CONSTRAINT
☐ Core 2 – Offsite Analysis	
☐ Sensitive/Critical Areas	
☐ SEPA	
☒ LID Infeasibility	
☐ Other	
☐	

☐ Additional Sheets Attached

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)

Threshold Discharge Area: (name or description) Threshold Drainage Area #2

Core Requirements (all 8 apply):

Discharge at Natural Location	Number of Natural Discharge Locations: 2
Offsite Analysis	Level: (1) / 2 / 3 dated: 01/29/2025
Flow Control (include facility summary sheet)	Level: 1 / (2) / 3 or Exemption Number _____ Flow Control BMPs Detention Pond
Conveyance System	Spill containment located at: _____
Erosion and Sediment Control / Construction Stormwater Pollution Prevention	CSWPP/CESCL/ESC Site Supervisor: Reserve Silica Corp. Contact Phone: _____ After Hours Phone: _____
Maintenance and Operation	Responsibility (circle one): (Private) / Public If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: Yes / (No)
Water Quality (include facility summary sheet)	Type (circle one): (Basic) / (Sens. Lake) / Enhanced Basic / Bog or Exemption No. _____ Landscape Management Plan: Yes / No
For Entire Project: % of Target Impervious that had a feasible FCBMP implemented 0%	Total Replaced Impervious surfaces on the site 4.86 AC Total New Pervious Surfaces on the site 34.85 AC Repl. Imp. on site mitigated w/flow control facility 4.78 AC Repl. Imp. on site mitigated w/water quality facility 4.78 AC Repl. Imp. on site mitigated with FCBMP _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
Special Requirements (as applicable):	
Area Specific Drainage Requirements	Type: CDA / SDO / MDP / BP / LMP / Shared Fac. / (None) Name: _____
Floodplain/Floodway Delineation	Type (circle one): Major / Minor / Exemption / (None) 100-year Base Flood Elevation (or range): _____ Datum:
Flood Protection Facilities	Describe:
Source Control (commercial / industrial land use)	Describe land use: Describe any structural c
Oil Control	High-use Site: Yes / (No) Treatment BMP: _____ Maintenance Agreement: Yes / No with whom? _____
Other Drainage Structures	
Describe:	

Must meet the requirements of the Sand and Gravel General Permit

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS	
MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☒ Clearing Limits	☒ Stabilize exposed surfaces
☒ Cover Measures	☒ Remove and restore Temporary ESC Facilities
☒ Perimeter Protection	☒ Clean and remove all silt and debris, ensure operation of Permanent Facilities, restore operation of Flow Control BMP Facilities as necessary
☒ Traffic Area Stabilization	☐ Flag limits of SAO and open space preservation areas
☒ Sediment Retention	☐ Other _____
☒ Surface Water Collection	
☐ Dewatering Control	
☒ Dust Control	
☒ Flow Control	
☒ Protection of Flow Control BMP Facilities (existing and proposed)	
☒ Maintain BMPs / Manage Project	

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)

Flow Control	Type/Description	Water Quality	Type/Description
☒ Detention	Area 5 and 6 Detention-Large Wetponds	☐ Vegetated Flowpath	
☐ Infiltration		☒ Wetpool	Area 5 and 6 Detention-Large Wetponds
☐ Regional Facility		☐ Filtration	
☐ Shared Facility		☐ Oil Control	
☒ Flow Control BMPs	Basic Dispersion Rock Pads	☐ Spill Control	
☐ Other		☐ Flow Control BMPs	
		☐ Other	

Part 15 EASEMENTS/TRACTS

- ☐ Drainage Easement
- ☐ Covenant
- ☐ Native Growth Protection Covenant
- ☐ Tract
- ☐ Other _____

Part 16 STRUCTURAL ANALYSIS

- ☐ Cast in Place Vault
- ☐ Retaining Wall
- ☐ Rockery > 4' High
- ☐ Structural on Steep Slope
- ☐ Other _____

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER

I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provided here is accurate.

February 28, 2025

Signed/Date

Appendix B

Flow Control and Water Quality Model Reports

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MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.59
Program License Number: 200210002
Project Simulation Performed on: 02/28/2025 8:59 AM
Report Generation Date: 02/28/2025 8:59 AM

Input File Name: TDA2_Area5DetPond_02192025.fld
Project Name: Reserve Inert Waste
Analysis Title: Area 5 Detention/Lrg WetPond
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 19
Precipitation Station : 96005605 Puget East 56 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961056 Puget East 56 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	12.636	21.608
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	12.636	21.608

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

-------Area (Acres) --------	
C, Forest, Flat	12.636
Subbasin Total	12.636

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3

---------- Subbasin : TDA 2 ----------

-------Area (Acres) --------	
C, Pasture, Flat	1.832
C, Pasture, Mod	0.186
C, Pasture, Steep	1.937
C, Lawn, Flat	1.832
C, Lawn, Mod	0.186
C, Lawn, Steep	1.937
ROADS/FLAT	0.700
ROADS/MOD	0.316
ROADS/STEEP	0.048
POND	1.040

Subbasin Total 10.012

---------- Subbasin : TDA 2 (Bypass) ----------
-------Area (Acres) --------
C, Pasture, Flat 0.247
C, Pasture, Mod 0.309
C, Pasture, Steep 0.747
C, Lawn, Flat 0.247
C, Lawn, Mod 0.309
C, Lawn, Steep 0.747
SIDEWALKS/STEEP 0.017

Subbasin Total 2.624

---------- Subbasin : TDA 2 (only PGIS & PGPS) ----------
-------Area (Acres) --------
C, Pasture, Flat 1.832
C, Pasture, Mod 0.186
C, Pasture, Steep 1.937
C, Lawn, Flat 1.832
C, Lawn, Mod 0.186
C, Lawn, Steep 1.937
ROADS/FLAT 0.700
ROADS/MOD 0.316
ROADS/STEEP 0.048

Subbasin Total 8.972

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 2

Link Name: WQ Sizing Link
Link Type: Copy
Downstream Link: None

Link Name: Area 5 Pond
Link Type: Structure
Downstream Link: None

User Specified Elevation Volume Table Used

Elevation (ft)	Pond Volume (cu-ft)
932.00	0.
933.00	17287.
933.46	26138.
933.70	32100.
934.00	41254.
935.00	73417.
936.00	108239.
937.00	145861.
938.00	186428.
939.00	230082.
941.00	325530.

Hydraulic Conductivity (in/hr) : 0.00

Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 30.00
Common Length (ft) : 0.000
Riser Crest Elevation : 937.00 ft

Hydraulic Structure Geometry

Number of Devices: 3

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 932.00
Diameter (in) : 0.67
Orientation : Horizontal
Elbow : Yes

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 932.50
Diameter (in) : 2.50
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 934.75
Diameter (in) : 2.50
Orientation : Horizontal
Elbow : Yes

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3
Number of Links: 2

********** Link: Area 5 Pond ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	933.850
1.11-Year	933.916
1.25-Year	934.182
2.00-Year	934.793
3.33-Year	935.125
5-Year	935.386
10-Year	935.969
25-Year	936.724
50-Year	936.994
100-Year	937.066

**********Groundwater Recharge Summary **********
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	2965.766
Total:	2965.766

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 2	1393.615
Subbasin: TDA 2 (Bypass)	457.989
Subbasin: TDA 2 (only PGIS & P	1393.615
Link: WQ Sizing Link	Not Applicable
Link: Area 5 Pond	0.000
Total:	3245.218

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 18.771 ac-ft/year, Post Developed: 20.539 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 2

********** Link: Area 5 Pond **********

WQ Stats

Basic Wet Pond Volume (91% Exceedance): 36997. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 55495. cu-ft
2-Year Discharge Rate : 0.291 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.60 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.35 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 4971.54
Inflow Volume Including PPT-Evap (ac-ft): 4971.54
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 4971.16
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

Flow Control Stats

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: Area 5 Pond

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.464	2-Year	0.291
5-Year	0.721	5-Year	0.416
10-Year	0.907	10-Year	0.492

25-Year	1.246	25-Year	0.573
50-Year	1.478	50-Year	0.663
100-Year	1.499	100-Year	1.056
200-Year	2.499	200-Year	1.387
500-Year	3.847	500-Year	1.822

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-5.2%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-5.2%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.0%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	62.3%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	135.8%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.59
Program License Number: 200210002
Project Simulation Performed on: 02/28/2025 9:02 AM
Report Generation Date: 02/28/2025 9:11 AM

Input File Name: TDA1_Area6DetPond_02192025.fld
Project Name: Reserve Inert Waste
Analysis Title: TDA 1 Detention/Lrg WetPond
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 19
Precipitation Station : 96005605 Puget East 56 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961056 Puget East 56 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	29.766	54.988
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	29.766	54.988

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

-------Area (Acres) --------	
C, Forest, Mod	29.766
Subbasin Total	29.766

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3

---------- Subbasin : TDA 1 ----------

-------Area (Acres) --------	
C, Pasture, Flat	4.752
C, Pasture, Mod	0.375
C, Pasture, Steep	5.626
C, Lawn, Flat	4.752
C, Lawn, Mod	0.375
C, Lawn, Steep	5.626
ROADS/FLAT	2.279
ROADS/MOD	1.290
ROADS/STEEP	0.149
POND	1.755

Subbasin Total 26.977

---------- Subbasin : TDA 1 (Bypassed) ----------
-------Area (Acres) --------
C, Pasture, Flat 0.051
C, Pasture, Mod 0.248
C, Pasture, Steep 1.063
C, Lawn, Flat 0.051
C, Lawn, Mod 0.248
C, Lawn, Steep 1.063
SIDEWALKS/STEEP 0.067

Subbasin Total 2.789

---------- Subbasin : TDA 1 (only PGIS & PGPS) ----------
-------Area (Acres) --------
C, Pasture, Flat 4.752
C, Pasture, Mod 0.375
C, Pasture, Steep 5.626
C, Lawn, Flat 4.752
C, Lawn, Mod 0.375
C, Lawn, Steep 5.626
ROADS/FLAT 2.279
ROADS/MOD 1.290
ROADS/STEEP 0.149

Subbasin Total 25.222

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 2

Link Name: Area 6 Pond
Link Type: Structure
Downstream Link: None

User Specified Elevation Volume Table Used

Elevation (ft)	Pond Volume (cu-ft)
915.00	0.
916.00	21772.
917.10	54090.
918.00	88054.
919.00	129100.
920.00	173885.
921.00	222439.
922.00	274645.
923.00	330499.
924.00	390048.
925.00	453336.
926.00	520424.
926.88	582670.

Constant Infiltration Option Used
Infiltration Rate (in/hr): 0.00

Riser Geometry
Riser Structure Type : Circular

Riser Diameter (in) : 30.00
Common Length (ft) : 0.000
Riser Crest Elevation : 925.00 ft

Hydraulic Structure Geometry

Number of Devices: 3

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 915.00
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 915.25
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 916.00
Diameter (in) : 2.75
Orientation : Horizontal
Elbow : Yes

Link Name: WQ Sizing Link
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3
Number of Links: 2

********** Link: Area 6 Pond ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	918.409
1.11-Year	918.639
1.25-Year	919.223
2.00-Year	920.457
3.33-Year	921.315
5-Year	922.183
10-Year	923.536
25-Year	925.047
50-Year	925.120
100-Year	925.172

************Groundwater Recharge Summary **************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation
Model Element Recharge Amount (ac-ft)

Subbasin: Subbasin 1	6984.828
Total:	6984.828

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 1	3785.721
Subbasin: TDA 1 (Bypassed)	475.246
Subbasin: TDA 1 (only PGIS & P	3785.721
Link: Area 6 Pond	0.000
Link: WQ Sizing Link	Not Applicable
Total:	8046.688

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 44.208 ac-ft/year, Post Developed: 50.928 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 2

********** Link: Area 6 Pond **********

WQ Stats

Basic Wet Pond Volume (91% Exceedance): 89463. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 134195. cu-ft

2-Year Discharge Rate : 0.525 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 1.50 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.86 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 11904.21
Inflow Volume Including PPT-Evap (ac-ft): 11904.21
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 11903.06
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

Flow Control Stats

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: Area 6 Pond

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.132	2-Year	0.525
5-Year	1.849	5-Year	0.615
10-Year	2.444	10-Year	0.677
25-Year	3.597	25-Year	1.019

50-Year	4.656	50-Year	1.852
100-Year	4.750	100-Year	2.641
200-Year	7.728	200-Year	3.340
500-Year	11.743	500-Year	4.253

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-54.6%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-54.6%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-42.9%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	78.8%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	131.2%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

Appendix C

Wetland A Hydroperiod Model Report

HERRERA
Science + Planning + Design

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.59
Program License Number: 200210002
Project Simulation Performed on: 02/28/2025 1:48 PM
Report Generation Date: 02/28/2025 1:49 PM

Input File Name: WetlandA_HydroperiodAnalysis.fld
Project Name: Reserve Inert Waste
Analysis Title: Wetland A Hydroperiod
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 19
Precipitation Station : 96005605 Puget East 56 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961056 Puget East 56 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	425.180	422.905
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	425.180	422.905

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 3

---------- Subbasin : Downstream Tributary Area ----------

	-------Area (Acres) --------
C, Forest, Flat	14.505
C, Forest, Mod	25.201
C, Forest, Steep	266.869
C, Pasture, Flat	0.435
C, Pasture, Mod	0.756
C, Pasture, Steep	8.007
C, Lawn, Flat	0.167
C, Lawn, Mod	0.290
C, Lawn, Steep	3.066
ROADS/FLAT	3.157
ROADS/MOD	5.484
ROADS/STEEP	58.075
Subbasin Total	386.011

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	Surface Runoff	Interflow	Groundwater
C, Forest, Flat		On	

C, Forest, Mod			On
C, Forest, Steep			On
C, Pasture, Flat			On
C, Pasture, Mod			On
C, Pasture, Steep			On
C, Lawn, Flat			On
C, Lawn, Mod			On
C, Lawn, Steep			On

---------- Subbasin : Ex TDA 3 ----------

-------Area (Acres) --------	
C, Pasture, Flat	0.282
C, Pasture, Mod	0.593
C, Pasture, Steep	0.632
C, Lawn, Flat	0.282
C, Lawn, Mod	0.593
C, Lawn, Steep	0.632
ROADS/FLAT	3.973
ROADS/MOD	8.364
ROADS/STEEP	8.908
Subbasin Total	24.259

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	|Surface Runoff |	Interflow |	Groundwater |
C, Forest, Flat			On
C, Forest, Mod			On
C, Forest, Steep			On
C, Pasture, Flat			On
C, Pasture, Mod			On
C, Pasture, Steep			On
C, Lawn, Flat			On
C, Lawn, Mod			On
C, Lawn, Steep			On

---------- Subbasin : Ex TDA 2 ----------

-------Area (Acres) --------	
C, Forest, Flat	0.069
C, Forest, Mod	0.175
C, Forest, Steep	0.171
C, Pasture, Flat	0.891
C, Pasture, Mod	2.253
C, Pasture, Steep	2.203
C, Lawn, Flat	0.891
C, Lawn, Mod	2.253
C, Lawn, Steep	2.203
ROADS/FLAT	0.633
ROADS/MOD	1.602
ROADS/STEEP	1.567
Subbasin Total	14.911

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	|Surface Runoff |	Interflow |	Groundwater |
C, Forest, Flat			On
C, Forest, Mod			On
C, Forest, Steep			On
C, Pasture, Flat			On
C, Pasture, Mod			On
C, Pasture, Steep			On
C, Lawn, Flat			On
C, Lawn, Mod			On
C, Lawn, Steep			On

----------SCENARIO: POSTDEVELOPED

Number of Subbasins: 4

---------- Subbasin : TDA 2 ----------

-------Area (Acres) --------	
C, Pasture, Flat	1.832
C, Pasture, Mod	0.186
C, Pasture, Steep	1.937
C, Lawn, Flat	1.832
C, Lawn, Mod	0.186
C, Lawn, Steep	1.937
ROADS/FLAT	0.700
ROADS/MOD	0.316
ROADS/STEEP	0.048
POND	1.040
Subbasin Total	10.012

---------- Subbasin : Prop TDA 3 ----------

-------Area (Acres) --------	
C, Pasture, Flat	5.332
C, Pasture, Mod	1.570
C, Pasture, Steep	4.589
C, Lawn, Flat	5.332
C, Lawn, Mod	1.570
C, Lawn, Steep	4.589
ROADS/FLAT	0.593
ROADS/MOD	0.175
ROADS/STEEP	0.510
Subbasin Total	24.258

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	|Surface Runoff |	Interflow |	Groundwater |
C, Forest, Flat		On	
C, Forest, Mod		On	
C, Forest, Steep		On	
C, Pasture, Flat		On	
C, Pasture, Mod		On	
C, Pasture, Steep		On	
C, Lawn, Flat		On	
C, Lawn, Mod		On	
C, Lawn, Steep		On	

---------- Subbasin : TDA 2 (Bypass) ----------

-------Area (Acres) --------	
C, Pasture, Flat	0.247
C, Pasture, Mod	0.309
C, Pasture, Steep	0.747
C, Lawn, Flat	0.247
C, Lawn, Mod	0.309
C, Lawn, Steep	0.747
SIDEWALKS/STEEP	0.017
Subbasin Total	2.624

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	|Surface Runoff |	Interflow |	Groundwater |
C, Forest, Flat		On	
C, Forest, Mod		On	
C, Forest, Steep		On	
C, Pasture, Flat		On	
C, Pasture, Mod		On	
C, Pasture, Steep		On	
C, Lawn, Flat		On	
C, Lawn, Mod		On	
C, Lawn, Steep		On	

---------- Subbasin : Downstream Tributary Area ----------

-------Area (Acres) --------

C, Forest, Flat	14.505
C, Forest, Mod	25.201
C, Forest, Steep	266.869
C, Pasture, Flat	0.435
C, Pasture, Mod	0.756
C, Pasture, Steep	8.007
C, Lawn, Flat	0.167
C, Lawn, Mod	0.290
C, Lawn, Steep	3.066
ROADS/FLAT	3.157
ROADS/MOD	5.484
ROADS/STEEP	58.075
Subbasin Total	386.011

The Following Table Lists Runoff Components that Differ from Default Values for the Current Subbasin

	Surface Runoff	Interflow	Groundwater
C, Forest, Flat		On	
C, Forest, Mod		On	
C, Forest, Steep		On	
C, Pasture, Flat		On	
C, Pasture, Mod		On	
C, Pasture, Steep		On	
C, Lawn, Flat		On	
C, Lawn, Mod		On	
C, Lawn, Steep		On	

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 1

Link Name: Wetland A
Link Type: Copy
Downstream Link: None

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 2

Link Name: Area 5 Pond
Link Type: Structure
Downstream Link Name: Wetland A

User Specified Elevation Volume Table Used

Elevation (ft)	Pond Volume (cu-ft)
932.00	0.
933.00	17287.
933.46	26138.
933.70	32100.
934.00	41254.
935.00	73417.
936.00	108239.
937.00	145861.
938.00	186428.
939.00	230082.
941.00	325530.

Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low

Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 30.00
Common Length (ft) : 0.000
Riser Crest Elevation : 937.00 ft

Hydraulic Structure Geometry

Number of Devices: 3

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 932.00
Diameter (in) : 0.67
Orientation : Horizontal
Elbow : Yes

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 932.50
Diameter (in) : 2.50
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 934.75
Diameter (in) : 2.50
Orientation : Horizontal
Elbow : Yes

Link Name: Wetland A
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 3
Number of Links: 1

********** Link: Wetland A ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	64.229
5-Year	89.543
10-Year	106.868
25-Year	136.560
50-Year	207.583
100-Year	229.503
200-Year	235.645
500-Year	243.264

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 4
Number of Links: 2

********** Link: Wetland A ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	52.843
5-Year	74.080
10-Year	91.959
25-Year	120.847
50-Year	175.627
100-Year	207.845
200-Year	209.230
500-Year	210.274

*************Groundwater Recharge Summary ***************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Downstream Tributary	72914.280
Subbasin: Ex TDA 3	532.245
Subbasin: Ex TDA 2	1985.203
Link: Wetland A	0.000
Total:	75431.730

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 2	1393.615
Subbasin: Prop TDA 3	4061.306
Subbasin: TDA 2 (Bypass)	457.989
Subbasin: Downstream Tributary	72914.280
Link: Area 5 Pond	Not Computed
Link: Wetland A	0.000
Total:	78827.190

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 477.416 ac-ft/year, Post Developed: 498.906 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 1

********** Link: Wetland A **********

2-Year Discharge Rate : 64.229 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 20.54 cfs
Off-line Design Discharge Rate (91% Exceedance): 11.33 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 219404.80
Inflow Volume Including PPT-Evap (ac-ft): 219404.80
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 219404.80
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

----------SCENARIO: POSTDEVELOPED

Number of Links: 2

********** Link: Wetland A **********

2-Year Discharge Rate : 52.843 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 17.39 cfs
Off-line Design Discharge Rate (91% Exceedance): 9.69 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 213476.30
Inflow Volume Including PPT-Evap (ac-ft): 213476.30
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 213476.30
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

**********Compliance Point Results **********

Scenario Predeveloped Compliance Link: Wetland A
Scenario Postdeveloped Compliance Link: Wetland A

*** Point of Compliance Flow Frequency Data ***
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	64.229	2-Year	52.843
5-Year	89.543	5-Year	74.080
10-Year	106.868	10-Year	91.959
25-Year	136.560	25-Year	120.847
50-Year	207.583	50-Year	175.627
100-Year	229.503	100-Year	207.845
200-Year	235.645	200-Year	209.230
500-Year	243.264	500-Year	210.274

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

**** Flow Duration Performance ****
Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%): -44.1% PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%): -42.4% PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%): 0.0% PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%): 0.0% PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

**** LID Duration Performance ****
Excursion at Predeveloped 8%Q2 (Must be Less Than 0%): -2.6% PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%): -4.5% PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

**********Wetland Hydrologic Loading Analysis Results **********

Predeveloped Wetland Location: Wetland A, Inflow
Postdeveloped Wetland Location: Wetland A, Inflow

Days out of Compliance: 0
Months out of Compliance: 0

Wetland A Hydroperiod Results

**********Mean Daily Wetland Inflow (cfs) **********

Must be within 20% for each Day

Month	Predeveloped	Postdeveloped	Percent Difference
Oct-01	7.478E-01	6.809E-01	-8.95%
Oct-02	6.558E-01	6.113E-01	-6.78%
Oct-03	7.396E-01	6.657E-01	-9.99%
Oct-04	8.437E-01	7.519E-01	-10.89%
Oct-05	6.998E-01	6.413E-01	-8.36%
Oct-06	1.126E+00	1.005E+00	-10.80%
Oct-07	9.195E-01	8.469E-01	-7.89%
Oct-08	9.457E-01	8.704E-01	-7.96%
Oct-09	1.126E+00	1.023E+00	-9.17%
Oct-10	1.038E+00	9.429E-01	-9.13%
Oct-11	9.261E-01	8.647E-01	-6.62%
Oct-12	9.437E-01	8.560E-01	-9.29%
Oct-13	9.102E-01	8.386E-01	-7.87%
Oct-14	9.662E-01	8.692E-01	-10.04%
Oct-15	8.184E-01	7.632E-01	-6.75%
Oct-16	7.648E-01	7.229E-01	-5.48%
Oct-17	1.192E+00	1.086E+00	-8.96%
Oct-18	1.237E+00	1.144E+00	-7.46%
Oct-19	1.296E+00	1.202E+00	-7.23%
Oct-20	1.401E+00	1.259E+00	-10.13%
Oct-21	1.404E+00	1.275E+00	-9.23%
Oct-22	1.415E+00	1.294E+00	-8.57%
Oct-23	1.510E+00	1.401E+00	-7.24%
Oct-24	1.437E+00	1.353E+00	-5.83%
Oct-25	1.460E+00	1.352E+00	-7.37%
Oct-26	1.581E+00	1.459E+00	-7.68%
Oct-27	1.861E+00	1.716E+00	-7.82%
Oct-28	1.710E+00	1.622E+00	-5.12%
Oct-29	1.808E+00	1.695E+00	-6.22%
Oct-30	1.657E+00	1.586E+00	-4.30%
Oct-31	1.989E+00	1.832E+00	-7.87%
Nov-01	1.784E+00	1.696E+00	-4.91%
Nov-02	1.614E+00	1.538E+00	-4.73%
Nov-03	2.163E+00	1.991E+00	-7.98%
Nov-04	2.280E+00	2.159E+00	-5.31%
Nov-05	1.768E+00	1.718E+00	-2.85%
Nov-06	1.737E+00	1.650E+00	-5.00%
Nov-07	1.941E+00	1.840E+00	-5.20%
Nov-08	1.855E+00	1.773E+00	-4.37%
Nov-09	2.214E+00	2.077E+00	-6.19%
Nov-10	2.452E+00	2.312E+00	-5.69%
Nov-11	2.629E+00	2.497E+00	-5.02%
Nov-12	2.209E+00	2.151E+00	-2.65%
Nov-13	2.514E+00	2.378E+00	-5.39%
Nov-14	2.483E+00	2.393E+00	-3.62%
Nov-15	2.499E+00	2.403E+00	-3.87%
Nov-16	2.762E+00	2.636E+00	-4.57%
Nov-17	2.882E+00	2.752E+00	-4.51%
Nov-18	2.594E+00	2.508E+00	-3.33%
Nov-19	3.279E+00	3.125E+00	-4.69%
Nov-20	2.938E+00	2.868E+00	-2.39%
Nov-21	2.903E+00	2.803E+00	-3.47%
Nov-22	2.727E+00	2.649E+00	-2.84%
Nov-23	3.600E+00	3.413E+00	-5.20%
Nov-24	3.937E+00	3.784E+00	-3.88%
Nov-25	3.822E+00	3.719E+00	-2.69%
Nov-26	3.376E+00	3.312E+00	-1.89%
Nov-27	3.534E+00	3.437E+00	-2.74%
Nov-28	2.778E+00	2.749E+00	-1.03%
Nov-29	3.134E+00	3.040E+00	-3.00%
Nov-30	3.464E+00	3.325E+00	-4.01%
Dec-01	3.273E+00	3.177E+00	-2.94%
Dec-02	3.483E+00	3.376E+00	-3.09%
Dec-03	3.644E+00	3.511E+00	-3.64%
Dec-04	3.776E+00	3.690E+00	-2.27%
Dec-05	3.548E+00	3.448E+00	-2.82%

Dec-06	3.559E+00	3.471E+00	-2.47%
Dec-07	3.319E+00	3.246E+00	-2.18%
Dec-08	3.155E+00	3.099E+00	-1.77%
Dec-09	2.966E+00	2.899E+00	-2.27%
Dec-10	3.387E+00	3.279E+00	-3.20%
Dec-11	3.317E+00	3.236E+00	-2.44%
Dec-12	3.264E+00	3.204E+00	-1.82%
Dec-13	3.136E+00	3.072E+00	-2.04%
Dec-14	3.213E+00	3.140E+00	-2.29%
Dec-15	3.507E+00	3.408E+00	-2.80%
Dec-16	3.188E+00	3.136E+00	-1.64%
Dec-17	3.344E+00	3.280E+00	-1.92%
Dec-18	3.183E+00	3.119E+00	-2.03%
Dec-19	3.215E+00	3.143E+00	-2.23%
Dec-20	3.684E+00	3.559E+00	-3.39%
Dec-21	3.785E+00	3.701E+00	-2.23%
Dec-22	3.302E+00	3.274E+00	-0.86%
Dec-23	3.239E+00	3.171E+00	-2.12%
Dec-24	3.165E+00	3.118E+00	-1.48%
Dec-25	2.990E+00	2.932E+00	-1.93%
Dec-26	3.630E+00	3.523E+00	-2.97%
Dec-27	3.550E+00	3.488E+00	-1.75%
Dec-28	3.000E+00	2.976E+00	-0.81%
Dec-29	3.579E+00	3.463E+00	-3.25%
Dec-30	3.493E+00	3.434E+00	-1.68%
Dec-31	2.914E+00	2.898E+00	-0.53%
Jan-01	3.188E+00	3.126E+00	-1.93%
Jan-02	3.573E+00	3.483E+00	-2.53%
Jan-03	3.287E+00	3.234E+00	-1.62%
Jan-04	3.383E+00	3.340E+00	-1.30%
Jan-05	3.158E+00	3.111E+00	-1.49%
Jan-06	3.232E+00	3.171E+00	-1.90%
Jan-07	3.322E+00	3.262E+00	-1.80%
Jan-08	3.110E+00	3.058E+00	-1.66%
Jan-09	3.309E+00	3.231E+00	-2.34%
Jan-10	3.505E+00	3.417E+00	-2.49%
Jan-11	3.091E+00	3.046E+00	-1.46%
Jan-12	3.326E+00	3.250E+00	-2.28%
Jan-13	3.486E+00	3.413E+00	-2.09%
Jan-14	4.003E+00	3.881E+00	-3.03%
Jan-15	4.013E+00	3.931E+00	-2.04%
Jan-16	3.678E+00	3.624E+00	-1.46%
Jan-17	3.515E+00	3.467E+00	-1.35%
Jan-18	3.697E+00	3.634E+00	-1.71%
Jan-19	3.784E+00	3.721E+00	-1.66%
Jan-20	3.590E+00	3.545E+00	-1.25%
Jan-21	3.134E+00	3.125E+00	-0.30%
Jan-22	3.123E+00	3.060E+00	-2.03%
Jan-23	3.697E+00	3.581E+00	-3.12%
Jan-24	3.642E+00	3.597E+00	-1.25%
Jan-25	3.300E+00	3.276E+00	-0.73%
Jan-26	3.120E+00	3.084E+00	-1.15%
Jan-27	3.502E+00	3.432E+00	-2.02%
Jan-28	3.089E+00	3.079E+00	-0.35%
Jan-29	3.016E+00	2.969E+00	-1.58%
Jan-30	3.015E+00	2.982E+00	-1.12%
Jan-31	3.548E+00	3.441E+00	-2.99%
Feb-01	3.506E+00	3.437E+00	-1.96%
Feb-02	3.454E+00	3.407E+00	-1.36%
Feb-03	3.032E+00	3.016E+00	-0.54%
Feb-04	3.029E+00	2.998E+00	-1.04%
Feb-05	2.940E+00	2.888E+00	-1.76%
Feb-06	3.513E+00	3.430E+00	-2.37%
Feb-07	3.288E+00	3.247E+00	-1.27%
Feb-08	3.490E+00	3.422E+00	-1.93%
Feb-09	3.283E+00	3.235E+00	-1.45%
Feb-10	3.151E+00	3.120E+00	-0.97%
Feb-11	2.974E+00	2.928E+00	-1.53%
Feb-12	3.579E+00	3.468E+00	-3.11%
Feb-13	3.730E+00	3.653E+00	-2.06%
Feb-14	3.356E+00	3.314E+00	-1.24%

Feb-15	3.523E+00	3.448E+00	-2.12%
Feb-16	3.846E+00	3.763E+00	-2.15%
Feb-17	4.356E+00	4.236E+00	-2.75%
Feb-18	4.070E+00	3.984E+00	-2.10%
Feb-19	4.114E+00	4.074E+00	-0.97%
Feb-20	3.437E+00	3.440E+00	0.08%
Feb-21	3.190E+00	3.163E+00	-0.85%
Feb-22	2.965E+00	2.946E+00	-0.62%
Feb-23	2.830E+00	2.811E+00	-0.69%
Feb-24	3.346E+00	3.261E+00	-2.54%
Feb-25	3.455E+00	3.392E+00	-1.83%
Feb-26	3.303E+00	3.269E+00	-1.02%
Feb-27	3.397E+00	3.354E+00	-1.25%
Feb-28	3.423E+00	3.373E+00	-1.46%
Mar-01	3.251E+00	3.203E+00	-1.47%
Mar-02	3.020E+00	2.987E+00	-1.11%
Mar-03	3.388E+00	3.303E+00	-2.53%
Mar-04	3.308E+00	3.256E+00	-1.58%
Mar-05	3.326E+00	3.268E+00	-1.74%
Mar-06	2.560E+00	2.574E+00	0.57%
Mar-07	2.710E+00	2.674E+00	-1.31%
Mar-08	3.009E+00	2.919E+00	-2.99%
Mar-09	3.565E+00	3.465E+00	-2.83%
Mar-10	3.267E+00	3.237E+00	-0.94%
Mar-11	2.999E+00	2.968E+00	-1.03%
Mar-12	3.350E+00	3.275E+00	-2.23%
Mar-13	2.976E+00	2.953E+00	-0.78%
Mar-14	2.994E+00	2.958E+00	-1.22%
Mar-15	2.934E+00	2.888E+00	-1.55%
Mar-16	2.624E+00	2.601E+00	-0.88%
Mar-17	2.817E+00	2.765E+00	-1.85%
Mar-18	2.754E+00	2.716E+00	-1.38%
Mar-19	2.674E+00	2.657E+00	-0.64%
Mar-20	2.636E+00	2.593E+00	-1.62%
Mar-21	2.488E+00	2.466E+00	-0.87%
Mar-22	3.077E+00	2.982E+00	-3.09%
Mar-23	3.112E+00	3.029E+00	-2.66%
Mar-24	2.940E+00	2.917E+00	-0.80%
Mar-25	2.778E+00	2.753E+00	-0.91%
Mar-26	2.793E+00	2.749E+00	-1.58%
Mar-27	2.569E+00	2.530E+00	-1.54%
Mar-28	2.587E+00	2.545E+00	-1.63%
Mar-29	2.982E+00	2.905E+00	-2.57%
Mar-30	3.008E+00	2.958E+00	-1.67%
Mar-31	2.879E+00	2.842E+00	-1.30%
Apr-01	2.484E+00	2.479E+00	-0.22%
Apr-02	2.205E+00	2.198E+00	-0.30%
Apr-03	2.042E+00	2.037E+00	-0.25%
Apr-04	2.358E+00	2.288E+00	-2.96%
Apr-05	2.630E+00	2.572E+00	-2.23%
Apr-06	2.389E+00	2.356E+00	-1.39%
Apr-07	2.117E+00	2.097E+00	-0.91%
Apr-08	2.528E+00	2.452E+00	-3.00%
Apr-09	2.675E+00	2.617E+00	-2.17%
Apr-10	2.319E+00	2.297E+00	-0.94%
Apr-11	2.472E+00	2.419E+00	-2.18%
Apr-12	2.390E+00	2.355E+00	-1.45%
Apr-13	2.023E+00	2.008E+00	-0.70%
Apr-14	1.924E+00	1.890E+00	-1.79%
Apr-15	1.741E+00	1.724E+00	-0.97%
Apr-16	1.933E+00	1.885E+00	-2.45%
Apr-17	2.035E+00	2.002E+00	-1.60%
Apr-18	1.632E+00	1.626E+00	-0.38%
Apr-19	2.161E+00	2.064E+00	-4.49%
Apr-20	2.252E+00	2.217E+00	-1.53%
Apr-21	1.786E+00	1.786E+00	-0.01%
Apr-22	1.926E+00	1.864E+00	-3.18%
Apr-23	2.374E+00	2.302E+00	-3.06%
Apr-24	1.996E+00	1.971E+00	-1.24%
Apr-25	1.686E+00	1.687E+00	0.04%
Apr-26	1.535E+00	1.520E+00	-0.97%

Apr-27	1.882E+00	1.825E+00	-3.01%
Apr-28	1.767E+00	1.728E+00	-2.23%
Apr-29	1.646E+00	1.620E+00	-1.60%
Apr-30	1.786E+00	1.733E+00	-2.98%
May-01	2.040E+00	1.978E+00	-2.99%
May-02	1.905E+00	1.871E+00	-1.78%
May-03	1.899E+00	1.864E+00	-1.86%
May-04	1.520E+00	1.512E+00	-0.56%
May-05	1.789E+00	1.727E+00	-3.47%
May-06	1.664E+00	1.629E+00	-2.09%
May-07	1.486E+00	1.468E+00	-1.22%
May-08	1.477E+00	1.454E+00	-1.57%
May-09	1.232E+00	1.226E+00	-0.48%
May-10	1.160E+00	1.136E+00	-2.06%
May-11	1.299E+00	1.252E+00	-3.64%
May-12	1.316E+00	1.267E+00	-3.74%
May-13	1.361E+00	1.334E+00	-2.02%
May-14	1.339E+00	1.306E+00	-2.48%
May-15	1.300E+00	1.266E+00	-2.59%
May-16	1.373E+00	1.338E+00	-2.55%
May-17	1.464E+00	1.419E+00	-3.05%
May-18	1.203E+00	1.196E+00	-0.57%
May-19	1.276E+00	1.227E+00	-3.86%
May-20	1.186E+00	1.162E+00	-1.98%
May-21	1.181E+00	1.166E+00	-1.31%
May-22	1.312E+00	1.273E+00	-2.94%
May-23	1.211E+00	1.174E+00	-3.08%
May-24	1.129E+00	1.094E+00	-3.11%
May-25	1.200E+00	1.171E+00	-2.40%
May-26	1.350E+00	1.291E+00	-4.37%
May-27	1.257E+00	1.231E+00	-2.08%
May-28	1.149E+00	1.127E+00	-1.92%
May-29	1.112E+00	1.072E+00	-3.56%
May-30	1.136E+00	1.092E+00	-3.94%
May-31	1.437E+00	1.366E+00	-4.90%
Jun-01	1.241E+00	1.218E+00	-1.81%
Jun-02	1.073E+00	1.069E+00	-0.42%
Jun-03	1.115E+00	1.087E+00	-2.53%
Jun-04	1.242E+00	1.191E+00	-4.10%
Jun-05	1.012E+00	9.968E-01	-1.55%
Jun-06	1.238E+00	1.171E+00	-5.42%
Jun-07	1.142E+00	1.119E+00	-1.98%
Jun-08	1.044E+00	1.028E+00	-1.55%
Jun-09	1.210E+00	1.168E+00	-3.41%
Jun-10	1.288E+00	1.245E+00	-3.33%
Jun-11	1.017E+00	9.963E-01	-2.03%
Jun-12	9.580E-01	9.229E-01	-3.66%
Jun-13	1.015E+00	9.858E-01	-2.92%
Jun-14	1.026E+00	9.792E-01	-4.52%
Jun-15	8.977E-01	8.876E-01	-1.13%
Jun-16	9.903E-01	9.413E-01	-4.95%
Jun-17	9.595E-01	9.285E-01	-3.23%
Jun-18	8.828E-01	8.694E-01	-1.52%
Jun-19	7.927E-01	7.864E-01	-0.79%
Jun-20	8.413E-01	8.073E-01	-4.04%
Jun-21	7.951E-01	7.771E-01	-2.26%
Jun-22	7.916E-01	7.647E-01	-3.39%
Jun-23	8.010E-01	7.758E-01	-3.15%
Jun-24	1.028E+00	9.598E-01	-6.60%
Jun-25	8.434E-01	8.331E-01	-1.22%
Jun-26	7.902E-01	7.702E-01	-2.53%
Jun-27	7.275E-01	7.081E-01	-2.66%
Jun-28	8.341E-01	7.842E-01	-5.99%
Jun-29	9.829E-01	9.322E-01	-5.17%
Jun-30	7.001E-01	6.962E-01	-0.56%
Jul-01	8.037E-01	7.756E-01	-3.50%
Jul-02	6.686E-01	6.579E-01	-1.60%
Jul-03	7.380E-01	7.094E-01	-3.88%
Jul-04	6.371E-01	6.267E-01	-1.64%
Jul-05	8.358E-01	7.799E-01	-6.69%
Jul-06	5.548E-01	5.661E-01	2.03%

Jul-07	6.044E-01	5.977E-01	-1.11%
Jul-08	8.133E-01	7.638E-01	-6.09%
Jul-09	7.027E-01	6.779E-01	-3.53%
Jul-10	6.795E-01	6.552E-01	-3.58%
Jul-11	6.320E-01	6.161E-01	-2.51%
Jul-12	6.680E-01	6.543E-01	-2.04%
Jul-13	5.750E-01	5.789E-01	0.68%
Jul-14	5.615E-01	5.553E-01	-1.09%
Jul-15	5.492E-01	5.423E-01	-1.27%
Jul-16	6.636E-01	6.237E-01	-6.01%
Jul-17	6.048E-01	5.858E-01	-3.15%
Jul-18	5.428E-01	5.342E-01	-1.57%
Jul-19	5.470E-01	5.379E-01	-1.67%
Jul-20	4.936E-01	4.891E-01	-0.90%
Jul-21	5.311E-01	5.217E-01	-1.78%
Jul-22	4.406E-01	4.476E-01	1.60%
Jul-23	4.004E-01	4.123E-01	2.98%
Jul-24	4.092E-01	4.160E-01	1.68%
Jul-25	4.486E-01	4.441E-01	-1.00%
Jul-26	5.529E-01	5.232E-01	-5.37%
Jul-27	4.756E-01	4.666E-01	-1.88%
Jul-28	4.358E-01	4.351E-01	-0.16%
Jul-29	3.965E-01	4.026E-01	1.54%
Jul-30	3.954E-01	4.001E-01	1.19%
Jul-31	3.794E-01	3.863E-01	1.80%
Aug-01	3.910E-01	3.934E-01	0.60%
Aug-02	4.768E-01	4.575E-01	-4.04%
Aug-03	4.530E-01	4.412E-01	-2.63%
Aug-04	4.547E-01	4.406E-01	-3.10%
Aug-05	3.852E-01	3.879E-01	0.72%
Aug-06	4.701E-01	4.506E-01	-4.14%
Aug-07	5.240E-01	4.913E-01	-6.24%
Aug-08	3.799E-01	3.829E-01	0.80%
Aug-09	3.997E-01	3.953E-01	-1.08%
Aug-10	3.681E-01	3.701E-01	0.55%
Aug-11	3.934E-01	3.877E-01	-1.46%
Aug-12	4.592E-01	4.362E-01	-5.00%
Aug-13	4.181E-01	4.056E-01	-3.00%
Aug-14	5.178E-01	4.803E-01	-7.24%
Aug-15	5.183E-01	4.857E-01	-6.29%
Aug-16	4.912E-01	4.648E-01	-5.37%
Aug-17	4.516E-01	4.333E-01	-4.05%
Aug-18	4.692E-01	4.452E-01	-5.10%
Aug-19	4.811E-01	4.543E-01	-5.57%
Aug-20	4.261E-01	4.136E-01	-2.93%
Aug-21	4.737E-01	4.467E-01	-5.69%
Aug-22	4.395E-01	4.195E-01	-4.54%
Aug-23	6.157E-01	5.535E-01	-10.11%
Aug-24	5.491E-01	5.082E-01	-7.46%
Aug-25	5.446E-01	5.054E-01	-7.21%
Aug-26	5.311E-01	4.963E-01	-6.55%
Aug-27	6.020E-01	5.514E-01	-8.41%
Aug-28	5.850E-01	5.377E-01	-8.09%
Aug-29	6.259E-01	5.739E-01	-8.31%
Aug-30	6.338E-01	5.974E-01	-5.74%
Aug-31	5.369E-01	5.105E-01	-4.92%
Sep-01	7.340E-01	6.595E-01	-10.16%
Sep-02	5.767E-01	5.399E-01	-6.38%
Sep-03	5.596E-01	5.225E-01	-6.63%
Sep-04	5.622E-01	5.200E-01	-7.50%
Sep-05	5.450E-01	5.050E-01	-7.34%
Sep-06	5.390E-01	4.999E-01	-7.26%
Sep-07	4.242E-01	4.095E-01	-3.47%
Sep-08	5.260E-01	4.855E-01	-7.71%
Sep-09	6.157E-01	5.596E-01	-9.11%
Sep-10	6.341E-01	5.785E-01	-8.76%
Sep-11	4.786E-01	4.550E-01	-4.94%
Sep-12	3.918E-01	3.843E-01	-1.90%
Sep-13	5.801E-01	5.214E-01	-10.11%
Sep-14	6.663E-01	5.886E-01	-11.66%
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Sep-16	6.523E-01	5.860E-01	-10.17%
Sep-17	7.988E-01	7.093E-01	-11.21%
Sep-18	6.750E-01	6.181E-01	-8.43%
Sep-19	7.423E-01	6.608E-01	-10.98%
Sep-20	6.762E-01	6.160E-01	-8.91%
Sep-21	5.493E-01	5.175E-01	-5.78%
Sep-22	7.200E-01	6.531E-01	-9.29%
Sep-23	7.497E-01	6.902E-01	-7.94%
Sep-24	6.617E-01	6.079E-01	-8.13%
Sep-25	5.166E-01	4.914E-01	-4.87%
Sep-26	7.191E-01	6.430E-01	-10.58%
Sep-27	6.308E-01	5.764E-01	-8.62%
Sep-28	7.784E-01	7.064E-01	-9.25%
Sep-29	5.556E-01	5.265E-01	-5.23%
Sep-30	7.046E-01	6.424E-01	-8.82%

**********Mean Monthly Wetland Inflow (cfs) **********

Must be within 15% for each Month

Month	Predeveloped	Postdeveloped	Percent Difference
Oct	1.198E+00	1.104E+00	-7.81%
Nov	2.662E+00	2.556E+00	-3.97%
Dec	3.348E+00	3.272E+00	-2.26%
Jan	3.402E+00	3.342E+00	-1.77%
Feb	3.414E+00	3.360E+00	-1.57%
Mar	2.948E+00	2.901E+00	-1.58%
Apr	2.090E+00	2.054E+00	-1.71%
May	1.380E+00	1.345E+00	-2.52%
Jun	9.760E-01	9.467E-01	-3.00%
Jul	5.723E-01	5.608E-01	-2.02%
Aug	4.860E-01	4.619E-01	-4.96%
Sep	6.222E-01	5.697E-01	-8.43%

Appendix D

Downstream Analysis Assessment

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Reserve Inert Waste Landfill Expansion Permitting: Downstream Analysis Report/Photographic Log

Contents

Photo Number	Photo Description

Appendices

Field Reconnaissance and Downstream Analysis

Projects that trigger Core Requirement 3 and/or Core Requirement 8 must prepare an offsite analysis report that evaluates the downstream flow path within 1/4 mile from the project site discharge locations. A Level 1 field inspection was conducted on January 29, 2025, by Owen Reese, PE, and Jamie Elrod, EIT, of Herrera Environmental Consultants, Inc. (Herrera), to evaluate the potential for offsite drainage and water quality problems associated with the proposed project.

The downstream analysis covered drainage paths within Areas 5 and 6 and the Plant Site, along the eastern and main haul roads towards the project discharge locations, and downstream near the existing Southwest Pond, and three Plant Ponds, as shown in the site map attached in Appendix A. Overall, the results of the analysis did not indicate existing or potential adverse stormwater impacts downstream of the Site.

The project drains to four threshold discharge areas (TDAs) as described in Section 1.2 of the Technical Information Report. For reference, TDA 1 receives runoff from most Area 6; TDA 2 receives runoff from Area 5 and the remaining portion of Area 6; TDA 3 receives runoff from Areas 1, 2 and 3; and TDA 4 receives runoff from Areas 3/4, 4, and the Plant Site. The downstream flow paths of each TDA are detailed below. Appendix A includes a project site plan which includes figure numbers that correspond to the locations where each site photograph was taken.

Only TDAs 1 and 2 receive runoff from the proposed Area 5 and 6 expansion. TDAs 3 and 4 have existing stormwater management facilities and receive runoff from portions of the site depicted in the 2014 Interim Reclamation Plan. As such, this downstream analysis primarily focuses on TDAs 1 and 2, but provides descriptions of conditions encountered in TDAs 3 and 4 for reference.

Threshold Discharge Area 1

While the team evaluated the downstream flow path of runoff from Area 6, they verified the existence of a drainage ditch (Figure 1) along the eastern side of the eastern haul road (upper arm) extending from the top of Area 6 at approximately 1,000 feet in elevation towards a depression formed from past coal mining activities. The eastern haul road is not crowned and has a raised edge alongside the ditch. Site observations concluded that the majority of stormwater from the haul road does not drain towards the ditch, but west across the road. The team verified that the eastern edge of the road defines the TDA boundary.

Runoff from the upper arm of the eastern haul road and from eastern side of the proposed Area 6 fill drains towards two culverts crossing under the eastern haul road (Figure 2). The upstream culvert discharges towards a low point at an elevation of ~936 feet formed by past coal mine activities (Figure 3) conducted northeast of the haul road plateau between Areas 5 and 6 (currently used as a staging area). The downstream culvert discharges towards a drainage swale conveys culvert outflow east towards the coal mine depression (Figure 4 and 5). Review of an earlier topography survey (prior to fill placement and construction of the eastern haul road) indicated that runoff from what is now the Area 6 fill area originally drained west towards Black Diamond-Ravensdale Road SE. Another coal mine seam remnant was located at the northern edge of landfill property (Figure 6).

The team observed a newly constructed temporary stormwater pond below the west side of the eastern haul road which collects runoff from Area 6 (Figure 7). Area 6 runoff drains northwest to a culvert beneath the eastern haul road (Figure 8), which directs it toward either the pond or across vegetated cover into an intermittent roadside ditch network along the eastern side of the main haul road. Although ditches showed signs of vegetation overgrowth, ditch geometry was still intact. Ditches measured typically had a trapezoidal section with an 8’ top width, 3’ bottom width, and 2.5’ depth. The ditch narrows downstream of a 24-inch culvert (Figure 9) located along the east side of the main haul road under an equipment access road. Downstream ditch geometry is shown in Figure 10.

Towards the main haul road switchback, steep slopes were observed on the east uphill side of the ditch (Figure 11). The project is located in an erosion hazard area and a potential steep slope hazard area. Runoff from proposed work will be managed and directed into the ditch network to prevent hillside impact, mitigating slope failure concerns. Under existing conditions, runoff from the east ditch continues to drain north onto an adjacent property - Parcel No. 3622069009 (Figure 12). A culvert is proposed to direct runoff from the east ditch towards an onsite forested area (Figure 13), where it will either infiltrate or continue draining towards ditches along Black Diamond-Ravensdale Road SE as shown in Figure 14.

Figure 1. Eastern Boundary of TDA 1.

View: Looking south along eastern side of eastern haul road (upper arm)

Other notes: Ditches look recently maintained. Ditch typically has a 6′ top width, 2′ bottom width, and 1.5′ depth. Rock edge treatment along ditch appears to prevent road runoff into ditch.

Figure 2. Area 6 Fill Location Drainage.

View: Looking south from top of eastern haul road (upper arm) at about 1,000′ elevation

Notes: Runoff drains southeast towards two culverts under the eastern haul road.

Figure 3. Upstream 12-inch Culvert Outlet into Coal Mine Depression.

View: Looking east along at outlet of upstream culvert (first of two under eastern haul road).

Notes: Outflow from 12-inch corrugated metal pipe flows toward coal mine depression.

Figure 4. Downstream 12-inch Culvert Outlet into Drainage Swale.

View: Looking east along at outlet of downstream culvert under eastern haul road.

Notes: Drainage swale conveys culvert (12-inch smooth wall polyethylene pipe) outflow east towards coal mine depression.

Figure 5. Eastern Coal Mining Remnant

View: Looking east towards coal mine remnant

Notes: Historical coal mine seam has become a surface water body and downstream drainage point for portions of Area 6 runoff.

Figure 6. Coal Mine Seam Remnant Northern Edge of Landfill Property

View: Looking east along small south to north access road attached to the eastern haul road.

Notes: Coal seam will be backfilled to match existing grade on both sides.

Figure 7. Area 6 Temporary Stormwater Pond

View: Looking northwest along eastern haul road

Notes: Depression where Area 6 runoff collects.

Figure 8. Western Downhill Side of the Area 6 Plateau

View: Looking southeast along eastern haul road

Notes: Runoff from Area 6 flows northwest to an 18" smooth wall polyethylene culvert beneath the eastern haul road, which directs it toward either the temporary storage pond or across vegetated cover into ditches along the eastern side of the main haul road.

Figure 9. Access Road Culvert

View: Looking north at culvert inlet along main haul road.

Notes: Culvert appears free flowing, but there is evidence of vegetation overgrowth and sediment accumulation at culvert inlet and outlet.

Figure 10. Roadside Ditch Network Along East Side of Main Haul Road

View: Looking south on main haul road.

Notes: Downstream of the culvert, a long stretch of ditch remains intact and typically has a 6′ top width, 2′ bottom width, and 2.25′ depth.

Figure 11. Steep Slopes on Downhill Side of Landfill Along East Side of Main Haul Road

View: Looking northeast at main haul road switchback.

Notes: Slopes of approximately 39% along the uphill side of road.

Figure 12. TDA 1 Existing Discharge Location

View: Looking northeast just passed the main haul road switchback.

Notes: Ditch flow line appears to continue onto adjacent property (Discharge Point 1).

Figure 13. TDA 1 Proposed Discharge Location

View: Looking northeast towards Black Diamond-Ravensdale Road SE.

Notes: Majority of runoff will infiltrate within the forested area or collect in ditches along Black Diamond-Ravensdale Road SE (Figure 13).

Figure 14. Downstream Flowpath of TDA 1 Runoff Under Proposed Conditions

View: Looking west along Black Diamond-Ravensdale Road SE.

Notes: TDA runoff which reaches the roadway will collect in roadside ditches, draining north.

Threshold Discharge Area 2

The team's observations confirmed the presence of intermittent roadside ditch networks along the eastern main haul roads draining south (Figure 15). The team located a culvert draining east under main haul road appears to collect runoff from Dale Strip Pit area (Figure 16). Ditches were observed downstream of the culvert (Figure 17) which appear to drain to a low point located on a small access road (Figure 18). The team followed the ditch flowline until the existing discharge point for TDA 2 was located (Figures 19 through 22).

Figure 15. Western Boundary of TDA 1 Along East Side of Main Haul Road

View: Looking south along eastern side of main haul road.

Notes: Gravel thickened edge keeps runoff from TDA 1 separate from haul road runoff. A ditch drainage line slightly visible; may be natural forming as runoff from Area 5 drains south along the edge of the haul road.

Figure 16. 8-inch HDPE Culvert Draining East Under Main Haul Road.

View: Looking west at culvert outlet.

Notes: Culvert appears to collect runoff from Dale Strip Pit area.

Figure 17. Main Haul Road Drainage Ditch

View: Looking south along eastern side of main haul road, downstream of 8-inch culvert.

Notes: Ditch centerline become more apparent downstream of culvert, and typical dimensions are 8′ top width, 2′ bottom width, and 2′ depth.

Figure 18. Low Point Located on Small Access Road

View: Looking west towards main haul road from small access road which extends east on into the powerline eastment and continues onto the adjacent property (Parcel No. 0121069001).

Notes: No culvert observed under access road, but thick vegetation may have obscured a pipe, ditch appears to drain towards low point in road.

Figure 19. Drainage Ditch Obstruction

View: Looking north at the location of a gravel trail; construction date and use unknown.

Notes: Drainage ditch appears to pick up south of the gravel trail, but ditch geometry was obscured by vegetation. Flow path appears obstructed by gravel trail transecting the ditch from the east. However, soil erosion along across the trail indicates that runoff continues draining south.

Figure 20. Continued Flowline Along eastern side of Main Haul Road

View: Looking south along main haul road.

Notes: South of the trail, there is no clear ditch geometry due to vegetation, but approximately 100' downstream, a more defined and recently maintained ditch is established (Figure 20)

Figure 21. Ditch Establishment

View: Looking south along eastern side of main haul road.

Notes: Gravel thickened edge keeps haul road runoff from draining into ditch. A ditch geometry becomes more clearly visible, approximate 8′ top width, 2′ bottom width and 3′ depth.

Figure 22. Existing TDA 2 Discharge Location

View: Looking south along eastern side of main haul road.

Notes: Ditch flow line ends, draining towards adjacent forest. (Discharge Point 2).

Threshold Discharge Area 3

The team evaluated the downstream flow path of runoff from TDA 3 which currently drains west towards a culvert under the lower haul road which discharges to an existing interceptor swale on the downhill side of Area 1 (Figure 23). The swale discharges towards the existing Southwest Pond (Figure 24). From this pond, runoff that does not infiltrate, is dispersed into the forest to the west through rock dispersion device (Figure 25). The team also photo documented the newly constructed wetpond (West Central Pond) designed to receive runoff from the central portion of the existing inert waste landfill (Figure 26).

As stated previously, on-site hydraulics of TDA 3 were not evaluated during the field visit as these areas have stormwater management facilities consistent with the 2014 Interim Reclamation Plan.

Figure 23. TDA 3 Outfall

View: Looking northwest along the lower haul road.

Notes: A 12-inch smooth wall polyethene pipe under the haul road discharges to an existing swale.

Figure 24. Existing Infiltration Pond

View: Looking east along pond access road.

Notes: Soft, damp soils were observed near the pond.

Figure 25. Rock Dispersion at Infiltration Pond Outlet/TDA 3 Existing Discharge Point

View: Looking south where runoff from the infiltration pond disperse to forested cover.

Notes: Runoff that does not infiltrate, is dispersed into the forest to the west.

Figure 26. TDA 3 Wet pond under Construction

View: Looking southeast at partially constructed two-cell wet pond.

Notes: Runoff from the central portion of the inert waste landfill will be routed to the new wet pond designed by Aspect Consulting. Construction of the wet pond began in 2023.

Threshold Discharge Area 4

While following the downstream flow path of Areas 3/4, the team observed that some runoff appears to collect in ditches along the west side of the main haul road (Figure 27). However, majority of runoff from Area 3/4, along with Area 4, drains west towards an access road above the LDA where runoff is collected in ditches that convey it to the northeast. Roadside ditches continue along the east side of the upper haul road downstream of the haul road switchback, draining towards a low point east of the intersection of the lower haul road and the upper haul road in the northwest (i.e., the Y). At the low point at the Y, a culvert conveys runoff from the ditches towards forested cover to the west (Figures 28 and 29).

The team continued downstream towards the northern portion of the Site, where they observed a ditch drainage network along Black Diamond-Ravensdale Road SE which drains into adjacent forested areas or onto the Plant Site (Figure 30).

Upon reviewing King County's iMap, an 18-inch diameter corrugated metal culvert is mapped beneath Black Diamond-Ravensdale Road SE, channeling runoff from the southern to the northern roadside ditches. On-site observations revealed a location of pooling water along the southern ditch, as well as visible flow towards the road edge (Figure 31). Although, the culvert was not visible due sediment accumulation and overgrown vegetation, the location of the pooling water closely aligns with the mapped located of the culvert. On the north side of the road, the ditch conveys runoff west and turns onto the Plant Site (Figures 32 and 33).

On the Plant Site, the team verified the existence of an excavated closed depression (Figure 34) and three existing infiltration ponds (Plant Ponds) (Figure 35).

Figure 27. Roadside Ditch Network Along West Side of Main Haul Road

View: Looking north on main haul road.

Notes: Ditch geometry is similar to that on the east side of the road (as describe in Figure 27). Two ditch turnouts were observed which direct runoff west onto Area 4.

Figure 28. Culvert Inlet at Ditch Along Lower Haul Road.

View: Looking east at culvert inlet.

Notes: An 18-inch smooth wall polyethylene pipe conveys runoff from the haul road ditches west under the haul road at the Y towards forested cover upstream of Black Diamond-Ravensdale Road SE. Ponded water was observed upstream of culvert in ditch.

Figure 29. Culvert Outlet into Drainage Swale

View: Looking south on the haul road towards culvert outlet.

Notes: Culvert outlet discharges runoff into a drainage swale which directs runoff towards Black Diamond-Ravensdale Road SE.

Figure 30. Roadside Ditch Network Along South Side of Black Diamond-Ravensdale Road SE.

View: Looking south along roadway downstream of culvert outlet (Figure 30).

Notes: Ditch geometry was typically 4′ top width, 2′ bottom width, and 2.5′ depth.

Figure 31. Evidence of Culvert Inlet under Black Diamond-Ravensdale Road SE.

View: Looking south towards from Black Diamond-Ravensdale Road SE.

Notes: Runoff from ditch appears to drain under road, but culvert inlet was not located.

Figure 32. Roadside Ditch Network Along North Side of Black Diamond-Ravensdale Road SE.

View: Looking northwest from Black Diamond-Ravensdale Road SE towards the Plant Site.

Notes: Ditch geometry on north side of road is typically a 12' top width, 4.5' bottom width and 3.5' depth. Evidence of ponding water indicates stormwater pools upstream before discharging onto Plant Site (Figure 32)

Figure 33. North Side Ditch Turnout onto Plant Site

View: Looking east along southern edge of Plant Site perimeter road.

Notes: The roadside ditch along the north side of Black Diamond-Ravensdale Road SE turns onto the Plant Site and continues draining in ditches along the south side the Plant Site perimeter road towards an excavated closed depression (Figure 33).

Figure 34. Closed Depression at Western End of Plant Site.

View: Looking west along southern edge of Plant Site perimeter road.

Notes: Stormwater from a portion of the perimeter road on the Plant site currently drains towards an excavated closed depression. There was no evidence of a flow path leaving the closed depression and surficial soils appeared to be coarse sand and gravel indicating water likely flows subsurface from the depression.

The existing infiltration ponds at the Plant Site appear to be hydraulically connected. The team interpreted the cause of the standing water in the ponds to be from exposed groundwater and surficial runoff from upstream areas at the Plant Site (Figure 35).

Figure 35. Plant Site Stormwater Pond (Discharge Point 4)

View: Looking east towards first stormwater pond cell along perimeter road.

Notes: An 18-inch smooth wall polyethylene pipe located under the perimeter road hydraulically connects the two stormwater ponds.

Appendix A

Downstream Analysis Site Map

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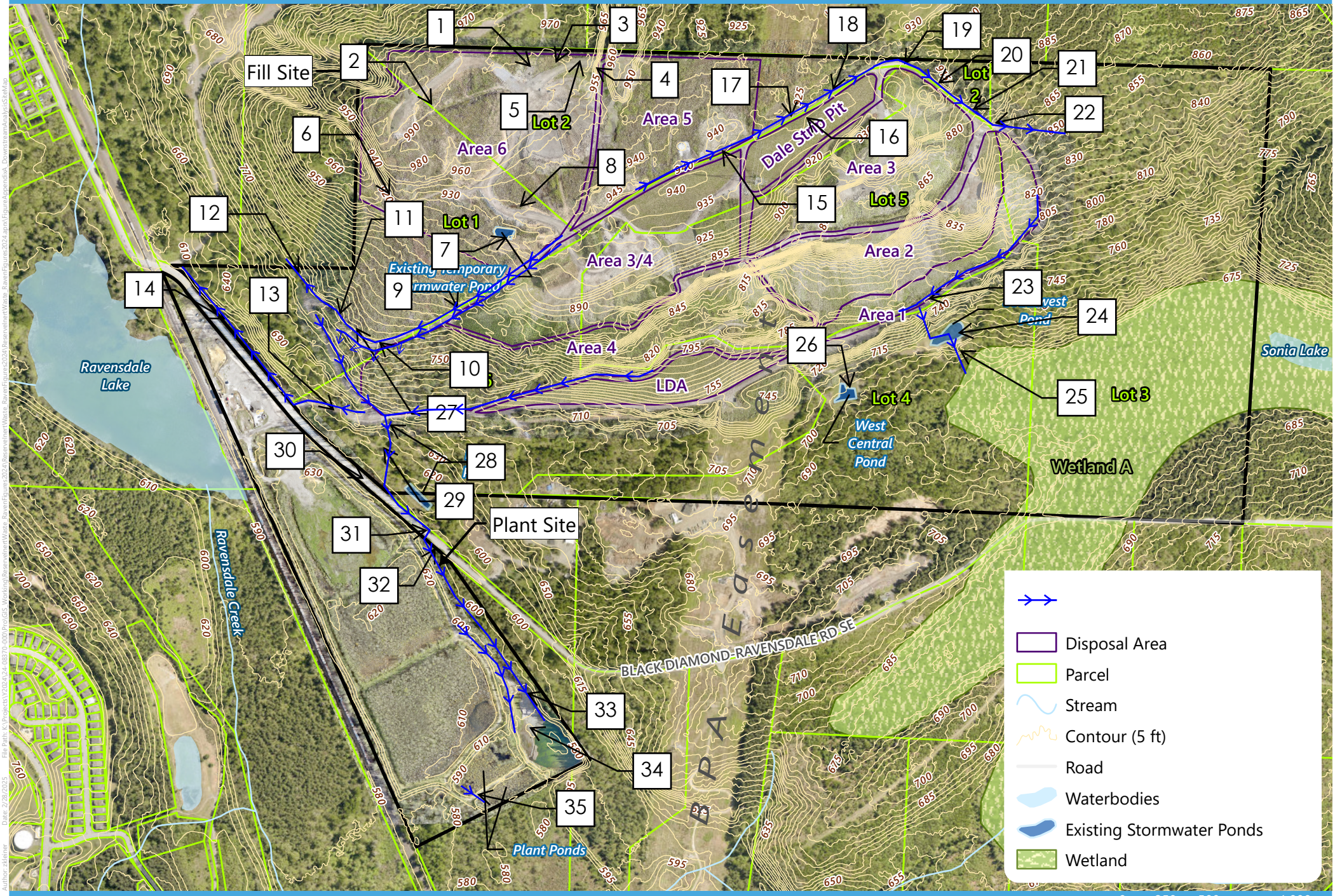
Appendix A.
Downstream Analysis Site Map.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County (Aerial, 2023)

Appendix E

Construction Stormwater Pollution Prevention (CSWPP) Plan

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February 28, 2025

Construction Stormwater Pollution Prevention Plan

Reserve Inert Waste Landfill Expansion Permitting

Prepared for
Reserve Silica Corporation
28131 Southeast Ravensdale Way
Ravensdale, Washington 98051

Prepared by
Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206-441-9080

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Facility Description

Reserve Silica Corporation (Reserve) operates an all-weather clean fill and inert waste dumpsite located at 28131 Ravensdale/Black Diamond Road, Ravensdale Washington (Site). Originally, the Site was used for coal and sand mining from 1924 to 2007. Reclamation began in 2007 with the importation of fill to reclaim the surface excavations. Reclamation grading and inert waste fill operations are covered under King County clearing and grading permit number GRDE15-0011 and Inert Waste Landfill permit number PR0082027.

Currently, the inert waste landfill is permitted to accept up to 2.75 million cubic yards of inert waste and soil meeting acceptance criteria for contaminant concentrations including loads of clean soil mixed with cured concrete, brick and masonry, ceramic materials, and asphaltic materials. The landfill is informally divided into the "Fill Site" which serves as an inert waste fill and mine reclamation area, and the "Plant Site" as shown in Figure 1. At the Fill Site, reclamation locations are designated as Areas—1, 2, 3, 3/4, 4, 5, and 6. The Plant Site contains an office, wheel wash, parking and maintenance area, and clean fill reclamation of the former wash plant silt ponds. No inert waste is accepted or placed on the Plant Site. The Plant Site previously included the aggregate processing facilities and wash plant associated with former sandstone mining activities.

To continue reclamation of past mining features and maximize fill capacity, Reserve authorized Herrera to assist in the permitting efforts to support the expansion of the inert waste landfill. The project proposes fill placement in Areas 5 and 6, and provides updated information on planned fill placement in Areas 1, 2, 3, 3/4, 4, and clean fill placement in the Plant Site as part of the ongoing reclamation effort generally consistent with the 2014 Interim Reclamation Plan. This Construction Stormwater Pollution Prevention Plan is submitted to aid in effective management of onsite construction-related activities and materials storage.

Contact Information/Responsible Parties

Reserve is the facility owner and operator. Reserve and CSWPPP contact information is as follows:

Primary Contact/CSWPP Supervisor:

Jeffry Wright (Operations Manager)
P.O. Box 99, Ravensdale, WA 98501 (425) 388-0268
jeffry.wright05@gmail.com | (253) 249-1828

Alternate Contact:

Marisa Floyd (Vice President)
20 First Plaza Center NW, Suite 308, Albuquerque, NM 87102
mlfloyd@swcp.com | (505) 247-2384

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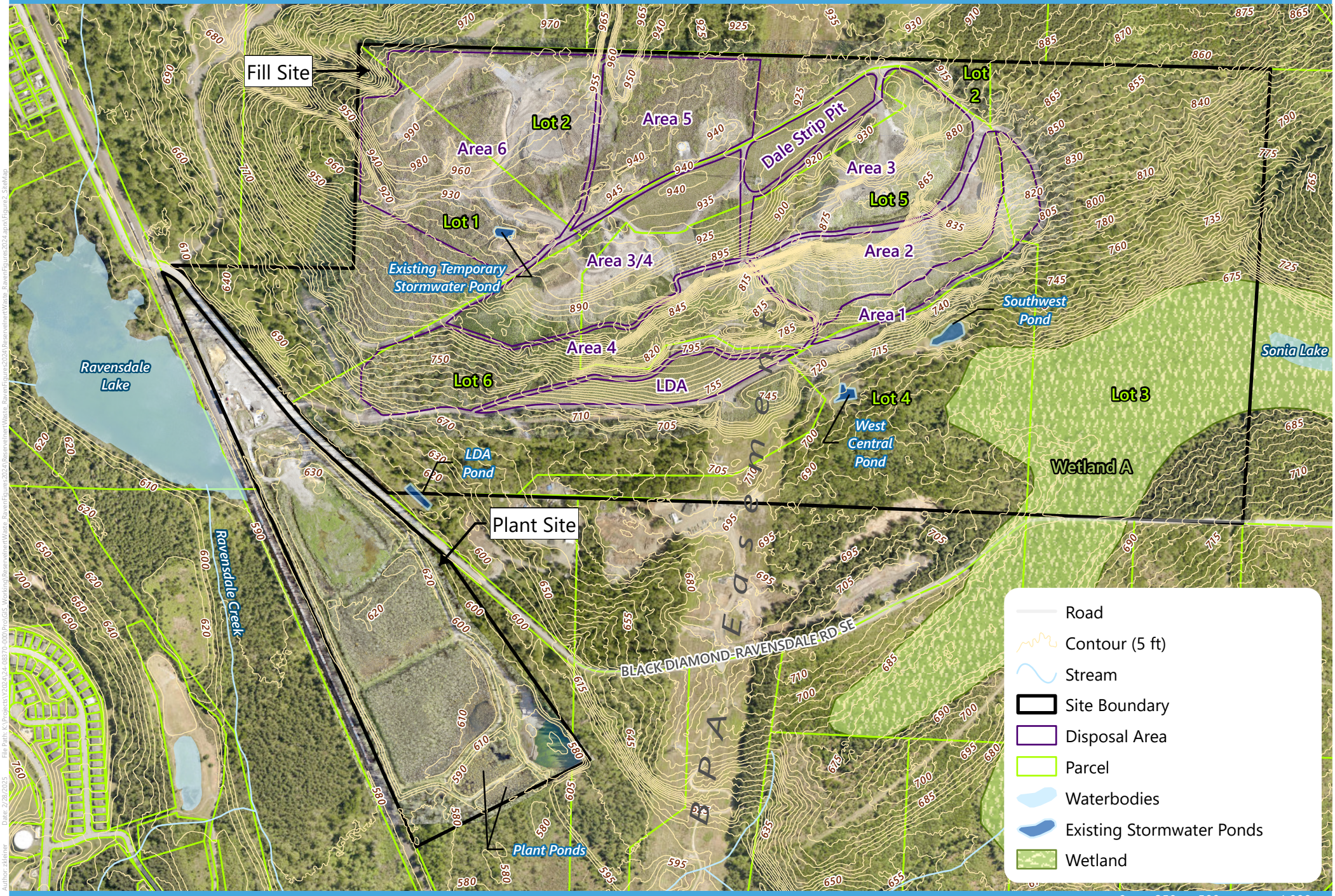
Figure 1.
Reserve Silica Ravensdale Facility Site Map.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: King County (Aerial, 2023)

0 250 500 1,000 Feet

File Path: K:\Projects\V2024\24-08370-000\ProjGIS_Working\ReserveInnerWaste_RavenFigure2024\ReserveInnerWaste_RavenFigure2024.aprx\Figure2_SiteMap
Date: 2/28/2025
Author: zkleiner

Existing Conditions

The Reserve Silica landfill is situated within the Covington Creek drainage basin of the Duwamish-Green River Watershed (WRIA 9). Stormwater from the Site flows north to Ravensdale Lake and Creek or south to Sonia and Ginder Lakes, all of which ultimately drain into Lake Sawyer. Site soils are characterized primarily as till soils of the Alderwood series (SCS hydrological soil group C). Existing critical areas include a Category 1 wetland (Wetland A) southwest of Areas 1 and 2, a coal mine hazard which includes all or portions of Areas 2, 3, 3/4, 4, 5, and 6, and potentially steep slope hazards particularly along the downhill side of Areas 1-4, north along the main haul road downstream of Area 6, and southern edge of the Plant Site. Additionally on the Plant Site, a Category 1 critical aquifer recharge area extends onto the parcel and resource, conservancy, and natural shorelines are designated adjacent to Ravensdale Lake. Freshwater emergent and forested shrub wetlands were mapped in the 2024 National Wetland Inventory at the Plant Site in the three former silt pond cells.

Proposed Construction Activities

The Project includes additional fill placement in Areas 1, 2, 3, 3/4, 4, and the Plant Site and the expansion of fill into Areas 5 and 6, disturbing approximately 80 acres of land. Stormwater runoff at the project site drains into four separate threshold discharge areas (TDAs) as described in Section 1.2 of the Technical Information Report. TDAs 1 and 2 receive runoff from the proposed Area 5 and 6 expansion. Stormwater generated from filled placement and haul roads constructed in Areas 5 and 6 will be conveyed through a series of stormwater pipes, ditches, and culverts and discharge to one of two stormwater management facilities integrated into the proposed project design which will discharge at the same location as existing conditions. TDAs 3 and 4 receive runoff from the ongoing reclamation activities in Areas 1, 2, 3, 3/4, 4, and the Plant Site currently managed via existing ditches and culverts and onsite stormwater ponds.

CSWPP Plan Analysis and Design

This Construction Stormwater Pollution Prevention (CSWPP) plan describes the proposed construction activities and temporary and permanent erosion and sediment control (ESC) measures, pollution prevention measures, inspection/monitoring activities, reporting and recordkeeping that will be implemented during the project. ESC measures are implemented to prevent, to the maximum extent practicable, the transport of sediment from the project site to downstream drainage facilities, water resources, and adjacent properties. The Project also proposes Stormwater Pollution Prevention and Spill (SWPPS) control measures to mitigate pollutant discharge onsite or adjacent stormwater systems or watercourses.

This CSWPP applies to the proposed clearing and grading activities in Areas 5 and 6.

ESC Plan Analysis and Design

The Erosion and Sediment Control (ESC) Plan was developed in accordance with the 2021 King County Surface Water Design Manual (KCSWDM). The ESC plan is organized according to the 13 required ESC measures in Section D.2.1 of the 2021 KCSWDM. As stated in Chapter 2 of the KCSWDM, all proposed projects must submit a Construction Stormwater Pollution Prevention (CSWPP) plan for implementing CSWPP measures, which identifies the measures and Best Management Practices (BMPs) required to prevent the discharge of sediment-laden water and other pollutants associated with construction/land disturbing activities.

Clearing Limits

The clearing limits for the Project will be marked with guideposts staked every 50-feet along the limits to protect adjacent land and reduce the area of soil exposed to construction. Given the size of Areas 5 and 6, use of continuous clearing limit fencing would be economically and environmentally wasteful. Proposed work will be located far from wetland and shoreline critical areas which would otherwise require more substantial protection. The Project drawings include a proposed guidepost BMPs, based on the design specifications of standard fences per KCSWDM BMP D.2.1.1.1 Plastic or Metal Fences and BMP D.2.1.3.1 Silt Fences.

Cover Measures

The Project will comply with cover measures consistent with the erosion control and reclamation requirements of the 2024 Inert Waste Landfill Permit No. PR0082027 issued by King County Public Health for disposal of inert waste in reclamation fill.

KCSWDM requires that areas with exposed soil will be minimized and stabilized in areas to remain unworked for more than seven days during the dry season (May 1 to September 30) or for more than two consecutive working days during the wet season (October 1 to April 30). During the wet season, slopes and stockpiles at 3H:1V or steeper and with more than ten feet of vertical relief shall be covered if they are to remain unworked for more than 12 hours and shall be located away from waterways and drainage channels wherever feasible. Exposed and unworked soils will be stabilized according to the time period set forth for dry and wet seasons. Any area to remain unworked for more than 30 days shall be seeded, unless the King County determines that winter weather makes vegetation establishment infeasible. Temporary seeding shall be applied via hydroseed with tackifier in accordance with D.2.1.2.6 of the KCSWDM. After fill placement, final cover will consist of 1-foot thickness of native soil and planted in accordance with the reclamation planting plan included with the project drawings L1.01 and L1.02. The target time of year for installing permanent seeding is September 1 through October 15.

Where practicable, soils shall be stabilized sooner than the minimum values listed. In addition, contractors shall cover exposed inert waste daily to control vectors and limit contaminant transport.

The cover BMPs for soil stabilization that shall be used on this project include:

- Surface Roughening – D.2.1.2.5
- Mulching – D.2.1.2.2
- Straw Wattles – D.2.1.2.5
- Temporary and permanent seeding – D.2.1.2.6

Perimeter Protection

During construction, the majority of stormwater runoff from disturbed areas will be routed to one of two sediment ponds (later converted to stormwater combined detention wetponds). Straw wattles shall be installed along the downhill side of all proposed fill areas. A brush barrier is proposed on the eastern boundary of Area 5 to reduce the transport of sediment-laden runoff onto adjacent property during the construction of the Area 5 ditches which will direct runoff to the Area 5 sediment pond.

The specific BMPs to be used for controlling filter sediment from sheetwash on this project include:

- Straw Wattles – D.2.1.2.5
- Brush Barrier – D.2.1.3.2.

Traffic Area Stabilization

Reserve uses haul roads for transporting inert waste and fill material. The main and eastern haul roads (Figure 1) consist of compacted crushed rock and gravel, while the lower haul road, which connects to Black Diamond-Ravensdale Road Southeast, is partially asphalt-paved and serves as the sole vehicle access point to the Fill Site. The Plant Site is accessible via two entrances from Black Diamond-Ravensdale Road Southeast. All three construction access routes shall be kept clear of refuse and sediment to prevent tracking onto paved roads. Vacuum sweeping shall be employed to clear material from paved roads not removed by tracking over the stabilized construction entrances. An existing wheel wash located on the Plant Site will be used by will be used for all equipment and trucks entering and leaving the property.

The specific BMPs related to establishing construction access that will be used on this project include:

- Stabilized construction entrance – D.2.1.4.1
- Construction road/parking area stabilization – D.2.1.4.2
- Wheel Wash – D.2.1.4.2

Sediment Retention

During construction, surface water collected from disturbed areas of Areas 5 and 6 will be routed through proposed stormwater ponds designed to remove sediment from runoff prior to release from the Site. The two proposed combined detention and large wetpond facilities (Area 5 and 6 Ponds) are designed to treat and detain runoff during interim and post-closure conditions for Areas 5 and 6. Since construction of facilities occurs early in the proposed construction sequence, they will also function as

sediment ponds. Although the proposed ponds are designed to remove solids by settling, the structures shall be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed and incorporated into the reclamation fill as construction is completed. The permanent stormwater BMPs shall be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized. There are no inlet structures on the site, therefore, storm drain inlet protection is not required.

The specific BMPs related to sediment retention that will be used on this project include:

- Sediment Pond – D.2.1.5.2

Surface Water Collection

As stated above, during construction, surface water collected from Areas 5 and 6 will be routed through proposed stormwater ponds designed to remove sediment from runoff prior to release from the Site. Ditches are proposed in Areas 5 and 6 to convey intercepted runoff from disturbed areas to and from sediment ponds or traps. Ditches are sized to convey the 100-year event under interim and post-closure conditions. Where site runoff is to be conveyed in proposed ditches, efforts shall be taken to prevent downstream erosion. Check dams are proposed within ditches to reduce flow velocities and channel erosion. Spacing of check dams will vary depending on ditch slope. Outlet protection is provided to prevent scour at conveyance outfalls in accordance with the Section 4.2.2 of the KCSWDM.

The specific BMPs for ditch and outlet stabilization that will be used on this project include:

- Check dams – D.2.1.6.4
- Outlet protection – D.2.1.6.5

Dewatering Control

Not applicable (N/A)—No dewatering is included in the Project as excavation of proposed stormwater ponds will not impact groundwater table.

Dust Control

Reserve uses a water truck for dust control. The water truck will be driven on-site (via the haul roads) to spray water over the disturbed areas to control dust generation. The water application rate will be control to prevent runoff of water applied for dust control.

Flow Control

The two proposed combined detention and large wetpond facilities (Area 5 and 6 Ponds) are designed to meet the Level 2 flow control standard, requiring post-development runoff to match historic durations for 50 percent of the 2-year through 50-year peak flows, as well as historic 2-year and 10-year peak flows.

Protect Existing and Proposed Flow Control BMPs

Currently, no flow control BMPs are on the Areas 5 and 6; the nature of the proposed Project is to install them for the proposed improvements. The Project proposes the construction of dispersion rock pad per Section C.2.4.3 of the KCSWDM downstream of ditch outfalls. Protections of proposed BMPs will be in accordance with the 2021 KCSWDM based on the following principles:

Protect flow control BMPs from sedimentation by installing and maintaining erosion and sediment control BMPs on areas draining into them.

Restore BMPs to full functionality if sediment accumulates, including removing sediment and replacing soils as needed. If restoration isn't possible, a new BMP may be required.

Keep heavy equipment off final-grade soils under flow control BMPs to retain infiltration rates.

Maintain Protective BMPs

Maintenance will be performed according to the requirements of the 2021 KCSWDM. Most of the ESC BMPs included in this plan are components of final site stabilization and would remain in place. However, if any Temporary Erosion and Sediment Control (TESC) measures are installed, they will be removed when no longer necessary.

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each BMP's specifications. Erosion and sediment control BMPs on inactive areas shall be inspected and maintained a minimum of once a month during the dry season, bi-monthly during the wet season, and within 24 hours following a storm event. Erosion and sediment control BMPs on active areas shall be inspected and maintained daily. Any area not requiring immediate attention shall have erosion and sediment controls addressed within 7 days.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment will stabilized on-site by incorporating into reclamation fill. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

Manage the Project

Reserve will manage the proposed project in compliance with 2021 KCSWDM requirements for Element 12 – Manage the Project, clearing and grading permit GRDE15-0011, Inert Waste Landfill permit number PR0082027 and Sand and Gravel General Permit No. WAG503029. The CSWPP Supervisor will be the primary contact for ESC and SWPPP matters, including reporting, , and overall implementation of the CSWPP plan.

SWPPS Plan Analysis and Design

The Stormwater Pollution Prevention and Spill (SWPPS)Plan was developed in accordance with the 2021 KCSWDM. The SWPPS Plan is organized according to the requirements of Section D.2.5.2 of the 2021 KCSWDM.

Based on the nature of the project, the following SWPPS sections are not applicable:

- Concrete Handling and Concrete Washout Areas
- Sawcutting and Surfacing Pollution Prevention
- Construction Stormwater Filtration
- Construction Stormwater Chemical Treatment
- Handling of pH Elevated Water
- Use of High pH Soil Amendments on Construction Sites

Fueling

Fueling will be performed in accordance with BMP A-48 from the 2021 King County Stormwater Pollution Prevention Manual, which is included in Appendix A.

Material Delivery, Storage, and Containment

BMPs for the loading, unloading, storage, and containment for potential pollutants will be implemented in accordance with the SWPPS BMPs in Appendix A.

Maintain Protective BMPs

BMPs for construction of filtration systems will be performed in accordance with the SWPPS BMPs in Appendix A.

Manage the Project

Protective measures and BMPs need to be made in accordance with the SWPPS BMPs in Appendix A.

Construction Sequence

The following describes the general sequence of Project actions as they pertain to erosion control measures.

1. Pre-construction meeting.
2. Stake clearing limits.
3. Install catch basin protection and flow control BMP area protection as required.
4. Install perimeter protection (e.g., brush barrier, etc.).
5. Construct Area 5 and 6 Ponds (will function as sediment ponds during construction).
6. Construct surface water controls (interceptor dikes, pipe slope drains, etc.) simultaneously with clearing and grading for project development. Construct SWPPS controls in anticipation of scheduled construction activity.
7. Maintain erosion control and SWPPS measures in accordance with King County standards and manufacturer's recommendations.
8. Relocate erosion control and SWPPS measures or install new measures so that as site conditions change the erosion and sediment control, and pollutant protection is always in accordance with the King County Construction Stormwater Pollution Prevention Standards.
9. Cover all areas that will be unworked for more than seven days during the dry season or two days during the wet season with straw, wood fiber mulch, compost, or equivalent.
10. Stabilize all areas that reach final grade within seven days.
11. Seed any areas to remain unworked for more than 30 days.
12. Upon completion of the project, all disturbed areas must be stabilized and BMPs removed if appropriate.

Site Inspections and Monitoring

Routine inspections and maintenance of the SWPPP will be performed as required by the Sand and Gravel General Permit No. WAG503029.

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Appendix A

Stormwater Pollution Prevention and Spill Control Plan BMPs

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A-48: Mobile Fueling of Vehicles and Heavy Equipment

The following best management practices apply to mobile fueling, also known as fleet fueling, wet fueling, or wet hosing. Mobile fueling is the practice of filling fuel tanks of vehicles or equipment by fuel tank trucks, tank trailers, and trucks with accessory fueling tanks that are driven to the yards or sites where the vehicles to be fueled are located.

Potential pollutants can include but are not limited to hydrocarbons, metals, oil and grease, and oxygen demanding substances.

BMPs are required by King County Water Quality Code (KCC 9.12). If the BMPs included here are not enough to prevent contamination of stormwater, you will be required to take additional measures.

Required Operational BMPs

- Obtain approval from the local fire department. Comply with local and Washington State fire codes.
- The driver/operator must be present and constantly observe all fuel transfer operations to ensure the implementation of the following procedures at all fuel transfer locations:
    - To the extent practical, locate the point of fueling at least 25 feet from the nearest storm drain or drainage ditch, or inside an impervious containment with a volumetric holding capacity equal to or greater than 110 percent of the fueling tank volume, or covering the catch basin to prevent discharge of spilled or leaked fuel. Covers are not required for storm drains that convey the inflow to a spill control separator approved by the local jurisdiction and the fire department;
    - Place a leak-proof drip pan or an absorbent pad under each fueling location prior to and during all dispensing operations. The pan or the absorbent pad must have a capacity of at least 5 gallons. There is no need to report spills retained in the drip pan or the pad;
    - Manage the handling and operation of fuel transfer hoses and nozzle, drip pan(s), and absorbent pads as needed to prevent spills/leaks of fuel from reaching the ground, storm drains, or surface waters;
    - Do not extend fueling hoses across a traffic lane without fluorescent traffic cones, or equivalent devices, conspicuously placed to block all traffic from crossing the fuel hose;
    - Remove the fill nozzle and cease filling the tank when the automatic shut-off valve engages. Do not lock automatic shutoff fueling nozzles in the open position;
    - Do not “top off” the fuel tanks; and
    - Do not use dispersants or soap to clean up spills or sheens.

- Develop and follow a mobile fueling plan that includes the required operational BMPs and spill response procedures.
- The responsible manager shall:
    - Sign and date the mobile fueling plan;
    - Distribute mobile fueling procedures to all operators; and
    - Update and retain the mobile fueling plan in the organization files.
- Immediately notify the local fire department (911) and Washington State Department of Ecology in the event of any spill entering surface or ground waters. Establish a "call down list" to ensure the rapid and proper notification of management and government officials should any significant amount of product be lost off-site. Keep the list in a protected but readily accessible location in the mobile fueling truck. The "call down list" should also pre-identify spill response contractors available in the area to ensure the rapid removal of significant product spillage into the environment.
- Train the driver/operator upon hiring, and annually thereafter, on proper fueling procedures, spill prevention, cleanup measures, and emergency procedures. Make all employees are aware of the significant liability associated with fuel spills.
- The driver/operator of the fueling vehicle must have:
    - A current copy of the mobile fueling plan;
    - Adequate flashlights or other mobile lighting to view fuel fill openings with poor accessibility; and
    - Two-way communication with the operator's home base.
- Maintain a minimum of the following spill clean-up materials in all fueling vehicles, that are readily available for use:
    - Non-water absorbents capable of absorbing at least 15 gallons of diesel fuel;
    - A catch basin plug or cover kit;
    - Two, five-gallon buckets with lids or sealable disposal bags;
    - A non-spark generating shovel; and
    - For fuel tankers and trailers with fueling tanks greater than 100 gallons, a non-water absorbent containment boom, minimum 10 feet in length with a 12-gallon minimum absorbent capacity.
- Use automatic shutoff nozzles for dispensing the fuel. Replace automatic shut-off nozzles as recommended by the manufacturer.
- Maintain fueling equipment, particularly hoses and nozzles.

Additional Information

- *Stormwater Pollution Prevention Manual*, Chapter 3: Commercial and Multifamily BMPs
    - A-3: Storage of Liquid Materials in Portable Containers
- *Stormwater Pollution Prevention Manual*, Chapter 5: Information Sheets

- Controlling and Collecting Contaminated Runoff
- Spill Response and Clean-up Plan

For more information or assistance contact the King County Stormwater Services at 206–477–4811 and visit kingcounty.gov/stormwater.

D.2.2 SWPPS MEASURES

This section details the SWPPS measures that are required to prevent, reduce, or eliminate the discharge of pollutants to onsite or adjacent stormwater systems or watercourses from construction-related activities such as materials delivery and storage, onsite equipment fueling and maintenance, demolition of existing buildings and disposition of demolition materials and other waste, and concrete handling, washout and disposal.. These SWPPS measures represent *Best Management Practices (BMPs)*[8] for the control of pollutant drips and spills as well as other impacts related to construction such as increased pH in concrete construction and handling activities. Compliance with each of the SWPPS measures, and with any project-specific control measures, to the extent applicable and necessary to meet the performance criteria in Section D.2.2, and compliance with the CSWPP implementation requirements in Section D.2.4, constitutes overall compliance with King County's CSWPP Standards.

Note: Additional measures shall be required by the County if the existing standards are insufficient to protect adjacent properties, drainage facilities, or water resources.

The standards for each individual SWPPS measure are divided into four sections:

1. Purpose
2. Conditions of Use
3. Design and Installation Specifications
4. Maintenance Requirements.

Note that the "Conditions of Use" always refers to site conditions. As site conditions change, SWPPS measures must be changed to remain in compliance with the requirements of this appendix.

Whenever compliance with King County SWPPS Standards is required, all of the following SWPPS measures must be considered for application to the project site as detailed in the following sections. The construction pollutant generating concerns addressed by the BMPs that follow include:

- Concrete handling, washout and disposal(specifically portland cement concrete)
- Sawcutting and surfacing activities
- Materials delivery, storage and containment
- Filtration and chemical treatment of construction water to facilitate disposal or discharge to approved locations
- Reporting requirements and documentation availability for specific BMP processes

Additionally, several of the ESC BMPs described in Section D.2.1 can be applicable to the SWPPS plan, e.g., use of cover, fencing and access protection to protect temporary materials storage locations. The applicant’s material supplier may be a resource (subject to King County approval) for BMPs to address specific project applications or proposals. Conditions of approval on adjustments may also specify additional requirements for the SWPPS plan.

[8] *Best Management Practices (BMPs)* means the best available and reasonable physical, structural, managerial, or behavioral activities, that when singly or in combination, eliminate or reduce the contamination of surface and/or ground waters.

D.2.2.4 MATERIAL DELIVERY, STORAGE AND CONTAINMENT

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g. Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds
- Hazardous chemicals such as acids, lime, adhesives, paints, solvents and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

The following steps should be taken to minimize risk:

1. Temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
2. Material Safety Data Sheets (MSDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
3. Hazardous material storage on-site should be minimized.
4. Hazardous materials should be handled as infrequently as possible.
5. During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
6. Materials should be stored in secondary containments, such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
7. Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, and within secondary containment.
8. If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.

Material Storage Areas and Secondary Containment Practices:

1. Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
2. Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.

3. Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
4. Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
5. Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
6. During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
7. Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
8. The spill kit should include, at a minimum:
    - 1-Water Resistant Nylon Bag
    - 3-Oil Absorbent Socks 3”x 4’
    - 2-Oil Absorbent Socks 3”x 10’
    - 12-Oil Absorbent Pads 17”x19”
    - 1-Pair Splash Resistant Goggles
    - 3-Pair Nitrile Gloves
    - 10-Disposable Bags with Ties
    - Instructions

6. Treatment: If necessary, pH adjustment shall be done in the collection tanks or temporary ponds and not in the permanent detention ponds.
7. Disposal options: The proposal to use CKD/CTB must contain a disposal plan that may include one or a combination of sanitary sewer or approved offsite disposal. Treated contact water may be discharged to the sanitary sewer if authorizations are obtained from the King County Industrial Waste Program (206-477-5300) and the local sewer district. All discharge conditions (e.g. pH, settleable solids) must be followed. If a sanitary sewer is not available at the site, contact water may be transported offsite to an approved site for disposal and proof of proper disposal must be submitted to King County. All authorizations for disposal shall be obtained prior to CKD/CTB application.
    - Infiltration: Depending on the site conditions, pH-adjusted stormwater may be infiltrated. Prior to infiltration, pH must be between 6.5 and 8.5.
    - Surface Water: Contact water from the application area shall not be discharged to surface waters, even if treatment has adjusted the pH.
8. Emergency backup plan: An emergency backup plan must be prepared and ready to implement to handle large quantities of stormwater.
9. Monitoring shall be conducted to determine that contact stormwater is not leaving the site. Offsite monitoring shall also be conducted to identify impacts to adjacent water bodies. Bonding may be required to cover mitigation of impacts and restoration.
10. A soils specialist will establish the mixing percentage for onsite soils. Soil amendments will never occur in excess of the ability of the onsite equipment and resources to meet all BMP requirements.
11. For sites one acre or larger, a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater permit must be obtained from Ecology. NPDES permits and 'Stormwater Pollution Prevention Plans (SWPPPs) must be amended and the use of CKD/CTB must be approved by Ecology prior to application.

The contractor/developer shall comply will all federal, state, and local regulations. A health and safety plan may be required for the protection of King County inspectors.

Additional BMPs may be applicable depending on mix design, proximity of wetlands or streams (e.g. within 300 feet of class/type I and 100 feet or less for other types) and site conditions.

D.2.2.10 MAINTAIN PROTECTIVE BMPS

Pollutant protection measures shall be maintained to assure continued performance of their intended function. Reporting and documentation shall be kept current and made available to DLS-Permitting as indicated.

Purpose: The purpose of maintaining protective BMPs is to provide effective pollutant protection when and where required by the plan and the project, and to provide timely and relevant project information.

When to Maintain: Protection measures shall be monitored per Section D.2.4.4 at a minimum, continuously during operation, and promptly maintained to fully functioning condition as necessary to assure continued performance of their intended function. Documentation shall be kept current per specific BMP requirements.

Measures to Use:

1. Maintain and repair all pollutant control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.
2. Maintain and repair storage locations for equipment and materials associated with BMP processes. Conduct materials disposal in compliance with County regulatory requirements.

3. As required, provide current reporting and performance documentation at an accessible location for the site inspector and other DLS-Permitting staff.
4. Remove all temporary pollutant control BMPs prior to final construction approval, or within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

D.2.2.11 MANAGE THE PROJECT

SWPPP requirements shall be implemented and managed as part of the overall CSWPP plan. Concrete construction and its impacts are primary among pollutant concerns on site development projects. Fueling operations and materials containment of treatment chemicals and other project materials are also typical pollutant concerns. Operations that produce these and other pollutants are often conducted by subcontractors and their laborers, yet may require specific protective measures, documentation and reporting. Protective measures and BMPs need to be made available prior to construction and suitable oversight provided to assure inspection, monitoring and documentation requirements are met.

Projects shall assign a qualified CSWPP Supervisor (Section D.2.3.1) to be the primary contact for SWPPP and ESC issues and reporting, coordination with subcontractors and implementation of the CSWPP plan as a whole.

Measures to Use:

1. Phase development projects to the maximum degree practicable and take into account seasonal work limits.
2. Inspection and monitoring – Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. Conduct site inspections and monitoring in accordance with the Construction Stormwater General Permit and King County requirements. Coordinate with subcontractors and laborers to assure the SWPPP measures are followed.
3. Documentation and reporting: – Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. Document site inspections and monitoring in accordance with the Construction Stormwater General Permit, specific BMP conditions and King County requirements. Log sheets provided in Reference Section 8 may be used if appropriate. Follow reporting requirements and provide documentation as requested to DLS-Permitting staff.
4. Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP in accordance with the Construction Stormwater General Permit and King County requirements. Obtain approval for specific SWPPP measures (e.g., chemical treatments of stormwater) well in advance of need. Coordinate SWPPP plan updates with the site inspector (see Section D.2.4.1).

Appendix F

Operations and Maintenance Manual

Operations and Maintenance Manual

Reserve Inert Waste Landfill Expansion Project

Prepared for
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February 28, 2025

1. O&M Overview

This project contains 8 BMPs that require proper operation and maintenance to ensure functionality of flow control, conveyance, and water quality facilities. These BMPs were developed to meet the requirements of the 2021 King County Stormwater design manual. See list below and tables on the succeeding pages for the project BMPs and associated maintenance requirements.

1. Detention Ponds
2. Control Structure/Flow Restrictor
3. Catch Basins and Manholes
4. Conveyance Pipes and Ditches
5. Debris Barriers (e.g., Trash Racks)
6. Access Roads
7. Wetpond
8. Basic Dispersion (Gravel Filled Trench)

NO. 1 – DETENTION PONDS

Maintenance Component	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Site	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Top or Side Slopes of Dam, Berm or Embankment	Rodent holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents removed or destroyed and dam or berm repaired.
	Tree growth	Tree growth threatens integrity of slopes, does not allow maintenance access, or interferes with maintenance activity. If trees are not a threat or not interfering with access or maintenance, they do not need to be removed.	Trees do not hinder facility performance or maintenance activities.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted slope.	Slopes stabilized using appropriate erosion control measures. If erosion is occurring on compacted slope, a licensed civil engineer should be consulted to resolve source of erosion.
	Settlement	Any part of a dam, berm or embankment that has settled 4 inches lower than the design elevation.	Top or side slope restored to design dimensions. If settlement is significant, a licensed civil engineer should be consulted to determine the cause of the settlement.
Storage Area	Sediment accumulation	Accumulated sediment that exceeds 10% of the designed pond depth.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner damaged (If Applicable)	Liner is visible or pond does not hold water as designed.	Liner repaired or replaced.
Inlet/Outlet Pipe.	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.
Emergency Overflow/Spillway	Tree growth	Tree growth impedes flow or threatens stability of spillway.	Trees removed.
	Rock missing	Only one layer of rock exists above native soil in area five square feet or larger or any exposure of native soil on the spillway.	Spillway restored to design standards.

NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the structure opening or is blocking capacity of the structure by more than 10%.	No Trash or debris blocking or potentially blocking entrance to structure.
		Trash or debris in the structure that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the structure.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Sediment	Sediment exceeds 60% of the depth from the bottom of the structure to the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section or is within 6 inches of the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section.	Sump of structure contains no sediment.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering structure through cracks, or maintenance person judges that structure is unsound.	Structure is sealed and structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering structure through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Structure has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Ladder rungs missing or unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
FROP-T Section	Damage	T section is not securely attached to structure wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure.	T section securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight or show signs of deteriorated grout.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes—other than designed holes—in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or missing	Cleanout gate is missing.	Replace cleanout gate.

NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		Cleanout gate is not watertight.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
Orifice Plate	Damaged or missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
	Deformed or damaged lip	Lip of overflow pipe is bent or deformed.	Overflow pipe does not allow overflow at an elevation lower than design
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.
Metal Grates (If Applicable)	Unsafe grate opening	Grate with opening wider than $^{7}/_{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance**.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and is structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $^{7}/_{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or missing	Grate missing or broken member(s) of the grate. **Any open structure requires urgent maintenance**.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance**.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 6 – CONVEYANCE PIPES AND DITCHES

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

NO. 7 – DEBRIS BARRIERS (E.G., TRASH RACKS)

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed.
Site	Trash and debris	Trash or debris plugging more than 20% of the area of the barrier.	Barrier clear to receive capacity flow.
	Sediment accumulation	Sediment accumulation of greater than 20% of the area of the barrier	Barrier clear to receive capacity flow.
Structure	Cracked broken or loose	Structure which bars attached to is damaged - pipe is loose or cracked or concrete structure is cracked, broken of loose.	Structure barrier attached to is sound.
Bars	Bar spacing	Bar spacing exceeds 6 inches.	Bars have at most 6 inches spacing.
	Damaged or missing bars	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than ¾ inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Repair or replace barrier to design standards.

NO. 12 – ACCESS ROADS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can).	Roadway drivable by maintenance vehicles.
		Debris which could damage vehicle tires or prohibit use of road.	Roadway drivable by maintenance vehicles.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Blocked roadway	Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
		Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.	At least 12-foot of width on access road.
Road Surface	Erosion, settlement, potholes, soft spots, ruts	Any surface defect which hinders or prevents maintenance access.	Road drivable by maintenance vehicles.
	Vegetation on road surface	Trees or other vegetation prevent access to facility by maintenance vehicles.	Maintenance vehicles can access facility.
Shoulders and Ditches	Erosion	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.
Modular Grid Pavement	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damaged or missing	Access surface compacted because of broken on missing modular block.	Access road surface restored so road infiltrates.

NO. 16 – WETPOND

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
Site	Trash and debris	Any trash and debris accumulated on the wetpond site.	Wetpond site free of any trash or debris.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Side Slopes of Dam, Berm, internal berm or Embankment	Rodent holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents removed or destroyed and dam or berm repaired.
	Tree growth	Tree growth threatens integrity of dams, berms or slopes, does not allow maintenance access, or interferes with maintenance activity. If trees are not a threat to dam, berm or embankment integrity, are not interfering with access or maintenance or leaves do not cause a plugging problem they do not need to be removed.	Trees do not hinder facility performance or maintenance activities.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted slope.	Slopes stabilized using appropriate erosion control measures. If erosion is occurring on compacted slope, a licensed civil engineer should be consulted to resolve source of erosion.
Top or Side Slopes of Dam, Berm, internal berm or Embankment	Settlement	Any part of a dam, berm or embankment that has settled 4 inches lower than the design elevation.	Top or side slope restored to design dimensions. If settlement is significant, a licensed civil engineer should be consulted to determine the cause of the settlement.
	Irregular surface on internal berm	Top of berm not uniform and level.	Top of berm graded to design elevation.
Pond Areas	Sediment accumulation (except first wetpool cell)	Accumulated sediment that exceeds 10% of the designed pond depth.	Sediment cleaned out to designed pond shape and depth.
	Sediment accumulation (first wetpool cell)	Sediment accumulations in pond bottom that exceeds the depth of sediment storage (1 foot) plus 6 inches.	Sediment storage contains no sediment.
	Liner damaged (If Applicable)	Liner is visible or pond does not hold water as designed.	Liner repaired or replaced.
	Water level (all wetpool cells)	Cell level(s) drops more than 12 inches in any 7-day period.	Cell level(s) drops less than 12 inches in any 7-day period.
	Algae mats (first wetpool cell)	Algae mats develop over more than 10% of the water surface should be removed.	Algae mats removed (usually in the late summer before Fall rains, especially in Sensitive Lake Protection Areas.)

NO. 16 – WETPOND

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
	Design planting and vegetation survival and maintenance	Sparse or dying design planting, or when design plantings are not thriving across 80% or more of the design vegetated areas within the pond; invasive vegetation e.g., cattails	Design plantings and vegetation are thriving and appropriately spaced across 80% or more of the design vegetated areas within the pond; invasives removed including root clumps
Gravity Drain	Inoperable valve	Valve will not open and close.	Valve opens and closes normally.
	Valve won't seal	Valve does not seal completely.	Valve completely seals closed.
Emergency Overflow Spillway	Tree growth	Tree growth impedes flow or threatens stability of spillway.	Trees removed.
	Rock missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. Rip-rap on inside slopes need not be replaced.	Spillway restored to design standards.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

Basic Dispersion (Gravel Filled Trench)

Basic dispersion for this project has two primary components that must be maintained: (1) gravel filled trench devices that disperse runoff from developed surfaces and (2) the vegetated area over which runoff is dispersed. Gravel filled trenches will be inspected annually and after major storm events to identify and repair any physical defects. When native soil is exposed or erosion channels are present, the sources of the erosion or concentrated flow need to be identified and mitigated. Concentrated flow can be mitigated by leveling the edge of the pervious area and/or realigning or replenishing the rocks in the gravel filled trenches. The vegetated area over which runoff is dispersed must be maintained in good condition free of bare spots and obstructions that would concentrate flows. Results expected include erosion or concentrated flow mitigation, well-established vegetation, and sheet flow established across the site.

BMP C.2.4 – Basic Dispersion - Gravel Filled Trench

Your property contains a stormwater management flow control BMP (best management practice) called "basic dispersion," which was installed to mitigate the stormwater quantity and quality impacts of some or all of the impervious surfaces or non-native pervious surfaces on your property. Basic dispersion is a strategy for utilizing any available capacity of onsite vegetated areas to retain, absorb, and filter the runoff from developed surfaces. This flow control BMP has two primary components that must be maintained: (1) the devices that disperse runoff from the developed surfaces and (2) the vegetated area over which runoff is dispersed.

Dispersion Devices

The dispersion devices used on your property include the following as indicated on the flow control BMP site plan: ❑ splash blocks, ❑ rock pads, ☒ gravel filled trenches, ❑ sheet flow. The size, placement, composition, and downstream flowpaths of these devices as depicted by the flow control BMP site plan and design details must be maintained and may not be changed without written approval either from the King County Water and Land Resources Division or through a future development permit from King County.

Dispersion devices must be inspected annually and after major storm events to identify and repair any physical defects. When native soil is exposed or erosion channels are present, the sources of the erosion or concentrated flow need to be identified and mitigated. Concentrated flow can be mitigated by leveling the edge of the pervious area and/or realigning or replenishing the rocks in the dispersion device, such as in rock pads and gravel filled trenches.

Vegetated Flowpaths

The vegetated area over which runoff is dispersed must be maintained in good condition free of bare spots and obstructions that would concentrate flows.

Appendix G

Landscape Bond Quantity Form

King County
Department of Local Services
Permitting Division
206-296-6600
www.kingcounty.gov

Landscape Bond Quantity Worksheet Form

For alternate formats, call 206-296-6600

Project Name: Reserve Silica - Ravensdale Facility

Permitting Project #: GRDE15-0011

Address: 28131 Ravensdale-Black Diamond Rd., Ravensdale, WA 98051

Prepared By: Owen Reese, P.E. **Phone:** 206-787-8281

Bonds are based upon required landscaping and will be posted for performance and/or maintenance**.** Required landscaping includes perimeter landscaping, surface parking area landscaping, (KCC 21A.16) and any landscaping required by SEPA environmental review. **The maintenance period is for the life of the project**, however, after posting for maintenance, the performance bond will be reduced to 30% of the total performance bond price including contingency, or other amount as warranted by site specific or current market considerations at the discretion of the department ($1,000.00 minimum). Bonds will be held for a minimum two year period. Upon re-inspection of the site at the end of the monitoring period, the bond will be released if the site has been properly maintained (KCC 21A.16.180). If the project has not been maintained and there are dead trees, shrubs, ground cover, or other deficiencies noted in the required landscaping, the bond will be held until the deficiencies are corrected.

	UNIT PRICE	UNIT TYPE	QUANTITY	PRICE
SOD LAWN AREAS	$500.00	MSF (1000 SQ. FT)	0	$0
HYDROSEEDING	$50.00	MSF (1000 SQ. FT)	1,028	$51,398
SOIL PREPARATION A. TOPSOIL (6 INCHES DEEP)	$25.00	CY (CUBIC YARD)	115,115	$2,877,877
B. MULCH (2 INCHES DEEP)	$4.00	SY (SQUARE YARD)	0	$0
C. PEAT MOSS (TWO INCHES DEEP)	$2.30	SY (SQUARE YARD)	0	$0
D. COMPOST (3 INCHES DEEP & TILLING	$26.00	SY (SQUARE YARD)	0	$0
E. FERTILIZER	$6.67	CY (CUBIC YARD)	0	$0
PLANT MATERIALS A. DECIDUOUS TREES				
1.75 - 2.00" CALIPER (minimum height 10') PERIMETER & PARKING AREAS	$250.00 EACH	COST & LABOR	0	$0
1 GALLON POT	$20.00 EACH	COST & LABOR	16,994	$339,880
B. EVERGREEN TREES				
1 GALLON POT	$10.00 EACH	COST & LABOR	6,772	$67,720
C. SHRUBS	$10.00 EACH	COST & LABOR	114,972	$1,149,720
D. GROUND COVER	$4.00 EACH	COST & LABOR	0	$0
SUB TOTAL BOND AMOUNT			**BOND AMOUNT SUB TOTAL:**	
			$	4,486,595

	UNIT PRICE	UNIT TYPE	QUANTITY	PRICE
MISCELLANEOUS TREE STAKES	$2.65 EACH	PER STAKE & LABOR	0	$0.00
FENCING: SOLID WOOD CEDAR	$28.50	LINEAR FOOT INCLUDES LABOR	0	$0.00
BERMING	$17.50	LINEAR FOOT INCLUDES LABOR	0	$0.00
IRRIGATION	80¢	SQUARE FOOT	0	$0.00
RELOCATING TREES ON SITE				
36" BALL	$260.00	EACH	0	$0.00
60" BALL	$920.00	EACH	0	$0.00
RELOCATING SHRUBS ON SITE			0	$0.00
12" BALL	$26.00	EACH	0	$0.00
24" BALL	$33.00	EACH	0	$0.00
ADDITIONAL ITEMS: Onsite recreation facilities			0	$0.00

SUB TOTAL BOND AMOUNT	**BOND SUB TOTAL:**
	$ 4,486,595
Add 30% of the Bond Sub-Total for Contingency in accordance with KCC 27A.30.020	**30 % CONTINGENCY:**
	$ 1,345,979
TOTAL BOND PRICE *	**TOTAL BOND PRICE:**
	$ 5,832,574

* NOTE: Permit inspection fees, in addition to the bond price, are required for monitoring the performance and maintenance of required landscaping**.**