TECHNICAL INFORMATION REPORT

Cumberland Aggregate Mine, King County, WA

Prepared for: Segale Properties LLC

Project No. 220395-B • September 6, 2023 FINAL

Aspect CONSULTING

earth + water

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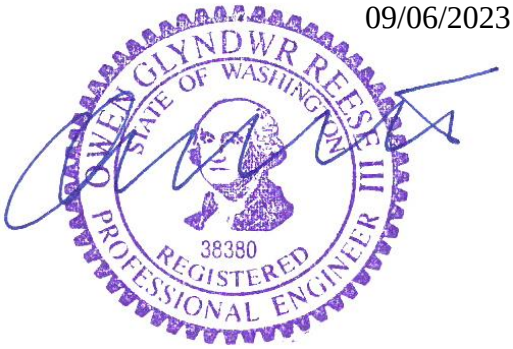
09/06/2023



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1 Project Overview

This Technical Information Report (TIR) documents the proposed stormwater management features for a proposed sand and gravel mine located on an approximately 990-acre property (Cumberland Property) owned by Segale Properties LLC (Segale). The Cumberland Property is located west of Cumberland-Kanaskat Road SE and south and east of the Green River in unincorporated King County. The Cumberland Property consists of 16 tax parcels that surround a roughly 599-acre parcel of land owned by the Washington State Department of Natural Resources (DNR). The TIR Worksheet is provided on Figure 1 and a Site Location Map is provided on Figure 2.

Mining of the Cumberland Property will involve surface mining of sand and gravel deposits in four mine segments (M-1 through M-4). The mine areas will be connected by a two-lane haul road that parallels the east, north, and west edges of the parcel owned by DNR. The primary entrance and exit to the Cumberland Property will be a new entrance from Cumberland-Kanaskat Road SE, located a little over a mile southeast of Palmer. Facilities located at the entrance area will include a truck scale, wheel wash, and small office.

Initially, limited processing (e.g., crushers, screens) will be performed on site. As mining progresses, an aggregate processing plant (including crushers, screens, a wash plant, and water and fines management) and an asphalt plant will be established. The asphalt plant will remain in M-1. The aggregate processing plant may remain in M-1 or may be relocated to M-3, once its northern portion has reached final grade.

Mining will be conducted using bulldozers, excavators, and loaders. Haul trucks will be used to transport the mined aggregate to the processing area; processing may include crushing, screening, washing, sorting and asphalt production. Aggregate product will be shipped from the mine site in trucks.

The target materials for mining are Vashon-age ice-contact and recessional outwash deposits. These materials are present at the surface of the Cumberland Property, beneath a relatively thin layer of topsoil. The ice-contact and outwash deposits are underlain by Vashon lodgment till overlying pre-Vashon glacial deposits and bedrock. Groundwater is present at depth in the ice-contact and recessional outwash deposits. The proposed mining will remain at least 10 feet above the seasonal high groundwater table.

The proposed stormwater improvements documented in this TIR and accompanying Engineering Plans include the following elements:

- Collect, convey, treat, and infiltrate all stormwater generated within the mine pits.
    - Conveyance will primarily consist of open ditches, lined with grass or rock depending on slope.
    - Treatment will consist of basic wetponds in most areas.
    - Basic wetponds followed by basic sand filters will be used where the infiltration pond will be within 1/4-mile of a fish-bearing surface water.

  - Infiltration ponds are sized to infiltrate 100 percent of runoff predicted with the Western Washington Hydrology Model (WWHM).
- Collect and fully disperse or treat and infiltrate stormwater from the haul road.
- Prevent off-site discharge of stormwater.

1.1 Predeveloped Site Conditions

The Cumberland Property consists of 15 tax parcels with a total area of approximately 990.53 acres as shown in Table 1. All tax parcels of the Cumberland Property are zoned F-Forest and owned by Segale Properties LLC.

Table 1. Tax Parcels Comprising Cumberland Property

Portion of Cumberland Property	Parcel Number	Approximate Area in Acres
West	1721079001	252.26
North	0921079001	158.35
East	1521079007	32.3
	1521079008 (includes 152107UNKN)	36.88
	1521079009	64.8
	1521079020	9.57
South	2121079001	130.7
	2121079005	41.39
	2121079006	76.52
	2121079008	41.16
	2121079009	102.06
	2121079015	3.2
	2121079016	29.7
	2121079029	9.91
	2121079030	1.73
	Total	990.53

The 15 parcels of the Cumberland Property are located around the perimeter of Section 16 of Township 21 North Range 7 East and can be grouped into four areas – north, south, east, and west (as shown in Table 1) based on the side of Section 16 on which they are located. The majority of Section 16 is a roughly 600-acre parcel owned by DNR, referred to in this report as the DNR Parcel. A roughly 40-acre privately owned parcel is located interior to the DNR Parcel.

The Cumberland Property is primarily undeveloped forest with a limited network of unpaved roads. The only substantial structures on the Cumberland Property are an approximately 1800-square-foot prefabricated steel building in the southwest portion

(Parcel No. 2121079029) and an overhead power transmission line owned by the Bonneville Power Administration (BPA) that crosses the western portion of the property.

The Cumberland Property is bordered to the east by Cumberland-Kanaskat Road SE, to the north by lands owned by Washington State Parks, which include the Kanaskat Palmer State Park and Recreation Area, to the west by the Green River and additional state-owned lands, and to the south by residential properties in the unincorporated community of Cumberland, Washington. County Road 309th Avenue SE, which becomes SE Green River Gorge Road, traverses the southwest portion of the Cumberland Property.

1.1.1 Existing Site Topography

The Cumberland Property is located on a glaciated bedrock terrane south of the Green River near Cumberland, Washington. Generally, the topography is mostly flat or gently sloping within the portions of the Cumberland Property proposed for mining, which are located on the glacial outwash plain. Geologic features that affect site topography include: bedrock features, kettles, and a glacial meltwater channel.

Two bedrock features rise above the outwash plain and affect topography within the Cumberland Property: Lizard Mountain rises to elevation 1474 feet in the northwest portion of the southern parcels, and a smaller bedrock knob rises to 932 feet in the northern portion of the western parcel. Lizard Mountain also extends into the DNR Parcel. These bedrock features and their side slopes are not proposed for mining.

Kettles were formed when blocks of glacial ice became surrounded by meltwater channels that deposited outwash sediment around them. Once the ice blocks melted away, topography depressions were left in the outwash plain. Kettles are present in the northern, western, and southern portions of the Cumberland Property. The deepest kettle is in the southwest portion of the northern parcel and extends onto the DNR Parcel. Its bottom elevation (710 feet) is approximately 100 feet below the surrounding elevations of the glacial plain.

The glacial meltwater channel is located in the northwest portion of the northern property, near the Green River. It was created when meltwater flowing from the receding glaciers eroded a portion of the outwash plain. The meltwater channel consists of an approximately 100-foot-tall steep slope leading to a terrace at elevation 700 to 730 feet. The current channel of the Green River is present off the Cumberland Property and is another 100 feet below the meltwater channel.

Topography within the areas proposed for mining in each of the four parcel groups comprising the Cumberland Property can be described as follows:

North – Topography of the portions of the North parcel proposed for mining primarily consists of an outwash plain at elevations of 840 to 860 feet, with a couple of shallow kettles extending 10 to 20 feet below the plain. The steep slopes formed by the meltwater channel are present in the eastern portion of the parcel and would be partially removed by mining. Finally, the northern edge of the deepest kettle extends into the southwestern portion of the parcel within the proposed mine limit.

East –A gentle slope descends from Cumberland-Kanaskat Road SE to the glacial outwash plain. The portions of the eastern parcels proposed for mining have flat to gently rolling terrain at elevations around 840 to 860 feet.

West – The outwash plain of the western parcel is present at 830 to 860 feet for most of the northern and central portion then slopes gently down to 810 feet at the southern edge. Along the western edge of the area proposed for mining, the topography slopes gently, then more steeply, towards the steep slopes leading to the Green River.

South – Topography of the southern group of parcels is dominated by a ridge extending south from Lizard Mountain through the rough middle of the group of parcels. The high point of the ridge, within the area proposed for mining, is at elevation 930 feet. To the west of the ridge, the outwash plain is present at elevations from 800 to 840 feet, with shallow kettles present in several area, particularly along the western border. To the east of the ridge, the terrain slopes more gently toward Cumberland Kanaskat Road SE at an elevation around 860 feet.

1.1.2 Existing Stormwater Drainage

There are no notable existing stormwater drainage features within the Cumberland Property. Precipitation falling on the parcels is either intercepted by the forest canopy or infiltrates where it lands. Any runoff generated from the limited road network infiltrates within a short distance of the road.

Existing drainage basins have been delineated based on topography and are shown on Figure 3. However, given the coarse nature of the surficial soils on the outwash plain, little to no runoff occurs and there are no drainage features within the areas proposed for mining.

As described in the following section, there are several wetlands and short stream segments located on the DNR Parcel and portions of the Cumberland Property outside of the areas proposed for mining. These features are related to the bedrock of Lizard Mountain and associated colluvial soils.

1.1.3 Critical Areas

Wetland, stream, coal mine hazard, and erosion hazard critical areas are present on portions of the Cumberland Property (Figure 3).

The wetland and stream critical areas, and their buffers, are located outside of the areas proposed for mining. The wetland boundaries, classifications, and buffer distances were developed by Raedeke Associates (2023).

Coal mine hazard areas extend into the eastern and southern mining areas. Associated Earth Sciences, Incorporated (AESI) evaluated the coal mining history of the Cumberland Property and adjacent areas and found that the mapped coal mine hazard areas are associated with the historical Old Carbon, Occidental, and Carbon Fuel Co. No.4 mines on Lizard Mountain (AESI, 2023). The Old Carbon Mine operated for about 3 years, beginning in 1895. The Occidental Mine operated from 1899 to 1913 then after 1924 and closed permanently in 1945. It is the most extensive of the three mines as it included two slope and one drift mines. Limited information exists about Carbon Fuel Co. Mine No. 4

as only a coal mine workings map is known to exist, and it is not documented in contemporaneous mining reports. Additional information about the coal mines from AESI's report is included in Appendix A.

Erosion hazard areas extend into the northern and southern mining areas. The erosion hazard areas were mapped by King County based on soil type and slope. Erosion controls would be implemented in the erosion hazard areas, and all areas of the proposed mine, as described in the Construction Stormwater Pollution Prevention Plan (CSWPPP), included in Appendix B.

1.1.4 Subsurface Conditions

AESI completed an Earth and Water Affected Environment Technical Report (AESI, 2023) that describes the site soils, geology, and hydrogeologic conditions. This section summarizes the findings of that report.

Surficial soils, as mapped by the Natural Resources Conservation Service (NRCS), primarily consist of Barneston, Arents, and Beausite soils, listed in descending order of prevalence on the Cumberland Property. The extent of soil units based on NRCS mapping is shown on Figure 4.

Barneston soils are the primary soil unit found on the Cumberland Property. They are gravelly coarse sandy loam soils that form on glacial outwash terraces and related escarpments. They are classified in hydrologic soils group A and described as "somewhat excessively drained," indicating good infiltration rates and a low potential for generating runoff.

Arents soils are found on terraces and drift plains and form in a mixture of volcanic ash and a variety of other deposits. On the Cumberland Property, they are present in the southern portion near 309th Avenue SE. Arents soils are classified in hydrologic soils group A indicating "moderately well drained to somewhat excessively drained" soils.

Beausite soils form in glacial till and colluvium (hillslope soil deposits) and are mapped along the southern slopes of Lizard Mountain and are barely present with the proposed mine limits. They are moderately deep (24 to 40 inches) and primarily consist of gravelly to extremely gravelly sandy loam. These soils are classified in hydrologic soils group C, indicating lower infiltration rates.

AESI (2023) describes the geologic history of the Cumberland Property and surrounding areas as follows:

The project site lies within the Puget Sound Lowland, which is a broad topographic and structural basin extending generally north-south between the Cascade Range on the east to the Olympic Mountains on the west. … The geology in the vicinity is complex with a range of geologic units exposed in close proximity to the site. …

The project site lies near the Green River Gorge, a section of the Green River characterized by exposures of steep bedrock cliffs. This bedrock is known as the Puget Group and consists of sedimentary rocks of Eocene age (56 million to 34 million years ago (Ma)). The Puget Group rocks outcrop in places throughout the vicinity of the site. Upstream areas along the Green River within the Cascades include exposures of younger

volcanic and volcanic sedimentary rocks of Oligocene to Miocene age (34 to 5 Ma). The Puget Group was intruded by intrusive igneous rock after deposition, and then faulted and folded into their present location. In the site vicinity, the Puget Group bedrock contains north-south trending fold axes and northwest-trending faults (Warren et al., 1945; Gower and Wanek, 1963).

Based on the referenced geologic mapping and AESI's work in the area, a buried erosional valley incised into the bedrock has been identified in the site vicinity. An ancient river, possibly analogous to the modern Green River, established course(s) through a bedrock valley in the immediate vicinity of the site. This paleo-valley was aggraded with sediments derived primarily by fluvial deposition processes and include fluvial sands and gravels and lacustrine silt/clay. Boring and geophysical data indicate that the depth and width of the buried valley is similar to that of the modern-day Green River Gorge.

Glacial ice has advanced southward from British Columbia into the Puget Lowland multiple times within the last 2 million years. The ice was part of the widespread Cordilleran continental ice sheet that covered much of northwestern North America and periodically extended down into the Puget Sound as a broad, tongue of ice commonly referred to as the Puget Lobe. The glacial sediments in the region of the site are a record of the Vashon-age Puget Lobe, which deposited glacial till, ice-contact deposits, and outwash sand and gravel. The Segale Property is located near the lateral margin of the Vashon-age Puget Lobe where the ice was thinner than it was in the Puget Sound area. Vashon-age glacial till drapes the irregular pre-Vashon topography locally in erosional contact with the underlying pre-Vashon sediments and bedrock. Ice-contact kettles are scattered throughout the landscape and indicate where large, stagnant blocks of ice were buried by rapid deglaciation. Sand and gravel were deposited onto outwash plains by meltwater flowing off the retreating ice. This meltwater simultaneously eroded into the landscape.

Post-glacial modification of the landscape is primarily from the modern Green River. The modern Green River has its source near the summit of the Cascades and flows westward entering the study area near Palmer Junction, located approximately ½ mile east of the site. From this point the modern Green River flows westward and southward from Palmer Junction and has incised into the thick sequence of deposits as it adjusted to the abrupt change (lowering) in regional surface water drainage "base-levels" of the Puget Lowland following Vashon deglaciation. The Vashon glacial deposits buried and preserved the pre-existing deposits and prevented the pre-Vashon rivers, including the ancient valley traversing the site vicinity, from re-establishing their preglacial courses. River incision, including large late Vashon-age recessional terraces carved into earlier Vashon-age sediments, was influenced by the occurrence of resistant bedrock progressively exposed during river erosion. Continued post-glacial incision was restricted within bedrock canyons that eroded deeper into the underlying bedrock forming the present Green River Gorge located west and northwest of the site.

Groundwater presence at the site has been evaluated by AESI (2023) based on monitoring at 14 wells (EB-1W through EB-10W, B-2, B-3, B-4 and B-5) installed for this project as well as review of historical records from monitoring on the DNR Parcel as part of a prior biosolids/sludge application project (Metro Seattle's "Silvigrow" project), domestic well logs, and locations and elevations of surface water bodies. AESI found

groundwater present in limited perched areas, a regional aquifer, and an underlying bedrock aquifer.

Perched groundwater occurs where infiltrating rainwater encounters lower-permeability soils and accumulates at the contact between higher-permeability soils on top of the lower-permeability soils. Perched groundwater is not laterally extensive at the site and was encountered in two limited areas near the area of proposed mining:

1) Above the silty/clayey alluvium and lacustrine deposits at EB-10W along the easternmost boundary of the southern portion of the Cumberland Property and in the vicinity of Deep Creek to the east of EB-10W.

2) Above low-permeability Vashon ice-contact deposits and lodgment till when encountered above the water table, including the Vashon till encountered in EB-8W along the terrace escarpment on the west side of the northern portion. This perched water expresses at a spring along the Green River (Spring S-3).

The regional aquifer is present in the highly permeable Vashon ice-contact deposits and underlying pre-Vashon sand and gravels. The Vashon ice-contact deposits are the primary deposits targeted for mining under the proposed project.

AESI has prepared groundwater contour maps illustrating wet and dry season groundwater elevations and flow directions (see Appendix A). The depth to groundwater varies seasonally and spatially throughout the Cumberland Property as shown in Table 2 (which is based on data presented in Tables 1 and 2 of AESI, 2023). Groundwater has not been encountered in the East area. In the North area, groundwater levels have been 111 to 126 feet below ground surface (feet bgs). In the West area, the depth to groundwater is typically 60 to 80 feet bgs in most wells and deeper at around 120 feet bgs in EB-6W, which is located closest to the Green River. In the South area, the wells are located along the western portion and groundwater levels have been shallower at roughly 12 to 40 feet bgs.

Groundwater flow in the regional aquifer is toward the Green River, resulting in different groundwater flow directions in the major portions of the Cumberland Property. Groundwater discharges as seepage from springs or seeps and as subsurface flow to the river or its alluvial aquifer.

The upper portions of the regional aquifer are unconfined, but the lower portions are confined below a discontinuous aquitard consisting of low-permeability Vashon till and fine-grained pre-Vashon deposits. The upper and lower portions of the regional aquifer are hydraulically connected where the aquitard is not present. Where present, the thickness of the aquitard ranges from 10 to 31 feet; however, it was not encountered in all borings.

Groundwater is also present in bedrock underlying the glacial deposits; however, water supply wells completed in the bedrock indicate low yields and localized groundwater presence.

Table 2. Groundwater Elevations

Area	Well	Geologic Unit	Well Screen Elevation in feet	Ground Elevation in feet	Groundwater Elevation in feet				Max. Depth to Groundwater in feet bgs	Min Depth to Groundwater in feet bgs
					2/11/2022	3/23/2022	5/13/2022	6/30/2022		
East	B-2	Qvic	808-798	848.62	<798	<798	<798	<798	Dry	Dry
	EB-1W	Qvic	707-677	830.02	717.3	718.1	717.1	717.2	112.92	111.92
	EB-7W	Qpv	635-625	844.9	724.3	724.3	723.6	724.3	121.3	120.6
North	EB-8W	Qpv	715-705	845.61	719	719.6	718.8	718.9	126.81	126.01
	EB-4W	Qpv	652-642	790.8	717.2	722.9	717.2	719.5	73.6	67.9
	EB-5W	Qvic	709-699	771	703.9	704.2	704	704.1	67.1	66.8
	EB-6W	Qvt	713-703	825.95	706.2	707.1	705.3	706.8	120.65	118.85
	EB-9W	Qpv	629-619	807.77	-	-	730	732.2	77.77	75.57
	B-3	Qpv / Tp	758-748	843.68	763.5	764.5	764.4	764	80.18	79.18
West	B-4	Qvic	725-715	790.24	740.2	742.7	729.5 *	740.7	60.74	47.54
	EB-2W	Qvic	764-754	825.05	789.9	791.2	787.8	788.3	37.25	33.85
	EB-3W	Qvic	726-716	780.52	742.9	743.6	741.4	741.7	39.12	36.92
South	B-5	Qvic	792-772	806.87	791.3	794.9	794.6	793	15.57	11.97

Notes:

Source: AESI, Earth and Water Affected Environment Technical Report, 2023.

Elevation datum is NAVD 88.

feet bgs feet below ground surface

Qvic Vashon ice-contact deposits

Qpv pre-Vashon deposits

Qvt Vashon lodgement till

Tp Puget Group Bedrock

* Potentially anomalous measurement

1.2 Developed Site Conditions

The proposed mining activities will proceed in phases in four mine segments: M-1 through M-4.The areas, depths, and volumes of each mine area are summarized in Table 3.

Each area will be subdivided into smaller segments. Initial activities at site will include constructing the facility entrance, scale and office, and haul road to M-1. Mining will then begin in the first segment of M-1, with clearing, stripping of topsoil, then extraction of aggregate. This same sequence will be followed in each mine segment.

Mining will occur in multiple mine segments at any one time, depending on market conditions, variations in the aggregate deposits to be mined, and operational needs.

Table 3. Proposed Mine Areas

Area	Approximate Area in Acres	Minimum Floor Elevation in feet NAVD88	Average depth in feet	Mine Volume in million cubic yards
M-1	107	730	80	13.6
M-2	77	760	72	8.9
M-3	182	740	72	21.3
M-4	161	800	42	11.0
Total	527	--	--	54.8

Mining will be conducted using bulldozers, excavators, and loaders. No blasting is proposed or expected to be necessary at the proposed mining project. The resource to be mined is gravel/aggregate and not hard rock.

Mining will form closed depressions (pits), which will contain stormwater and locate the most intensive industrial activities well below surrounding grade providing a noise and visual barrier. Initially, limited processing (e.g., crushers, screens) will be performed on site. As mining progresses, an aggregate processing plant (crushers, screens, wash plant, and water and fines management) and an asphalt plant will be established in M-1. The asphalt plant will remain in M-1. The aggregate processing plant may remain in M-1 or may be relocated to M-3 once the northern portion of M-3 has reached final grade.

Haul trucks will be used to transport the mined aggregate to the processing area; processing may include crushing, screening, washing, sorting and asphalt production. Aggregate product will be shipped from the mine site in trucks.

Activities at the proposed mine site will include the following:

- General office area (approximately 1,500 to 2,000 square feet.)
- Truck scales
- Maintenance shop (approximately 10,000-15,000 square feet.)

- Aggregate processing and product stockpiles
- Process water treatment /recycling facility
- Asphalt plant and yard
- Truck parking area
- Two-lane haul road

The asphalt plant, crusher, and water reclamation equipment (i.e., clarifier, filter press, etc.), where wash water/process water is being handled, will be located on an asphalt pad. The asphalt pad will collect all wash water and stormwater generated on it for reuse in washing aggregate. None of the wash water or stormwater runoff associated with the asphalt pad will be allowed to escape the recycling system and infiltrate into the ground.

The limits of mining will maintain a forested setback/buffer of 50 feet along the boundary of the Cumberland Property. Mining is also located at least 1/4-mile from any existing residences.

Mining will stay well above (minimum of 10 feet) regional groundwater levels to assure that runoff from the mining area has adequate profile of material to filter through prior to making contact to regional groundwater levels.

This proposed mining site is expected to have an operation life of approximately 25 to 35 years. The site will be reclaimed/revegetated and returned to forest use. Reclamation will occur segmentally as mine segments reach final grade. Reclamation activities include: stockpiling top soil during mining operations, amending topsoil with wash plant fines, placing amended topsoil on areas where mining has ceased (typically mine side slopes first, followed by the mine floor), and revegetating with native plant species to recreate its current forested state. All structures, equipment, and appurtenances will be removed as part of reclamation.

2 Conditions and Requirements Summary

According to Figure 1.1.2.A in the 2021 King County Surface Water Design Manual (KCSWDM; King County, 2021), the project requires Full Drainage Review as it creates more than 2,000 square feet of new and replaced impervious surface. The project does not trigger Large Project Drainage Review as it is not an Urban Planned Development, nor does it create 50 or more acres of new impervious surface, nor is it located within a critical aquifer recharge area.

Full Drainage Review requires compliance with Core Requirements 1 to 9 and special requirements 1 to 5 of the KCSWDM. The 2021 version of the KCSWDM is the applicable version for this project. The following subsections document the approach for complying with each of these requirements.

2.1 Core Requirement #1: Discharge at the Natural Location

All stormwater runoff will be discharged at the natural location and will not create a significant adverse impact to downhill properties or erosion/steep slope areas. All stormwater generated within the mine segments will be infiltrated within the natural drainage basin as under existing conditions. Most stormwater runoff generated by the haul road and ancillary facilities will also be infiltrated, though some stormwater from smaller areas of impervious surfaces will be managed on site through dispersion.

2.2 Core Requirement #2: Off-Site Analysis

A Level 1 off-site analysis is provided in Section 3 of this TIR.

2.3 Core Requirement #3: Flow Control

The project site is located in a Forest Production Zone Area on King County's Flow Control Applications Map, which requires meeting the Conservation Flow Control standard:

"Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. Also match developed peak discharge rates to predeveloped peak discharge rates for the 2- and 10-year return periods. Assume historic site conditions as the predeveloped condition," (King County, 2021).

The historical site condition for the project site is forest cover.

The project will meet the flow control requirement by infiltrating stormwater from the mine segments and the majority of the mine haul road, and fully dispersing the stormwater from small portions of the haul road and ancillary structures.

2.4 Core Requirement #4: Conveyance System

The proposed project complies with this core requirement by designing the new conveyance system elements to convey at least the 25-year peak flow. The conveyance system consists primarily of open ditches, with a few culverts at road crossings.

Spill control devices (reverse slope pipe) are included in the water quality ponds prior to infiltration.

2.5 Core Requirement #5: Erosion and Sediment Control

A comprehensive Construction Stormwater Pollution Prevention Plan (CSWPPP) is included in Appendix B. Stormwater discharges from mining activity will be permitted under the Sand and Gravel General Permit, which is a combined State Waste Discharge Permit and National Pollution Discharge Elimination System (NPDES) permit. Erosion and sediment control activities described in the CSWPPP are largely governed by the requirements of the Sand and Gravel General Permit.

2.6 Core Requirement #6: Maintenance and Operations

Maintenance and operation of the proposed drainage facilities will be the responsibility of the mine operator. Operation and maintenance is addressed in Section 10 of this TIR.

A drainage facility declaration of covenant and grant of easement will be recorded prior to engineering plan approval.

2.7 Core Requirement #7: Financial Guarantees and Liability

The proposed project will comply with the financial guarantee requirements related to the construction of drainage facilities. A Bond Quantity worksheet is addressed in Section 9.

2.8 Core Requirement #8: Water Quality

The project site is located in a Forest Production Zone Area on King County's Water Quality Control Applications Map, which requires meeting the Basic Water Quality Treatment standard.

The project is industrial, so the Enhanced Basic Water Quality menu is potentially applicable except for areas where runoff is infiltrated in accordance with Section 5.2 of the KCSWDM. The porous site soils generally do not meet the groundwater protection standards in Section 5.2.1, so the exception only applies to facilities located more than 0.25 miles from fish-bearing fresh waters (e.g., the Green River or Deep Creek).

Where the Basic Water Quality Treatment menu applies, treatment is provided by wetponds prior to infiltration for the mine segments and majority of the haul road. Basic treatment for a small portion of the haul road and ancillary facilities is provided by full dispersion.

Where the Enhanced Water Quality Treatment menu applies, treatment is provided by a treatment train consisting of a basic wetpond followed by a basic sand filter. This applies to one or more infiltration ponds located in mine segments M-1 and M-3.

2.9 Core Requirement #9: Flow Control Best Management Practices

All projects are required to "provide onsite flow control BMPs to mitigate the impacts of stormwater and surface water runoff generated by new impervious surface, new pervious surface, existing impervious surfaces and replaced impervious surface targeted for mitigation," (King County, 2021).

The proposed project meets this requirement through infiltration of stormwater runoff from all mine segments and the majority of the haul road. Flow control for stormwater from a small portion of the haul road and ancillary structures near the facility entrance is provided by full dispersion.

2.10 Special Requirement #1: Other Adopted Area-Specific Requirements

Unless specified by King County, no other adopted area-specific requirements will apply to this project. There are no known adopted Critical Drainage Area designation, Master Drainage Plans, Basin Plans, Salmon Conservation Plans, Stormwater Compliance Plans, Lake Management Plans, Flood Hazard Management Plans or Shared Facility Drainage Plans that have specific drainage requirements that apply to the project site.

2.11 Special Requirement #2: Flood Hazard Area Delineation

The Cumberland Property includes wetlands and streams as shown in Figure 3. The flood hazard area for the on-site wetlands and stream has not been delineated and is not shown on a Flood Insurance Rate Map (FIRM). The flood hazards areas have been assumed to fall within the regulatory buffers for these water bodies. An approximate or minor floodplain study will be completed later in the permitting process.

2.12 Special Requirement #3: Flood Protection Facilities

This special requirement does not apply to this project as the project does not rely on existing flood protection facilities or modify or construct new flood protection facilities.

2.13 Special Requirement #4: Source Control

This special requirement applies to this project. The project will implement structural source control measures for the activities conducted on site, including mining of sand and gravel and operation of an asphalt plant. Specifically, the following source control BMPs, as identified in the Stormwater Pollution Prevention Manual (King County, 2021b) are applicable:

A-37 Mining and Quarrying of Sand, Gravel, and Other Materials

A-41 Wheel Wash and Tire Bath Track Out Control

A-19 Concrete and Asphalt Production and Recycling

A-17 Stationary Fueling Operations

A-18 Vehicle and Equipment Repair and Maintenance

A-2 Outdoor Storage of Liquid Materials in Stationary Tanks

2.14 Special Requirement #5: Oil Control

This special requirement applies to the asphalt plant operation where over 1,500 gallons per year of petroleum are stored and/or transferred. A coalescing plate oil/water separator is used in the asphalt plant area.

Other portions of the facility do not qualify as high use because they are not subject to the use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight. A fleet of 25 or more 10-ton vehicles is not kept at the site.

3 Off-Site Analysis

3.1 Study Area Definition

The 2021 KCSWDM requires that the off-site analysis extend "downstream one mile (minimum flowpath distance) from the proposed project discharge location and shall extend upstream as necessary to encompass the off-site drainage area tributary to the proposed project site." As under existing and proposed conditions the Cumberland Property does not have an off-site surface discharge, the study area was limited to the property boundaries.

3.2 Resource Review

The following resources were reviewed as a component of the off-site analysis:

Adopted Basin Plans. No adopted basin plans are applicable to the study area. The study area is east of the South Green River Soos Planning Zone, the closest basin planning area in King County.

Floodplain/Floodway Maps. The study area is located in an area covered by FEMA Map Panel 53033C1325G, which has not been printed. The study area is located approximately 200 feet above the river, and is not located in a mapped floodplain or floodway.

Other Off-site Analysis Reports. No other off-site analysis reports relevant to the study area are known to exist.

Sensitive Areas Folio. King County's online iMap tool was reviewed to identify Critical Areas within the study area. Coal mine hazard and erosion hazard areas were identified as present on portions of the study area. The locations of these hazard areas are shown on Figure 3.

DNRP Drainage Complaints and Studies. No drainage complaints or studies were identified in or near the study area on iMap.

Road Drainage Problem. No roads maintained by KCDOT are present in the study area.

USDA Soils Survey. The USDA NRCS Web Soil Survey was reviewed for the study area. Soils present on site are predominantly well-drained Barneston and Arents series soils, with a small amount of Beausite soils associated with Lizard Mountain. Additional detail about site soils is provided in Section 1.1.4.

Wetlands Inventory Maps. No wetlands identified in the King County Wetlands Inventory as shown on iMap are present on the site. Several wetlands are present on the DNR Parcel and portions of the study area. Wetlands and buffers are shown in Figure 3.

Migrating River Studies. None exist for the site.

Ecology's 303(d)/305(b) Impaired Waters. Ecology's online Water Quality Atlas was reviewed to determine if any 303(d) listed waters are present in the study area. No impaired waters are mapped within the study area. The reach of the Green River

downgradient of the Cumberland Property is listed as impaired for low dissolved oxygen concentration (listing ID# 10824).

King County Designated Water Quality Problems. There are no designated water quality problems mapped in the study area in iMap.

Stormwater Compliance Plans. None are known to exist for the study area.

3.3 Field Inspection and Drainage System Description

No significant drainage features were identified within the study area. Any drainage features present will either be: 1) removed and replaced by construction of the haul road, or 2) removed during mining activity. No features currently present will be key components of the proposed drainage system.

3.4 Upstream Analysis

The project would have no negative upstream impacts. The steepness of terrain upgradient of the site prevents the possibility of tailwater conditions that could extend off site.

3.5 Conclusions

No mitigation for off-site impacts is required for this project. A Level 2 or Level 3 review is not required as drainage problems were not identified.

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

4.1 Existing Site Hydrology

Predeveloped site hydrology was simulated with the Western Washington Hydrology Model 2012 (WWHM2012), version 4.2.18. To meet the Conservation Flow Control standard, the predeveloped condition for each mine segment was simulated as the historical site condition, which for this project location is forest cover. The land use assumptions used in the predeveloped model are summarized in Table 4.

Table 4. Land Use Assumptions for Predeveloped Condition

Pervious Areas	Mine 1A	Mine 1B	Mine 2	Mine 3A	Mine 3B	Mine 3C	Mine 4A	Mine 4B	Mine 4C
A, Forest, Flat	2.28	65.92	68.65	18.39	27.51	41.26	39.3	37.87	12.54
A, Forest, Medium	4.92	32.11	8.6	33.69	29.08	15.27	19.65	21.82	22.72
A, Forest, Steep	5.11	0.98	0	9.05	7.33	0.61	0	5.05	2.39
Total	12.31	99.01	77.25	61.13	63.92	57.14	58.95	64.74	37.65

Soil types were determined from the soils map (Figure 4) described in Section 1.1.4 of this TIR. The slope assumptions were based on the topographic survey.

WWHM outputs for each mine site for the predeveloped condition is presented in Appendix C.

4.2 Developed Site Hydrology

Developed site hydrology was also simulated in WWHM2012, using the land use assumptions shown in Table 5. Steep and moderate mine slope areas were modeled as outwash grass (A, lawn), and mine bottom areas were modeled as 50 percent outwash grass and 50 percent till grass (C, lawn).

Table 5. Land Use Assumptions for Developed Condition

Type	Land Segment	Mine 1A	Mine 1B	Mine 2	Mine 3A	Mine 3B	Mine 3C	Mine 4A	Mine 4B	Mine 4C
Impervious	Roads, Medium	0	3.13	3	0	3.31	0	0.26	0.8	0.68
	Total Impervious	0	3.13	3	0	3.31	0	0.26	0.8	0.68
Pervious	A, Lawn, Flat	2	32.41	22.07	20.15	23.64	23.60	25.66	26.36	11.33
	A, Lawn, Medium	0.33	5.92	0	0	0	0	0	0	0
	A, Lawn, Steep	7.98	25.14	30.11	20.83	13.33	9.94	7.37	11.22	14.31
	C, Lawn, Flat	2	32.41	22.07	20.15	23.64	23.60	25.66	26.36	11.33
	Total Pervious	12.31	95.88	74.25	61.13	60.61	57.14	58.69	63.94	36.97
Total Area		12.31	99.01	77.25	61.13	63.92	57.14	58.95	64.74	37.65

Total peak flows for the predeveloped and developed mitigated conditions are shown in Table 6.

Table 6. Peak Flows (cfs) for Predeveloped and Developed Mitigated Conditions

Condition	Frequency	Return Period	Mine 1A	Mine 1B	Mine 2	Mine 3A	Mine 3B	Mine 3C	Mine 4A	Mine 4B	Mine 4C
Predeveloped	.5	2	0.22	1.43	1.01	1.01	1.11	0.81	0.85	0.97	0.61
	.2	5	0.70	4.50	3.23	3.19	3.19	2.55	2.67	3.06	1.91
	.1	10	1.26	8.20	6.01	5.82	5.83	4.65	4.87	5.59	3.49
	.04	25	2.31	15.56	11.77	11.07	11.06	8.82	9.24	10.60	6.64
	.02	50	3.41	23.53	18.25	16.75	16.74	13.83	13.97	16.03	10.05
	.01	100	4.83	34.12	27.20	24.33	24.29	19.33	20.27	23.26	14.59
Developed (unmitigated)	.5	2	1.28	19.74	15.66	3.37	4.15	10.81	11.34	12.69	2.83
	.2	5	4.55	37.81	29.90	11.13	10.12	21.17	22.02	24.48	8.20
	.1	10	8.57	54.26	42.82	21.34	16.94	30.76	31.84	35.27	14.62
	.04	25	16.48	81.09	63.86	43.57	30.47	46.60	47.99	52.95	27.58
	.02	50	24.86	106.10	83.43	69.88	45.49	61.53	63.15	69.49	41.97
	.01	100	85.70	135.96	106.78	107.68	66.17	79.52	81.36	89.30	61.63
Developed (mitigated)	.5	2	0	0	0	0	0	0	0	0	0
	.2	5	0	0	0	0	0	0	0	0	0
	.1	10	0	0	0	0	0	0	0	0	0
	.04	25	0	0	0	0	0	0	0	0	0
	.02	50	0	0	0	0	0	0	0	0	0
	.01	100	0	0	0	0	0	0	0	0	0

Notes:
1) Peak flow for the developed-mitigated condition is the overflow from the infiltration pond. cfs = cubic feet per second

4.3 Performance Standards

As described in Section 2 of the TIR, the following performance standards apply to the site:

- Flow Control = Conservation Flow Control
- Conveyance System Capacity = 25-year peak flow, minimum
- Area-specific Water Quality Treatment Menu = Sensitive Lake

No special source control or oil control requirements apply to the site.

4.4 Water Quality System

Water quality treatment facilities precede each infiltration pond and are shown in Figure 5. The water quality treatment system for mine sites 1B, 2, 3C, 4A, 4B, and 5 consists of a two-cell wetpond. The water quality treatment system for mine sites 1A, 3A, 3B, and 4C consists of a two-cell wetpond followed by a sand filter. The wetponds have a trapezoidal shape with a wetpool depth of 4 feet and the sides are sloped at 3H:1V (Horizontal:Vertical). The wetpond dimensions vary based on required wetpool volumes shown in Table 7 shown below.

Table 7. Wetpond Dimensions

Mine Site	Required Wetpool Volume (cf)	Actual Wetpool Volume (cf)	Presettling Ponds			
			Cell 1		Cell 2	
			Bottom Width (ft)	Bottom Length (ft)	Bottom Width (ft)	Bottom Length (ft)
1A	14,227	14,448	6	42	16	72
1B	158,240	159,372	51	177	84	276
2	117,878	118,812	42	150	71	237
3A	89,668	89,868	35	129	60	204
3B	113,940	114,567	41	147	69.5	232.5
3C	96,346	97,464	37	135	63	213
4A	104,422	105,372	39	141	66	222
4B	111,187	113,592	41	147	69	231
4C	55,391	55,887	25	99	44.5	157.5

A 12-inch diameter reverse slope outlet pipe connects the wetponds to the sand filter or infiltration pond and provides spill protection to prevent oils or other floatables from entering the sand filter or infiltration pond.

The sand filters were sized in WWHM2012 using the sand filter element to treat 95 percent of stormwater runoff. The treatment media in each filtration system is 1.5 feet of sand with a design infiltration rate of 1 inch per hour. The sand filters are unlined, so treated stormwater can infiltrate into the underlying coarse native soils. The native soils have a much higher infiltration rate than the sand treatment media. Each sand filter takes on a trapezoidal shape with a maximum depth of storage over the treatment sand of 4.5 feet and 2.5H:1V side slopes. The yielded surface area of each sand bed varies by location as shown in Table 8.

Table 8. Sand Filter Dimensions

Mine Site	Bottom Surface Area[1] (sf)	Top Surface Area[2] (sf)
1A	1,378	3,662
3A	8,450	13,344
3B	11,250	16,819
4C	5,000	8,882

Notes:

[1] The bottom surface area, at the top of the sand media.

[2] The resulting top area, at the maximum depth of storage over the treatment sand of 4.5 feet.

The wetponds and large sand filters are on-line water quality treatment facilities. All flow within each mine site enters the facilities. During large storms, overflow passes directly to the infiltration pond.

Design calculations for the water quality treatment facilities are presented in Appendix C.

4.5 Flow Control System

Flow control is achieved through infiltration of all stormwater generated within the mine segments. Infiltration is provided by infiltration ponds in each mine segment and in the sand filters in mine segments 1A, 3A, 3B, and 4C. Each sand filter infiltrates 95 percent of the runoff volume from the site. The remainder passes to the infiltration pond.

The sand filters were designed based on an infiltration rate of 1 inch per hour for the sand media. The underlying native soils have a much higher infiltration rate, as indicated by the soil types mapped by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). documented by Associated Earth Sciences, Inc. (AESI, 2023).

Infiltration ponds were designed based on the design infiltration rate of 20 inches per hour for the Barneston gravelly coarse sandy loam soils series.

The infiltration ponds each have a storage depth of 6 feet, and total depth of 7 feet (allowing for a 1-foot freeboard). The infiltration ponds are trapezoidal in shape and have 3H:1V side slopes with differing dimensions as shown in Table 9 below.

Table 9. Infiltration Pond Dimensions

Mine Site	Bottom Surface Area (sf)	Top Surface Area[1] (sf)
1A	2,324	8,750
1B	34,104	54,600
2	26,100	43,824
3A	18,750	34,164
3B	27,500	45,014
3C	18,750	34,164
4A	19,200	34,404
4B	20,625	37,089
4C	20,625	37,089

Notes:
[1] The resulting top area, at 7 feet.

5 Conveyance System Analysis and Design

The proposed conveyance system consists of the following elements:

- Roadside Ditches
- Culverts

Conveyance design flows were determined using the peak flow results for the developed basins, prior to treatment or infiltration, using the hydrology model described in Section 4. Both ditches and culverts for road crossings were designed to convey the 25-year flow for the entire developed basin. Peak flows are shown in Table 10, and conveyance calculations are presented in Appendix D.

Table 10. 25-Year Peak Inflows

Ditch Segment	Basin	Peak Inflow to Ditches	
		in cfs	in gpm
1	Bypass	8.89	3,990
2	Mine SW	4.64	2,083
3	Mine SW	4.81	2,159
4	Bypass	1.27	570
5	Mine SW	9.59	4,304
6	Bypass	1.27	570
7	Mine SW	5.13	2,303
8	Bypass	1.06	476
9	Mine SW	2.31	1,037
10	Bypass	3.97	1,782

Ditch Segment	Basin	Peak Inflow to Ditches	
		in cfs	in gpm
12	Mine 1B	2.03	911
13	Mine 2	1.77	794
14	Mine 2	2.07	929
15	Mine 3B	3.58	1,607
16	Mine 3C	2.73	1,225
17	Mine 4A	0.36	162
18	Mine 4B	0.94	422

Nineteen ditch segments were sized in FlowMaster using two different ditch sections. All ditch segments utilize a triangular cross section with 4H:1V (roadside) and 2H:1V sideslopes. Bypass ditches have a maximum depth of 1.5 feet and maximum width of 9 feet, while mine stormwater ditches have a maximum depth of 1 foot and maximum width of 6 feet.

The ditch segment conveying the largest peak flow is ditch segment 5 with 9.59 cfs. Based on the 25-year peak flow of 9.59 cfs, normal depth was predicted to be 1.2 feet. This leaves approximately 0.3 feet of freeboard available. Ditch 5 segment has a 10 percent profile. The predicted velocity is 5.04 fps. As such, additional erosion protection measures such as rock dams will be required.

The culverts were designed to convey the 25-year recurrence interval with a minimum 0.5-foot freeboard from the ditch design water surface elevation to the crown of the pipe. Culvert 1 is a 24-inch-diameter PVC road crossing at 0.5 percent slope, which conveys runoff from offsite drainage basin (ditch 1, 8.89 cfs). Culverts 2 is a 12-in. diameter PVC pipe at 11.70 percent grade. Culvert 2 receives flow from ditch 7 (5.13 cfs) and ditch 9 (1.07 cfs).

6 Special Reports and Studies

The following special reports and studies have been prepared for the Cumberland Mine project:

- Earth and Water Affected Environment Technical Report (AESI, 2023)
- Critical Areas Investigation (Raedeke Associates, Inc., 2023)

Excerpts from the Earth and Water Affected Environment Technical Report are included in Appendix A.

The wetlands, streams, and buffers identified in the Critical Areas Investigation are shown on Figure 2 and were incorporated as constraints on the design of the proposed mine.

7 Other Permits

The following additional permits will be required for the project:

- Sand and Gravel General Permit from Ecology for stormwater discharges
- Surface Mine Reclamation Permit from DNR for mine reclamation
- Construction Permit from the Puget Sound Clean Air Agency (PSCAA) for discharges to air from the asphalt plants and other sources (crushers)
- Forest Practices Act (FPA) Authorization from DNR for logging.

8 Construction Stormwater Pollution Prevention Plan Analysis and Design

A CSWPPP has been developed and is included in Appendix B. Development of the CSWPPP did not require technical analysis or design.

9 Bond Quantities, Facility Summaries, and Declaration of Covenant

9.1 Bond Quantities Worksheet

A bond quantities worksheet is provided in Appendix E.

Since mining progresses segmentally with surfaces stabilized and stormwater facilities constructed for each segment at a time, the bond quantities are based on construction of one stormwater facility (wetpond, sand filter, infiltration pond) and stabilization of 20 acres. A similar approach has been used for bonds on other surface mining facilities in King County.

9.2 Flow Control and Water Quality Facility Summary Sheet and Sketch

In accordance with the 2021 KCSWDM, facility summaries, including an 8.5-inch by 11-inch sketch of each facility, will be submitted following approval of the plans for the proposed facilities.

9.3 Declaration of Covenant for Privately Maintained Flow Control and Water Quality Facilities

A declaration of covenant and grant of easement for maintenance and inspection of the proposed flow control and water quality facilities will be prepared and submitted later in the permitting process.

10 Operations and Maintenance Manual

An Operations and Maintenance Manual is provided in Appendix F.

11 References

Associated Earth Sciences, Inc. (AESI), 2023, Earth and Water Affected Environment Technical Report, Cumberland Property, Prepared for Segale Properties LLC, Final, June 13, 2023.

Gower, H.D. and Wanek, A.A., 1963, Preliminary geologic map of the Cumberland quadrangle, King County, Washington: Washington Division of Mines and Geology Map GM:-2.

King County, 2021a, Surface Water Design Manual, July 23, 2021.

King County, 2021b, Stormwater Pollution Prevention Manual, July 2021.

Raedeke Associates, Inc. 2023, Letter Report RE: Segale Properties Cumberland Ownership – Critical Area Investigation, February 13, 2023.

Warren, W.C., Norbisrath, H., Grivetti, R.M., and Brown, S.P., 1945, Preliminary geologic map and brief description of the coal fields of King County, Washington: U.S. Geological Survey Coal Investigation Map [unnumbered], scale 1:31,680

12 Limitations

Work for this project was performed for Segale Properties LLC (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

FIGURES

King County Department of Development and Environmental Services

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner:

Segale Properties, LLC

Owner Address

5811 Segale Park Drive C
Tukwila, WA 98188

Phone:

(206) 575-2000

Project Engineer:

Owen Reese, PE

Company: Aspect Consulting, LLC

Address/Phone: 710 2nd Avenue, Suite 550
Seattle, WA 98104 | 206-838-5844

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name:

Cumberland Mine

Location:

Township 21 North

Range 7 East

Section 9, 17, 15, and 21

Part 3 TYPE OF PERMIT APPLICATION

- ☐ Subdivision
- ☐ Short Subdivision
- ☒ Grading
- ☐ Commercial
- ☐ Other _____

Part 4 OTHER REVIEWS AND PERMITS

- ☐ DFW HPA
- ☐ Shoreline Management
- ☐ COE 404
- ☐ Rockery
- ☐ DOE Dam Safety
- ☐ Structural Vaults
- ☐ FEMA Floodplain
- ☒ Other
- ☐ COE Wetlands

DNR Reclamation Permit; DNR Forest Practices Permit; Ecology Sand and Gravel General NPDES Permit; PSCAA Construction Permit

Part 5 SITE COMMUNITY AND DRAINAGE BASIN

Community
N/A

Drainage Basin
Middle Green River

Part 6 SITE CHARACTERISTICS

- ☐ River
- ☒ Stream Two: Type O and Type N
- ☐ Critical Stream Reach
- ☒ Depressions/Swales
- ☐ Lake
- ☐ Steep Slopes
- ☐ Floodplain
- ☒ Wetlands portions of two Category II
- ☒ Seeps/Springs
- ☐ High Groundwater Table
- ☐ Groundwater Recharge
- ☒ Other Coal Mine Hazard Area

Part 7 SOILS

Soil Type	Slopes	Erosion Potential	Erosive Velocities
Barneston	0 to 8 percent	Low	High
Barneston	8 to 15 percent	Low	High
Arents	0 to 8 percent	Low	High

☐ Additional Sheets Attached

Part 8 DEVELOPMENT LIMITATIONS

	REFERENCE	LIMITATION / SITE CONSTRAINT
☐		
☐		
☐		
☐		
☐		
☐		

☐ Additional Sheets Attached

Part 9 ESC REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION

- ☒ Sedimentation Facilities
- ☒ Stabilized Construction Entrance
- ☒ Perimeter Runoff Control
- ☒ Clearing and Grading Restrictions
- ☒ Cover Practices
- ☒ Construction Sequence
- ☒ Other

MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION

- ☒ Stabilize Exposed Surface
- ☒ Remove and Restore Temporary ESC Facilities
- ☐ Clean and Remove All Silt and Debris
- ☒ Ensure Operation of Permanent Facilities
- ☒ Flag Limits of SAO and open space preservation areas
- ☒ Other

Part 10 SURFACE WATER SYSTEM

- ☒ Grass Lined Channel
- ☐ Pipe System
- ☒ Open Channel
- ☐ Detention Pond
- ☒ Wet Pond
- ☐ Tank
- ☐ Detention
- ☐ Energy Dissipater
- ☐ Wetland
- ☐ Stream
- ☒ Infiltration
- ☒ Depression
- ☒ Flow Dispersal
- ☐ Waiver
- ☐ Regional Detention

Method of Analysis

WWHM & 2021 KCSWDM

Compensation / Mitigation of Eliminated Site Storage

N/A

Brief Description of System Operation

Stormwater contained in the closed depressions of the four proposed mine areas. Each mine area will have an open channel conveyance system leading to a wetpond followed by infiltration. A sand filter will be installed between the wetpond and infiltration in areas within 1/4-mile of the Green River of Deep Creek. The stormwater facilities have been designed to meet the Level 2 Flow Control and Basic Water Quality treatment standards.

Facility Related Site Limitations

Reference	Facility	Limitation

Part 11 STRUCTURAL ANALYSIS

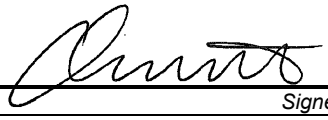
- ☐ Cast in Place Vault
- ☐ Retaining Wall
- ☐ Rockery > 4' High
- ☐ Structural on Steep Slope
- ☐ Other

Part 12 EASEMENTS/TRACTS

- ☐ Drainage Easement
- ☒ Access Easement
- ☐ Native Growth Protection Easement
- ☐ Tract
- ☐ Other

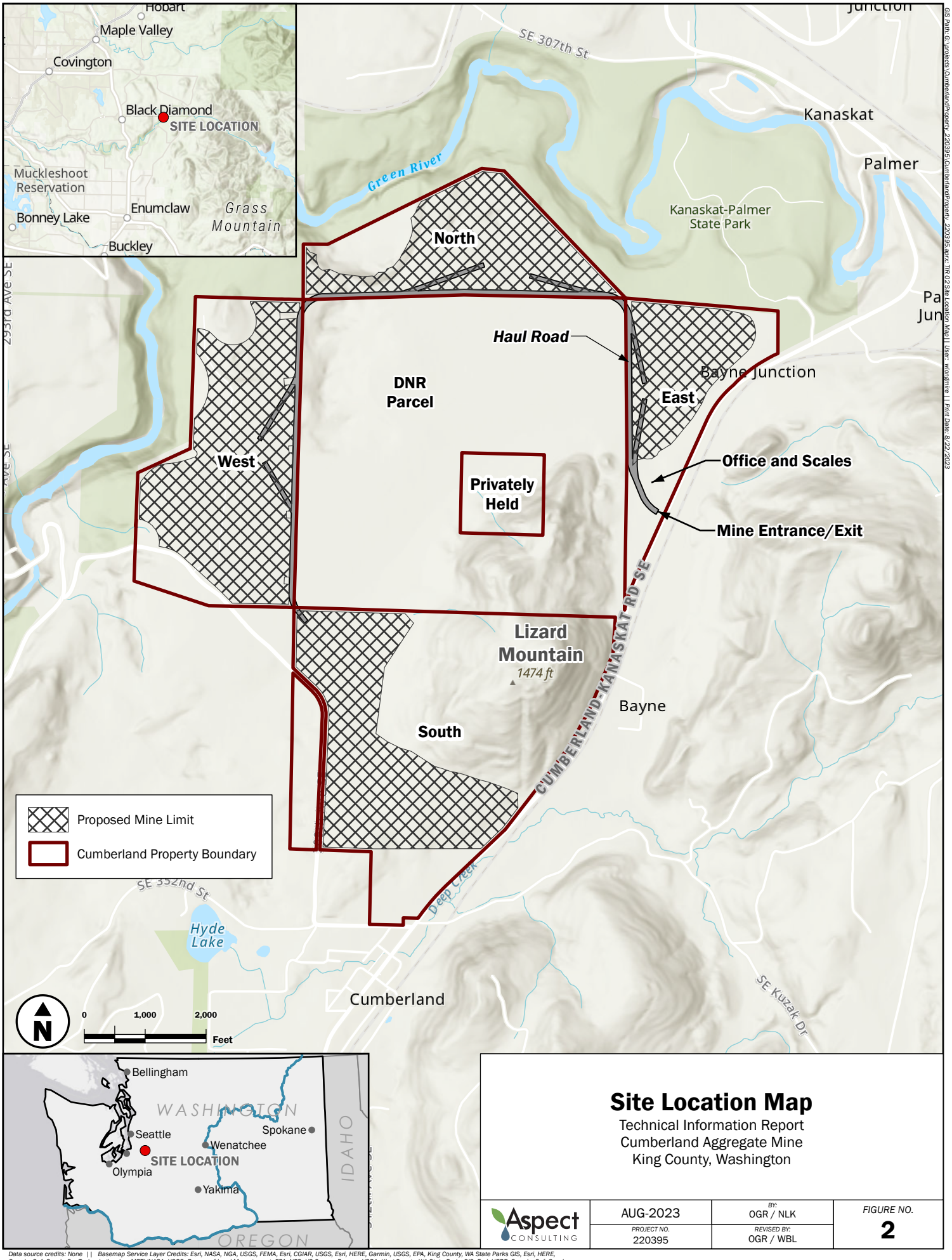
Part 13 SIGNATURE OF PROFESSIONAL ENGINEER

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



8/23/2023

Signed/Date

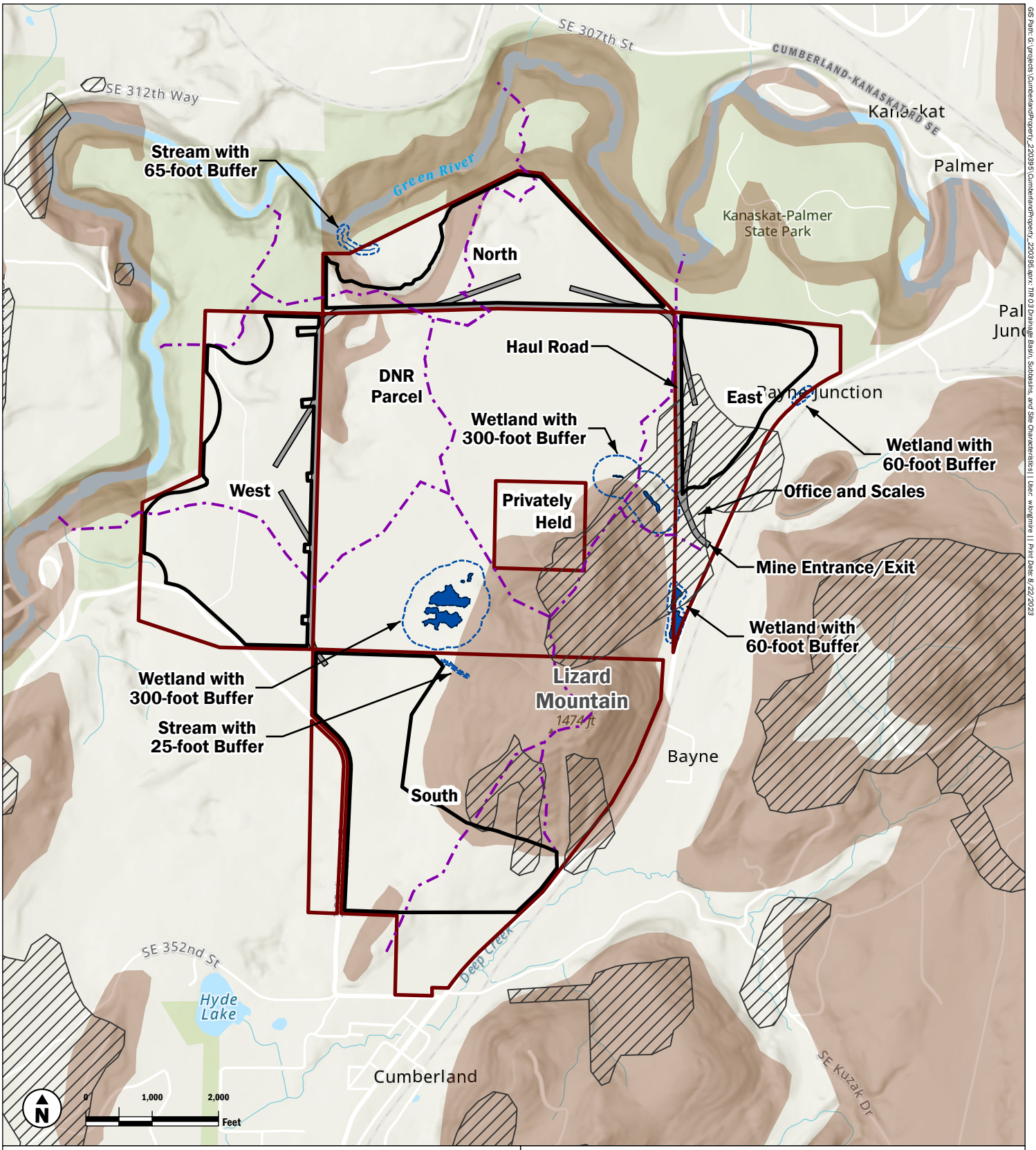


Site Location Map

Technical Information Report
Cumberland Aggregate Mine
King County, Washington

Aspect CONSULTING	AUG-2023	BY: OGR / NLK	FIGURE NO. 2
	PROJECT NO. 220395	REVISED BY: OGR / WBL	

GIS Path: G:\projects\CumberlandProperty_220395\CumberlandProperty_220395.aprx; TIR 02 Site Location Map | User: wlogemann | Print Date: 8/22/2023



Cumberland Property Boundary
Proposed Mine Limit
Coal Mine Hazard Area
Erosion Hazard Area
Stream
Wetland
Wetland/Stream Buffer
Drainage Basin Boundary

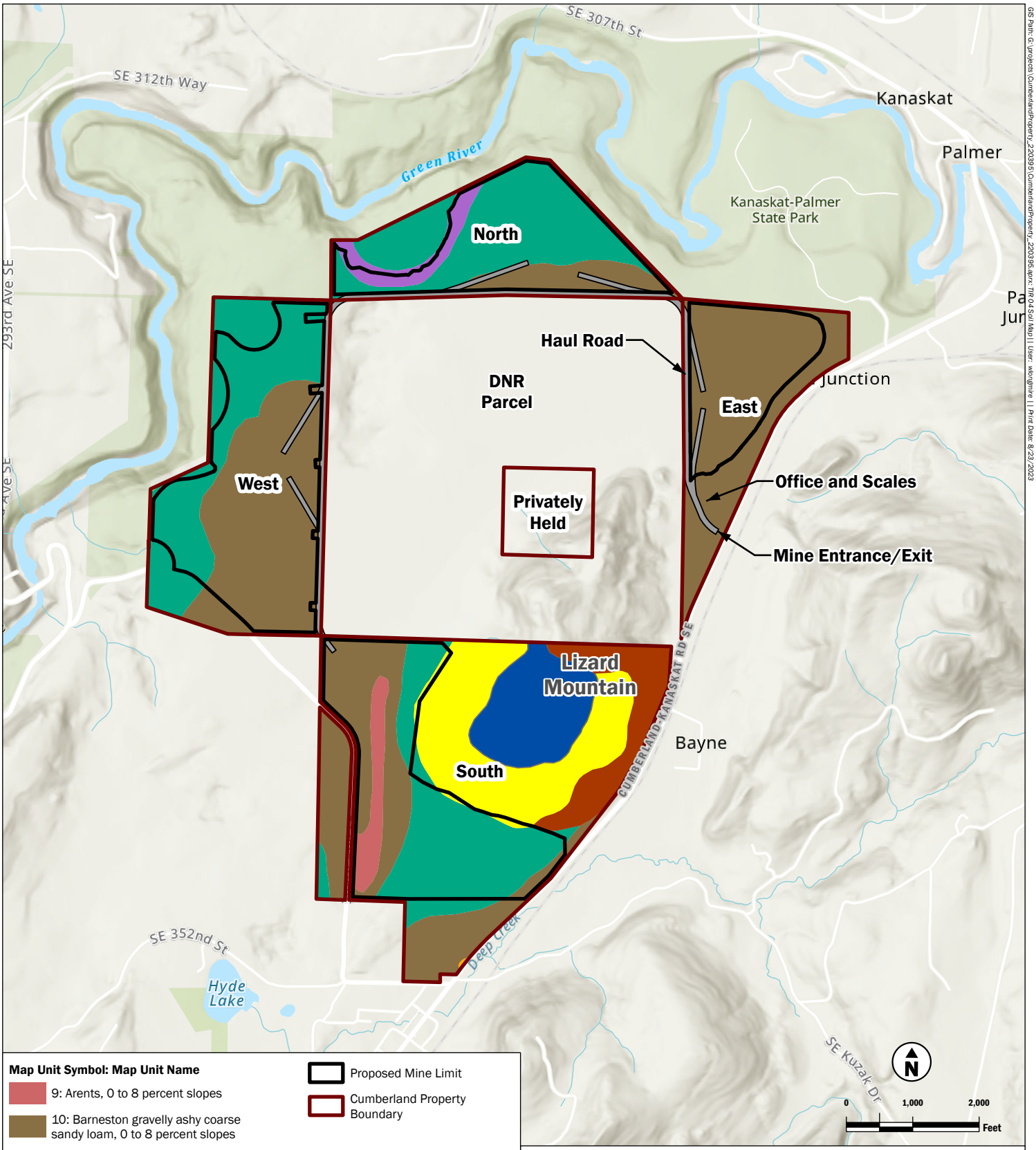
Drainage Basin, Subbasins, and Site Characteristics

Technical Information Report
Cumberland Aggregate Mine
King County, Washington

Aspect CONSULTING	AUG-2023	BY: OGR / NLK	FIGURE NO. 3
	PROJECT NO. 220395	REVISED BY: OGR / WBL	

Data source credits: None | | Basemap Service Layer Credits: Esri, NASA, NGA, USGS, FEMA, King County, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

GIS Path: G:\projects\Cumberland\Property_220395\Cumberland\Property_220395.aprx; TIR 03 Drainage Basin, Subbasins, and Site Characteristics | | User: wbingham | | Print Date: 8/22/2023



Map Unit Symbol: Map Unit Name

- 9: Arents, 0 to 8 percent slopes
- 10: Barneston gravelly ashy coarse sandy loam, 0 to 8 percent slopes
- 11: Barneston gravelly ashy coarse sandy loam, 8 to 15 percent slopes
- 12: Barneston gravelly ashy coarse sandy loam, 30 to 65 percent slopes
- 18: Beausite gravelly loam, 30 to 65 percent slopes
- 42: Chuckanut gravelly ashy sandy loam, 15 to 30 percent slopes
- 43: Chuckanut gravelly ashy sandy loam, 30 to 65 percent slopes
- 158: Norma loam, 0 to 3 percent slopes

- Proposed Mine Limit
- Cumberland Property Boundary

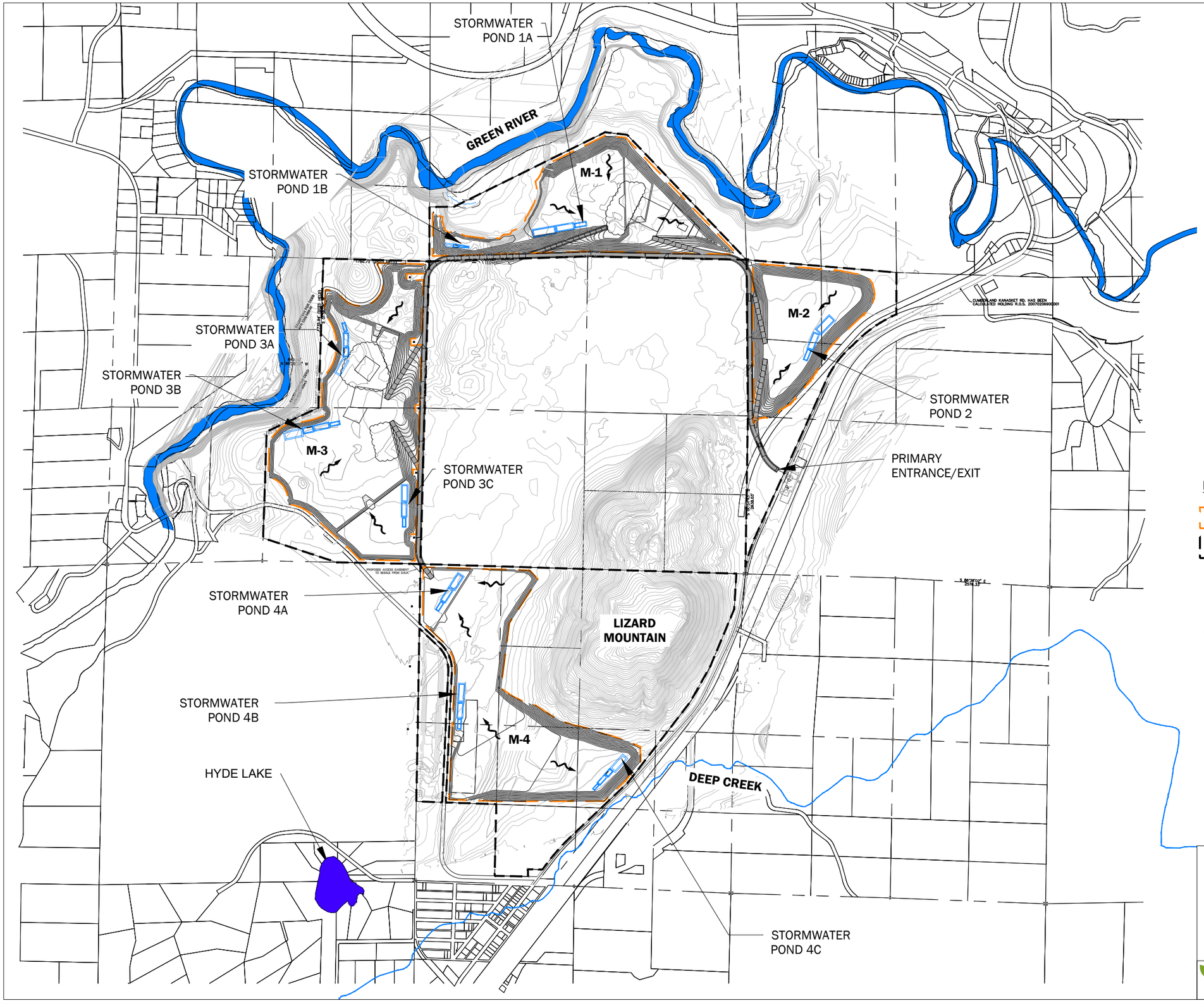
Note: Soils data from USDA NRCS Soil Survey for Snoqualmie Pass Area, Washington (Parts of King and Pierce Counties) (WA634), September 2022.

Soils Map

Technical Information Report
Cumberland Aggregate Mine
King County, Washington

Aspect CONSULTING	AUG-2023	BY: OGR / NLK	FIGURE NO. 4
	PROJECT NO. 220395	REVISED BY: OGR / WBL	

Data source credits: None | | Basemap Service Layer Credits: Esri, NASA, NGA, USGS, FEMA, King County, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA



Legend

- M-1 — MINE AREA
- CUMBERLAND PROPERTY BOUNDARY
- STORMWATER FACILITY
- STORMWATER FLOW DIRECTION

NOTES:

1) EACH STORMWATER FACILITY CONSISTS OF A BASIC WETPOND (WITH REVERSE-SLOPED PIPE FOR SPILL CONTROL) FOLLOWED BY AN INFILTRATION POND
2) PONDS 1B, 3A, 3B, AND 4C HAVE A BASIC SAND FILTER BETWEEN THE WETPOND AND INFILTRATION POND.
3) MINE PIT FLOORS WOULD BE GRADED, OR HAVE OPEN DITCHES, TO DIRECT FLOW TO THE STORMWATER FACILITIES

0 1600 3200 Feet

Proposed Stormwater Facilities

Technical Information Report
Cumberland Aggregate Mine
King County, Washington

Aspect Consulting	Aug-2023	BY: OGR/JPR	FIGURE NO. 5
	PROJECT NO. 220395	REVISED BY: OGR	

CAD Path: Q:\Segale\Cumberland\220395-05.dwg Layout: Figure 5 || Date Saved: 8/23/2023 9:44:01 AM || User: jreinhardt

APPENDIX A

Excerpts from Earth and Water Affected Environment Technical Report

associated
earth sciences
incorporated

Earth and Water Affected Environment Technical Report

CUMBERLAND PROPERTY

King County, Washington

Prepared For

SEGALE PROPERTIES LLC

Project No. 20200367H001
June 13, 2023

Associated Earth Sciences, Inc.

www.aesgeo.com

Kirkland | Mount Vernon | Tacoma

Recent Green River channel deposits generally consist of sandy gravel with cobbles and low-lying terraces consist of overbank gravelly sand with variable silt. Modern Green River alluvium consists primarily of andesite (Borden and Troost, 2001). Outside of its mapped extent, the alluvium is generally limited to banks along the Green River.

Alluvium along smaller streams and creeks is generally confined to the channel and adjacent banks and floodplains and composed of sand with variable silt/clay and cobble content. Along some reaches of Deep Creek the sandy bed contains gravel and cobbles, such as upstream of SE Kuzak Road and downstream of 328th Way SE. The streambed in the Deep Creek reach that lies adjacent to Cumberland-Kanaskat Road SE along a shallow sloping terrace consists of sandy alluvium with interbeds of silt and clay as observed in EB-10W and EB-11W.

3.4.10 Existing Fill/Disturbed Ground

Fill materials (those not naturally placed) represent anthropogenically altered ground and are primarily associated with roads around the site and vicinity. Fill materials were encountered in one exploration (EB-7W) to a depth of 2 feet and generally consisted of silty gravelly sand, with abundant organics. Fill soils are likely to be encountered in areas mapped as Arents soils such as the roads near the prefabricated steel building in the southern Segale Property.

Stockpiles relating to former coal mining operations are present at multiple locations around the perimeter of Lizard Mountain (see Section 3.5 below). Some of these stockpiles were observed directly during our site reconnaissance and some were not observed directly but are visible on LIDAR-based shaded relief maps of the area. Fill may exceed several feet in thickness in these areas.

3.5 PAST MINING HISTORY - COAL MINES

3.5.1 Coal Mine Literature Review and Limitations

Various maps and reports obtained from the DNR were reviewed. These documents include Landes and Ruddy (1902), Smith (1911), Evans (1912a, 1912b, 1924), Green (1947), Warren et al. (1945), Gower and Wanek (1963), Vine (1969), Phillips (1984), and LaSalata et al. (1985). Coal mine locations on file with the DNR are shown on Figure 25. The Coal Mine Hazard Areas shown on Figure 25 were obtained from King County mapping and were intended for use by King County staff to identify areas that may warrant further coal mine hazard study. The extent of the Coal Mine Hazard Areas shown may not necessarily coincide with actual known locations of underground coal mine workings.

Coal mine maps obtained from the DNR depict the locations of the various mines within the vicinity of the Segale Property project area and details associated with the layout of entrances, airways, slopes, chutes, and pillars at various times. We understand the DNR coal mine map

collection is incomplete because some of the original coal mine maps were damaged or destroyed in a fire. Washington State began requiring coal mines to file maps of their underground workings in 1910 (Botting, 1910). While in operation, the mine operators were required to produce inspector reports with production figures. State mine inspectors filed these reports and maps until the coal mines shut down. If the mine had shut down without notice, the state had no leverage to retrieve an updated mine map. Maps of the coal mines currently available through the DNR are included in Appendix H.

Coal on the Segale Property was extracted using both underground tunneling and open pit (strip mine) excavations. Underground mining in the area included both drift, or "water-level," and slope mines. Drift mines are self-draining mines in which the lowest point in the mine is the portal. A frequent practice was to first establish as a drift mine and later, when all coal above the level of the portal had been extracted, then convert to a slope mine. In slope mines, gangways along the strike of the coal bed are driven off the main slope at various levels. Slope mines may require continuous pumping to remove excess water.

In areas of King County, such as the subject site where the coal seams are dipping at a fairly steep inclination, underground coal mining was typically accomplished using the “chute and pillar” method. In this method, a “chute” consists of a passageway not over 12 feet wide that is driven up the dip of a coal seam from a gangway constructed along the strike of the seam. The chutes may be widened to form a “room” or “breast.” Additional passages, known as “counters,” “airways,” and “crosscuts” are used to provide ventilation for the mine. Crosscuts can also serve as manways. The remaining portion of the coal seam left in place between these passageways are known as “pillars." A diagram of typical chute and pillar coal mine workings is provided in Appendix H.

Coal mines extracted bituminous coal from the seams along Lizard Mountain. Coal consists of five components: moisture, volatile matter, fixed carbon, ash, and sulfur. Bituminous coal has less fixed carbon and more volatile matter than anthracite coal. Volatile matter usually consists of short and long chain hydrocarbons (organic compounds) and mineral matter. Coal in the Cumberland-Palmer area generally consists of 3.9-7.2% moisture, 24.9-38.6% volatile matter, 38.7-51.2% fixed carbon, 11.1-23.1% ash, and 0.5-1.2% sulfur (Green, 1947).

3.5.2 Lizard Mountain Geologic Structure

The bedrock exposed at Lizard Mountain can be divided into two regions that are separated by a west-northwest trending fault near the DNR Property 16 and southern Segale Property border. The regions are referred to as the northern Lizard Mountain and southern Lizard Mountain in subsequent sections. Evans (1912a) describes the fault as one with considerable vertical displacement and the block to the north has dropped considerably, although no estimate of the vertical offset is described in the reviewed literature.

Geologic mapping of northern Lizard Mountain by Vine (1969) identified six coal seams, although coal mine records of the area indicate that up to ten coal seams were encountered. The Occidental Mine is situated on the northern side of Lizard Mountain along the western limb of a syncline. Strike and dip measurements reported for the northern portion of Lizard Mountain (Evans, 1912b, Vine, 1969) indicate bedding dips 24 to 45 degrees to the southeast (Figure 6). A subset of strike and dip measurements are shown on Figure 6 due to map scale. Mapped coal seams include Occidental Nos. 1, 2, 3, 6, and 14 (Vine, 1969). The coal beds are offset by a northwest-trending fault of unknown displacement in the eastern side of the DNR Property 16. The fault is mapped as downward throw on the southwest side. Five of the six coal seams identified by Vine (1969) are mapped to extend into the eastern Segale Property and of these the Occidental No. 14 slope mine extends beneath the eastern Segale Property. A discussion of the Occidental Mine and underground workings is included in Sections 3.5.5. and 3.5.7., respectively.

Geologic mapping of southern Lizard Mountain by Vine (1969) identified two coal seams, named the Old Carbon and Cumberland. The bedding and coal seams dip towards a syncline located near the center of southern Lizard Mountain. The Old Carbon Mine is located on the eastern side of the syncline fold axis where bedding dips east about 50 to 75 degrees to the west (Evans 1912b, Vine 1969) (Figure 6). The Carbon Fuel Co. Mine No. 4 is located on the western side of the syncline fold axis where bedding dips about 37 to 47 degrees to the east (Evans, 1912b, Vine, 1969). The mines are mapped within the southern Segale Property. Coal mine maps are included in Appendix H.

3.5.3 Coal Mine Geologic Reconnaissance

AESI observed the surface expression of mine features around Lizard Mountain during our geologic reconnaissance and our observations are shown on Figure 26. Select reconnaissance photos are included in Appendix H. Reconnaissance of Lizard Mountain suggests that the actual extent of the coal mine workings in this area may be greater than depicted on the historical coal mine maps available through the DNR library. Unmapped mine features were also located during our reconnaissance and inferred to be prospects based on information provided in Smith (1911), Warren et al. (1945), and Vine (1969).

3.5.4 Old Carbon Mine

The Old Carbon Mine was the first coal mine in the area and began operations in 1895. It operated as a drift mine for about 3 years and then closed down. Limited information is available on mine workings and no coal production was documented likely because the mine closed prior to implementation of the state coal mine reporting regulations. The Old Carbon bed was estimated by Vine (1969) to be 5 feet 4 inches thick including impurities. We observed seepage near the mapped underground mine portal, which is covered, and is the primary source of surface water in Stream L.

West of the Old Carbon Mine, the Cumberland bed was strip-mined (Vine, 1969). The strip mine was confirmed by visual reconnaissance (Photo H-1, Appendix H) and is visible on LIDAR imagery (Figure 26), but no record of surface mining exists in the DNR mine map records. The Cumberland bed was estimated by Vine (1969) to be 7 feet 4 inches thick as exposed at the strip mine. We did not observe surface flow in the strip mine area during site visits on February 1 and March 24, 2022.

3.5.5 Occidental Mine

The Occidental Mine, also referred to as the Gibbons Mine, encountered ten coal-bearing seams and partially worked eight of them (Landes and Ruddy, 1902). It operated both slope and drifts. Primary coal beds worked at the Occidental Mine are the Occidental No. 1, No. 2, No. 3, No. 6, and No. 14 seams, which totaled about 23 feet 8 inches of coal (Evans, 1924). The greatest amount of workings have come from the No. 3 and No. 14 seams (Evans, 1924; Vine, 1969), about 4 feet 9 inches thick and 6 feet thick, respectively (Evans 1912b). The uppermost beds may have been surface-mined (Figure 26).

Most of the coal zones are irregular and average less than 2 feet in thickness separated by thin beds of shale and impure coal, commonly referred to in the mining literature as "bone." Mining practices extracted the entire bed including interbeds. Evans (1912b) reported the mine was opened in 1898 and according to the State Mine Inspector's Reports the coal mine began shipping in 1899. It is reported that in September of 1910 a slope that opened onto the No. 14 bed encountered groundwater and flooded an entire section of the mine (Evans, 1912a; Evans, 1912b; Evans, 1924). The mine closed 3 years later (Evans, 1924). Between 1899 to 1913 the Occidental Mine produced about 307,029 tons (Evans, 1924).

The Occidental Mine is reported to have been reopened subsequent to 1924 before closing permanently in 1945 (Kombol, 2021; LaSalata et al., 1985). The most recent mine map available from the DNR dated 1940 depicts a new slope opened onto Occidental No. 14 in DNR Property 16. Total production is reported at 709,433 tons (LaSalata et al., 1985).

3.5.6 Carbon Fuel Co. Mine No. 4

This mine, as named, is not listed in any of the above-mentioned reports. Only a coal mine workings map is available. The mine is located on the opposite (western) side of the Lizard Mountain syncline from the Old Carbon Mine and is associated with the same coal beds. The mine's location was confirmed by visual reconnaissance (Photo H-2) and LIDAR imagery (Figure 26).

Some seepage areas were observed that appear to be associated with unmapped mine features. Drainage from mapped mine portals was observed and are interpreted to be the primary source of surface water in Stream J. Drainage from a suspected mine opening at Stream K is shown in Photo H-3. Water quality analysis of the mine drainage is presented later in the report. The extent of prospect workings is unknown because they are undocumented. Review of LIDAR imagery

clearly depicts a series of shallow depressions scattered around Lizard Mountain (Figure 26). Many of these depressions overlie areas of mapped underground coal workings and are suspected to be subsidence features (Photo H-4).

3.5.7 Underground Workings

The majority of the mine workings appear to be primarily limited to the area within Lizard Mountain and outside of the proposed sand and gravel mining area. This includes areas of mapped workings and associated coal mine features observed during our reconnaissance in the areas of the former Old Carbon Mine and Carbon Fuel Company Mine No. 4.

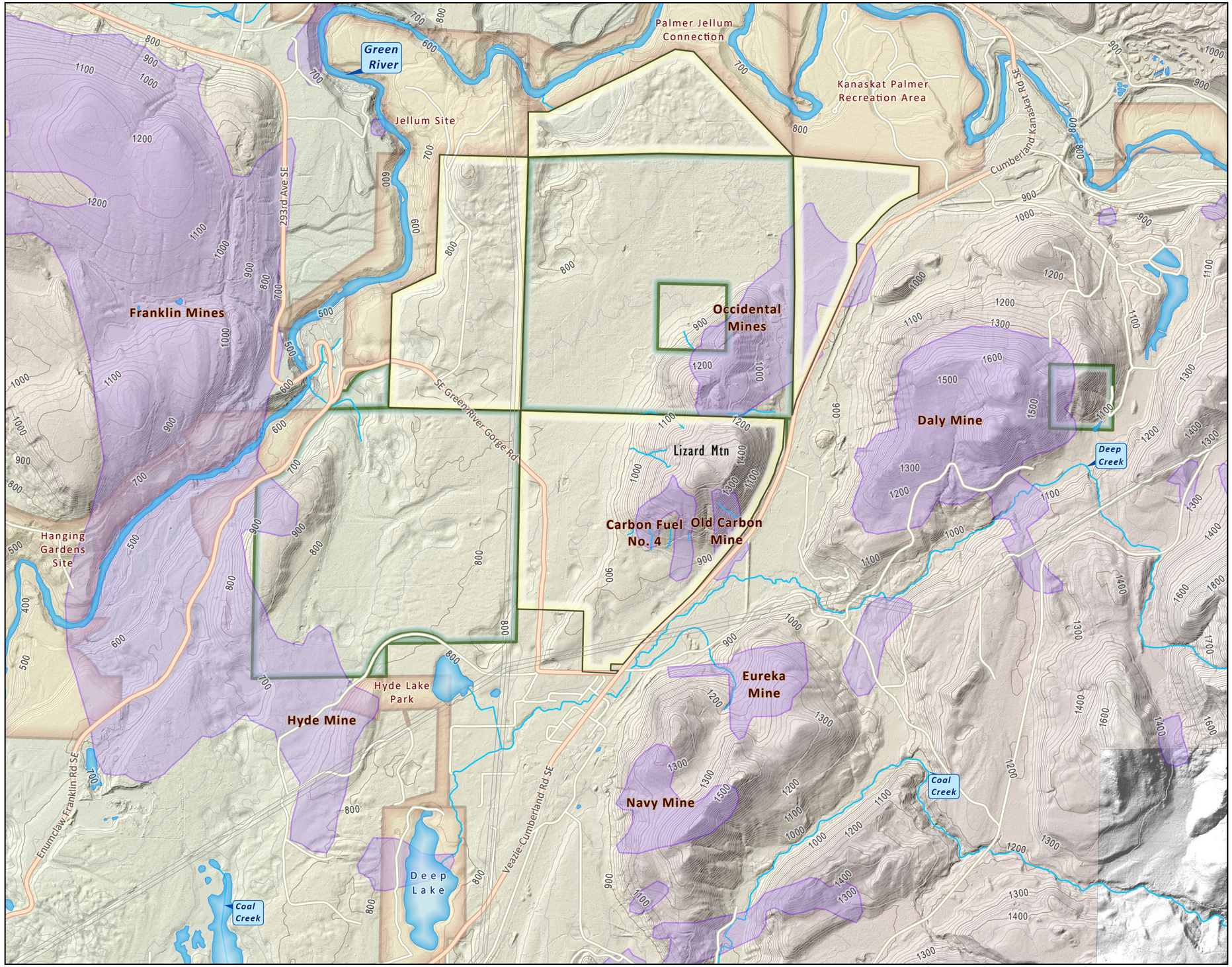
Workings associated with the Occidental Mine extend northeast of Lizard Mountain. The mapped workings in this area lie underneath the DNR Property in the eastern portion of Section 16 and a portion of the adjoining eastern Segale Property in Section 15 (Parcel No. 1521079009) where aggregate resource mining is proposed. Review of a 1932 map of the Occidental Mine obtained from the DNR coal mine map collection, indicates that the mine workings in this area are present between approximately elevation 480 feet and 760 feet. Due to the attitude of the bedding in the Puget Group bedrock in this area, the elevations of the coal mine workings increase toward the northwest. The datum on which these elevations are based is not stated on the mine map but given the elevations of other known features shown on the map, these elevations appear to be within 10 feet of the modern NAVD88 datum. Given the existing ground surface elevation in this portion of the Segale Property of approximately 840 to 860 feet, the mapped underground coal mine workings in this area are located approximately 80 to 380 feet below the existing ground surface. The condition of the underground coal mine workings in this area is unknown.

Mining in the area was typically conducted using the chute and pillar method, which is consistent with the layout of the coal mine workings shown on the mine maps (Appendix H). Late-stage mining practices often included removal of the pillars in a process known as retreat mining. Removal of the pillars would not increase the aerial extent of the mine workings, but it would typically result in their collapse due to the loss of the roof support provided by the pillars. Although mining operations at the Occidental Mine were known to shut down prior to 1932, some additional mining occurred subsequent to 1932. The most recent mine map produced in 1940 depicts workings in DNR Property 16; however, the maximum extent of the mine workings at the time of its permanent closure in 1945 is not known because the DNR coal mine map collection is incomplete. The production between 1940 and 1945 was 53,213 tons (LaSalata et al., 1985).

3.6 PAST MINING HISTORY - METAL MINES

3.6.1 Metal Mine Literature Review

Various maps, memos, and reports available with the DNR, U.S. Geological Survey (USGS), and University of Washington Libraries were reviewed. The reviewed reports include Huntting (1956),



SITE

COAL MINE HAZARD AREA (REGIONAL HAZARD DATA FROM KING CO)

UTILITY CORRIDOR

WADNR MANAGED PROPERTY

PARK, OPEN SPACE, NATURAL AREA

CONTOUR 100 FT

CONTOUR 20 FT

NOTE: COAL MINE HAZARD AREAS ARE DEFINED BY THE KING COUNTY CODE. REGIONAL HAZARD AREAS ARE AN APPROXIMATION OF THE COAL MINE DISTRIBUTION SHOWN ON HISTORICAL COAL MINE MAPS.

DATA SOURCES / REFERENCES:
PSLC: KING COUNTY 2016 LIDAR, 3' PIXEL FLOWN 3/16
WADNR WGS: HISTORICAL COAL MINE MAP COLLECTION
KING CO: STREETS, PARCELS, COAL MINE HAZARD AREA 4/22

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 2000

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

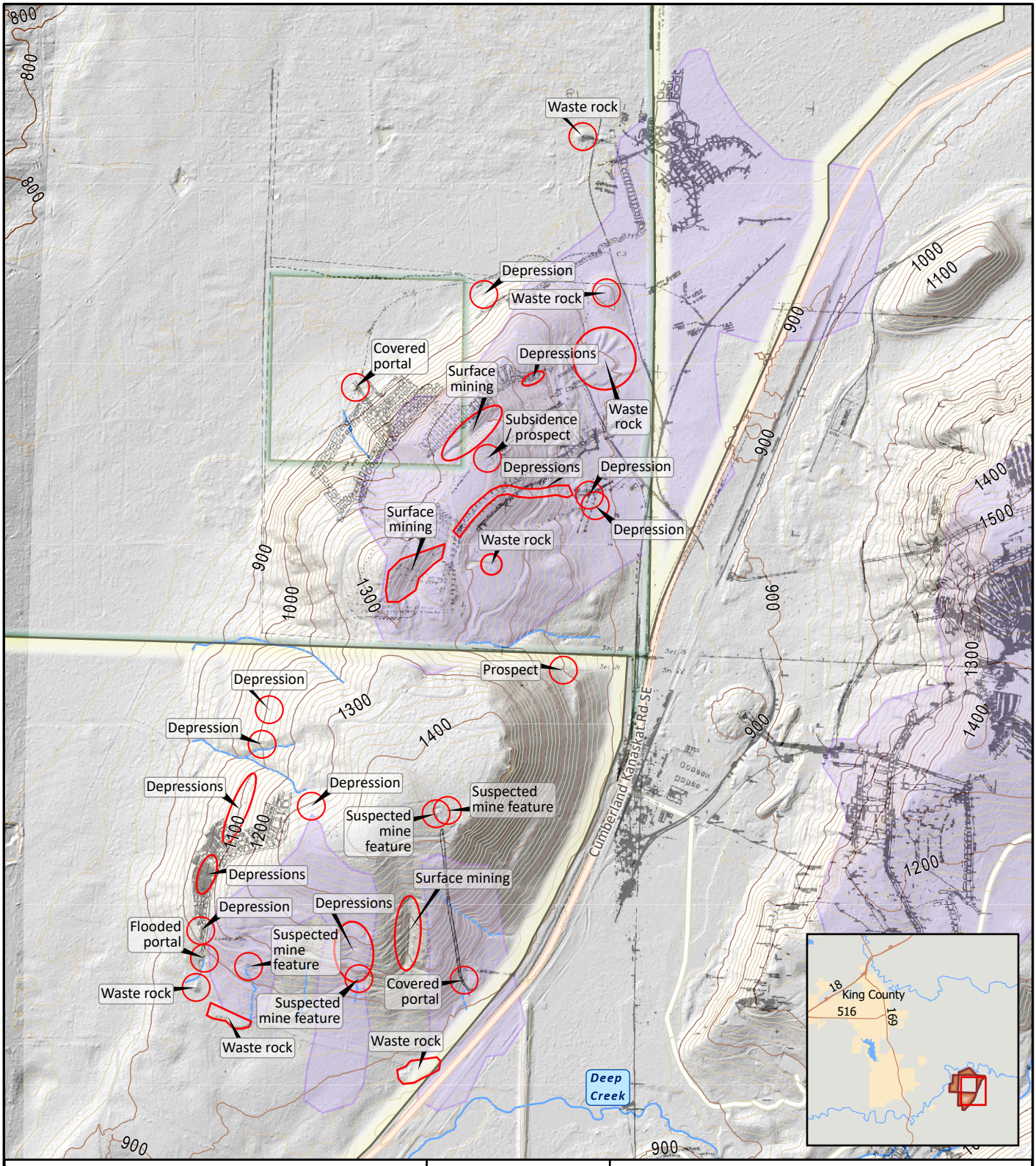
associated earth sciences incorporated

REGIONAL COAL MINES AND COAL MINE HAZARD AREAS

CUMBERLAND PROPERTY
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20200367H001	5/23	25

G:\GIS_Projects\aaY2020\200367 Cumberland 22\aprx\EC_upd\200367H001 F25 RegCoalHaz EC_CP_0323.aprx | 200367H001 F25 RegCoalHaz EC_CP_0323 | 5/11/2023 2:30 PM



SITE

MINE FEATURE

COAL MINE HAZARD AREA (REGIONAL HAZARD DATA FROM KING CO)

WADNR MANAGED PROPERTY

CONTOUR 100 FT

CONTOUR 20 FT

DATA SOURCES / REFERENCES:
WADNR COAL MINE MAP K0_A
KING CO: ROADS 4/22, COAL HAZARD AREAS
PSRC: KING CO 2016 LIDAR, CONTOURS FROM LIDAR
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 150

FEET

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

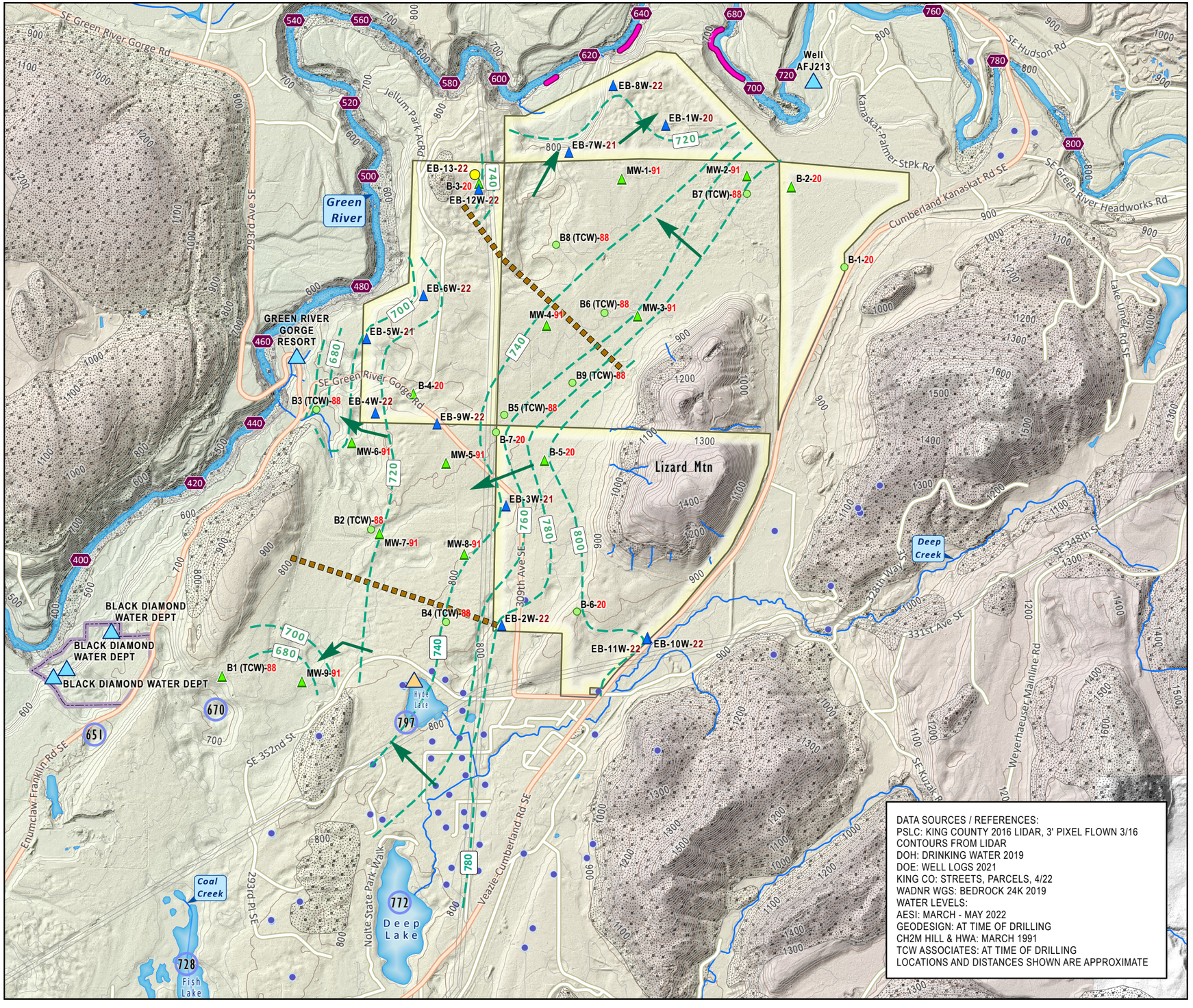
associated earth sciences incorporated

LIZARD MOUNTAIN COAL MINES

CUMBERLAND PROPERTY
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20200367H001	5/23	26

G:\GIS_Projects\aaY2020\200367 Cumberland 22\aprx\EC_upd\200367H001 F26 LizardMtn_CP_0323.aprx | 200367H001 F26 LizardMtn_CP_0323 | 5/3/2023 5:12 PM



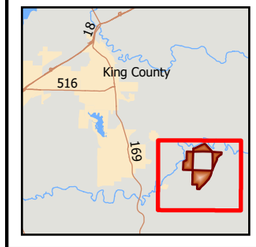
SITE

AESI EXPLORATION TYPE-YEAR

- EXPLORATION BORING (AESI)
- MONITORING WELL (AESI)

PREVIOUS EXPLORATION TYPE- YEAR BY OTHERS

- MONITORING WELL
- EXPLORATION BORING
- GROUP A WATER SUPPLY
- GROUP B WELL, PWSID 52236D
- WELL
- APPROXIMATE SEASONAL LAKE ELEVATION
- GROUNDWATER FLOW
- DIRECT GROUNDWATER DISCHARGE TO RIVER
- WET SEASON HIGH GROUNDWATER ELEVATION
- CAPTURE ZONE LIMIT
- NEAR SURFACE BEDROCK
- UTILITY CORRIDOR
- CONTOUR 100 FT
- CONTOUR 20 FT
- RIVER ELEVATION IN FT



N

0 2000

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

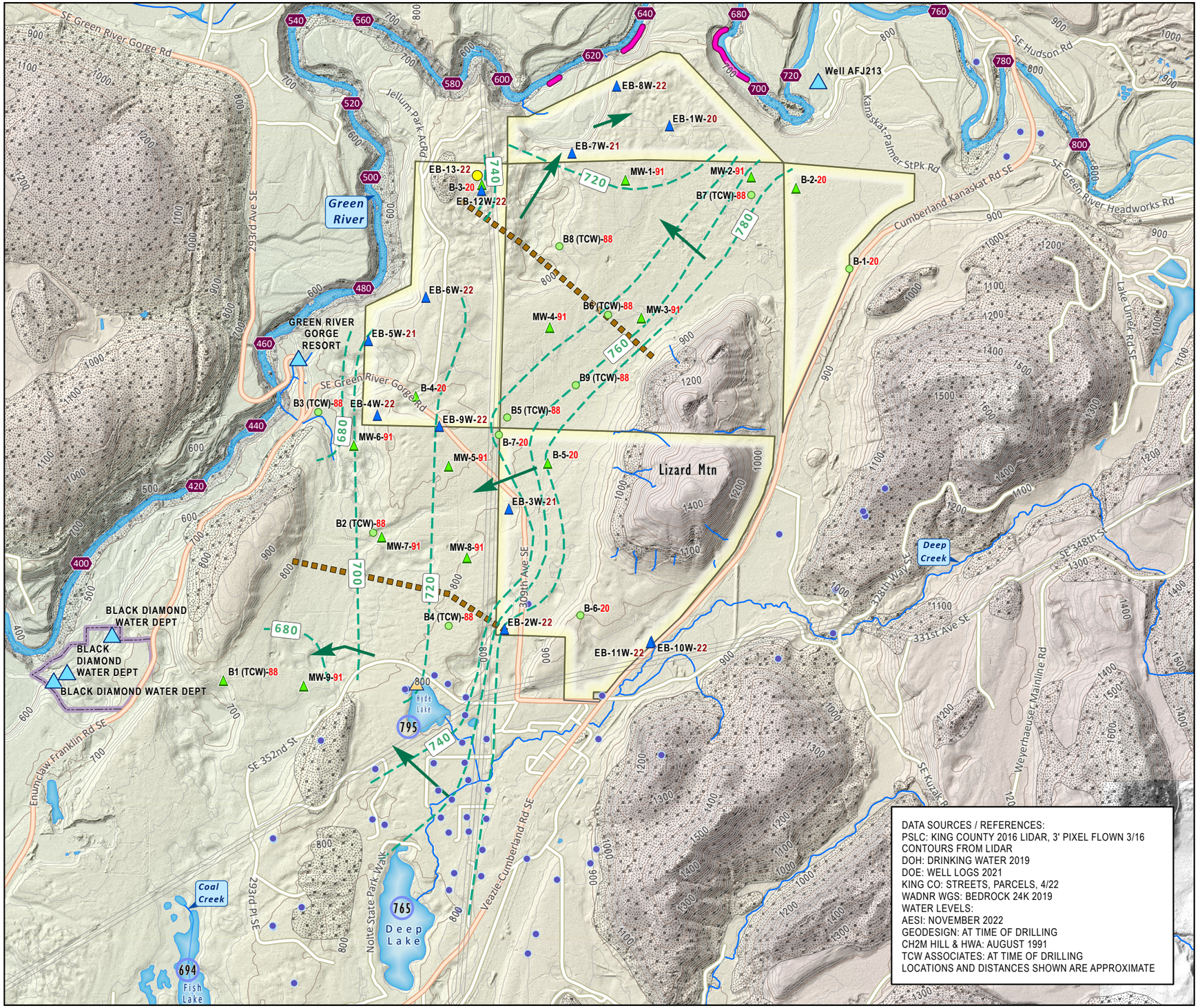
associated earth sciences incorporated

WET SEASON GROUNDWATER ELEVATION AND FLOW

CUMBERLAND PROPERTY
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20200367H001	5/23	29

G:\GIS_Projects\aaY2020\200367 Cumberland 22\aprx\EC_upd\200367H001 F29 WSGW EC_CP_0323.aprx | 200367H001 F29 WSGW EC_CP_0323 | 5/11/2023 3:02 PM



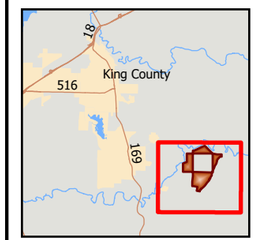
SITE

AESI EXPLORATION TYPE-YEAR

- EXPLORATION BORING (AESI)
- MONITORING WELL (AESI)

PREVIOUS EXPLORATION TYPE- YEAR BY OTHERS

- MONITORING WELL
- EXPLORATION BORING
- GROUP A WATER SUPPLY
- GROUP B WELL, PWSID 52236D
- WELL
- APPROXIMATE SEASONAL LAKE ELEVATION
- DIRECT GROUNDWATER DISCHARGE TO RIVER
- GROUNDWATER FLOW
- SEASONAL LOW GROUNDWATER ELEVATIONS
- CAPTURE ZONE LIMIT
- NEAR SURFACE BEDROCK
- UTILITY CORRIDOR
- CONTOUR 100 FT
- CONTOUR 20 FT
- RIVER ELEVATION IN FT



N

0 2000

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

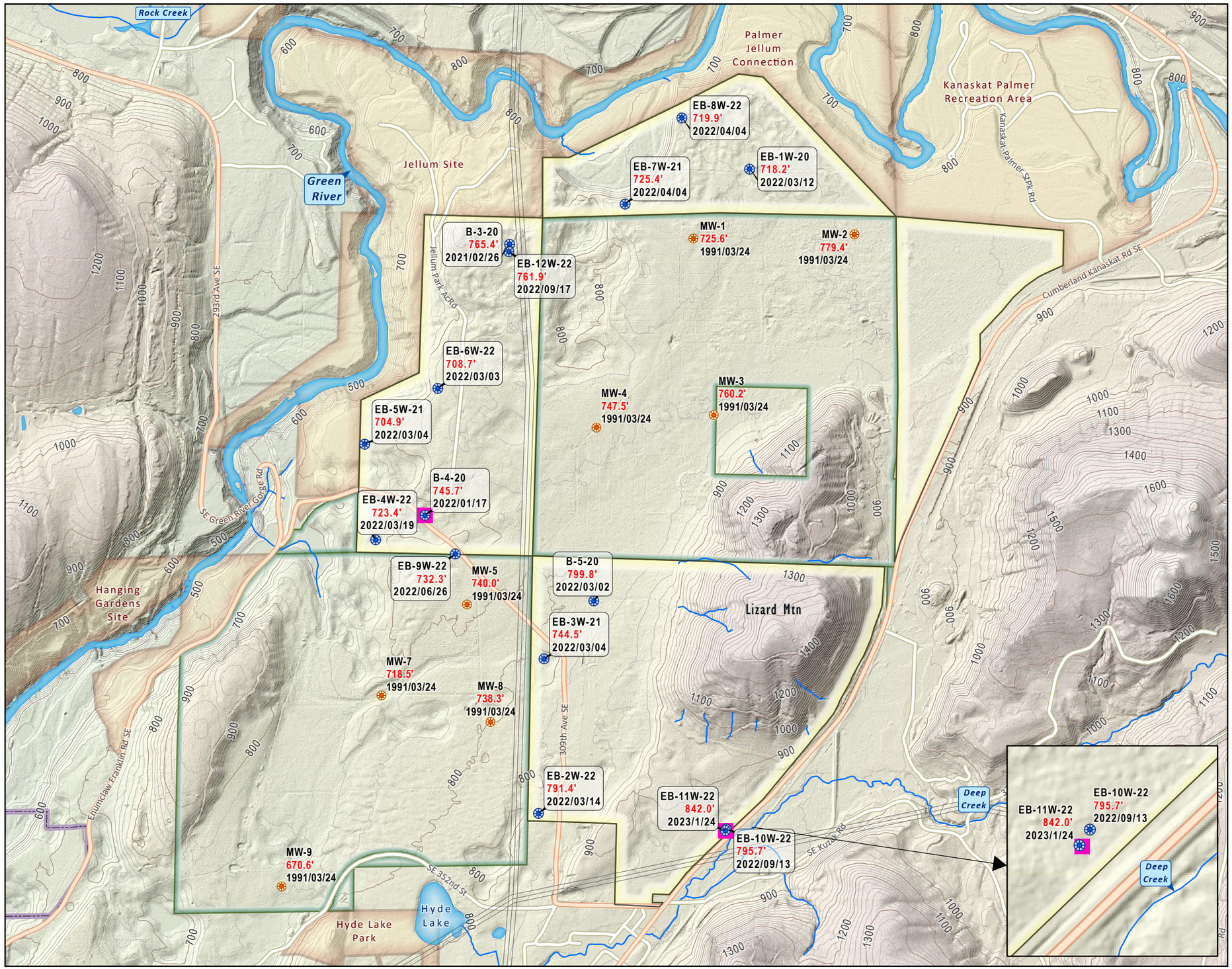
associated earth sciences incorporated

DRY SEASON GROUNDWATER ELEVATION AND FLOW

CUMBERLAND PROPERTY
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20200367H001	5/23	30

G:\GIS_Projects\aaY2020\200367 Cumberland 22\aprx\EC_updt\200367H001 F30 DSGW EC_CP_0323.aprx | 200367H001 F30 DSGW EC_CP_0323 | 5/11/2023 4:00 PM



SITE

SURVEYED MONITORING WELL

MONITORING WELL, BY OTHERS, UNKNOWN DATUM

SURVEYED MONITORING WELL (PERCHED GROUNDWATER)

TRANSMISSION LINE

WADNR MANAGED PROPERTY

PARK, OPEN SPACE, NATURAL AREA

CONTOUR 100 FT

CONTOUR 20 FT

Groundwater levels reported from:
EB-9W, EB-10W, EB-11W, and EB-12W monitoring wells do not yet have wet season water levels recorded. The seasonal high groundwater is likely higher than presented on this figure.

The datum reference is not specified.

Perched groundwater at B-4 is interpreted as discontinuous. Perched groundwater at EB-11W is part of a thicker, more continuous perching horizon near Deep Creek.

DATA SOURCES / REFERENCES:
PSLC: KING COUNTY 2016 LIDAR, 3' PIXEL FLOWN 3/16
CONTOURS FROM LIDAR
KING CO: STREETS, PARCELS, 4/22

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 1500

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

SEASONAL HIGH GROUNDWATER

CUMBERLAND PROPERTY
KING COUNTY, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20200367H001	03/23	X

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APPENDIX B

Construction Stormwater Pollution Prevention Plan

At Tanker Truck Transfer Areas to Above/Below-Ground Storage Tanks

- Pave the area on which the transfer takes place. If any transferred liquid, such as gasoline, is reactive with asphalt, pave the area with Portland cement concrete.
- Slope, berm, or dike the transfer area to a dead-end sump, spill containment sump, a spill control oil/water separator, or other spill control device. The minimum spill retention time should be 15 minutes at the greater flow rate of the highest fuel dispenser nozzle through-put rate, or the peak flow rate of the 6-month, 24-hour storm event over the surface of the containment pad, whichever is greater. The capacity of the spill containment sump should be a minimum of 50 gallons with adequate additional capacity provided for grit sedimentation.

S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment

Description of Pollutant Sources: Mobile fueling, also known as fleet fueling, wet fueling, or wet hosing, is the practice of filling fuel tanks of vehicles by tank trucks that are driven to the yards or sites where the vehicles to be fueled are located. Diesel fuel is categorized as a Class II Combustible Liquid, whereas gasoline is categorized as a Flammable Liquid.

Note that some local fire departments may have restrictions on mobile fueling practices.

Historically organizations conducted mobile fueling for off-road vehicles operated for extended periods in remote areas. This includes construction sites, logging operations, and farms. Some organizations conduct mobile fueling of on-road vehicles commercially in the State of Washington.

Pollutant Control Approach: Fueling operators need proper training of fueling operations, the use of spill/drip control, and fuel transfer procedures.

Applicable Operational BMPs:

Organizations and individuals conducting mobile fueling operations must implement the BMPs in the following list. The operating procedures for the driver/operator should be simple, clear, effective, and their implementation verified by the organization liable for environmental and third party damage.

- Ensure that the local fire department approves all mobile fueling operations. Comply with local and Washington State fire codes.
- In fueling locations that are in close proximity to sensitive aquifers, designated wetlands, wetland buffers, or other waters of the State, approval by local jurisdictions is necessary to ensure compliance with additional local requirements.
- Ensure compliance with all 49 CFR 178 requirements for all fuel delivery vehicles or containers. Documentation from a Department of Transportation (DOT) Registered Inspector provides proof of compliance.
- Ensure the presence and the constant observation/monitoring of the driver/operator at the fuel transfer location at all times during fuel transfer and ensure implementation of the following procedures at the fuel transfer locations:

- Locate the point of fueling at least 25 feet from the nearest storm sewer 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 storm sewer to ensure no inflow of spilled or leaked fuel. Covers are not required for storm sewers that convey the inflow to a spill control separator approved by the local jurisdiction and the fire department. Potential spill/leak conveyance surfaces must be impervious and in good repair. Do not remove the drain cover if sheen is present. Properly collect and dispose of any contaminated material.
- Place a drip pan, or an absorbent pad under each fueling location prior to and during all dispensing operations. The pan (must be liquid tight) and 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 sewer, and receiving waters.
- Avoid extending the 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 receiving equipment.

- Provide the driver/operator of the fueling vehicle with:
  - Adequate flashlights or other mobile lighting to view fuel fill openings with poor accessibility. Consult with local fire department for additional lighting requirements.
  - Two-way communication with his/her home base.
- Train the driver/operator annually in spill prevention and cleanup measures and emergency procedures. Make all employees aware of the significant liability associated with fuel spills.
- The responsible manager shall properly sign and date the fueling operating procedures. Distribute procedures to the operators, retain them in the organization files, and make them available in the event an authorized government agency requests a review.
- Immediately notify the local fire department (911), the appropriate regional office of the Department of Ecology, and the local jurisdiction 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 identify spill response contractors available in the area to ensure the rapid removal of significant product spillage into the environment.
- In all fueling vehicles, maintain a minimum of the following spill cleanup materials and have them readily available for use:

A-17: Stationary Fueling Operations

The following best management practices (BMPs) apply to the fueling of vehicles and equipment, including gas stations and fuel pumps to service equipment or vehicles, where the fuel pumps were constructed or substantially remodeled after July 1995. "Substantial remodeling" means replacing the canopy, adding fuel tanks, or relocating or adding one or more fuel dispensers in such a way that modifies the impervious concrete paving in the fueling area.

For fueling operations installed prior to July 1995, see activity sheet A-47: Older Stationary Fueling Operations. For mobile fueling operations see activity sheet A-48: Mobile Fueling of Vehicles and Heavy Equipment. For in-water and over-water fueling operations, see activity sheet A-30: Marine Activities.

All BMPs related to fueling must be consistent with the requirements of the King County Fire Code (KCC 17.04). The water quality requirements presented in this manual are separate from, and in addition to, the requirements of the King County Fire Code.

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 BMPs

- Design the fueling island to minimize stormwater contamination, to control spills, and to collect and direct contaminated stormwater and/or wastewater for treatment.
- The fueling island must have a roof or canopy to prevent the direct entry of precipitation onto the spill containment pad. At a minimum, cover the spill containment pad (within the grade break or fuel dispensing area) and extend several additional feet to reduce the introduction of windblown rain.
    - Roofs and canopies 10 feet or less in height must have a minimum overhang of 3 feet on all sides.
    - Roofs and canopies greater than 10 feet in height mush have a minimum overhand of 5 feet on each side.
- Convey runoff collected from the roof and canopy to a stormwater drainage system or receiving water outside of the spill containment pad. This will prevent mixing of uncontaminated runoff from the roof or canopy with contaminated runoff collected on the spill containment pad.
- Design the fueling island as a spill containment pad with a sill or berm, raised to a minimum of four inches, to prevent the runoff of spilled liquids and to prevent the

run-on of stormwater from the surround area. Raised sills are not required at the open-grate trenches that connect to an approved drainage-control system.

- The spill containment pad must be constructed of impervious concrete. Asphalt is not acceptable.
- Slope the spill containment pad around the fueling island towards the spill containment pad drains; either trench drains, catch basins and/or a dead-end sump. The slope of the drains shall not be less than 1 percent.
- Drains from the spill containment pad must have a normally closed shutoff valve. The valve may be opened to convey stormwater with residual contamination to an oil control treatment system (e.g., oil/water separator, catch basin insert, or equivalent treatment) which then discharges to:
    - at a minimum, a basic treatment system (e.g., sand filter, filter strips, water quality vault) prior to discharging to a storm drainage system, surface water or ground, or
    - a sanitary sewer. Approval from the local sewer authority is required for conveyance of any fuel-contaminated stormwater to a sanitary sewer. State and local regulations prohibit discharges that could cause a fire or explosion (WAC, Section 173-216-060; KCC 28.84.060). For conveyance to the sanitary sewer, a catch basin shall be installed upstream of the oil control treatment system, and a normally closed shutoff valve is required at the discharge point of the oil control treatment system.
- In the case of a fuel spill, spilled fuel must be pumped from the drains or catch basins and must be treated and disposed of offsite in accordance with Department of Ecology regulations. The valve may only then be opened to convey stormwater with residual contamination.
- Discharges from the treatment systems (oil control treatment and basic treatment system) to storm drainage systems, sanitary sewer, surface water or to the ground must not display ongoing or recurring visible sheen and must not contain oil or grease.
- Alternatively, collect runoff from the spill containment pad in a dead-end sump and hold for proper off-site disposal. The dead-end sump must be easily inspected, maintained, and pumped.
- The minimum spill retention volume of the oil control treatment system or dead-end sump shall be:
    - 15 minutes for the flow rate of the dispensing mechanism with the highest through-put rate, or
    - if the area is uncovered, the 15-minute peak flow rate of the 6-month, 24-hour storm event over the surface of the spill containment pad – whichever is greater.
    - The volume of the dead-end sump shall be a minimum of 50 gallons with an adequate grit sedimentation volume.

Additional Required BMPs for Vehicles or Equipment 10 feet in height or greater

A roof or canopy may not be feasible at fueling stations that regularly fuel vehicles or equipment that are 10 feet in height or greater. At those types of fueling facilities, the following BMPs apply, as well as other applicable BMPs for fueling stations:

- If a roof or canopy is infeasible, then the concrete fueling pad must be equipped with emergency spill control features including a shutoff valve for drainage from the fueling area. The drainage shutoff valve may be kept open to convey stormwater with residual contamination from the fueling pad.
- Maintain the valve in the closed position during a spill event and cleanup. An electronically actuated valve is preferred to minimize the time lapse between spill and containment.
- In the case of a fuel spill, spilled fuel must be pumped from the drains or catch basins and must be treated and disposed of offsite in accordance with Department of Ecology regulations. The valve may only then be reopened to convey stormwater with residual contamination.:
    - to a sanitary sewer, if approved by the sewer authority, or
    - to an oil control treatment system (e.g., an oil/water separator, catch basin insert, or equivalent treatment), and then, at a minimum, to a basic treatment system (e.g., sand filter, filter strips, water quality vault). Discharges from treatment systems to stormwater drainage systems, sanitary sewer or surface water must not display ongoing or recurring visible sheen and must not contain oil or grease.

Required Operational BMPs

- Train employees on the proper use of fuel dispensers.
- Post signs in accordance with the Uniform Fire Code (UFC) or International Fire Code (IFC). Post “No Topping Off” signs. Topping off fuel tanks results in spillage and vents gasoline fumes to the air.
- The person conducting the fuel transfer must be present at the fueling pump during fuel transfer. It is encouraged to post “Stay with Vehicle During Fueling” signage near fuel dispensers.
- Make sure that the automatic shutoff on the fuel nozzle is functioning properly.
- Prepare an emergency spill response and cleanup plan. Have designated trained person(s) available either on-site or on call at all times to implement the plan promptly and properly and immediately cleanup all spills.
- Keep suitable cleanup materials, such as dry adsorbent materials, on-site to allow prompt cleanup of a spill. Do not use dispersants or soap to clean up spills or sheens.
- Immediately notify Ecology, the local jurisdiction, and the local sewer authority if a spill reaches sanitary or storm sewers, ground water, or surface water, in accordance with federal and Ecology spill reporting requirements.

- Sweep or vacuum the fueling area as needed to collect sediment and debris. Never hose down the fueling area to the storm drains. Contaminated runoff and spills must be collected for proper disposal.
- Keep drained oil filters in a closed leak-proof container or drum.
- Transfer the fuel from the delivery tank trucks to the fuel storage tank over impervious, contained areas and ensure that appropriate overflow protection is used. Alternatively, cover nearby storm drains during the filling process and use drip pans under all hose connections.

Supplemental BMPs

- Use absorbent materials in or around catch basin inlets on the property to filter oily runoff. Properly dispose of all gas and oil-contaminated absorbents
- A catch basin inserts configured for oil removal may remove some of the pollutants in runoff. The oil-absorbent filter media must be able to retain absorbed oil during future storm events. Replace the filter media if the absorption capacity has been surpassed. See the *King County Surface Water Design Manual* for more information regarding which filter media provide acceptable oil retention.

Additional Information

- *Stormwater Pollution Prevention Manual*, Chapter 3: Commercial and Multifamily BMPs
    - A-30: Marine Activities
    - A-47: Older Stationary Fueling Operations
    - A-48: Mobile Fueling of Vehicles and Heavy Equipment
- *Stormwater Pollution Prevention Manual*, Chapter 5: Information Sheets
    - Catch Basin Insert
    - Containment
    - Covering
    - Oil/Water Separators
    - Spill Response and Clean-up Plan
- *King County Surface Water Design Manual*

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

- Non-water absorbents capable of absorbing at least 15 gallons of fuel.
- A storm drain plug or cover kit.
- A non-water absorbent containment boom of a minimum 10 feet in length with a 12-gallon minimum absorbent capacity.
- A non-spark generating shovel (a steel shovel could generate a spark and cause an explosion in the right environment around a spill).
- Two, five-gallon buckets with lids.

- Use automatic shutoff nozzles for dispensing the fuel. Replace automatic shut-off nozzles as recommended by the manufacturer.
- Maintain and replace equipment on fueling vehicles, particularly hoses and nozzles, at established intervals to prevent failures.
- Immediately remove and properly dispose of soils with visible surface contamination to prevent the spread of chemicals to groundwater or receiving water via stormwater runoff.
- Do not use dispersants to clean up spills or sheens unless properly removed for disposal following application. Dispersants are prohibited from use for spills on water or where the dispersant may enter storm drains, surface waters, treatment systems, or sanitary sewers.

Applicable Structural Source Control BMPs:

Include the following fuel transfer site components:

- Automatic fuel transfer shut-off nozzles.
- An adequate lighting system at the filling point.

S426 BMPs for Spills of Oil and Hazardous Substances

Description of Pollutant Sources: Washington Administrative Code requires owners or operators of facilities engaged in drilling, producing, gathering, storing, processing, transferring, distributing, refining, or consuming oil and/or oil products to have a Spill Prevention and Emergency Cleanup Plan (SPECP). The SPECP is required if the above ground storage capacity of the facility is 1,320 gallons or more of oil. Additionally, the SPECP is required if the facility, due to its location, could reasonably be expected to discharge oil in harmful quantities, as defined in 40 CFR Part 110, into or upon the navigable waters of the United States or adjoining shorelines {40 CFR 112.1 (b)}. Onshore and offshore facilities, which, due to their location, could not reasonably be expected to discharge oil into or upon the navigable waters of the United States or adjoining shorelines are exempt from these regulations {40 CFR 112.1(d)(1)(i)}. State Law requires owners of businesses that produce dangerous wastes to have a SPECP. These businesses should refer to Washington State/Federal Emergency Spill Cleanup Requirements (see I-2.15 Other Requirements). The federal definition of oil is oil of any kind or any form, including, but not limited to petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.

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.2.2.3 SAWCUTTING AND SURFACING POLLUTION PREVENTION

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to surface waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to, sawing, coring, grinding, roughening, hydro-demolition, bridge and road surfacing

Design and Installation Specifications

1. Vacuum slurry and cuttings during cutting and surfacing operations.
2. Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
3. Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
4. Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
5. Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose process water in a manner that does not violate ground water or surface water quality standards.
6. Handle and dispose cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

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

D.2.2.6 CONSTRUCTION STORMWATER FILTRATION

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Background Information:

Filtration with sand media has been used for over a century to treat water and wastewater. The use of sand filtration for treatment of stormwater has developed recently, generally to treat runoff from streets, parking lots, and residential areas. The application of filtration to construction stormwater treatment is currently under development.

Conditions of Use

Traditional BMPs used to control soil erosion and sediment loss from sites under development may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 μm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with polymer treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from the appropriate regional Ecology office must be obtained at each site where polymers use is proposed prior to use. For more guidance on stormwater chemical treatment see BMP D.2.2.5.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow. Rapid sand filters are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids. In contrast, slow sand filters have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow sand filtration has generally been used to treat stormwater. Slow sand filtration is mechanically simple in comparison to rapid sand filtration but requires a much larger filter area.

Filtration Equipment.

Sand media filters are available with automatic backwashing features that can filter to 50 μm particle size. Screen or bag filters can filter down to 5 μm. Fiber wound filters can remove particles down to 0.5 μm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process Description.

Stormwater is collected at interception point(s) on the site and is diverted to an untreated stormwater sediment pond or tank for removal of large sediment and storage of the stormwater before it is treated by the filtration system. The untreated stormwater is pumped from the trap, pond, or tank through the filtration system in a rapid sand filtration system. Slow sand filtration systems are designed as flow through systems using gravity.

Maintenance Standards

Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the untreated stormwater pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.

- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.

Sizing Criteria for Flow-Through Treatment Systems for Flow Control Exempt Water Bodies:

When sizing storage ponds or tanks for flow-through systems for flow control exempt water bodies the treatment system capacity should be a factor. The untreated stormwater storage pond or tank should be sized to hold 1.5 times the runoff volume of the 10-year, 24-hour storm event minus the treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft². Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the chemical treatment system to accommodate extreme storms. Runoff volume shall be calculated using the methods presented in Volume 3, Chapter 2 of the *SWMMWW* (or Chapter 4 of the King County *Surface Water Design Manual* if no chemicals are proposed for use). Worst-case conditions (i.e., producing the most runoff) should be used for analyses (most likely conditions present prior to final landscaping).

Sizing Criteria for Flow Control Water Bodies:

Sites that must implement flow control for the developed site condition must also control stormwater release rates during construction. Construction site stormwater discharges shall not exceed the discharge durations of the pre-developed condition for the range of pre-developed discharge rates from 1/2 of the 2-year flow through the 10-year flow as predicted by an approved continuous runoff model. The pre-developed condition to be matched shall be the land cover condition immediately prior to the development project. This restriction on release rates can affect the size of the storage pond, the filtration system, and the flow rate through the filter system.

The following is how WWHM can be used to determine the release rates from the filtration systems:

1. Determine the pre-developed flow durations to be matched by entering the land use area under the "Pre-developed" scenario in WWHM. The default flow range is from ½ of the 2-year flow through the 10-year flow.
2. Enter the post developed land use area in the "Developed Unmitigated" scenario in WWHM.
3. Copy the land use information from the "Developed Unmitigated" to "Developed Mitigated" scenario.
4. There are two possible ways to model stormwater filtration systems:
    a. The stormwater filtration system uses an untreated stormwater storage pond/tank and the discharge from this pond/tank is pumped to one or more filters. In-line filtration chemicals would be added to the flow right after the pond/tank and before the filter(s). Because the discharge is pumped, WWHM can't generate a stage/storage /discharge (SSD) table for this system. This system is modeled the same way as described Ecology's BMP C250 (or BMP D.2.2.5 when seeking King County approval for non-chemical treatment) and is as follows:

        While in the "Developed Mitigated" scenario, add a pond element under the basin element containing the post-developed land use areas. This pond element represents information on the available untreated stormwater storage and discharge from the filtration system. In cases where the discharge from the filtration system is controlled by a pump, a stage/storage/discharge (SSD) table representing the pond must be generated outside WWHM and imported into WWHM. WWHM can route the runoff from the post-developed condition through this SSD table (the pond) and determine compliance with the flow duration standard. This would be an iterative design procedure where if the initial SSD table proved to be out of compliance, the designer would have to modify the SSD table outside WWHM and re-import in WWHM and route the runoff through it again. The iteration will continue until a pond that enables compliance with the flow duration standard is designed.

        Notes on SSD table characteristics:

- The pump discharge rate would likely be initially set at just below ½ if the 2-year flow from the pre-developed condition. As runoff coming into the untreated stormwater storage pond increases and the available untreated stormwater storage volume gets used up, it would be necessary to increase the pump discharge rate above ½ of the 2-year. The increase(s) above ½ of the 2-year must be such that they provide some relief to the untreated stormwater storage needs but at the same time they will not cause violations of the flow duration standard at the higher flows. The final design SSD table will identify the appropriate pumping rates and the corresponding stage and storages.
- When building such a flow control system, the design must ensure that any automatic adjustments to the pumping rates will be as a result of changes to the available storage in accordance with the final design SSD table.

b. The stormwater filtration system uses a storage pond/tank and the discharge from this pond/tank gravity flows to the filter. This is usually a slow sand filter system and it is possible to model it in WWHM as a Filter element or as a combination of Pond and Filter element placed in series. The stage/storage/discharge table(s) may then be generated within WWHM as follows:

   i. While in the "Developed Mitigated" scenario, add a Filter element under the basin element containing the post-developed land use areas. The length and width of this filter element would have to be the same as the bottom length and width of the upstream untreated stormwater storage pond/tank.

   ii. In cases where the length and width of the filter is not the same as those for the bottom of the upstream untreated stormwater storage tank/pond, the treatment system may be modeled as a Pond element followed by a Filter element. By having these two elements, WWHM would then generate a SSD table for the storage pond which then gravity flows to the Filter element. The Filter element downstream of the untreated stormwater storage pond would have a storage component through the media, and an overflow component for when the filtration capacity is exceeded.

   WWHM can route the runoff from the post-developed condition through the treatment systems in 4b and determine compliance with the flow duration standard. This would be an iterative design procedure where if the initial sizing estimates for the treatment system proved to be inadequate, the designer would have to modify the system and route the runoff through it again. The iteration would continue until compliance with the flow duration standard is achieved.

5. It should be noted that the above procedures would be used to meet the flow control requirements. The filtration system must be able to meet the runoff treatment requirements. It is likely that the discharge flow rate of ½ of the 2-year or more may exceed the treatment capacity of the system. If that is the case, the untreated stormwater discharge rate(s) (i.e., influent to the treatment system) must be reduced to allow proper treatment. Any reduction in the flows would likely result in the need for a larger untreated stormwater storage volume.

If system design does not allow you to discharge at the slower rates as described above and if the site has a retention or detention pond that will serve the planned development, the discharge from the treatment system may be directed to the permanent retention/detention pond to comply with the flow control requirements. In this case, the untreated stormwater storage pond and treatment system will be sized according to the sizing criteria for flow-through treatment systems for flow control exempt waterbodies described earlier except all discharges (water passing through the treatment system and stormwater bypassing the treatment system) will be directed into the permanent retention/detention pond. If site constraints make locating the untreated stormwater storage pond difficult, the permanent retention/detention pond may be divided to serve as the untreated stormwater discharge pond and the post-treatment flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The post-treatment flow control pond's revised dimensions must be

entered into the WWHM and the WWHM must be run to confirm compliance with the flow control requirement.

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 C

Hydrologic Model Output and Flow Control and Water Quality Facility Calculations

WWHM2012
PROJECT REPORT

Project Name: Cumberland Property - Pond Design
Site Name: Cumberland Property
Site Address: Cumberland - Kanaskat Road
City : King County
Report Date: 5/31/2023
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.14
Version Date: 2021/08/18
Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

Low Flow Threshold for POC 3 : 50 Percent of the 2 Year

High Flow Threshold for POC 3: 50 year

Low Flow Threshold for POC 4 : 50 Percent of the 2 Year

High Flow Threshold for POC 4: 50 year

Low Flow Threshold for POC 5 : 50 Percent of the 2 Year

High Flow Threshold for POC 5: 50 year

Low Flow Threshold for POC 6 : 50 Percent of the 2 Year

High Flow Threshold for POC 6: 50 year

Low Flow Threshold for POC 7 : 50 Percent of the 2 Year

High Flow Threshold for POC 7: 50 year

Low Flow Threshold for POC 8 : 50 Percent of the 2 Year

High Flow Threshold for POC 8: 50 year

Low Flow Threshold for POC 9 : 50 Percent of the 2 Year

High Flow Threshold for POC 9: 50 year

Low Flow Threshold for POC 10 : 50 Percent of the 2 Year

High Flow Threshold for POC 10: 50 year

PREDEVELOPED LAND USE

Name : Mine 1A
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	2.28
A B, Forest, Mod	4.92
A B, Forest, Steep	5.11
Pervious Total	12.31

Impervious Land Use	acre
Impervious Total	0
Basin Total	12.31

Element Flows To:

Surface	Interflow	Groundwater

Name : Mine 1B
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	65.92
A B, Forest, Mod	32.11

A B, Forest, Steep	**.98**
Pervious Total	**99.01**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**99.01**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Mine 2
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Flat	**73**
A B, Forest, Mod	**8.6**
Pervious Total	**81.6**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**81.6**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Mine 3A
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Flat	**18.39**
A B, Forest, Mod	**33.69**
A B, Forest, Steep	**9.05**
Pervious Total	**61.13**

Impervious Land Use	acre
Impervious Total	0
Basin Total	61.13

Element Flows To:
Surface | Interflow | Groundwater

Name : Mine 3B
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	27.51
A B, Forest, Mod	29.08
A B, Forest, Steep	7.33
Pervious Total	63.92

Impervious Land Use	acre
Impervious Total	0
Basin Total	63.92

Element Flows To:
Surface | Interflow | Groundwater

Name : Mine 3C
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	41.26
A B, Forest, Mod	15.27
A B, Forest, Steep	.61
Pervious Total	57.14

Impervious Land Use	acre
Impervious Total	0

Basin Total	**57.14**

Element Flows To:

Surface	Interflow	Groundwater

Name : Mine 4A
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	42.48
A B, Forest, Mod	19.65
Pervious Total	**62.13**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**62.13**

Element Flows To:

Surface	Interflow	Groundwater

Name : Mine 4B
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	37.87
A B, Forest, Mod	21.82
A B, Forest, Steep	5.05
Pervious Total	**64.74**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**64.74**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Mine 4C
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	12.54
A B, Forest, Mod	22.72
A B, Forest, Steep	2.39
Pervious Total	37.65

Impervious Land Use	acre
Impervious Total	0
Basin Total	37.65

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Mine 5
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	10.97
A B, Forest, Mod	5.94
A B, Forest, Steep	4.09
Pervious Total	21

Impervious Land Use	acre
Impervious Total	0
Basin Total	21

Element Flows To:

Surface **Interflow** **Groundwater**

MITIGATED LAND USE

Name : Mine 1A
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Lawn, Flat	**2**
A B, Lawn, Steep	**7.98**
A B, Lawn, Mod	**.33**
A B, Lawn, Flat	**2**
Pervious Total	**12.31**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**12.31**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 1A	Sand Filter 1A	

Name : Sand Filter 1A
Bottom Length: 52.00 ft.
Bottom Width: 26.00 ft.
Depth: 6 ft.
Side slope 1: 2.5 To 1
Side slope 2: 2.5 To 1
Side slope 3: 2.5 To 1
Side slope 4: 2.5 To 1
Filtration On
Hydraulic conductivity: 1
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 419.578
Total Volume Through Riser (ac-ft.): 18.55
Total Volume Through Facility (ac-ft.): 438.128
Percent Infiltrated: 95.77
Total Precip Applied to Facility: 11.108
Total Evap From Facility: 2.025
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 24 in.

Element Flows To:

Outlet 1 **Outlet 2**
Infiltration Pond 1A

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.031	0.000	0.000	0.000
0.0667	0.031	0.002	0.000	0.032
0.1333	0.032	0.004	0.000	0.034
0.2000	0.032	0.006	0.000	0.035
0.2667	0.033	0.008	0.000	0.036
0.3333	0.034	0.010	0.000	0.038
0.4000	0.034	0.013	0.000	0.039
0.4667	0.035	0.015	0.000	0.041
0.5333	0.036	0.017	0.000	0.042
0.6000	0.036	0.020	0.000	0.043
0.6667	0.037	0.022	0.000	0.045
0.7333	0.037	0.025	0.000	0.046
0.8000	0.038	0.027	0.000	0.048
0.8667	0.039	0.030	0.000	0.049
0.9333	0.039	0.033	0.000	0.050
1.0000	0.040	0.035	0.000	0.052
1.0667	0.041	0.038	0.000	0.053
1.1333	0.041	0.041	0.000	0.054
1.2000	0.042	0.044	0.000	0.056
1.2667	0.043	0.046	0.000	0.057
1.3333	0.044	0.049	0.000	0.059
1.4000	0.044	0.052	0.000	0.060
1.4667	0.045	0.055	0.000	0.061
1.5333	0.046	0.058	0.000	0.063
1.6000	0.046	0.061	0.000	0.064
1.6667	0.047	0.065	0.000	0.066
1.7333	0.048	0.068	0.000	0.067
1.8000	0.049	0.071	0.000	0.068
1.8667	0.049	0.074	0.000	0.070
1.9333	0.050	0.078	0.000	0.071
2.0000	0.051	0.081	0.000	0.073
2.0667	0.052	0.085	0.000	0.074
2.1333	0.052	0.088	0.000	0.075
2.2000	0.053	0.092	0.000	0.077
2.2667	0.054	0.095	0.000	0.078
2.3333	0.055	0.099	0.000	0.080
2.4000	0.055	0.102	0.000	0.081
2.4667	0.056	0.106	0.000	0.082
2.5333	0.057	0.110	0.000	0.084
2.6000	0.058	0.114	0.000	0.085
2.6667	0.059	0.118	0.000	0.086
2.7333	0.059	0.122	0.000	0.088
2.8000	0.060	0.126	0.000	0.089
2.8667	0.061	0.130	0.000	0.091
2.9333	0.062	0.134	0.000	0.092
3.0000	0.063	0.138	0.000	0.093
3.0667	0.063	0.142	0.000	0.095
3.1333	0.064	0.147	0.000	0.096
3.2000	0.065	0.151	0.000	0.098

3.2667	0.066	0.155	0.000	0.099
3.3333	0.067	0.160	0.000	0.100
3.4000	0.068	0.164	0.000	0.102
3.4667	0.069	0.169	0.000	0.103
3.5333	0.069	0.174	0.000	0.105
3.6000	0.070	0.178	0.000	0.106
3.6667	0.071	0.183	0.000	0.107
3.7333	0.072	0.188	0.000	0.109
3.8000	0.073	0.193	0.000	0.110
3.8667	0.074	0.198	0.000	0.112
3.9333	0.075	0.203	0.000	0.113
4.0000	0.076	0.208	0.000	0.114
4.0667	0.076	0.213	0.000	0.116
4.1333	0.077	0.218	0.000	0.117
4.2000	0.078	0.223	0.000	0.118
4.2667	0.079	0.228	0.000	0.120
4.3333	0.080	0.234	0.000	0.121
4.4000	0.081	0.239	0.000	0.123
4.4667	0.082	0.245	0.000	0.124
4.5333	0.083	0.250	0.129	0.125
4.6000	0.084	0.256	0.670	0.127
4.6667	0.085	0.261	1.438	0.128
4.7333	0.086	0.267	2.369	0.130
4.8000	0.087	0.273	3.421	0.131
4.8667	0.088	0.279	4.552	0.132
4.9333	0.089	0.285	5.721	0.134
5.0000	0.090	0.291	6.887	0.135
5.0667	0.091	0.297	8.008	0.137
5.1333	0.092	0.303	9.046	0.138
5.2000	0.093	0.309	9.967	0.139
5.2667	0.094	0.315	10.75	0.141
5.3333	0.095	0.321	11.38	0.142
5.4000	0.096	0.328	11.88	0.144
5.4667	0.097	0.334	12.28	0.145
5.5333	0.098	0.341	12.80	0.146
5.6000	0.099	0.347	13.21	0.148
5.6667	0.100	0.354	13.60	0.149
5.7333	0.101	0.361	13.99	0.150
5.8000	0.102	0.367	14.36	0.152
5.8667	0.103	0.374	14.72	0.153
5.9333	0.104	0.381	15.08	0.155
6.0000	0.105	0.388	15.43	0.156
6.0667	0.106	0.395	15.76	0.157

Name : Infiltration Pond 1A
Bottom Length: 83.00 ft.
Bottom Width: 28.00 ft.
Depth: 7 ft.
Volume at riser head: 0.6665 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 18.945
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 18.945

Percent Infiltrated: 100
Total Precip Applied to Facility: 0.395
Total Evap From Facility: 0.003
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.053	0.000	0.000	0.000
0.0778	0.054	0.004	0.000	1.100
0.1556	0.055	0.008	0.000	1.124
0.2333	0.057	0.012	0.000	1.148
0.3111	0.058	0.017	0.000	1.173
0.3889	0.059	0.021	0.000	1.198
0.4667	0.060	0.026	0.000	1.223
0.5444	0.061	0.031	0.000	1.248
0.6222	0.063	0.036	0.000	1.274
0.7000	0.064	0.041	0.000	1.299
0.7778	0.065	0.046	0.000	1.325
0.8556	0.067	0.051	0.000	1.351
0.9333	0.068	0.056	0.000	1.378
1.0111	0.069	0.062	0.000	1.404
1.0889	0.071	0.067	0.000	1.431
1.1667	0.072	0.073	0.000	1.458
1.2444	0.073	0.078	0.000	1.485
1.3222	0.075	0.084	0.000	1.512
1.4000	0.076	0.090	0.000	1.540
1.4778	0.077	0.096	0.000	1.568
1.5556	0.079	0.102	0.000	1.595
1.6333	0.080	0.108	0.000	1.624
1.7111	0.081	0.115	0.000	1.652
1.7889	0.083	0.121	0.000	1.680
1.8667	0.084	0.128	0.000	1.709
1.9444	0.086	0.134	0.000	1.738
2.0222	0.087	0.141	0.000	1.767
2.1000	0.089	0.148	0.000	1.796
2.1778	0.090	0.155	0.000	1.826
2.2556	0.092	0.162	0.000	1.856
2.3333	0.093	0.169	0.000	1.886
2.4111	0.095	0.176	0.000	1.916
2.4889	0.096	0.184	0.000	1.946
2.5667	0.098	0.192	0.000	1.977
2.6444	0.099	0.199	0.000	2.007
2.7222	0.101	0.207	0.000	2.038
2.8000	0.102	0.215	0.000	2.069

2.8778	0.104	0.223	0.000	2.101
2.9556	0.105	0.231	0.000	2.132
3.0333	0.107	0.239	0.000	2.164
3.1111	0.108	0.248	0.000	2.196
3.1889	0.110	0.256	0.000	2.228
3.2667	0.112	0.265	0.000	2.261
3.3444	0.113	0.274	0.000	2.293
3.4222	0.115	0.283	0.000	2.326
3.5000	0.117	0.292	0.000	2.359
3.5778	0.118	0.301	0.000	2.392
3.6556	0.120	0.310	0.000	2.425
3.7333	0.122	0.320	0.000	2.459
3.8111	0.123	0.329	0.000	2.493
3.8889	0.125	0.339	0.000	2.527
3.9667	0.127	0.349	0.000	2.561
4.0444	0.128	0.359	0.000	2.595
4.1222	0.130	0.369	0.000	2.630
4.2000	0.132	0.379	0.000	2.664
4.2778	0.133	0.389	0.000	2.699
4.3556	0.135	0.400	0.000	2.735
4.4333	0.137	0.410	0.000	2.770
4.5111	0.139	0.421	0.000	2.806
4.5889	0.140	0.432	0.000	2.841
4.6667	0.142	0.443	0.000	2.877
4.7444	0.144	0.454	0.000	2.914
4.8222	0.146	0.465	0.000	2.950
4.9000	0.148	0.477	0.000	2.986
4.9778	0.149	0.489	0.000	3.023
5.0556	0.151	0.500	0.000	3.060
5.1333	0.153	0.512	0.000	3.097
5.2111	0.155	0.524	0.000	3.135
5.2889	0.157	0.536	0.000	3.172
5.3667	0.159	0.549	0.000	3.210
5.4444	0.161	0.561	0.000	3.248
5.5222	0.163	0.574	0.000	3.286
5.6000	0.164	0.586	0.000	3.325
5.6778	0.166	0.599	0.000	3.363
5.7556	0.168	0.612	0.000	3.402
5.8333	0.170	0.626	0.000	3.441
5.9111	0.172	0.639	0.000	3.480
5.9889	0.174	0.652	0.000	3.520
6.0667	0.176	0.666	0.182	3.559
6.1444	0.178	0.680	0.572	3.599
6.2222	0.180	0.694	1.046	3.639
6.3000	0.182	0.708	1.509	3.679
6.3778	0.184	0.722	1.879	3.720
6.4556	0.186	0.737	2.114	3.761
6.5333	0.188	0.751	2.300	3.801
6.6111	0.190	0.766	2.462	3.842
6.6889	0.192	0.781	2.614	3.884
6.7667	0.194	0.796	2.757	3.925
6.8444	0.196	0.811	2.894	3.967
6.9222	0.198	0.827	3.024	4.008
7.0000	0.200	0.842	3.149	4.050
7.0778	0.203	0.858	3.269	4.093

Name : Mine 1B
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	32.41
A B, Lawn, Mod	5.92
A B, Lawn, Steep	25.14
C, Lawn, Flat	32.41
Pervious Total	95.88

Impervious Land Use	acre
ROADS FLAT	3.13
Impervious Total	3.13
Basin Total	99.01

Element Flows To:

Surface	Interflow	Groundwater
Infiltration Pond 1B	Infiltration Pond 1B	

Name : Infiltration Pond 1B
Bottom Length: 348.00 ft.
Bottom Width: 98.00 ft.
Depth: 7 ft.
Volume at riser head: 5.9417 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 7301.68
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 7301.68
Percent Infiltrated: 100
Total Precip Applied to Facility: 237.628
Total Evap From Facility: 45.714
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:

Outlet 1	Outlet 2

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.782	0.000	0.000	0.000
0.0778	0.787	0.061	0.000	15.88
0.1556	0.792	0.122	0.000	15.98
0.2333	0.797	0.184	0.000	16.07
0.3111	0.802	0.246	0.000	16.17
0.3889	0.806	0.309	0.000	16.27
0.4667	0.811	0.372	0.000	16.37
0.5444	0.816	0.435	0.000	16.46
0.6222	0.821	0.499	0.000	16.56
0.7000	0.826	0.563	0.000	16.66
0.7778	0.831	0.627	0.000	16.76
0.8556	0.836	0.692	0.000	16.86
0.9333	0.841	0.757	0.000	16.96
1.0111	0.845	0.823	0.000	17.05
1.0889	0.850	0.889	0.000	17.15
1.1667	0.855	0.955	0.000	17.25
1.2444	0.860	1.022	0.000	17.35
1.3222	0.865	1.089	0.000	17.45
1.4000	0.870	1.157	0.000	17.55
1.4778	0.875	1.225	0.000	17.65
1.5556	0.880	1.293	0.000	17.75
1.6333	0.885	1.361	0.000	17.85
1.7111	0.890	1.431	0.000	17.95
1.7889	0.895	1.500	0.000	18.05
1.8667	0.900	1.570	0.000	18.16
1.9444	0.905	1.640	0.000	18.26
2.0222	0.910	1.711	0.000	18.36
2.1000	0.915	1.782	0.000	18.46
2.1778	0.920	1.853	0.000	18.56
2.2556	0.925	1.925	0.000	18.66
2.3333	0.930	1.997	0.000	18.77
2.4111	0.935	2.070	0.000	18.87
2.4889	0.940	2.143	0.000	18.97
2.5667	0.946	2.216	0.000	19.07
2.6444	0.951	2.290	0.000	19.18
2.7222	0.956	2.364	0.000	19.28
2.8000	0.961	2.439	0.000	19.38
2.8778	0.966	2.514	0.000	19.49
2.9556	0.971	2.589	0.000	19.59
3.0333	0.976	2.665	0.000	19.70
3.1111	0.982	2.741	0.000	19.80
3.1889	0.987	2.817	0.000	19.90
3.2667	0.992	2.894	0.000	20.01
3.3444	0.997	2.972	0.000	20.11
3.4222	1.002	3.050	0.000	20.22
3.5000	1.008	3.128	0.000	20.32
3.5778	1.013	3.206	0.000	20.43
3.6556	1.018	3.285	0.000	20.54
3.7333	1.023	3.365	0.000	20.64
3.8111	1.029	3.445	0.000	20.75
3.8889	1.034	3.525	0.000	20.85
3.9667	1.039	3.606	0.000	20.96
4.0444	1.044	3.687	0.000	21.07

4.1222	1.050	3.768	0.000	21.17
4.2000	1.055	3.850	0.000	21.28
4.2778	1.060	3.932	0.000	21.39
4.3556	1.066	4.015	0.000	21.50
4.4333	1.071	4.098	0.000	21.60
4.5111	1.076	4.182	0.000	21.71
4.5889	1.082	4.266	0.000	21.82
4.6667	1.087	4.350	0.000	21.93
4.7444	1.093	4.435	0.000	22.04
4.8222	1.098	4.520	0.000	22.15
4.9000	1.103	4.606	0.000	22.26
4.9778	1.109	4.692	0.000	22.36
5.0556	1.114	4.778	0.000	22.47
5.1333	1.120	4.865	0.000	22.58
5.2111	1.125	4.953	0.000	22.69
5.2889	1.130	5.040	0.000	22.80
5.3667	1.136	5.128	0.000	22.91
5.4444	1.141	5.217	0.000	23.02
5.5222	1.147	5.306	0.000	23.13
5.6000	1.152	5.396	0.000	23.24
5.6778	1.158	5.485	0.000	23.36
5.7556	1.163	5.576	0.000	23.47
5.8333	1.169	5.666	0.000	23.58
5.9111	1.174	5.758	0.000	23.69
5.9889	1.180	5.849	0.000	23.80
6.0667	1.186	5.941	0.182	23.91
6.1444	1.191	6.034	0.572	24.03
6.2222	1.197	6.127	1.046	24.14
6.3000	1.202	6.220	1.509	24.25
6.3778	1.208	6.314	1.879	24.36
6.4556	1.213	6.408	2.114	24.48
6.5333	1.219	6.503	2.300	24.59
6.6111	1.225	6.598	2.462	24.70
6.6889	1.230	6.693	2.614	24.82
6.7667	1.236	6.789	2.757	24.93
6.8444	1.242	6.885	2.894	25.04
6.9222	1.247	6.982	3.024	25.16
7.0000	1.253	7.080	3.149	25.27
7.0778	1.259	7.177	3.269	25.39

Name : Mine 2
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**22.07**
A B, Lawn, Steep	**30.1**
C, Lawn, Flat	**22.07**
Pervious Total	**74.24**

Impervious Land Use	**acre**
ROADS FLAT	**4.36**
ROADS MOD	**3**

Impervious Total **7.36**

Basin Total **81.6**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Infiltration Pond 2	Infiltration Pond 2	

Name : Infiltration Pond 2
Bottom Length: 290.00 ft.
Bottom Width: 90.00 ft.
Depth: 7 ft.
Volume at riser head: 4.6597 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 6485.484
Total Volume Through Riser (ac-ft.): 0.39
Total Volume Through Facility (ac-ft.): 6485.874
Percent Infiltrated: 99.99
Total Precip Applied to Facility: 183.455
Total Evap From Facility: 35.058
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:

Outlet 1	**Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.599	0.000	0.000	0.000
0.0778	0.603	0.046	0.000	12.16
0.1556	0.607	0.093	0.000	12.24
0.2333	0.611	0.141	0.000	12.33
0.3111	0.615	0.189	0.000	12.41
0.3889	0.619	0.237	0.000	12.49
0.4667	0.623	0.285	0.000	12.58
0.5444	0.627	0.334	0.000	12.66
0.6222	0.632	0.383	0.000	12.74
0.7000	0.636	0.432	0.000	12.83
0.7778	0.640	0.482	0.000	12.91
0.8556	0.644	0.532	0.000	12.99

0.9333	0.648	0.582	0.000	13.08
1.0111	0.652	0.632	0.000	13.16
1.0889	0.657	0.683	0.000	13.25
1.1667	0.661	0.735	0.000	13.33
1.2444	0.665	0.786	0.000	13.42
1.3222	0.669	0.838	0.000	13.50
1.4000	0.674	0.890	0.000	13.59
1.4778	0.678	0.943	0.000	13.68
1.5556	0.682	0.996	0.000	13.76
1.6333	0.686	1.049	0.000	13.85
1.7111	0.691	1.103	0.000	13.93
1.7889	0.695	1.157	0.000	14.02
1.8667	0.699	1.211	0.000	14.11
1.9444	0.704	1.266	0.000	14.19
2.0222	0.708	1.321	0.000	14.28
2.1000	0.712	1.376	0.000	14.37
2.1778	0.717	1.431	0.000	14.46
2.2556	0.721	1.487	0.000	14.54
2.3333	0.725	1.544	0.000	14.63
2.4111	0.730	1.600	0.000	14.72
2.4889	0.734	1.657	0.000	14.81
2.5667	0.739	1.714	0.000	14.90
2.6444	0.743	1.772	0.000	14.99
2.7222	0.747	1.830	0.000	15.08
2.8000	0.752	1.888	0.000	15.17
2.8778	0.756	1.947	0.000	15.25
2.9556	0.761	2.006	0.000	15.34
3.0333	0.765	2.066	0.000	15.43
3.1111	0.770	2.125	0.000	15.52
3.1889	0.774	2.185	0.000	15.61
3.2667	0.779	2.246	0.000	15.70
3.3444	0.783	2.306	0.000	15.80
3.4222	0.788	2.368	0.000	15.89
3.5000	0.792	2.429	0.000	15.98
3.5778	0.797	2.491	0.000	16.07
3.6556	0.801	2.553	0.000	16.16
3.7333	0.806	2.616	0.000	16.25
3.8111	0.810	2.678	0.000	16.34
3.8889	0.815	2.742	0.000	16.44
3.9667	0.819	2.805	0.000	16.53
4.0444	0.824	2.869	0.000	16.62
4.1222	0.829	2.933	0.000	16.71
4.2000	0.833	2.998	0.000	16.81
4.2778	0.838	3.063	0.000	16.90
4.3556	0.842	3.129	0.000	16.99
4.4333	0.847	3.194	0.000	17.09
4.5111	0.852	3.260	0.000	17.18
4.5889	0.856	3.327	0.000	17.27
4.6667	0.861	3.394	0.000	17.37
4.7444	0.866	3.461	0.000	17.46
4.8222	0.870	3.528	0.000	17.56
4.9000	0.875	3.596	0.000	17.65
4.9778	0.880	3.665	0.000	17.75
5.0556	0.884	3.733	0.000	17.84
5.1333	0.889	3.802	0.000	17.94
5.2111	0.894	3.872	0.000	18.03
5.2889	0.899	3.941	0.000	18.13

5.3667	0.903	4.011	0.000	18.22
5.4444	0.908	4.082	0.000	18.32
5.5222	0.913	4.153	0.000	18.42
5.6000	0.918	4.224	0.000	18.51
5.6778	0.923	4.296	0.000	18.61
5.7556	0.927	4.368	0.000	18.71
5.8333	0.932	4.440	0.000	18.80
5.9111	0.937	4.513	0.000	18.90
5.9889	0.942	4.586	0.000	19.00
6.0667	0.947	4.659	0.182	19.10
6.1444	0.952	4.733	0.572	19.19
6.2222	0.956	4.807	1.046	19.29
6.3000	0.961	4.882	1.509	19.39
6.3778	0.966	4.957	1.879	19.49
6.4556	0.971	5.032	2.114	19.59
6.5333	0.976	5.108	2.300	19.69
6.6111	0.981	5.184	2.462	19.79
6.6889	0.986	5.261	2.614	19.89
6.7667	0.991	5.338	2.757	19.98
6.8444	0.996	5.415	2.894	20.08
6.9222	1.001	5.493	3.024	20.18
7.0000	1.006	5.571	3.149	20.28
7.0778	1.011	5.649	3.269	20.38

Name : Mine 3A
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**20.15**
A B, Lawn, Steep	**20.83**
C, Lawn, Flat	**20.15**
Pervious Total	**61.13**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**61.13**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 3A	Sand Filter 3A	

Name : Sand Filter 3A
Bottom Length: 130.00 ft.
Bottom Width: 65.00 ft.
Depth: 6 ft.
Side slope 1: 2.5 To 1

Side slope 2: 2.5 To 1
Side slope 3: 2.5 To 1
Side slope 4: 2.5 To 1
Filtration On
Hydraulic conductivity: 1
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 3780.34
Total Volume Through Riser (ac-ft.): 175.418
Total Volume Through Facility (ac-ft.): 3955.757
Percent Infiltrated: 95.57
Total Precip Applied to Facility: 65.187
Total Evap From Facility: 13.199
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 36 in.

Element Flows To:
Outlet 1 **Outlet 2**
Infiltration Pond 3A

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.194	0.000	0.000	0.000
0.0667	0.195	0.013	0.000	0.204
0.1333	0.197	0.026	0.000	0.213
0.2000	0.198	0.039	0.000	0.221
0.2667	0.200	0.052	0.000	0.230
0.3333	0.201	0.065	0.000	0.239
0.4000	0.203	0.079	0.000	0.247
0.4667	0.204	0.093	0.000	0.256
0.5333	0.206	0.106	0.000	0.265
0.6000	0.207	0.120	0.000	0.273
0.6667	0.209	0.134	0.000	0.282
0.7333	0.210	0.148	0.000	0.291
0.8000	0.212	0.162	0.000	0.299
0.8667	0.213	0.176	0.000	0.308
0.9333	0.215	0.191	0.000	0.317
1.0000	0.216	0.205	0.000	0.326
1.0667	0.218	0.219	0.000	0.334
1.1333	0.220	0.234	0.000	0.343
1.2000	0.221	0.249	0.000	0.352
1.2667	0.223	0.264	0.000	0.360
1.3333	0.224	0.279	0.000	0.369
1.4000	0.226	0.294	0.000	0.378
1.4667	0.228	0.309	0.000	0.386
1.5333	0.229	0.324	0.000	0.395
1.6000	0.231	0.339	0.000	0.404
1.6667	0.232	0.355	0.000	0.412
1.7333	0.234	0.370	0.000	0.421
1.8000	0.236	0.386	0.000	0.430
1.8667	0.237	0.402	0.000	0.439
1.9333	0.239	0.418	0.000	0.447
2.0000	0.241	0.434	0.000	0.456
2.0667	0.242	0.450	0.000	0.465

2.1333	0.244	0.466	0.000	0.473
2.2000	0.246	0.483	0.000	0.482
2.2667	0.247	0.499	0.000	0.491
2.3333	0.249	0.516	0.000	0.499
2.4000	0.251	0.532	0.000	0.508
2.4667	0.252	0.549	0.000	0.517
2.5333	0.254	0.566	0.000	0.526
2.6000	0.256	0.583	0.000	0.534
2.6667	0.257	0.600	0.000	0.543
2.7333	0.259	0.617	0.000	0.552
2.8000	0.261	0.635	0.000	0.560
2.8667	0.262	0.652	0.000	0.569
2.9333	0.264	0.670	0.000	0.578
3.0000	0.266	0.687	0.000	0.586
3.0667	0.268	0.705	0.000	0.595
3.1333	0.269	0.723	0.000	0.604
3.2000	0.271	0.741	0.000	0.612
3.2667	0.273	0.759	0.000	0.621
3.3333	0.275	0.778	0.000	0.630
3.4000	0.276	0.796	0.000	0.639
3.4667	0.278	0.815	0.000	0.647
3.5333	0.280	0.833	0.000	0.656
3.6000	0.282	0.852	0.000	0.665
3.6667	0.283	0.871	0.000	0.673
3.7333	0.285	0.890	0.000	0.682
3.8000	0.287	0.909	0.000	0.691
3.8667	0.289	0.928	0.000	0.699
3.9333	0.290	0.947	0.000	0.708
4.0000	0.292	0.967	0.000	0.717
4.0667	0.294	0.986	0.000	0.725
4.1333	0.296	1.006	0.000	0.734
4.2000	0.298	1.026	0.000	0.743
4.2667	0.299	1.046	0.000	0.752
4.3333	0.301	1.066	0.000	0.760
4.4000	0.303	1.086	0.000	0.769
4.4667	0.305	1.106	0.000	0.778
4.5333	0.307	1.127	0.193	0.786
4.6000	0.309	1.147	1.006	0.795
4.6667	0.310	1.168	2.162	0.804
4.7333	0.312	1.189	3.576	0.812
4.8000	0.314	1.210	5.199	0.821
4.8667	0.316	1.231	6.993	0.830
4.9333	0.318	1.252	8.926	0.838
5.0000	0.320	1.273	10.96	0.847
5.0667	0.322	1.295	13.07	0.856
5.1333	0.324	1.316	15.22	0.865
5.2000	0.325	1.338	17.38	0.873
5.2667	0.327	1.360	19.50	0.882
5.3333	0.329	1.381	21.56	0.891
5.4000	0.331	1.404	23.53	0.899
5.4667	0.333	1.426	25.37	0.908
5.5333	0.335	1.448	27.07	0.917
5.6000	0.337	1.470	28.59	0.925
5.6667	0.339	1.493	29.94	0.934
5.7333	0.341	1.516	31.11	0.943
5.8000	0.343	1.538	32.11	0.951
5.8667	0.345	1.561	32.95	0.960

5.9333	0.347	1.584	33.68	0.969
6.0000	0.348	1.608	34.34	0.978
6.0667	0.350	1.631	35.48	0.986

Name : Infiltration Pond 3A
Bottom Length: 250.00 ft.
Bottom Width: 75.00 ft.
Depth: 7 ft.
Volume at riser head: 3.4966 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 180.514
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 180.514
Percent Infiltrated: 100
Total Precip Applied to Facility: 5.297
Total Evap From Facility: 0.087
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.430	0.000	0.000	0.000
0.0778	0.433	0.033	0.000	8.750
0.1556	0.437	0.067	0.000	8.821
0.2333	0.440	0.101	0.000	8.892
0.3111	0.444	0.136	0.000	8.963
0.3889	0.448	0.170	0.000	9.034
0.4667	0.451	0.205	0.000	9.105
0.5444	0.455	0.241	0.000	9.177
0.6222	0.458	0.276	0.000	9.248
0.7000	0.462	0.312	0.000	9.320
0.7778	0.465	0.348	0.000	9.392
0.8556	0.469	0.384	0.000	9.465
0.9333	0.472	0.421	0.000	9.537
1.0111	0.476	0.458	0.000	9.610
1.0889	0.480	0.495	0.000	9.683
1.1667	0.483	0.533	0.000	9.756
1.2444	0.487	0.570	0.000	9.829
1.3222	0.491	0.608	0.000	9.903
1.4000	0.494	0.647	0.000	9.977
1.4778	0.498	0.685	0.000	10.05

1.5556	0.502	0.724	0.000	10.12
1.6333	0.505	0.764	0.000	10.20
1.7111	0.509	0.803	0.000	10.27
1.7889	0.513	0.843	0.000	10.34
1.8667	0.516	0.883	0.000	10.42
1.9444	0.520	0.923	0.000	10.49
2.0222	0.524	0.964	0.000	10.57
2.1000	0.528	1.005	0.000	10.65
2.1778	0.531	1.046	0.000	10.72
2.2556	0.535	1.087	0.000	10.80
2.3333	0.539	1.129	0.000	10.87
2.4111	0.543	1.171	0.000	10.95
2.4889	0.547	1.214	0.000	11.03
2.5667	0.550	1.256	0.000	11.10
2.6444	0.554	1.299	0.000	11.18
2.7222	0.558	1.343	0.000	11.26
2.8000	0.562	1.386	0.000	11.33
2.8778	0.566	1.430	0.000	11.41
2.9556	0.570	1.474	0.000	11.49
3.0333	0.573	1.519	0.000	11.57
3.1111	0.577	1.564	0.000	11.65
3.1889	0.581	1.609	0.000	11.72
3.2667	0.585	1.654	0.000	11.80
3.3444	0.589	1.700	0.000	11.88
3.4222	0.593	1.746	0.000	11.96
3.5000	0.597	1.792	0.000	12.04
3.5778	0.601	1.839	0.000	12.12
3.6556	0.605	1.886	0.000	12.20
3.7333	0.609	1.933	0.000	12.28
3.8111	0.613	1.980	0.000	12.36
3.8889	0.617	2.028	0.000	12.44
3.9667	0.621	2.076	0.000	12.52
4.0444	0.625	2.125	0.000	12.60
4.1222	0.629	2.174	0.000	12.68
4.2000	0.633	2.223	0.000	12.76
4.2778	0.637	2.272	0.000	12.84
4.3556	0.641	2.322	0.000	12.92
4.4333	0.645	2.372	0.000	13.01
4.5111	0.649	2.422	0.000	13.09
4.5889	0.653	2.473	0.000	13.17
4.6667	0.657	2.524	0.000	13.25
4.7444	0.661	2.575	0.000	13.33
4.8222	0.665	2.627	0.000	13.42
4.9000	0.669	2.679	0.000	13.50
4.9778	0.673	2.731	0.000	13.58
5.0556	0.677	2.783	0.000	13.67
5.1333	0.682	2.836	0.000	13.75
5.2111	0.686	2.889	0.000	13.83
5.2889	0.690	2.943	0.000	13.92
5.3667	0.694	2.997	0.000	14.00
5.4444	0.698	3.051	0.000	14.09
5.5222	0.702	3.106	0.000	14.17
5.6000	0.707	3.160	0.000	14.25
5.6778	0.711	3.215	0.000	14.34
5.7556	0.715	3.271	0.000	14.42
5.8333	0.719	3.327	0.000	14.51
5.9111	0.723	3.383	0.000	14.59

5.9889	0.728	3.439	0.000	14.68
6.0667	0.732	3.496	0.182	14.77
6.1444	0.736	3.553	0.572	14.85
6.2222	0.741	3.611	1.046	14.94
6.3000	0.745	3.669	1.509	15.03
6.3778	0.749	3.727	1.879	15.11
6.4556	0.753	3.785	2.114	15.20
6.5333	0.758	3.844	2.300	15.29
6.6111	0.762	3.903	2.462	15.37
6.6889	0.766	3.963	2.614	15.46
6.7667	0.771	4.022	2.757	15.55
6.8444	0.775	4.083	2.894	15.64
6.9222	0.779	4.143	3.024	15.72
7.0000	0.784	4.204	3.149	15.81
7.0778	0.788	4.265	3.269	15.90

Name : Mine 3B
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**23.64**
A B, Lawn, Steep	**13.33**
C, Lawn, Flat	**23.64**
Pervious Total	**60.61**

Impervious Land Use	**acre**
ROADS MOD	**3.31**
Impervious Total	**3.31**
Basin Total	**63.92**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 3B	Sand Filter 3B	

Name : Sand Filter 3B
Bottom Length: 150.00 ft.
Bottom Width: 75.00 ft.
Depth: 6 ft.
Side slope 1: 2.5 To 1
Side slope 2: 2.5 To 1
Side slope 3: 2.5 To 1
Side slope 4: 2.5 To 1
Filtration On
Hydraulic conductivity: 1
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 5269.066

Total Volume Through Riser (ac-ft.): 218.113
Total Volume Through Facility (ac-ft.): 5487.179
Percent Infiltrated: 96.03
Total Precip Applied to Facility: 87.217
Total Evap From Facility: 17.599
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 36 in.

Element Flows To:
Outlet 1 **Outlet 2**
Infiltration Pond 3B

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.258	0.000	0.000	0.000
0.0667	0.260	0.017	0.000	0.272
0.1333	0.261	0.034	0.000	0.283
0.2000	0.263	0.052	0.000	0.295
0.2667	0.265	0.069	0.000	0.306
0.3333	0.266	0.087	0.000	0.318
0.4000	0.268	0.105	0.000	0.329
0.4667	0.270	0.123	0.000	0.341
0.5333	0.272	0.141	0.000	0.353
0.6000	0.274	0.159	0.000	0.364
0.6667	0.275	0.178	0.000	0.376
0.7333	0.277	0.196	0.000	0.387
0.8000	0.279	0.215	0.000	0.399
0.8667	0.281	0.233	0.000	0.410
0.9333	0.282	0.252	0.000	0.422
1.0000	0.284	0.271	0.000	0.434
1.0667	0.286	0.290	0.000	0.445
1.1333	0.288	0.309	0.000	0.457
1.2000	0.290	0.328	0.000	0.468
1.2667	0.291	0.348	0.000	0.480
1.3333	0.293	0.367	0.000	0.491
1.4000	0.295	0.387	0.000	0.503
1.4667	0.297	0.407	0.000	0.515
1.5333	0.299	0.427	0.000	0.526
1.6000	0.301	0.447	0.000	0.538
1.6667	0.302	0.467	0.000	0.549
1.7333	0.304	0.487	0.000	0.561
1.8000	0.306	0.507	0.000	0.572
1.8667	0.308	0.528	0.000	0.584
1.9333	0.310	0.549	0.000	0.596
2.0000	0.312	0.569	0.000	0.607
2.0667	0.314	0.590	0.000	0.619
2.1333	0.316	0.611	0.000	0.630
2.2000	0.317	0.632	0.000	0.642
2.2667	0.319	0.654	0.000	0.653
2.3333	0.321	0.675	0.000	0.665
2.4000	0.323	0.696	0.000	0.677
2.4667	0.325	0.718	0.000	0.688
2.5333	0.327	0.740	0.000	0.700

2.6000	0.329	0.762	0.000	0.711
2.6667	0.331	0.784	0.000	0.723
2.7333	0.333	0.806	0.000	0.735
2.8000	0.335	0.828	0.000	0.746
2.8667	0.337	0.851	0.000	0.758
2.9333	0.339	0.873	0.000	0.769
3.0000	0.340	0.896	0.000	0.781
3.0667	0.342	0.919	0.000	0.792
3.1333	0.344	0.941	0.000	0.804
3.2000	0.346	0.964	0.000	0.816
3.2667	0.348	0.988	0.000	0.827
3.3333	0.350	1.011	0.000	0.839
3.4000	0.352	1.034	0.000	0.850
3.4667	0.354	1.058	0.000	0.862
3.5333	0.356	1.082	0.000	0.873
3.6000	0.358	1.106	0.000	0.885
3.6667	0.360	1.130	0.000	0.897
3.7333	0.362	1.154	0.000	0.908
3.8000	0.364	1.178	0.000	0.920
3.8667	0.366	1.202	0.000	0.931
3.9333	0.368	1.227	0.000	0.943
4.0000	0.370	1.251	0.000	0.954
4.0667	0.372	1.276	0.000	0.966
4.1333	0.374	1.301	0.000	0.978
4.2000	0.376	1.326	0.000	0.989
4.2667	0.378	1.351	0.000	1.001
4.3333	0.381	1.377	0.000	1.012
4.4000	0.383	1.402	0.000	1.024
4.4667	0.385	1.428	0.000	1.035
4.5333	0.387	1.454	0.193	1.047
4.6000	0.389	1.479	1.006	1.059
4.6667	0.391	1.505	2.162	1.070
4.7333	0.393	1.532	3.576	1.082
4.8000	0.395	1.558	5.199	1.093
4.8667	0.397	1.584	6.993	1.105
4.9333	0.399	1.611	8.926	1.116
5.0000	0.401	1.638	10.96	1.128
5.0667	0.403	1.664	13.07	1.140
5.1333	0.406	1.691	15.22	1.151
5.2000	0.408	1.719	17.38	1.163
5.2667	0.410	1.746	19.50	1.174
5.3333	0.412	1.773	21.56	1.186
5.4000	0.414	1.801	23.53	1.197
5.4667	0.416	1.829	25.37	1.209
5.5333	0.418	1.856	27.07	1.221
5.6000	0.420	1.884	28.59	1.232
5.6667	0.423	1.913	29.94	1.244
5.7333	0.425	1.941	31.11	1.255
5.8000	0.427	1.969	32.11	1.267
5.8667	0.429	1.998	32.95	1.278
5.9333	0.431	2.026	33.68	1.290
6.0000	0.433	2.055	34.34	1.302
6.0667	0.436	2.084	35.48	1.313

Name : Infiltration Pond 3B
Bottom Length: 275.00 ft.

Bottom Width: 100.00 ft.
Depth: 7 ft.
Volume at riser head: 4.8420 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 226.561
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 226.561
Percent Infiltrated: 100
Total Precip Applied to Facility: 8.578
Total Evap From Facility: 0.127
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.631	0.000	0.000	0.000
0.0778	0.635	0.049	0.000	12.81
0.1556	0.639	0.098	0.000	12.89
0.2333	0.643	0.148	0.000	12.97
0.3111	0.647	0.198	0.000	13.05
0.3889	0.651	0.249	0.000	13.13
0.4667	0.655	0.300	0.000	13.22
0.5444	0.659	0.351	0.000	13.30
0.6222	0.663	0.402	0.000	13.38
0.7000	0.667	0.454	0.000	13.46
0.7778	0.672	0.506	0.000	13.55
0.8556	0.676	0.559	0.000	13.63
0.9333	0.680	0.611	0.000	13.71
1.0111	0.684	0.665	0.000	13.80
1.0889	0.688	0.718	0.000	13.88
1.1667	0.692	0.772	0.000	13.96
1.2444	0.696	0.826	0.000	14.05
1.3222	0.701	0.880	0.000	14.13
1.4000	0.705	0.935	0.000	14.22
1.4778	0.709	0.990	0.000	14.30
1.5556	0.713	1.045	0.000	14.39
1.6333	0.717	1.101	0.000	14.47
1.7111	0.722	1.157	0.000	14.56
1.7889	0.726	1.213	0.000	14.64
1.8667	0.730	1.270	0.000	14.73
1.9444	0.734	1.327	0.000	14.82
2.0222	0.739	1.384	0.000	14.90

2.1000	0.743	1.442	0.000	14.99
2.1778	0.747	1.500	0.000	15.07
2.2556	0.752	1.558	0.000	15.16
2.3333	0.756	1.617	0.000	15.25
2.4111	0.760	1.676	0.000	15.34
2.4889	0.765	1.735	0.000	15.42
2.5667	0.769	1.795	0.000	15.51
2.6444	0.773	1.855	0.000	15.60
2.7222	0.778	1.915	0.000	15.69
2.8000	0.782	1.976	0.000	15.77
2.8778	0.786	2.037	0.000	15.86
2.9556	0.791	2.098	0.000	15.95
3.0333	0.795	2.160	0.000	16.04
3.1111	0.800	2.222	0.000	16.13
3.1889	0.804	2.284	0.000	16.22
3.2667	0.808	2.347	0.000	16.31
3.3444	0.813	2.410	0.000	16.40
3.4222	0.817	2.474	0.000	16.49
3.5000	0.822	2.537	0.000	16.58
3.5778	0.826	2.601	0.000	16.67
3.6556	0.831	2.666	0.000	16.76
3.7333	0.835	2.731	0.000	16.85
3.8111	0.840	2.796	0.000	16.94
3.8889	0.844	2.861	0.000	17.03
3.9667	0.849	2.927	0.000	17.12
4.0444	0.853	2.994	0.000	17.21
4.1222	0.858	3.060	0.000	17.30
4.2000	0.862	3.127	0.000	17.40
4.2778	0.867	3.194	0.000	17.49
4.3556	0.872	3.262	0.000	17.58
4.4333	0.876	3.330	0.000	17.67
4.5111	0.881	3.398	0.000	17.77
4.5889	0.885	3.467	0.000	17.86
4.6667	0.890	3.536	0.000	17.95
4.7444	0.895	3.606	0.000	18.04
4.8222	0.899	3.675	0.000	18.14
4.9000	0.904	3.745	0.000	18.23
4.9778	0.908	3.816	0.000	18.33
5.0556	0.913	3.887	0.000	18.42
5.1333	0.918	3.958	0.000	18.51
5.2111	0.922	4.030	0.000	18.61
5.2889	0.927	4.102	0.000	18.70
5.3667	0.932	4.174	0.000	18.80
5.4444	0.937	4.247	0.000	18.89
5.5222	0.941	4.320	0.000	18.99
5.6000	0.946	4.393	0.000	19.08
5.6778	0.951	4.467	0.000	19.18
5.7556	0.956	4.541	0.000	19.27
5.8333	0.960	4.616	0.000	19.37
5.9111	0.965	4.691	0.000	19.47
5.9889	0.970	4.766	0.000	19.56
6.0667	0.975	4.842	0.182	19.66
6.1444	0.979	4.918	0.572	19.76
6.2222	0.984	4.994	1.046	19.85
6.3000	0.989	5.071	1.509	19.95
6.3778	0.994	5.148	1.879	20.05
6.4556	0.999	5.225	2.114	20.15

6.5333	1.004	5.303	2.300	20.24
6.6111	1.008	5.382	2.462	20.34
6.6889	1.013	5.460	2.614	20.44
6.7667	1.018	5.539	2.757	20.54
6.8444	1.023	5.619	2.894	20.64
6.9222	1.028	5.699	3.024	20.74
7.0000	1.033	5.779	3.149	20.84
7.0778	1.038	5.859	3.269	20.93

Name : Mine 3C
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**23.6**
A B, Lawn, Steep	**9.94**
C, Lawn, Flat	**23.6**
Pervious Total	**57.14**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**57.14**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Infiltration Pond 3C	Infiltration Pond 3C	

Name : Infiltration Pond 3C
Bottom Length: 250.00 ft.
Bottom Width: 75.00 ft.
Depth: 7 ft.
Volume at riser head: 3.4966 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 4578.556
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 4578.556
Percent Infiltrated: 100
Total Precip Applied to Facility: 128.626
Total Evap From Facility: 25.237
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure

Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.430	0.000	0.000	0.000
0.0778	0.433	0.033	0.000	8.750
0.1556	0.437	0.067	0.000	8.821
0.2333	0.440	0.101	0.000	8.892
0.3111	0.444	0.136	0.000	8.963
0.3889	0.448	0.170	0.000	9.034
0.4667	0.451	0.205	0.000	9.105
0.5444	0.455	0.241	0.000	9.177
0.6222	0.458	0.276	0.000	9.248
0.7000	0.462	0.312	0.000	9.320
0.7778	0.465	0.348	0.000	9.392
0.8556	0.469	0.384	0.000	9.465
0.9333	0.472	0.421	0.000	9.537
1.0111	0.476	0.458	0.000	9.610
1.0889	0.480	0.495	0.000	9.683
1.1667	0.483	0.533	0.000	9.756
1.2444	0.487	0.570	0.000	9.829
1.3222	0.491	0.608	0.000	9.903
1.4000	0.494	0.647	0.000	9.977
1.4778	0.498	0.685	0.000	10.05
1.5556	0.502	0.724	0.000	10.12
1.6333	0.505	0.764	0.000	10.20
1.7111	0.509	0.803	0.000	10.27
1.7889	0.513	0.843	0.000	10.34
1.8667	0.516	0.883	0.000	10.42
1.9444	0.520	0.923	0.000	10.49
2.0222	0.524	0.964	0.000	10.57
2.1000	0.528	1.005	0.000	10.65
2.1778	0.531	1.046	0.000	10.72
2.2556	0.535	1.087	0.000	10.80
2.3333	0.539	1.129	0.000	10.87
2.4111	0.543	1.171	0.000	10.95
2.4889	0.547	1.214	0.000	11.03
2.5667	0.550	1.256	0.000	11.10
2.6444	0.554	1.299	0.000	11.18
2.7222	0.558	1.343	0.000	11.26
2.8000	0.562	1.386	0.000	11.33
2.8778	0.566	1.430	0.000	11.41
2.9556	0.570	1.474	0.000	11.49
3.0333	0.573	1.519	0.000	11.57
3.1111	0.577	1.564	0.000	11.65
3.1889	0.581	1.609	0.000	11.72
3.2667	0.585	1.654	0.000	11.80
3.3444	0.589	1.700	0.000	11.88
3.4222	0.593	1.746	0.000	11.96

3.5000	0.597	1.792	0.000	12.04
3.5778	0.601	1.839	0.000	12.12
3.6556	0.605	1.886	0.000	12.20
3.7333	0.609	1.933	0.000	12.28
3.8111	0.613	1.980	0.000	12.36
3.8889	0.617	2.028	0.000	12.44
3.9667	0.621	2.076	0.000	12.52
4.0444	0.625	2.125	0.000	12.60
4.1222	0.629	2.174	0.000	12.68
4.2000	0.633	2.223	0.000	12.76
4.2778	0.637	2.272	0.000	12.84
4.3556	0.641	2.322	0.000	12.92
4.4333	0.645	2.372	0.000	13.01
4.5111	0.649	2.422	0.000	13.09
4.5889	0.653	2.473	0.000	13.17
4.6667	0.657	2.524	0.000	13.25
4.7444	0.661	2.575	0.000	13.33
4.8222	0.665	2.627	0.000	13.42
4.9000	0.669	2.679	0.000	13.50
4.9778	0.673	2.731	0.000	13.58
5.0556	0.677	2.783	0.000	13.67
5.1333	0.682	2.836	0.000	13.75
5.2111	0.686	2.889	0.000	13.83
5.2889	0.690	2.943	0.000	13.92
5.3667	0.694	2.997	0.000	14.00
5.4444	0.698	3.051	0.000	14.09
5.5222	0.702	3.106	0.000	14.17
5.6000	0.707	3.160	0.000	14.25
5.6778	0.711	3.215	0.000	14.34
5.7556	0.715	3.271	0.000	14.42
5.8333	0.719	3.327	0.000	14.51
5.9111	0.723	3.383	0.000	14.59
5.9889	0.728	3.439	0.000	14.68
6.0667	0.732	3.496	0.182	14.77
6.1444	0.736	3.553	0.572	14.85
6.2222	0.741	3.611	1.046	14.94
6.3000	0.745	3.669	1.509	15.03
6.3778	0.749	3.727	1.879	15.11
6.4556	0.753	3.785	2.114	15.20
6.5333	0.758	3.844	2.300	15.29
6.6111	0.762	3.903	2.462	15.37
6.6889	0.766	3.963	2.614	15.46
6.7667	0.771	4.022	2.757	15.55
6.8444	0.775	4.083	2.894	15.64
6.9222	0.779	4.143	3.024	15.72
7.0000	0.784	4.204	3.149	15.81
7.0778	0.788	4.265	3.269	15.90

Name : Mine 4A
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	25.66
A B, Lawn, Steep	7.37

C, Lawn, Flat	25.66
Pervious Total	58.69

Impervious Land Use	acre
ROADS FLAT	3.18
ROADS MOD	0.26
Impervious Total	3.44
Basin Total	62.13

Element Flows To:

Surface	Interflow	Groundwater
Infiltration Pond 4A	Infiltration Pond 4A	

Name : Mine 4B
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	26.36
A B, Lawn, Steep	11.22
C, Lawn, Flat	26.36
Pervious Total	63.94

Impervious Land Use	acre
ROADS MOD	0.8
Impervious Total	0.8
Basin Total	64.74

Element Flows To:

Surface	Interflow	Groundwater
Infiltration Pond 4B	Infiltration Pond 4B	

Name : Mine 4C
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	11.33
A B, Lawn, Steep	14.31

C, Lawn, Flat	**11.33**
Pervious Total	**36.97**

Impervious Land Use	**acre**
ROADS MOD	**0.68**
Impervious Total	**0.68**
Basin Total	**37.65**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 4C	Sand Filter 4C	

Name : Infiltration Pond 4A
Bottom Length: 245.00 ft.
Bottom Width: 85.00 ft.
Depth: 7 ft.
Volume at riser head: 3.7983 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 5897.881
Total Volume Through Riser (ac-ft.): 0.01
Total Volume Through Facility (ac-ft.): 5897.891
Percent Infiltrated: 100
Total Precip Applied to Facility: 146.313
Total Evap From Facility: 28.976
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:

Outlet 1	**Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.478	0.000	0.000	0.000
0.0778	0.481	0.037	0.000	9.712
0.1556	0.485	0.074	0.000	9.784
0.2333	0.488	0.112	0.000	9.856
0.3111	0.492	0.150	0.000	9.928

0.3889	0.495	0.189	0.000	10.00
0.4667	0.499	0.228	0.000	10.07
0.5444	0.503	0.267	0.000	10.14
0.6222	0.506	0.306	0.000	10.21
0.7000	0.510	0.345	0.000	10.29
0.7778	0.513	0.385	0.000	10.36
0.8556	0.517	0.425	0.000	10.43
0.9333	0.521	0.466	0.000	10.51
1.0111	0.524	0.506	0.000	10.58
1.0889	0.528	0.547	0.000	10.65
1.1667	0.532	0.589	0.000	10.73
1.2444	0.535	0.630	0.000	10.80
1.3222	0.539	0.672	0.000	10.88
1.4000	0.543	0.714	0.000	10.95
1.4778	0.547	0.757	0.000	11.03
1.5556	0.550	0.799	0.000	11.10
1.6333	0.554	0.842	0.000	11.18
1.7111	0.558	0.886	0.000	11.25
1.7889	0.562	0.929	0.000	11.33
1.8667	0.565	0.973	0.000	11.41
1.9444	0.569	1.017	0.000	11.48
2.0222	0.573	1.062	0.000	11.56
2.1000	0.577	1.106	0.000	11.64
2.1778	0.581	1.151	0.000	11.71
2.2556	0.584	1.197	0.000	11.79
2.3333	0.588	1.242	0.000	11.87
2.4111	0.592	1.288	0.000	11.94
2.4889	0.596	1.334	0.000	12.02
2.5667	0.600	1.381	0.000	12.10
2.6444	0.604	1.428	0.000	12.18
2.7222	0.607	1.475	0.000	12.26
2.8000	0.611	1.522	0.000	12.33
2.8778	0.615	1.570	0.000	12.41
2.9556	0.619	1.618	0.000	12.49
3.0333	0.623	1.667	0.000	12.57
3.1111	0.627	1.715	0.000	12.65
3.1889	0.631	1.764	0.000	12.73
3.2667	0.635	1.813	0.000	12.81
3.3444	0.639	1.863	0.000	12.89
3.4222	0.643	1.913	0.000	12.97
3.5000	0.647	1.963	0.000	13.05
3.5778	0.651	2.014	0.000	13.13
3.6556	0.655	2.064	0.000	13.21
3.7333	0.659	2.115	0.000	13.29
3.8111	0.663	2.167	0.000	13.37
3.8889	0.667	2.219	0.000	13.45
3.9667	0.671	2.271	0.000	13.54
4.0444	0.675	2.323	0.000	13.62
4.1222	0.679	2.376	0.000	13.70
4.2000	0.683	2.429	0.000	13.78
4.2778	0.687	2.482	0.000	13.86
4.3556	0.691	2.536	0.000	13.95
4.4333	0.695	2.590	0.000	14.03
4.5111	0.699	2.644	0.000	14.11
4.5889	0.704	2.699	0.000	14.19
4.6667	0.708	2.754	0.000	14.28
4.7444	0.712	2.809	0.000	14.36

4.8222	0.716	2.864	0.000	14.44
4.9000	0.720	2.920	0.000	14.53
4.9778	0.724	2.976	0.000	14.61
5.0556	0.729	3.033	0.000	14.70
5.1333	0.733	3.090	0.000	14.78
5.2111	0.737	3.147	0.000	14.87
5.2889	0.741	3.205	0.000	14.95
5.3667	0.745	3.262	0.000	15.04
5.4444	0.750	3.321	0.000	15.12
5.5222	0.754	3.379	0.000	15.21
5.6000	0.758	3.438	0.000	15.29
5.6778	0.762	3.497	0.000	15.38
5.7556	0.767	3.557	0.000	15.46
5.8333	0.771	3.616	0.000	15.55
5.9111	0.775	3.677	0.000	15.64
5.9889	0.779	3.737	0.000	15.72
6.0667	0.784	3.798	0.182	15.81
6.1444	0.788	3.859	0.572	15.90
6.2222	0.792	3.921	1.046	15.99
6.3000	0.797	3.982	1.509	16.07
6.3778	0.801	4.045	1.879	16.16
6.4556	0.806	4.107	2.114	16.25
6.5333	0.810	4.170	2.300	16.34
6.6111	0.814	4.233	2.462	16.43
6.6889	0.819	4.297	2.614	16.51
6.7667	0.823	4.361	2.757	16.60
6.8444	0.827	4.425	2.894	16.69
6.9222	0.832	4.489	3.024	16.78
7.0000	0.836	4.554	3.149	16.87
7.0778	0.841	4.619	3.269	16.96

Name : Infiltration Pond 4B
Bottom Length: 275.00 ft.
Bottom Width: 75.00 ft.
Depth: 7 ft.
Volume at riser head: 3.8211 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 5335.089
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 5335.089
Percent Infiltrated: 100
Total Precip Applied to Facility: 143.496
Total Evap From Facility: 28.347
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.473	0.000	0.000	0.000
0.0778	0.477	0.037	0.000	9.624
0.1556	0.481	0.074	0.000	9.700
0.2333	0.484	0.111	0.000	9.776
0.3111	0.488	0.149	0.000	9.852
0.3889	0.492	0.187	0.000	9.929
0.4667	0.496	0.226	0.000	10.00
0.5444	0.500	0.265	0.000	10.08
0.6222	0.503	0.304	0.000	10.16
0.7000	0.507	0.343	0.000	10.23
0.7778	0.511	0.383	0.000	10.31
0.8556	0.515	0.422	0.000	10.39
0.9333	0.519	0.463	0.000	10.47
1.0111	0.523	0.503	0.000	10.54
1.0889	0.527	0.544	0.000	10.62
1.1667	0.530	0.585	0.000	10.70
1.2444	0.534	0.627	0.000	10.78
1.3222	0.538	0.668	0.000	10.86
1.4000	0.542	0.710	0.000	10.94
1.4778	0.546	0.753	0.000	11.02
1.5556	0.550	0.795	0.000	11.10
1.6333	0.554	0.838	0.000	11.18
1.7111	0.558	0.882	0.000	11.26
1.7889	0.562	0.925	0.000	11.34
1.8667	0.566	0.969	0.000	11.42
1.9444	0.570	1.013	0.000	11.50
2.0222	0.574	1.058	0.000	11.58
2.1000	0.578	1.103	0.000	11.66
2.1778	0.582	1.148	0.000	11.74
2.2556	0.586	1.193	0.000	11.82
2.3333	0.590	1.239	0.000	11.90
2.4111	0.594	1.285	0.000	11.99
2.4889	0.598	1.332	0.000	12.07
2.5667	0.602	1.378	0.000	12.15
2.6444	0.606	1.425	0.000	12.23
2.7222	0.610	1.473	0.000	12.31
2.8000	0.615	1.520	0.000	12.40
2.8778	0.619	1.568	0.000	12.48
2.9556	0.623	1.617	0.000	12.56
3.0333	0.627	1.665	0.000	12.65
3.1111	0.631	1.714	0.000	12.73
3.1889	0.635	1.763	0.000	12.81
3.2667	0.639	1.813	0.000	12.90
3.3444	0.644	1.863	0.000	12.98
3.4222	0.648	1.913	0.000	13.07
3.5000	0.652	1.964	0.000	13.15
3.5778	0.656	2.015	0.000	13.24
3.6556	0.660	2.066	0.000	13.32
3.7333	0.665	2.118	0.000	13.41
3.8111	0.669	2.169	0.000	13.49

3.8889	0.673	2.222	0.000	13.58
3.9667	0.677	2.274	0.000	13.66
4.0444	0.682	2.327	0.000	13.75
4.1222	0.686	2.380	0.000	13.84
4.2000	0.690	2.434	0.000	13.92
4.2778	0.694	2.488	0.000	14.01
4.3556	0.699	2.542	0.000	14.09
4.4333	0.703	2.596	0.000	14.18
4.5111	0.707	2.651	0.000	14.27
4.5889	0.712	2.707	0.000	14.36
4.6667	0.716	2.762	0.000	14.44
4.7444	0.720	2.818	0.000	14.53
4.8222	0.725	2.874	0.000	14.62
4.9000	0.729	2.931	0.000	14.71
4.9778	0.733	2.988	0.000	14.80
5.0556	0.738	3.045	0.000	14.89
5.1333	0.742	3.103	0.000	14.97
5.2111	0.747	3.160	0.000	15.06
5.2889	0.751	3.219	0.000	15.15
5.3667	0.756	3.277	0.000	15.24
5.4444	0.760	3.336	0.000	15.33
5.5222	0.764	3.396	0.000	15.42
5.6000	0.769	3.455	0.000	15.51
5.6778	0.773	3.515	0.000	15.60
5.7556	0.778	3.576	0.000	15.69
5.8333	0.782	3.636	0.000	15.78
5.9111	0.787	3.698	0.000	15.87
5.9889	0.791	3.759	0.000	15.96
6.0667	0.796	3.821	0.182	16.06
6.1444	0.800	3.883	0.572	16.15
6.2222	0.805	3.945	1.046	16.24
6.3000	0.810	4.008	1.509	16.33
6.3778	0.814	4.071	1.879	16.42
6.4556	0.819	4.135	2.114	16.51
6.5333	0.823	4.199	2.300	16.61
6.6111	0.828	4.263	2.462	16.70
6.6889	0.832	4.328	2.614	16.79
6.7667	0.837	4.393	2.757	16.89
6.8444	0.842	4.458	2.894	16.98
6.9222	0.846	4.524	3.024	17.07
7.0000	0.851	4.590	3.149	17.17
7.0778	0.856	4.656	3.269	17.26

Name : Sand Filter 4C
Bottom Length: 100.00 ft.
Bottom Width: 50.00 ft.
Depth: 6 ft.
Side slope 1: 2.5 To 1
Side slope 2: 2.5 To 1
Side slope 3: 2.5 To 1
Side slope 4: 2.5 To 1
Filtration On
Hydraulic conductivity: 1
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 2319.48
Total Volume Through Riser (ac-ft.): 112.637

Total Volume Through Facility (ac-ft.): 2432.117
Percent Infiltrated: 95.37
Total Precip Applied to Facility: 40.198
Total Evap From Facility: 7.919
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 36 in.

Element Flows To:
Outlet 1 **Outlet 2**
Infiltration Pond 4C

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.114	0.000	0.000	0.000
0.0667	0.115	0.007	0.000	0.120
0.1333	0.117	0.015	0.000	0.126
0.2000	0.118	0.023	0.000	0.131
0.2667	0.119	0.031	0.000	0.136
0.3333	0.120	0.039	0.000	0.141
0.4000	0.121	0.047	0.000	0.146
0.4667	0.122	0.055	0.000	0.151
0.5333	0.124	0.063	0.000	0.156
0.6000	0.125	0.072	0.000	0.162
0.6667	0.126	0.080	0.000	0.167
0.7333	0.127	0.088	0.000	0.172
0.8000	0.128	0.097	0.000	0.177
0.8667	0.130	0.106	0.000	0.182
0.9333	0.131	0.114	0.000	0.187
1.0000	0.132	0.123	0.000	0.192
1.0667	0.133	0.132	0.000	0.198
1.1333	0.135	0.141	0.000	0.203
1.2000	0.136	0.150	0.000	0.208
1.2667	0.137	0.159	0.000	0.213
1.3333	0.138	0.168	0.000	0.218
1.4000	0.140	0.178	0.000	0.223
1.4667	0.141	0.187	0.000	0.228
1.5333	0.142	0.196	0.000	0.234
1.6000	0.143	0.206	0.000	0.239
1.6667	0.145	0.216	0.000	0.244
1.7333	0.146	0.225	0.000	0.249
1.8000	0.147	0.235	0.000	0.254
1.8667	0.148	0.245	0.000	0.259
1.9333	0.150	0.255	0.000	0.264
2.0000	0.151	0.265	0.000	0.270
2.0667	0.152	0.275	0.000	0.275
2.1333	0.154	0.285	0.000	0.280
2.2000	0.155	0.296	0.000	0.285
2.2667	0.156	0.306	0.000	0.290
2.3333	0.158	0.317	0.000	0.295
2.4000	0.159	0.327	0.000	0.300
2.4667	0.160	0.338	0.000	0.306
2.5333	0.162	0.349	0.000	0.311
2.6000	0.163	0.360	0.000	0.316

2.6667	0.164	0.370	0.000	0.321
2.7333	0.166	0.382	0.000	0.326
2.8000	0.167	0.393	0.000	0.331
2.8667	0.168	0.404	0.000	0.336
2.9333	0.170	0.415	0.000	0.342
3.0000	0.171	0.427	0.000	0.347
3.0667	0.173	0.438	0.000	0.352
3.1333	0.174	0.450	0.000	0.357
3.2000	0.175	0.461	0.000	0.362
3.2667	0.177	0.473	0.000	0.367
3.3333	0.178	0.485	0.000	0.372
3.4000	0.180	0.497	0.000	0.378
3.4667	0.181	0.509	0.000	0.383
3.5333	0.182	0.521	0.000	0.388
3.6000	0.184	0.533	0.000	0.393
3.6667	0.185	0.546	0.000	0.398
3.7333	0.187	0.558	0.000	0.403
3.8000	0.188	0.571	0.000	0.409
3.8667	0.189	0.583	0.000	0.414
3.9333	0.191	0.596	0.000	0.419
4.0000	0.192	0.609	0.000	0.424
4.0667	0.194	0.622	0.000	0.429
4.1333	0.195	0.635	0.000	0.434
4.2000	0.197	0.648	0.000	0.439
4.2667	0.198	0.661	0.000	0.445
4.3333	0.200	0.674	0.000	0.450
4.4000	0.201	0.688	0.000	0.455
4.4667	0.203	0.701	0.000	0.460
4.5333	0.204	0.715	0.193	0.465
4.6000	0.206	0.728	1.006	0.470
4.6667	0.207	0.742	2.162	0.475
4.7333	0.209	0.756	3.576	0.481
4.8000	0.210	0.770	5.199	0.486
4.8667	0.212	0.784	6.993	0.491
4.9333	0.213	0.798	8.926	0.496
5.0000	0.215	0.813	10.96	0.501
5.0667	0.216	0.827	13.07	0.506
5.1333	0.218	0.842	15.22	0.511
5.2000	0.219	0.856	17.38	0.517
5.2667	0.221	0.871	19.50	0.522
5.3333	0.222	0.886	21.56	0.527
5.4000	0.224	0.901	23.53	0.532
5.4667	0.226	0.916	25.37	0.537
5.5333	0.227	0.931	27.07	0.542
5.6000	0.229	0.946	28.59	0.547
5.6667	0.230	0.961	29.94	0.553
5.7333	0.232	0.977	31.11	0.558
5.8000	0.234	0.992	32.11	0.563
5.8667	0.235	1.008	32.95	0.568
5.9333	0.237	1.024	33.68	0.573
6.0000	0.238	1.039	34.34	0.578
6.0667	0.240	1.055	35.48	0.583

Name : Infiltration Pond 4C
Bottom Length: 275.00 ft.
Bottom Width: 75.00 ft.

Depth: 7 ft.
Volume at riser head: 3.8211 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 118.579
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 118.579
Percent Infiltrated: 100
Total Precip Applied to Facility: 6.038
Total Evap From Facility: 0.093
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.473	0.000	0.000	0.000
0.0778	0.477	0.037	0.000	9.624
0.1556	0.481	0.074	0.000	9.700
0.2333	0.484	0.111	0.000	9.776
0.3111	0.488	0.149	0.000	9.852
0.3889	0.492	0.187	0.000	9.929
0.4667	0.496	0.226	0.000	10.00
0.5444	0.500	0.265	0.000	10.08
0.6222	0.503	0.304	0.000	10.16
0.7000	0.507	0.343	0.000	10.23
0.7778	0.511	0.383	0.000	10.31
0.8556	0.515	0.422	0.000	10.39
0.9333	0.519	0.463	0.000	10.47
1.0111	0.523	0.503	0.000	10.54
1.0889	0.527	0.544	0.000	10.62
1.1667	0.530	0.585	0.000	10.70
1.2444	0.534	0.627	0.000	10.78
1.3222	0.538	0.668	0.000	10.86
1.4000	0.542	0.710	0.000	10.94
1.4778	0.546	0.753	0.000	11.02
1.5556	0.550	0.795	0.000	11.10
1.6333	0.554	0.838	0.000	11.18
1.7111	0.558	0.882	0.000	11.26
1.7889	0.562	0.925	0.000	11.34
1.8667	0.566	0.969	0.000	11.42
1.9444	0.570	1.013	0.000	11.50
2.0222	0.574	1.058	0.000	11.58
2.1000	0.578	1.103	0.000	11.66

2.1778	0.582	1.148	0.000	11.74
2.2556	0.586	1.193	0.000	11.82
2.3333	0.590	1.239	0.000	11.90
2.4111	0.594	1.285	0.000	11.99
2.4889	0.598	1.332	0.000	12.07
2.5667	0.602	1.378	0.000	12.15
2.6444	0.606	1.425	0.000	12.23
2.7222	0.610	1.473	0.000	12.31
2.8000	0.615	1.520	0.000	12.40
2.8778	0.619	1.568	0.000	12.48
2.9556	0.623	1.617	0.000	12.56
3.0333	0.627	1.665	0.000	12.65
3.1111	0.631	1.714	0.000	12.73
3.1889	0.635	1.763	0.000	12.81
3.2667	0.639	1.813	0.000	12.90
3.3444	0.644	1.863	0.000	12.98
3.4222	0.648	1.913	0.000	13.07
3.5000	0.652	1.964	0.000	13.15
3.5778	0.656	2.015	0.000	13.24
3.6556	0.660	2.066	0.000	13.32
3.7333	0.665	2.118	0.000	13.41
3.8111	0.669	2.169	0.000	13.49
3.8889	0.673	2.222	0.000	13.58
3.9667	0.677	2.274	0.000	13.66
4.0444	0.682	2.327	0.000	13.75
4.1222	0.686	2.380	0.000	13.84
4.2000	0.690	2.434	0.000	13.92
4.2778	0.694	2.488	0.000	14.01
4.3556	0.699	2.542	0.000	14.09
4.4333	0.703	2.596	0.000	14.18
4.5111	0.707	2.651	0.000	14.27
4.5889	0.712	2.707	0.000	14.36
4.6667	0.716	2.762	0.000	14.44
4.7444	0.720	2.818	0.000	14.53
4.8222	0.725	2.874	0.000	14.62
4.9000	0.729	2.931	0.000	14.71
4.9778	0.733	2.988	0.000	14.80
5.0556	0.738	3.045	0.000	14.89
5.1333	0.742	3.103	0.000	14.97
5.2111	0.747	3.160	0.000	15.06
5.2889	0.751	3.219	0.000	15.15
5.3667	0.756	3.277	0.000	15.24
5.4444	0.760	3.336	0.000	15.33
5.5222	0.764	3.396	0.000	15.42
5.6000	0.769	3.455	0.000	15.51
5.6778	0.773	3.515	0.000	15.60
5.7556	0.778	3.576	0.000	15.69
5.8333	0.782	3.636	0.000	15.78
5.9111	0.787	3.698	0.000	15.87
5.9889	0.791	3.759	0.000	15.96
6.0667	0.796	3.821	0.182	16.06
6.1444	0.800	3.883	0.572	16.15
6.2222	0.805	3.945	1.046	16.24
6.3000	0.810	4.008	1.509	16.33
6.3778	0.814	4.071	1.879	16.42
6.4556	0.819	4.135	2.114	16.51
6.5333	0.823	4.199	2.300	16.61

6.6111	0.828	4.263	2.462	16.70
6.6889	0.832	4.328	2.614	16.79
6.7667	0.837	4.393	2.757	16.89
6.8444	0.842	4.458	2.894	16.98
6.9222	0.846	4.524	3.024	17.07
7.0000	0.851	4.590	3.149	17.17
7.0778	0.856	4.656	3.269	17.26

Name : Mine 5
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**3.39**
A B, Lawn, Steep	**13.72**
C, Lawn, Flat	**3.39**
Pervious Total	**20.5**

Impervious Land Use	**acre**
ROADS MOD	**0.5**
Impervious Total	**0.5**
Basin Total	**21**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Infiltration Pond 5	Infiltration Pond 5	

Name : Infiltration Pond 5
Bottom Length: 250.00 ft.
Bottom Width: 75.00 ft.
Depth: 7 ft.
Volume at riser head: 3.4966 acre-feet.
Infiltration On
Infiltration rate: 20
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 969.14
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 969.14
Percent Infiltrated: 100
Total Precip Applied to Facility: 125.965
Total Evap From Facility: 19.623
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure

Riser Height: 6 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.430	0.000	0.000	0.000
0.0778	0.433	0.033	0.000	8.750
0.1556	0.437	0.067	0.000	8.821
0.2333	0.440	0.101	0.000	8.892
0.3111	0.444	0.136	0.000	8.963
0.3889	0.448	0.170	0.000	9.034
0.4667	0.451	0.205	0.000	9.105
0.5444	0.455	0.241	0.000	9.177
0.6222	0.458	0.276	0.000	9.248
0.7000	0.462	0.312	0.000	9.320
0.7778	0.465	0.348	0.000	9.392
0.8556	0.469	0.384	0.000	9.465
0.9333	0.472	0.421	0.000	9.537
1.0111	0.476	0.458	0.000	9.610
1.0889	0.480	0.495	0.000	9.683
1.1667	0.483	0.533	0.000	9.756
1.2444	0.487	0.570	0.000	9.829
1.3222	0.491	0.608	0.000	9.903
1.4000	0.494	0.647	0.000	9.977
1.4778	0.498	0.685	0.000	10.05
1.5556	0.502	0.724	0.000	10.12
1.6333	0.505	0.764	0.000	10.20
1.7111	0.509	0.803	0.000	10.27
1.7889	0.513	0.843	0.000	10.34
1.8667	0.516	0.883	0.000	10.42
1.9444	0.520	0.923	0.000	10.49
2.0222	0.524	0.964	0.000	10.57
2.1000	0.528	1.005	0.000	10.65
2.1778	0.531	1.046	0.000	10.72
2.2556	0.535	1.087	0.000	10.80
2.3333	0.539	1.129	0.000	10.87
2.4111	0.543	1.171	0.000	10.95
2.4889	0.547	1.214	0.000	11.03
2.5667	0.550	1.256	0.000	11.10
2.6444	0.554	1.299	0.000	11.18
2.7222	0.558	1.343	0.000	11.26
2.8000	0.562	1.386	0.000	11.33
2.8778	0.566	1.430	0.000	11.41
2.9556	0.570	1.474	0.000	11.49
3.0333	0.573	1.519	0.000	11.57
3.1111	0.577	1.564	0.000	11.65
3.1889	0.581	1.609	0.000	11.72
3.2667	0.585	1.654	0.000	11.80
3.3444	0.589	1.700	0.000	11.88
3.4222	0.593	1.746	0.000	11.96

3.5000	0.597	1.792	0.000	12.04
3.5778	0.601	1.839	0.000	12.12
3.6556	0.605	1.886	0.000	12.20
3.7333	0.609	1.933	0.000	12.28
3.8111	0.613	1.980	0.000	12.36
3.8889	0.617	2.028	0.000	12.44
3.9667	0.621	2.076	0.000	12.52
4.0444	0.625	2.125	0.000	12.60
4.1222	0.629	2.174	0.000	12.68
4.2000	0.633	2.223	0.000	12.76
4.2778	0.637	2.272	0.000	12.84
4.3556	0.641	2.322	0.000	12.92
4.4333	0.645	2.372	0.000	13.01
4.5111	0.649	2.422	0.000	13.09
4.5889	0.653	2.473	0.000	13.17
4.6667	0.657	2.524	0.000	13.25
4.7444	0.661	2.575	0.000	13.33
4.8222	0.665	2.627	0.000	13.42
4.9000	0.669	2.679	0.000	13.50
4.9778	0.673	2.731	0.000	13.58
5.0556	0.677	2.783	0.000	13.67
5.1333	0.682	2.836	0.000	13.75
5.2111	0.686	2.889	0.000	13.83
5.2889	0.690	2.943	0.000	13.92
5.3667	0.694	2.997	0.000	14.00
5.4444	0.698	3.051	0.000	14.09
5.5222	0.702	3.106	0.000	14.17
5.6000	0.707	3.160	0.000	14.25
5.6778	0.711	3.215	0.000	14.34
5.7556	0.715	3.271	0.000	14.42
5.8333	0.719	3.327	0.000	14.51
5.9111	0.723	3.383	0.000	14.59
5.9889	0.728	3.439	0.000	14.68
6.0667	0.732	3.496	0.182	14.77
6.1444	0.736	3.553	0.572	14.85
6.2222	0.741	3.611	1.046	14.94
6.3000	0.745	3.669	1.509	15.03
6.3778	0.749	3.727	1.879	15.11
6.4556	0.753	3.785	2.114	15.20
6.5333	0.758	3.844	2.300	15.29
6.6111	0.762	3.903	2.462	15.37
6.6889	0.766	3.963	2.614	15.46
6.7667	0.771	4.022	2.757	15.55
6.8444	0.775	4.083	2.894	15.64
6.9222	0.779	4.143	3.024	15.72
7.0000	0.784	4.204	3.149	15.81
7.0778	0.788	4.265	3.269	15.90

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:12.31
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:12.31
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.225285
5 year	0.702292
10 year	1.256245
25 year	2.313306
50 year	3.413919
100 year	4.828049

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.411	0.000
1950	1.586	0.000
1951	0.547	0.000
1952	0.186	0.000
1953	0.153	0.000
1954	0.334	0.000
1955	0.156	0.000
1956	0.157	0.000
1957	0.283	0.000
1958	0.082	0.000
1959	0.161	0.000
1960	0.140	0.000
1961	0.315	0.000
1962	0.010	0.000
1963	0.691	0.000
1964	0.703	0.000
1965	0.078	0.000
1966	0.028	0.000
1967	0.335	0.000
1968	0.095	0.000
1969	0.168	0.000
1970	0.345	0.000
1971	0.324	0.000
1972	0.370	0.000
1973	0.092	0.000

1974	0.204	0.000
1975	0.262	0.000
1976	0.128	0.000
1977	0.010	0.000
1978	0.177	0.000
1979	0.040	0.000
1980	0.155	0.000
1981	0.564	0.000
1982	0.088	0.000
1983	0.499	0.000
1984	1.670	0.000
1985	0.048	0.000
1986	0.270	0.000
1987	0.464	0.000
1988	0.078	0.000
1989	0.179	0.000
1990	0.761	0.000
1991	2.602	0.000
1992	0.059	0.000
1993	0.087	0.000
1994	0.025	0.000
1995	0.089	0.000
1996	1.536	0.000
1997	2.382	0.000
1998	0.037	0.000
1999	2.735	0.000
2000	0.067	0.000
2001	0.010	0.000
2002	0.409	0.000
2003	0.374	0.000
2004	0.500	0.000
2005	0.175	0.000
2006	0.338	0.000
2007	4.615	0.000
2008	1.941	0.000
2009	0.488	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	4.6153	0.0000
2	2.7348	0.0000
3	2.6017	0.0000
4	2.3820	0.0000
5	1.9415	0.0000
6	1.6698	0.0000
7	1.5862	0.0000
8	1.5360	0.0000
9	0.7613	0.0000
10	0.7034	0.0000
11	0.6905	0.0000
12	0.5643	0.0000
13	0.5467	0.0000
14	0.4997	0.0000
15	0.4989	0.0000
16	0.4877	0.0000

17	0.4644	0.0000
18	0.4106	0.0000
19	0.4092	0.0000
20	0.3738	0.0000
21	0.3699	0.0000
22	0.3448	0.0000
23	0.3385	0.0000
24	0.3355	0.0000
25	0.3345	0.0000
26	0.3245	0.0000
27	0.3152	0.0000
28	0.2834	0.0000
29	0.2704	0.0000
30	0.2616	0.0000
31	0.2035	0.0000
32	0.1860	0.0000
33	0.1786	0.0000
34	0.1771	0.0000
35	0.1753	0.0000
36	0.1676	0.0000
37	0.1611	0.0000
38	0.1575	0.0000
39	0.1558	0.0000
40	0.1550	0.0000
41	0.1532	0.0000
42	0.1399	0.0000
43	0.1285	0.0000
44	0.0949	0.0000
45	0.0919	0.0000
46	0.0888	0.0000
47	0.0883	0.0000
48	0.0865	0.0000
49	0.0816	0.0000
50	0.0784	0.0000
51	0.0777	0.0000
52	0.0666	0.0000
53	0.0586	0.0000
54	0.0485	0.0000
55	0.0399	0.0000
56	0.0367	0.0000
57	0.0284	0.0000
58	0.0252	0.0000
59	0.0099	0.0000
60	0.0098	0.0000
61	0.0098	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1126	306	0	0	Pass
0.1460	221	0	0	Pass
0.1793	158	0	0	Pass

0.2127	133	0	0	Pass
0.2460	108	0	0	Pass
0.2794	92	0	0	Pass
0.3127	81	0	0	Pass
0.3461	63	0	0	Pass
0.3794	56	0	0	Pass
0.4128	52	0	0	Pass
0.4461	45	0	0	Pass
0.4795	43	0	0	Pass
0.5128	36	0	0	Pass
0.5461	34	0	0	Pass
0.5795	32	0	0	Pass
0.6128	32	0	0	Pass
0.6462	31	0	0	Pass
0.6795	28	0	0	Pass
0.7129	26	0	0	Pass
0.7462	26	0	0	Pass
0.7796	23	0	0	Pass
0.8129	22	0	0	Pass
0.8463	21	0	0	Pass
0.8796	19	0	0	Pass
0.9130	18	0	0	Pass
0.9463	18	0	0	Pass
0.9796	17	0	0	Pass
1.0130	17	0	0	Pass
1.0463	17	0	0	Pass
1.0797	17	0	0	Pass
1.1130	14	0	0	Pass
1.1464	14	0	0	Pass
1.1797	14	0	0	Pass
1.2131	14	0	0	Pass
1.2464	14	0	0	Pass
1.2798	13	0	0	Pass
1.3131	12	0	0	Pass
1.3465	12	0	0	Pass
1.3798	12	0	0	Pass
1.4131	12	0	0	Pass
1.4465	12	0	0	Pass
1.4798	12	0	0	Pass
1.5132	12	0	0	Pass
1.5465	11	0	0	Pass
1.5799	10	0	0	Pass
1.6132	9	0	0	Pass
1.6466	9	0	0	Pass
1.6799	8	0	0	Pass
1.7133	8	0	0	Pass
1.7466	8	0	0	Pass
1.7800	8	0	0	Pass
1.8133	8	0	0	Pass
1.8466	8	0	0	Pass
1.8800	8	0	0	Pass
1.9133	8	0	0	Pass
1.9467	7	0	0	Pass
1.9800	6	0	0	Pass
2.0134	6	0	0	Pass
2.0467	6	0	0	Pass
2.0801	6	0	0	Pass

2.1134	5	0	0	Pass
2.1468	5	0	0	Pass
2.1801	5	0	0	Pass
2.2135	5	0	0	Pass
2.2468	5	0	0	Pass
2.2801	5	0	0	Pass
2.3135	5	0	0	Pass
2.3468	5	0	0	Pass
2.3802	5	0	0	Pass
2.4135	4	0	0	Pass
2.4469	4	0	0	Pass
2.4802	4	0	0	Pass
2.5136	4	0	0	Pass
2.5469	4	0	0	Pass
2.5803	4	0	0	Pass
2.6136	3	0	0	Pass
2.6470	3	0	0	Pass
2.6803	3	0	0	Pass
2.7136	3	0	0	Pass
2.7470	2	0	0	Pass
2.7803	2	0	0	Pass
2.8137	2	0	0	Pass
2.8470	2	0	0	Pass
2.8804	2	0	0	Pass
2.9137	2	0	0	Pass
2.9471	2	0	0	Pass
2.9804	2	0	0	Pass
3.0138	2	0	0	Pass
3.0471	2	0	0	Pass
3.0805	2	0	0	Pass
3.1138	2	0	0	Pass
3.1471	2	0	0	Pass
3.1805	2	0	0	Pass
3.2138	2	0	0	Pass
3.2472	2	0	0	Pass
3.2805	2	0	0	Pass
3.3139	2	0	0	Pass
3.3472	2	0	0	Pass
3.3806	2	0	0	Pass
3.4139	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent	Volume Comment	Infiltration Volume	Cumulative Volume
	Treatment?	Needs Treatment	Through Facility	(ac-ft.)	Infiltration

		Infiltrated	Treated (ac-ft)	(ac-ft)		Credit	
Infiltration Pond 1A POC		N	17.24			N	100.00
Sand Filter 1A		N	398.70			N	0.00
Total Volume Infiltrated			415.94	0.00	0.00		4.14
0.00	0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:99.01
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:95.88
Total Impervious Area:3.13

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	1.428004
5 year	4.501669
10 year	8.203968
25 year	15.558966
50 year	23.525462
100 year	34.123111

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1949	2.613	0.000
1950	11.246	0.000
1951	3.495	0.000
1952	1.181	0.000
1953	0.973	0.000
1954	2.132	0.000
1955	0.989	0.000
1956	0.994	0.000
1957	1.727	0.000
1958	0.517	0.000

1959	1.021	0.000
1960	0.887	0.000
1961	2.008	0.000
1962	0.079	0.000
1963	4.398	0.000
1964	4.503	0.000
1965	0.492	0.000
1966	0.179	0.000
1967	2.208	0.000
1968	0.601	0.000
1969	1.065	0.000
1970	2.198	0.000
1971	2.067	0.000
1972	2.356	0.000
1973	0.582	0.000
1974	1.294	0.000
1975	1.665	0.000
1976	0.813	0.000
1977	0.080	0.000
1978	1.125	0.000
1979	0.252	0.000
1980	0.984	0.000
1981	3.587	0.000
1982	0.559	0.000
1983	3.184	0.000
1984	10.748	0.000
1985	0.299	0.000
1986	1.721	0.000
1987	2.964	0.000
1988	0.497	0.000
1989	1.098	0.000
1990	4.856	0.000
1991	16.869	0.000
1992	0.370	0.000
1993	0.548	0.000
1994	0.159	0.000
1995	0.562	0.000
1996	10.874	0.000
1997	15.469	0.000
1998	0.232	0.000
1999	19.630	0.000
2000	0.420	0.000
2001	0.079	0.000
2002	2.610	0.000
2003	2.383	0.000
2004	3.262	0.000
2005	1.117	0.000
2006	2.232	0.000
2007	33.646	0.000
2008	12.611	0.000
2009	3.120	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	**Predeveloped**	**Mitigated**
1	33.6462	0.0000

2	19.6302	0.0000
3	16.8687	0.0000
4	15.4692	0.0000
5	12.6106	0.0000
6	11.2462	0.0000
7	10.8743	0.0000
8	10.7475	0.0000
9	4.8565	0.0000
10	4.5030	0.0000
11	4.3977	0.0000
12	3.5873	0.0000
13	3.4945	0.0000
14	3.2620	0.0000
15	3.1837	0.0000
16	3.1205	0.0000
17	2.9640	0.0000
18	2.6125	0.0000
19	2.6102	0.0000
20	2.3829	0.0000
21	2.3564	0.0000
22	2.2320	0.0000
23	2.2084	0.0000
24	2.1980	0.0000
25	2.1317	0.0000
26	2.0672	0.0000
27	2.0077	0.0000
28	1.7272	0.0000
29	1.7211	0.0000
30	1.6647	0.0000
31	1.2936	0.0000
32	1.1808	0.0000
33	1.1249	0.0000
34	1.1172	0.0000
35	1.0982	0.0000
36	1.0647	0.0000
37	1.0212	0.0000
38	0.9935	0.0000
39	0.9894	0.0000
40	0.9842	0.0000
41	0.9730	0.0000
42	0.8874	0.0000
43	0.8133	0.0000
44	0.6010	0.0000
45	0.5823	0.0000
46	0.5625	0.0000
47	0.5594	0.0000
48	0.5484	0.0000
49	0.5168	0.0000
50	0.4968	0.0000
51	0.4921	0.0000
52	0.4202	0.0000
53	0.3704	0.0000
54	0.2988	0.0000
55	0.2519	0.0000
56	0.2318	0.0000
57	0.1791	0.0000
58	0.1588	0.0000

59	0.0798	0.0000
60	0.0790	0.0000
61	0.0789	0.0000

Stream Protection Duration
POC #2
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.7140	303	0	0	Pass
0.9444	218	0	0	Pass
1.1748	155	0	0	Pass
1.4053	135	0	0	Pass
1.6357	106	0	0	Pass
1.8661	89	0	0	Pass
2.0965	75	0	0	Pass
2.3269	62	0	0	Pass
2.5574	56	0	0	Pass
2.7878	50	0	0	Pass
3.0182	46	0	0	Pass
3.2486	39	0	0	Pass
3.4790	37	0	0	Pass
3.7094	34	0	0	Pass
3.9399	33	0	0	Pass
4.1703	30	0	0	Pass
4.4007	28	0	0	Pass
4.6311	27	0	0	Pass
4.8615	25	0	0	Pass
5.0920	23	0	0	Pass
5.3224	21	0	0	Pass
5.5528	21	0	0	Pass
5.7832	19	0	0	Pass
6.0136	19	0	0	Pass
6.2441	19	0	0	Pass
6.4745	19	0	0	Pass
6.7049	19	0	0	Pass
6.9353	18	0	0	Pass
7.1657	15	0	0	Pass
7.3961	15	0	0	Pass
7.6266	15	0	0	Pass
7.8570	15	0	0	Pass
8.0874	14	0	0	Pass
8.3178	12	0	0	Pass
8.5482	12	0	0	Pass
8.7787	12	0	0	Pass
9.0091	12	0	0	Pass
9.2395	12	0	0	Pass
9.4699	12	0	0	Pass
9.7003	12	0	0	Pass
9.9308	12	0	0	Pass
10.1612	12	0	0	Pass
10.3916	12	0	0	Pass
10.6220	11	0	0	Pass
10.8524	10	0	0	Pass

11.0828	9	0	0	Pass
11.3133	8	0	0	Pass
11.5437	8	0	0	Pass
11.7741	8	0	0	Pass
12.0045	8	0	0	Pass
12.2349	8	0	0	Pass
12.4654	8	0	0	Pass
12.6958	7	0	0	Pass
12.9262	6	0	0	Pass
13.1566	6	0	0	Pass
13.3870	6	0	0	Pass
13.6175	5	0	0	Pass
13.8479	5	0	0	Pass
14.0783	5	0	0	Pass
14.3087	5	0	0	Pass
14.5391	5	0	0	Pass
14.7695	5	0	0	Pass
15.0000	5	0	0	Pass
15.2304	5	0	0	Pass
15.4608	5	0	0	Pass
15.6912	4	0	0	Pass
15.9216	4	0	0	Pass
16.1521	4	0	0	Pass
16.3825	4	0	0	Pass
16.6129	4	0	0	Pass
16.8433	4	0	0	Pass
17.0737	3	0	0	Pass
17.3042	3	0	0	Pass
17.5346	3	0	0	Pass
17.7650	3	0	0	Pass
17.9954	3	0	0	Pass
18.2258	3	0	0	Pass
18.4562	3	0	0	Pass
18.6867	3	0	0	Pass
18.9171	3	0	0	Pass
19.1475	3	0	0	Pass
19.3779	3	0	0	Pass
19.6083	3	0	0	Pass
19.8388	2	0	0	Pass
20.0692	2	0	0	Pass
20.2996	2	0	0	Pass
20.5300	2	0	0	Pass
20.7604	2	0	0	Pass
20.9909	2	0	0	Pass
21.2213	2	0	0	Pass
21.4517	2	0	0	Pass
21.6821	2	0	0	Pass
21.9125	2	0	0	Pass
22.1429	2	0	0	Pass
22.3734	2	0	0	Pass
22.6038	2	0	0	Pass
22.8342	2	0	0	Pass
23.0646	2	0	0	Pass
23.2950	2	0	0	Pass
23.5255	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment? Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment Water Quality Treated
Infiltration Pond 1B POC	N	6644.53			N	100.00	
Total Volume Infiltrated		6644.53	0.00	0.00		100.00	0.00
						0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #3
Total Pervious Area:81.6
Total Impervious Area:0

Mitigated Landuse Totals for POC #3
Total Pervious Area:74.24
Total Impervious Area:7.36

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	Flow(cfs)
2 year	1.06596
5 year	3.407703
10 year	6.33743
25 year	12.402907
50 year	19.242256
100 year	28.668783

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #3

Year	Predeveloped	Mitigated
1949	1.981	0.000
1950	8.864	0.000
1951	2.654	0.000
1952	0.895	0.000
1953	0.737	0.000
1954	1.618	0.000
1955	0.750	0.000
1956	0.751	0.000
1957	1.287	0.000
1958	0.391	0.000
1959	0.773	0.000
1960	0.672	0.000
1961	1.523	0.000
1962	0.065	0.000
1963	3.336	0.000
1964	3.422	0.000
1965	0.373	0.000
1966	0.135	0.000
1967	1.709	0.000
1968	0.455	0.000
1969	0.807	0.000
1970	1.668	0.000
1971	1.568	0.000
1972	1.788	0.000
1973	0.441	0.000
1974	0.981	0.000
1975	1.263	0.000
1976	0.616	0.000
1977	0.066	0.000
1978	0.853	0.000
1979	0.190	0.000
1980	0.746	0.000
1981	2.719	0.000
1982	0.424	0.000
1983	2.417	0.000
1984	8.179	0.000
1985	0.224	0.000
1986	1.305	0.000
1987	2.250	0.000
1988	0.376	0.000
1989	0.822	0.000
1990	3.686	0.000
1991	12.867	0.000
1992	0.280	0.000
1993	0.415	0.000
1994	0.120	0.000
1995	0.426	0.000
1996	8.559	0.000
1997	11.812	0.000
1998	0.175	0.000
1999	15.528	0.000
2000	0.318	0.000
2001	0.065	0.000
2002	1.981	0.000

2003	1.808	0.000
2004	2.490	0.000
2005	0.848	0.000
2006	1.727	0.000
2007	26.735	0.000
2008	9.631	2.542
2009	2.371	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #3

Rank	Predeveloped	Mitigated
1	26.7350	2.5423
2	15.5282	0.0000
3	12.8668	0.0000
4	11.8118	0.0000
5	9.6310	0.0000
6	8.8637	0.0000
7	8.5587	0.0000
8	8.1787	0.0000
9	3.6857	0.0000
10	3.4222	0.0000
11	3.3356	0.0000
12	2.7194	0.0000
13	2.6544	0.0000
14	2.4898	0.0000
15	2.4169	0.0000
16	2.3711	0.0000
17	2.2503	0.0000
18	1.9814	0.0000
19	1.9812	0.0000
20	1.8084	0.0000
21	1.7879	0.0000
22	1.7268	0.0000
23	1.7086	0.0000
24	1.6680	0.0000
25	1.6176	0.0000
26	1.5685	0.0000
27	1.5232	0.0000
28	1.3054	0.0000
29	1.2870	0.0000
30	1.2627	0.0000
31	0.9807	0.0000
32	0.8949	0.0000
33	0.8525	0.0000
34	0.8478	0.0000
35	0.8225	0.0000
36	0.8070	0.0000
37	0.7735	0.0000
38	0.7513	0.0000
39	0.7498	0.0000
40	0.7459	0.0000
41	0.7373	0.0000
42	0.6723	0.0000
43	0.6157	0.0000
44	0.4551	0.0000
45	0.4410	0.0000

46	0.4259	0.0000
47	0.4236	0.0000
48	0.4154	0.0000
49	0.3912	0.0000
50	0.3762	0.0000
51	0.3726	0.0000
52	0.3178	0.0000
53	0.2804	0.0000
54	0.2240	0.0000
55	0.1905	0.0000
56	0.1753	0.0000
57	0.1354	0.0000
58	0.1201	0.0000
59	0.0658	0.0000
60	0.0651	0.0000
61	0.0651	0.0000

Stream Protection Duration
POC #3
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5330	312	10	3	Pass
0.7220	216	9	4	Pass
0.9109	153	9	5	Pass
1.0999	128	9	7	Pass
1.2889	100	7	7	Pass
1.4779	87	7	8	Pass
1.6669	71	5	7	Pass
1.8559	58	4	6	Pass
2.0448	52	3	5	Pass
2.2338	48	3	6	Pass
2.4228	40	2	5	Pass
2.6118	38	0	0	Pass
2.8008	35	0	0	Pass
2.9898	34	0	0	Pass
3.1787	32	0	0	Pass
3.3677	29	0	0	Pass
3.5567	27	0	0	Pass
3.7457	25	0	0	Pass
3.9347	23	0	0	Pass
4.1236	22	0	0	Pass
4.3126	19	0	0	Pass
4.5016	19	0	0	Pass
4.6906	19	0	0	Pass
4.8796	19	0	0	Pass
5.0686	19	0	0	Pass
5.2575	19	0	0	Pass
5.4465	15	0	0	Pass
5.6355	15	0	0	Pass
5.8245	15	0	0	Pass
6.0135	15	0	0	Pass
6.2025	15	0	0	Pass
6.3914	13	0	0	Pass

6.5804	13	0	0	Pass
6.7694	13	0	0	Pass
6.9584	12	0	0	Pass
7.1474	12	0	0	Pass
7.3364	12	0	0	Pass
7.5253	12	0	0	Pass
7.7143	12	0	0	Pass
7.9033	12	0	0	Pass
8.0923	12	0	0	Pass
8.2813	10	0	0	Pass
8.4702	10	0	0	Pass
8.6592	9	0	0	Pass
8.8482	9	0	0	Pass
9.0372	8	0	0	Pass
9.2262	8	0	0	Pass
9.4152	8	0	0	Pass
9.6041	8	0	0	Pass
9.7931	6	0	0	Pass
9.9821	6	0	0	Pass
10.1711	6	0	0	Pass
10.3601	5	0	0	Pass
10.5491	5	0	0	Pass
10.7380	5	0	0	Pass
10.9270	5	0	0	Pass
11.1160	5	0	0	Pass
11.3050	5	0	0	Pass
11.4940	5	0	0	Pass
11.6830	5	0	0	Pass
11.8719	4	0	0	Pass
12.0609	4	0	0	Pass
12.2499	4	0	0	Pass
12.4389	4	0	0	Pass
12.6279	4	0	0	Pass
12.8168	4	0	0	Pass
13.0058	3	0	0	Pass
13.1948	3	0	0	Pass
13.3838	3	0	0	Pass
13.5728	3	0	0	Pass
13.7618	3	0	0	Pass
13.9507	3	0	0	Pass
14.1397	3	0	0	Pass
14.3287	3	0	0	Pass
14.5177	3	0	0	Pass
14.7067	3	0	0	Pass
14.8957	3	0	0	Pass
15.0846	3	0	0	Pass
15.2736	3	0	0	Pass
15.4626	3	0	0	Pass
15.6516	2	0	0	Pass
15.8406	2	0	0	Pass
16.0296	2	0	0	Pass
16.2185	2	0	0	Pass
16.4075	2	0	0	Pass
16.5965	2	0	0	Pass
16.7855	2	0	0	Pass
16.9745	2	0	0	Pass
17.1634	2	0	0	Pass

17.3524	2	0	0	Pass
17.5414	2	0	0	Pass
17.7304	2	0	0	Pass
17.9194	2	0	0	Pass
18.1084	2	0	0	Pass
18.2973	2	0	0	Pass
18.4863	2	0	0	Pass
18.6753	2	0	0	Pass
18.8643	2	0	0	Pass
19.0533	2	0	0	Pass
19.2423	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #3
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for	Total Volume	Volume	Infiltration	Cumulative	Percent	Water Quality
	Treatment?	Needs Treatment (ac-ft)	Through Facility (ac-ft)	Volume (ac-ft.)	Infiltration Volume	Percent Infiltrated	Water Quality Treated
Infiltration Pond 2 POC	N	5902.15			N	99.99	
Total Volume Infiltrated		5902.15	0.00	0.00		99.99	0.00
		No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #4
Total Pervious Area:61.13
Total Impervious Area:0

Mitigated Landuse Totals for POC #4
Total Pervious Area:61.13
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	Flow(cfs)
2 year	1.008682
5 year	3.190497
10 year	5.824676
25 year	11.067315

50 year	16.754264
100 year	24.328124

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #4

Year	Predeveloped	Mitigated
1949	1.868	0.000
1950	7.522	0.000
1951	2.492	0.000
1952	0.845	0.000
1953	0.697	0.000
1954	1.523	0.000
1955	0.708	0.000
1956	0.714	0.000
1957	1.270	0.000
1958	0.371	0.000
1959	0.732	0.000
1960	0.636	0.000
1961	1.435	0.000
1962	0.049	0.000
1963	3.143	0.000
1964	3.208	0.000
1965	0.353	0.000
1966	0.129	0.000
1967	1.527	0.000
1968	0.431	0.000
1969	0.762	0.000
1970	1.570	0.000
1971	1.477	0.000
1972	1.683	0.000
1973	0.417	0.000
1974	0.926	0.000
1975	1.190	0.000
1976	0.583	0.000
1977	0.049	0.000
1978	0.805	0.000
1979	0.181	0.000
1980	0.705	0.000
1981	2.566	0.000
1982	0.401	0.000
1983	2.272	0.000
1984	7.634	0.000
1985	0.218	0.000
1986	1.230	0.000
1987	2.115	0.000
1988	0.356	0.000
1989	0.802	0.000

1990	3.467	0.000
1991	11.931	0.000
1992	0.266	0.000
1993	0.393	0.000
1994	0.114	0.000
1995	0.403	0.000
1996	7.285	0.000
1997	10.926	0.000
1998	0.166	0.000
1999	13.036	0.000
2000	0.302	0.000
2001	0.049	0.000
2002	1.863	0.000
2003	1.702	0.000
2004	2.301	0.000
2005	0.798	0.000
2006	1.541	0.000
2007	22.147	0.000
2008	8.905	0.000
2009	2.224	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #4

Rank	Predeveloped	Mitigated
1	22.1470	0.0000
2	13.0361	0.0000
3	11.9311	0.0000
4	10.9264	0.0000
5	8.9054	0.0000
6	7.6341	0.0000
7	7.5216	0.0000
8	7.2847	0.0000
9	3.4674	0.0000
10	3.2076	0.0000
11	3.1428	0.0000
12	2.5663	0.0000
13	2.4916	0.0000
14	2.3005	0.0000
15	2.2722	0.0000
16	2.2235	0.0000
17	2.1151	0.0000
18	1.8680	0.0000
19	1.8632	0.0000
20	1.7017	0.0000
21	1.6835	0.0000
22	1.5697	0.0000
23	1.5411	0.0000
24	1.5270	0.0000
25	1.5226	0.0000
26	1.4768	0.0000
27	1.4346	0.0000
28	1.2696	0.0000
29	1.2303	0.0000
30	1.1900	0.0000
31	0.9255	0.0000
32	0.8452	0.0000

33	0.8051	0.0000
34	0.8019	0.0000
35	0.7979	0.0000
36	0.7621	0.0000
37	0.7317	0.0000
38	0.7140	0.0000
39	0.7083	0.0000
40	0.7046	0.0000
41	0.6965	0.0000
42	0.6356	0.0000
43	0.5832	0.0000
44	0.4308	0.0000
45	0.4173	0.0000
46	0.4032	0.0000
47	0.4010	0.0000
48	0.3930	0.0000
49	0.3706	0.0000
50	0.3561	0.0000
51	0.3529	0.0000
52	0.3018	0.0000
53	0.2658	0.0000
54	0.2178	0.0000
55	0.1810	0.0000
56	0.1664	0.0000
57	0.1287	0.0000
58	0.1141	0.0000
59	0.0493	0.0000
60	0.0488	0.0000
61	0.0487	0.0000

Stream Protection Duration
POC #4
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5043	311	0	0	Pass
0.6685	219	0	0	Pass
0.8326	155	0	0	Pass
0.9968	130	0	0	Pass
1.1609	105	0	0	Pass
1.3250	88	0	0	Pass
1.4892	77	0	0	Pass
1.6533	60	0	0	Pass
1.8175	56	0	0	Pass
1.9816	49	0	0	Pass
2.1457	44	0	0	Pass
2.3099	36	0	0	Pass
2.4740	36	0	0	Pass
2.6382	32	0	0	Pass
2.8023	32	0	0	Pass
2.9665	30	0	0	Pass
3.1306	28	0	0	Pass
3.2947	26	0	0	Pass
3.4589	26	0	0	Pass

3.6230	22	0	0	Pass
3.7872	21	0	0	Pass
3.9513	21	0	0	Pass
4.1154	19	0	0	Pass
4.2796	19	0	0	Pass
4.4437	19	0	0	Pass
4.6079	17	0	0	Pass
4.7720	17	0	0	Pass
4.9361	17	0	0	Pass
5.1003	14	0	0	Pass
5.2644	14	0	0	Pass
5.4286	14	0	0	Pass
5.5927	14	0	0	Pass
5.7568	14	0	0	Pass
5.9210	12	0	0	Pass
6.0851	12	0	0	Pass
6.2493	12	0	0	Pass
6.4134	12	0	0	Pass
6.5775	12	0	0	Pass
6.7417	12	0	0	Pass
6.9058	12	0	0	Pass
7.0700	12	0	0	Pass
7.2341	12	0	0	Pass
7.3982	10	0	0	Pass
7.5624	9	0	0	Pass
7.7265	8	0	0	Pass
7.8907	8	0	0	Pass
8.0548	8	0	0	Pass
8.2190	8	0	0	Pass
8.3831	8	0	0	Pass
8.5472	8	0	0	Pass
8.7114	8	0	0	Pass
8.8755	8	0	0	Pass
9.0397	6	0	0	Pass
9.2038	6	0	0	Pass
9.3679	6	0	0	Pass
9.5321	6	0	0	Pass
9.6962	5	0	0	Pass
9.8604	5	0	0	Pass
10.0245	5	0	0	Pass
10.1886	5	0	0	Pass
10.3528	5	0	0	Pass
10.5169	5	0	0	Pass
10.6811	5	0	0	Pass
10.8452	5	0	0	Pass
11.0093	4	0	0	Pass
11.1735	4	0	0	Pass
11.3376	4	0	0	Pass
11.5018	4	0	0	Pass
11.6659	4	0	0	Pass
11.8300	4	0	0	Pass
11.9942	3	0	0	Pass
12.1583	3	0	0	Pass
12.3225	3	0	0	Pass
12.4866	3	0	0	Pass
12.6507	3	0	0	Pass
12.8149	3	0	0	Pass

12.9790	3	0	0	Pass
13.1432	2	0	0	Pass
13.3073	2	0	0	Pass
13.4715	2	0	0	Pass
13.6356	2	0	0	Pass
13.7997	2	0	0	Pass
13.9639	2	0	0	Pass
14.1280	2	0	0	Pass
14.2922	2	0	0	Pass
14.4563	2	0	0	Pass
14.6204	2	0	0	Pass
14.7846	2	0	0	Pass
14.9487	2	0	0	Pass
15.1129	2	0	0	Pass
15.2770	2	0	0	Pass
15.4411	2	0	0	Pass
15.6053	2	0	0	Pass
15.7694	2	0	0	Pass
15.9336	2	0	0	Pass
16.0977	2	0	0	Pass
16.2618	2	0	0	Pass
16.4260	2	0	0	Pass
16.5901	2	0	0	Pass
16.7543	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #4
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment?	Volume Needs Treatment (ac-ft)	Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment Treated
Infiltration Pond 3A POC	N	164.27				N	100.00	
Sand Filter 3A	N	3599.74				N	0.00	
Total Volume Infiltrated		3764.01	0.00	0.00			4.36	
0.00	0%	No Treat. Credit						

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #5
Total Pervious Area:63.92

Total Impervious Area:0

Mitigated Landuse Totals for POC #5
Total Pervious Area:60.61
Total Impervious Area:3.31

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	Flow(cfs)
2 year	1.010969
5 year	3.193517
10 year	5.826174
25 year	11.062027
50 year	16.738311
100 year	24.294583

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #5

Year	Predeveloped	Mitigated
1949	1.865	0.000
1950	7.663	0.000
1951	2.490	0.000
1952	0.844	0.000
1953	0.695	0.000
1954	1.521	0.000
1955	0.707	0.000
1956	0.712	0.000
1957	1.258	0.000
1958	0.370	0.000
1959	0.730	0.000
1960	0.634	0.000
1961	1.433	0.000
1962	0.051	0.000
1963	3.139	0.000
1964	3.206	0.000
1965	0.352	0.000
1966	0.128	0.000
1967	1.538	0.000
1968	0.430	0.000
1969	0.761	0.000
1970	1.568	0.000
1971	1.475	0.000
1972	1.681	0.000
1973	0.416	0.000
1974	0.924	0.000
1975	1.188	0.000

1976	0.582	0.000
1977	0.052	0.000
1978	0.804	0.000
1979	0.180	0.000
1980	0.703	0.000
1981	2.562	0.000
1982	0.400	0.000
1983	2.270	0.000
1984	7.637	0.000
1985	0.216	0.000
1986	1.229	0.000
1987	2.113	0.000
1988	0.355	0.000
1989	0.796	0.000
1990	3.464	0.000
1991	11.950	0.000
1992	0.265	0.000
1993	0.392	0.000
1994	0.114	0.000
1995	0.402	0.000
1996	7.417	0.000
1997	10.949	0.000
1998	0.166	0.000
1999	13.310	0.000
2000	0.301	0.000
2001	0.051	0.000
2002	1.861	0.000
2003	1.700	0.000
2004	2.306	0.000
2005	0.797	0.000
2006	1.555	0.000
2007	22.673	0.000
2008	8.924	0.000
2009	2.222	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #5

Rank	Predeveloped	Mitigated
1	22.6728	0.0000
2	13.3097	0.0000
3	11.9502	0.0000
4	10.9488	0.0000
5	8.9243	0.0000
6	7.6630	0.0000
7	7.6370	0.0000
8	7.4172	0.0000
9	3.4637	0.0000
10	3.2064	0.0000
11	3.1386	0.0000
12	2.5621	0.0000
13	2.4900	0.0000
14	2.3058	0.0000
15	2.2701	0.0000
16	2.2225	0.0000
17	2.1132	0.0000
18	1.8653	0.0000

19	1.8614	0.0000
20	1.6998	0.0000
21	1.6814	0.0000
22	1.5679	0.0000
23	1.5548	0.0000
24	1.5382	0.0000
25	1.5208	0.0000
26	1.4750	0.0000
27	1.4327	0.0000
28	1.2575	0.0000
29	1.2286	0.0000
30	1.1883	0.0000
31	0.9240	0.0000
32	0.8437	0.0000
33	0.8037	0.0000
34	0.7970	0.0000
35	0.7959	0.0000
36	0.7607	0.0000
37	0.7302	0.0000
38	0.7119	0.0000
39	0.7070	0.0000
40	0.7033	0.0000
41	0.6953	0.0000
42	0.6343	0.0000
43	0.5819	0.0000
44	0.4299	0.0000
45	0.4164	0.0000
46	0.4023	0.0000
47	0.4001	0.0000
48	0.3921	0.0000
49	0.3697	0.0000
50	0.3553	0.0000
51	0.3521	0.0000
52	0.3010	0.0000
53	0.2651	0.0000
54	0.2163	0.0000
55	0.1804	0.0000
56	0.1660	0.0000
57	0.1283	0.0000
58	0.1138	0.0000
59	0.0515	0.0000
60	0.0510	0.0000
61	0.0510	0.0000

Stream Protection Duration
POC #5
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5055	310	0	0	Pass
0.6695	219	0	0	Pass
0.8334	155	0	0	Pass
0.9974	132	0	0	Pass
1.1614	105	0	0	Pass

1.3253	90	0	0	Pass
1.4893	77	0	0	Pass
1.6533	61	0	0	Pass
1.8172	56	0	0	Pass
1.9812	49	0	0	Pass
2.1452	46	0	0	Pass
2.3091	37	0	0	Pass
2.4731	36	0	0	Pass
2.6371	33	0	0	Pass
2.8010	32	0	0	Pass
2.9650	30	0	0	Pass
3.1290	29	0	0	Pass
3.2929	26	0	0	Pass
3.4569	26	0	0	Pass
3.6209	23	0	0	Pass
3.7848	22	0	0	Pass
3.9488	21	0	0	Pass
4.1128	19	0	0	Pass
4.2767	19	0	0	Pass
4.4407	19	0	0	Pass
4.6047	18	0	0	Pass
4.7687	18	0	0	Pass
4.9326	17	0	0	Pass
5.0966	14	0	0	Pass
5.2606	14	0	0	Pass
5.4245	14	0	0	Pass
5.5885	14	0	0	Pass
5.7525	14	0	0	Pass
5.9164	12	0	0	Pass
6.0804	12	0	0	Pass
6.2444	12	0	0	Pass
6.4083	12	0	0	Pass
6.5723	12	0	0	Pass
6.7363	12	0	0	Pass
6.9002	12	0	0	Pass
7.0642	12	0	0	Pass
7.2282	12	0	0	Pass
7.3921	12	0	0	Pass
7.5561	10	0	0	Pass
7.7201	8	0	0	Pass
7.8840	8	0	0	Pass
8.0480	8	0	0	Pass
8.2120	8	0	0	Pass
8.3759	8	0	0	Pass
8.5399	8	0	0	Pass
8.7039	8	0	0	Pass
8.8678	8	0	0	Pass
9.0318	7	0	0	Pass
9.1958	6	0	0	Pass
9.3598	6	0	0	Pass
9.5237	6	0	0	Pass
9.6877	5	0	0	Pass
9.8517	5	0	0	Pass
10.0156	5	0	0	Pass
10.1796	5	0	0	Pass
10.3436	5	0	0	Pass
10.5075	5	0	0	Pass

10.6715	5	0	0	Pass
10.8355	5	0	0	Pass
10.9994	4	0	0	Pass
11.1634	4	0	0	Pass
11.3274	4	0	0	Pass
11.4913	4	0	0	Pass
11.6553	4	0	0	Pass
11.8193	4	0	0	Pass
11.9832	3	0	0	Pass
12.1472	3	0	0	Pass
12.3112	3	0	0	Pass
12.4751	3	0	0	Pass
12.6391	3	0	0	Pass
12.8031	3	0	0	Pass
12.9670	3	0	0	Pass
13.1310	3	0	0	Pass
13.2950	3	0	0	Pass
13.4590	2	0	0	Pass
13.6229	2	0	0	Pass
13.7869	2	0	0	Pass
13.9509	2	0	0	Pass
14.1148	2	0	0	Pass
14.2788	2	0	0	Pass
14.4428	2	0	0	Pass
14.6067	2	0	0	Pass
14.7707	2	0	0	Pass
14.9347	2	0	0	Pass
15.0986	2	0	0	Pass
15.2626	2	0	0	Pass
15.4266	2	0	0	Pass
15.5905	2	0	0	Pass
15.7545	2	0	0	Pass
15.9185	2	0	0	Pass
16.0824	2	0	0	Pass
16.2464	2	0	0	Pass
16.4104	2	0	0	Pass
16.5743	2	0	0	Pass
16.7383	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #5
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Percent Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Comment
Percent Volume Infiltrated	Water Quality Treated					

Infiltration Pond 3B POC N 206.17 N
100.00
Sand Filter 3B N 4993.33 N
0.00
Total Volume Infiltrated 5199.50 0.00 0.00 3.97
0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #6
Total Pervious Area:57.14
Total Impervious Area:0

Mitigated Landuse Totals for POC #6
Total Pervious Area:57.14
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #6

Return Period	Flow(cfs)
2 year	0.809847
5 year	2.551909
10 year	4.649653
25 year	8.816089
50 year	13.328091
100 year	19.32945

Flow Frequency Return Periods for Mitigated. POC #6

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #6

Year	Predeveloped	Mitigated
1949	1.479	0.000
1950	6.423	0.000
1951	1.979	0.000
1952	0.669	0.000
1953	0.551	0.000
1954	1.207	0.000
1955	0.560	0.000
1956	0.562	0.000
1957	0.974	0.000
1958	0.293	0.000
1959	0.578	0.000
1960	0.502	0.000

1961	1.137	0.000
1962	0.046	0.000
1963	2.490	0.000
1964	2.551	0.000
1965	0.279	0.000
1966	0.101	0.000
1967	1.256	0.000
1968	0.340	0.000
1969	0.603	0.000
1970	1.245	0.000
1971	1.171	0.000
1972	1.334	0.000
1973	0.330	0.000
1974	0.732	0.000
1975	0.943	0.000
1976	0.460	0.000
1977	0.046	0.000
1978	0.637	0.000
1979	0.143	0.000
1980	0.557	0.000
1981	2.031	0.000
1982	0.317	0.000
1983	1.803	0.000
1984	6.090	0.000
1985	0.169	0.000
1986	0.975	0.000
1987	1.679	0.000
1988	0.281	0.000
1989	0.620	0.000
1990	2.750	0.000
1991	9.564	0.000
1992	0.210	0.000
1993	0.310	0.000
1994	0.090	0.000
1995	0.318	0.000
1996	6.208	0.000
1997	8.772	0.000
1998	0.131	0.000
1999	11.220	0.000
2000	0.238	0.000
2001	0.046	0.000
2002	1.478	0.000
2003	1.350	0.000
2004	1.850	0.000
2005	0.633	0.000
2006	1.269	0.000
2007	19.251	0.000
2008	7.152	0.000
2009	1.768	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #6

Rank	Predeveloped	Mitigated
1	19.2508	0.0000
2	11.2202	0.0000
3	9.5636	0.0000

4	8.7723	0.0000
5	7.1516	0.0000
6	6.4229	0.0000
7	6.2084	0.0000
8	6.0902	0.0000
9	2.7504	0.0000
10	2.5510	0.0000
11	2.4902	0.0000
12	2.0311	0.0000
13	1.9795	0.0000
14	1.8495	0.0000
15	1.8031	0.0000
16	1.7677	0.0000
17	1.6788	0.0000
18	1.4793	0.0000
19	1.4783	0.0000
20	1.3495	0.0000
21	1.3345	0.0000
22	1.2694	0.0000
23	1.2560	0.0000
24	1.2448	0.0000
25	1.2072	0.0000
26	1.1707	0.0000
27	1.1370	0.0000
28	0.9746	0.0000
29	0.9743	0.0000
30	0.9427	0.0000
31	0.7325	0.0000
32	0.6686	0.0000
33	0.6369	0.0000
34	0.6327	0.0000
35	0.6202	0.0000
36	0.6028	0.0000
37	0.5781	0.0000
38	0.5622	0.0000
39	0.5602	0.0000
40	0.5572	0.0000
41	0.5508	0.0000
42	0.5024	0.0000
43	0.4604	0.0000
44	0.3402	0.0000
45	0.3296	0.0000
46	0.3184	0.0000
47	0.3166	0.0000
48	0.3104	0.0000
49	0.2925	0.0000
50	0.2812	0.0000
51	0.2786	0.0000
52	0.2378	0.0000
53	0.2097	0.0000
54	0.1688	0.0000
55	0.1425	0.0000
56	0.1312	0.0000
57	0.1014	0.0000
58	0.0899	0.0000
59	0.0461	0.0000
60	0.0456	0.0000

61 0.0456 0.0000

Stream Protection Duration
POC #6
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.4049	303	0	0	Pass
0.5355	218	0	0	Pass
0.6660	155	0	0	Pass
0.7965	135	0	0	Pass
0.9271	106	0	0	Pass
1.0576	89	0	0	Pass
1.1881	75	0	0	Pass
1.3187	62	0	0	Pass
1.4492	58	0	0	Pass
1.5798	50	0	0	Pass
1.7103	46	0	0	Pass
1.8408	40	0	0	Pass
1.9714	37	0	0	Pass
2.1019	34	0	0	Pass
2.2324	34	0	0	Pass
2.3630	30	0	0	Pass
2.4935	28	0	0	Pass
2.6241	27	0	0	Pass
2.7546	25	0	0	Pass
2.8851	23	0	0	Pass
3.0157	22	0	0	Pass
3.1462	21	0	0	Pass
3.2767	19	0	0	Pass
3.4073	19	0	0	Pass
3.5378	19	0	0	Pass
3.6683	19	0	0	Pass
3.7989	19	0	0	Pass
3.9294	18	0	0	Pass
4.0600	15	0	0	Pass
4.1905	15	0	0	Pass
4.3210	15	0	0	Pass
4.4516	15	0	0	Pass
4.5821	15	0	0	Pass
4.7126	12	0	0	Pass
4.8432	12	0	0	Pass
4.9737	12	0	0	Pass
5.1043	12	0	0	Pass
5.2348	12	0	0	Pass
5.3653	12	0	0	Pass
5.4959	12	0	0	Pass
5.6264	12	0	0	Pass
5.7569	12	0	0	Pass
5.8875	12	0	0	Pass
6.0180	11	0	0	Pass
6.1486	10	0	0	Pass
6.2791	9	0	0	Pass
6.4096	9	0	0	Pass

6.5402	8	0	0	Pass
6.6707	8	0	0	Pass
6.8012	8	0	0	Pass
6.9318	8	0	0	Pass
7.0623	8	0	0	Pass
7.1928	7	0	0	Pass
7.3234	6	0	0	Pass
7.4539	6	0	0	Pass
7.5845	6	0	0	Pass
7.7150	5	0	0	Pass
7.8455	5	0	0	Pass
7.9761	5	0	0	Pass
8.1066	5	0	0	Pass
8.2371	5	0	0	Pass
8.3677	5	0	0	Pass
8.4982	5	0	0	Pass
8.6288	5	0	0	Pass
8.7593	5	0	0	Pass
8.8898	4	0	0	Pass
9.0204	4	0	0	Pass
9.1509	4	0	0	Pass
9.2814	4	0	0	Pass
9.4120	4	0	0	Pass
9.5425	4	0	0	Pass
9.6731	3	0	0	Pass
9.8036	3	0	0	Pass
9.9341	3	0	0	Pass
10.0647	3	0	0	Pass
10.1952	3	0	0	Pass
10.3257	3	0	0	Pass
10.4563	3	0	0	Pass
10.5868	3	0	0	Pass
10.7174	3	0	0	Pass
10.8479	3	0	0	Pass
10.9784	3	0	0	Pass
11.1090	3	0	0	Pass
11.2395	2	0	0	Pass
11.3700	2	0	0	Pass
11.5006	2	0	0	Pass
11.6311	2	0	0	Pass
11.7616	2	0	0	Pass
11.8922	2	0	0	Pass
12.0227	2	0	0	Pass
12.1533	2	0	0	Pass
12.2838	2	0	0	Pass
12.4143	2	0	0	Pass
12.5449	2	0	0	Pass
12.6754	2	0	0	Pass
12.8059	2	0	0	Pass
12.9365	2	0	0	Pass
13.0670	2	0	0	Pass
13.1976	2	0	0	Pass
13.3281	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #6
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique		Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Infiltrated	Water Quality Percent Treated	Comment
Infiltration Pond	3C POC	N	4166.49			N	100.00		
Total Volume Infiltrated			4166.49	0.00	0.00		100.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #7
Total Pervious Area:62.13
Total Impervious Area:0

Mitigated Landuse Totals for POC #7
Total Pervious Area:58.69
Total Impervious Area:3.44

Flow Frequency Return Periods for Predeveloped. POC #7

Return Period	Flow(cfs)
2 year	0.889078
5 year	2.802396
10 year	5.106829
25 year	9.684508
50 year	14.642502
100 year	21.237726

Flow Frequency Return Periods for Mitigated. POC #7

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #7

Year	Predeveloped	Mitigated
1949	1.625	0.000
1950	7.026	0.000
1951	2.175	0.000
1952	0.735	0.000
1953	0.605	0.000
1954	1.326	0.000
1955	0.616	0.000
1956	0.618	0.000
1957	1.073	0.000
1958	0.321	0.000
1959	0.635	0.000
1960	0.552	0.000
1961	1.249	0.000
1962	0.050	0.000
1963	2.736	0.000
1964	2.802	0.000
1965	0.306	0.000
1966	0.111	0.000
1967	1.377	0.000
1968	0.374	0.000
1969	0.662	0.000
1970	1.368	0.000
1971	1.286	0.000
1972	1.466	0.000
1973	0.362	0.000
1974	0.805	0.000
1975	1.036	0.000
1976	0.506	0.000
1977	0.050	0.000
1978	0.700	0.000
1979	0.157	0.000
1980	0.612	0.000
1981	2.232	0.000
1982	0.348	0.000
1983	1.981	0.000
1984	6.689	0.000
1985	0.186	0.000
1986	1.071	0.000
1987	1.844	0.000
1988	0.309	0.000
1989	0.682	0.000
1990	3.022	0.000
1991	10.502	0.000
1992	0.230	0.000
1993	0.341	0.000
1994	0.099	0.000
1995	0.350	0.000
1996	6.793	0.000
1997	9.632	0.000
1998	0.144	0.000
1999	12.269	0.000
2000	0.261	0.000
2001	0.050	0.000
2002	1.624	0.000
2003	1.483	0.000

2004	2.031	0.000
2005	0.695	0.000
2006	1.392	0.000
2007	21.040	0.000
2008	7.852	0.239
2009	1.942	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #7

Rank	Predeveloped	Mitigated
1	21.0401	0.2389
2	12.2688	0.0000
3	10.5024	0.0000
4	9.6318	0.0000
5	7.8520	0.0000
6	7.0258	0.0000
7	6.7930	0.0000
8	6.6895	0.0000
9	3.0218	0.0000
10	2.8022	0.0000
11	2.7361	0.0000
12	2.2317	0.0000
13	2.1745	0.0000
14	2.0313	0.0000
15	1.9809	0.0000
16	1.9418	0.0000
17	1.8443	0.0000
18	1.6254	0.0000
19	1.6241	0.0000
20	1.4826	0.0000
21	1.4661	0.0000
22	1.3917	0.0000
23	1.3770	0.0000
24	1.3676	0.0000
25	1.3263	0.0000
26	1.2862	0.0000
27	1.2491	0.0000
28	1.0727	0.0000
29	1.0708	0.0000
30	1.0357	0.0000
31	0.8048	0.0000
32	0.7346	0.0000
33	0.6998	0.0000
34	0.6951	0.0000
35	0.6823	0.0000
36	0.6624	0.0000
37	0.6352	0.0000
38	0.6179	0.0000
39	0.6155	0.0000
40	0.6123	0.0000
41	0.6053	0.0000
42	0.5520	0.0000
43	0.5059	0.0000
44	0.3738	0.0000
45	0.3622	0.0000
46	0.3499	0.0000

47	0.3480	0.0000
48	0.3411	0.0000
49	0.3214	0.0000
50	0.3090	0.0000
51	0.3061	0.0000
52	0.2613	0.0000
53	0.2304	0.0000
54	0.1856	0.0000
55	0.1566	0.0000
56	0.1442	0.0000
57	0.1114	0.0000
58	0.0988	0.0000
59	0.0501	0.0000
60	0.0496	0.0000
61	0.0495	0.0000

Stream Protection Duration
POC #7
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.4445	303	0	0	Pass
0.5880	218	0	0	Pass
0.7314	155	0	0	Pass
0.8748	135	0	0	Pass
1.0182	106	0	0	Pass
1.1616	89	0	0	Pass
1.3050	75	0	0	Pass
1.4484	62	0	0	Pass
1.5918	58	0	0	Pass
1.7353	50	0	0	Pass
1.8787	46	0	0	Pass
2.0221	39	0	0	Pass
2.1655	37	0	0	Pass
2.3089	34	0	0	Pass
2.4523	33	0	0	Pass
2.5957	30	0	0	Pass
2.7392	28	0	0	Pass
2.8826	27	0	0	Pass
3.0260	25	0	0	Pass
3.1694	23	0	0	Pass
3.3128	21	0	0	Pass
3.4562	21	0	0	Pass
3.5996	19	0	0	Pass
3.7431	19	0	0	Pass
3.8865	19	0	0	Pass
4.0299	19	0	0	Pass
4.1733	19	0	0	Pass
4.3167	18	0	0	Pass
4.4601	15	0	0	Pass
4.6035	15	0	0	Pass
4.7470	15	0	0	Pass
4.8904	15	0	0	Pass
5.0338	14	0	0	Pass

5.1772	12	0	0	Pass
5.3206	12	0	0	Pass
5.4640	12	0	0	Pass
5.6074	12	0	0	Pass
5.7508	12	0	0	Pass
5.8943	12	0	0	Pass
6.0377	12	0	0	Pass
6.1811	12	0	0	Pass
6.3245	12	0	0	Pass
6.4679	12	0	0	Pass
6.6113	11	0	0	Pass
6.7547	10	0	0	Pass
6.8982	9	0	0	Pass
7.0416	8	0	0	Pass
7.1850	8	0	0	Pass
7.3284	8	0	0	Pass
7.4718	8	0	0	Pass
7.6152	8	0	0	Pass
7.7586	8	0	0	Pass
7.9021	7	0	0	Pass
8.0455	6	0	0	Pass
8.1889	6	0	0	Pass
8.3323	6	0	0	Pass
8.4757	5	0	0	Pass
8.6191	5	0	0	Pass
8.7625	5	0	0	Pass
8.9060	5	0	0	Pass
9.0494	5	0	0	Pass
9.1928	5	0	0	Pass
9.3362	5	0	0	Pass
9.4796	5	0	0	Pass
9.6230	5	0	0	Pass
9.7664	4	0	0	Pass
9.9098	4	0	0	Pass
10.0533	4	0	0	Pass
10.1967	4	0	0	Pass
10.3401	4	0	0	Pass
10.4835	4	0	0	Pass
10.6269	3	0	0	Pass
10.7703	3	0	0	Pass
10.9137	3	0	0	Pass
11.0572	3	0	0	Pass
11.2006	3	0	0	Pass
11.3440	3	0	0	Pass
11.4874	3	0	0	Pass
11.6308	3	0	0	Pass
11.7742	3	0	0	Pass
11.9176	3	0	0	Pass
12.0611	3	0	0	Pass
12.2045	3	0	0	Pass
12.3479	2	0	0	Pass
12.4913	2	0	0	Pass
12.6347	2	0	0	Pass
12.7781	2	0	0	Pass
12.9215	2	0	0	Pass
13.0650	2	0	0	Pass
13.2084	2	0	0	Pass

13.3518	2	0	0	Pass
13.4952	2	0	0	Pass
13.6386	2	0	0	Pass
13.7820	2	0	0	Pass
13.9254	2	0	0	Pass
14.0688	2	0	0	Pass
14.2123	2	0	0	Pass
14.3557	2	0	0	Pass
14.4991	2	0	0	Pass
14.6425	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #7
On-line facility volume: 2.398 **acre-feet**
On-line facility target flow: 1.4826 **cfs.**
Adjusted for 15 min: 1.4826 **cfs.**
Off-line facility target flow: 0.8221 **cfs.**
Adjusted for 15 min: 0.8221 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment
Infiltration Pond 4A POC	N	5367.08			N	100.00	
Total Volume Infiltrated		5367.08	0.00	0.00		100.00	
0.00	0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #8
Total Pervious Area:64.74
Total Impervious Area:0

Mitigated Landuse Totals for POC #8
Total Pervious Area:63.94
Total Impervious Area:0.8

Flow Frequency Return Periods for Predeveloped. POC #8

Return Period	Flow(cfs)
2 year	0.971581
5 year	3.064764
10 year	5.587153
25 year	10.599854
50 year	16.030826

100 year	23.257072

Flow Frequency Return Periods for Mitigated. POC #8

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #8

Year	Predeveloped	Mitigated
1949	1.784	0.000
1950	7.520	0.000
1951	2.384	0.000
1952	0.807	0.000
1953	0.665	0.000
1954	1.455	0.000
1955	0.676	0.000
1956	0.680	0.000
1957	1.190	0.000
1958	0.353	0.000
1959	0.698	0.000
1960	0.606	0.000
1961	1.371	0.000
1962	0.052	0.000
1963	3.003	0.000
1964	3.071	0.000
1965	0.336	0.000
1966	0.123	0.000
1967	1.491	0.000
1968	0.411	0.000
1969	0.727	0.000
1970	1.500	0.000
1971	1.411	0.000
1972	1.609	0.000
1973	0.398	0.000
1974	0.884	0.000
1975	1.137	0.000
1976	0.556	0.000
1977	0.052	0.000
1978	0.768	0.000
1979	0.172	0.000
1980	0.672	0.000
1981	2.450	0.000
1982	0.382	0.000
1983	2.173	0.000
1984	7.322	0.000
1985	0.205	0.000
1986	1.175	0.000
1987	2.023	0.000
1988	0.340	0.000
1989	0.755	0.000
1990	3.315	0.000

1991	11.476	0.000
1992	0.253	0.000
1993	0.375	0.000
1994	0.109	0.000
1995	0.384	0.000
1996	7.273	0.000
1997	10.521	0.000
1998	0.158	0.000
1999	13.096	0.000
2000	0.287	0.000
2001	0.052	0.000
2002	1.782	0.000
2003	1.627	0.000
2004	2.216	0.000
2005	0.763	0.000
2006	1.507	0.000
2007	22.383	0.000
2008	8.576	0.000
2009	2.129	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #8

Rank	Predeveloped	Mitigated
1	22.3825	0.0000
2	13.0958	0.0000
3	11.4761	0.0000
4	10.5206	0.0000
5	8.5761	0.0000
6	7.5198	0.0000
7	7.3225	0.0000
8	7.2731	0.0000
9	3.3148	0.0000
10	3.0713	0.0000
11	3.0026	0.0000
12	2.4502	0.0000
13	2.3843	0.0000
14	2.2161	0.0000
15	2.1729	0.0000
16	2.1286	0.0000
17	2.0228	0.0000
18	1.7842	0.0000
19	1.7816	0.0000
20	1.6267	0.0000
21	1.6088	0.0000
22	1.5069	0.0000
23	1.5004	0.0000
24	1.4910	0.0000
25	1.4553	0.0000
26	1.4113	0.0000
27	1.3708	0.0000
28	1.1901	0.0000
29	1.1753	0.0000
30	1.1368	0.0000
31	0.8836	0.0000
32	0.8067	0.0000
33	0.7685	0.0000

34	0.7627	0.0000
35	0.7553	0.0000
36	0.7274	0.0000
37	0.6979	0.0000
38	0.6797	0.0000
39	0.6760	0.0000
40	0.6724	0.0000
41	0.6647	0.0000
42	0.6064	0.0000
43	0.5560	0.0000
44	0.4108	0.0000
45	0.3980	0.0000
46	0.3845	0.0000
47	0.3823	0.0000
48	0.3748	0.0000
49	0.3533	0.0000
50	0.3395	0.0000
51	0.3364	0.0000
52	0.2874	0.0000
53	0.2533	0.0000
54	0.2054	0.0000
55	0.1723	0.0000
56	0.1585	0.0000
57	0.1225	0.0000
58	0.1086	0.0000
59	0.0522	0.0000
60	0.0517	0.0000
61	0.0516	0.0000

Stream Protection Duration
POC #8
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.4858	307	0	0	Pass
0.6428	217	0	0	Pass
0.7998	155	0	0	Pass
0.9569	134	0	0	Pass
1.1139	106	0	0	Pass
1.2709	89	0	0	Pass
1.4279	76	0	0	Pass
1.5849	61	0	0	Pass
1.7420	56	0	0	Pass
1.8990	50	0	0	Pass
2.0560	46	0	0	Pass
2.2130	38	0	0	Pass
2.3700	37	0	0	Pass
2.5271	33	0	0	Pass
2.6841	33	0	0	Pass
2.8411	30	0	0	Pass
2.9981	29	0	0	Pass
3.1551	26	0	0	Pass
3.3122	26	0	0	Pass
3.4692	23	0	0	Pass

3.6262	22	0	0	Pass
3.7832	21	0	0	Pass
3.9402	19	0	0	Pass
4.0973	19	0	0	Pass
4.2543	19	0	0	Pass
4.4113	19	0	0	Pass
4.5683	18	0	0	Pass
4.7253	18	0	0	Pass
4.8824	15	0	0	Pass
5.0394	15	0	0	Pass
5.1964	14	0	0	Pass
5.3534	14	0	0	Pass
5.5104	14	0	0	Pass
5.6675	12	0	0	Pass
5.8245	12	0	0	Pass
5.9815	12	0	0	Pass
6.1385	12	0	0	Pass
6.2956	12	0	0	Pass
6.4526	12	0	0	Pass
6.6096	12	0	0	Pass
6.7666	12	0	0	Pass
6.9236	12	0	0	Pass
7.0807	12	0	0	Pass
7.2377	11	0	0	Pass
7.3947	9	0	0	Pass
7.5517	8	0	0	Pass
7.7087	8	0	0	Pass
7.8658	8	0	0	Pass
8.0228	8	0	0	Pass
8.1798	8	0	0	Pass
8.3368	8	0	0	Pass
8.4938	8	0	0	Pass
8.6509	7	0	0	Pass
8.8079	6	0	0	Pass
8.9649	6	0	0	Pass
9.1219	6	0	0	Pass
9.2789	5	0	0	Pass
9.4360	5	0	0	Pass
9.5930	5	0	0	Pass
9.7500	5	0	0	Pass
9.9070	5	0	0	Pass
10.0640	5	0	0	Pass
10.2211	5	0	0	Pass
10.3781	5	0	0	Pass
10.5351	4	0	0	Pass
10.6921	4	0	0	Pass
10.8491	4	0	0	Pass
11.0062	4	0	0	Pass
11.1632	4	0	0	Pass
11.3202	4	0	0	Pass
11.4772	4	0	0	Pass
11.6343	3	0	0	Pass
11.7913	3	0	0	Pass
11.9483	3	0	0	Pass
12.1053	3	0	0	Pass
12.2623	3	0	0	Pass
12.4194	3	0	0	Pass

12.5764	3	0	0	Pass
12.7334	3	0	0	Pass
12.8904	3	0	0	Pass
13.0474	3	0	0	Pass
13.2045	2	0	0	Pass
13.3615	2	0	0	Pass
13.5185	2	0	0	Pass
13.6755	2	0	0	Pass
13.8325	2	0	0	Pass
13.9896	2	0	0	Pass
14.1466	2	0	0	Pass
14.3036	2	0	0	Pass
14.4606	2	0	0	Pass
14.6176	2	0	0	Pass
14.7747	2	0	0	Pass
14.9317	2	0	0	Pass
15.0887	2	0	0	Pass
15.2457	2	0	0	Pass
15.4027	2	0	0	Pass
15.5598	2	0	0	Pass
15.7168	2	0	0	Pass
15.8738	2	0	0	Pass
16.0308	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #8
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment? Needs Water Quality Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Comment
Infiltration Pond 4B POC	N	4854.93			N	
100.00						
Total Volume Infiltrated		4854.93	0.00	0.00		
100.00 0.00	0%	No Treat. Credit				

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #9
Total Pervious Area:37.65
Total Impervious Area:0

Mitigated Landuse Totals for POC #9
Total Pervious Area:36.97
Total Impervious Area:0.68

Flow Frequency Return Periods for Predeveloped. POC #9

Return Period	Flow(cfs)
2 year	0.605501
5 year	1.914351
10 year	3.494072
25 year	6.637316
50 year	10.046264
100 year	14.58559

Flow Frequency Return Periods for Mitigated. POC #9

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #9

Year	Predeveloped	Mitigated
1949	1.119	0.000
1950	4.567	0.000
1951	1.493	0.000
1952	0.506	0.000
1953	0.417	0.000
1954	0.912	0.000
1955	0.424	0.000
1956	0.427	0.000
1957	0.756	0.000
1958	0.222	0.000
1959	0.438	0.000
1960	0.380	0.000
1961	0.859	0.000
1962	0.030	0.000
1963	1.882	0.000
1964	1.922	0.000
1965	0.211	0.000
1966	0.077	0.000
1967	0.920	0.000
1968	0.258	0.000
1969	0.456	0.000
1970	0.940	0.000
1971	0.884	0.000
1972	1.008	0.000
1973	0.250	0.000
1974	0.554	0.000
1975	0.713	0.000
1976	0.349	0.000
1977	0.030	0.000

1978	0.482	0.000
1979	0.108	0.000
1980	0.422	0.000
1981	1.537	0.000
1982	0.240	0.000
1983	1.361	0.000
1984	4.579	0.000
1985	0.130	0.000
1986	0.737	0.000
1987	1.267	0.000
1988	0.213	0.000
1989	0.478	0.000
1990	2.077	0.000
1991	7.164	0.000
1992	0.159	0.000
1993	0.235	0.000
1994	0.068	0.000
1995	0.241	0.000
1996	4.423	0.000
1997	6.562	0.000
1998	0.100	0.000
1999	7.928	0.000
2000	0.181	0.000
2001	0.030	0.000
2002	1.116	0.000
2003	1.019	0.000
2004	1.383	0.000
2005	0.478	0.000
2006	0.930	0.000
2007	13.498	0.000
2008	5.348	0.000
2009	1.333	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #9

Rank	**Predeveloped**	**Mitigated**
1	13.4984	0.0000
2	7.9284	0.0000
3	7.1644	0.0000
4	6.5617	0.0000
5	5.3479	0.0000
6	4.5794	0.0000
7	4.5668	0.0000
8	4.4233	0.0000
9	2.0772	0.0000
10	1.9224	0.0000
11	1.8823	0.0000
12	1.5366	0.0000
13	1.4929	0.0000
14	1.3834	0.0000
15	1.3612	0.0000
16	1.3325	0.0000
17	1.2671	0.0000
18	1.1186	0.0000
19	1.1161	0.0000
20	1.0193	0.0000

21	1.0083	0.0000
22	0.9402	0.0000
23	0.9300	0.0000
24	0.9201	0.0000
25	0.9119	0.0000
26	0.8845	0.0000
27	0.8592	0.0000
28	0.7563	0.0000
29	0.7368	0.0000
30	0.7126	0.0000
31	0.5541	0.0000
32	0.5060	0.0000
33	0.4820	0.0000
34	0.4780	0.0000
35	0.4779	0.0000
36	0.4562	0.0000
37	0.4379	0.0000
38	0.4270	0.0000
39	0.4240	0.0000
40	0.4218	0.0000
41	0.4170	0.0000
42	0.3805	0.0000
43	0.3490	0.0000
44	0.2578	0.0000
45	0.2497	0.0000
46	0.2413	0.0000
47	0.2400	0.0000
48	0.2352	0.0000
49	0.2218	0.0000
50	0.2131	0.0000
51	0.2112	0.0000
52	0.1805	0.0000
53	0.1590	0.0000
54	0.1298	0.0000
55	0.1082	0.0000
56	0.0996	0.0000
57	0.0770	0.0000
58	0.0683	0.0000
59	0.0304	0.0000
60	0.0301	0.0000
61	0.0300	0.0000

Stream Protection Duration
POC #9
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3028	310	0	0	Pass
0.4012	219	0	0	Pass
0.4996	155	0	0	Pass
0.5980	131	0	0	Pass
0.6964	106	0	0	Pass
0.7948	90	0	0	Pass
0.8933	77	0	0	Pass

0.9917	61	0	0	Pass
1.0901	56	0	0	Pass
1.1885	49	0	0	Pass
1.2869	45	0	0	Pass
1.3854	36	0	0	Pass
1.4838	36	0	0	Pass
1.5822	33	0	0	Pass
1.6806	32	0	0	Pass
1.7790	30	0	0	Pass
1.8775	29	0	0	Pass
1.9759	26	0	0	Pass
2.0743	26	0	0	Pass
2.1727	23	0	0	Pass
2.2711	21	0	0	Pass
2.3696	21	0	0	Pass
2.4680	19	0	0	Pass
2.5664	19	0	0	Pass
2.6648	19	0	0	Pass
2.7632	18	0	0	Pass
2.8617	17	0	0	Pass
2.9601	17	0	0	Pass
3.0585	14	0	0	Pass
3.1569	14	0	0	Pass
3.2553	14	0	0	Pass
3.3537	14	0	0	Pass
3.4522	14	0	0	Pass
3.5506	12	0	0	Pass
3.6490	12	0	0	Pass
3.7474	12	0	0	Pass
3.8458	12	0	0	Pass
3.9443	12	0	0	Pass
4.0427	12	0	0	Pass
4.1411	12	0	0	Pass
4.2395	12	0	0	Pass
4.3379	12	0	0	Pass
4.4364	11	0	0	Pass
4.5348	10	0	0	Pass
4.6332	8	0	0	Pass
4.7316	8	0	0	Pass
4.8300	8	0	0	Pass
4.9285	8	0	0	Pass
5.0269	8	0	0	Pass
5.1253	8	0	0	Pass
5.2237	8	0	0	Pass
5.3221	8	0	0	Pass
5.4206	7	0	0	Pass
5.5190	6	0	0	Pass
5.6174	6	0	0	Pass
5.7158	6	0	0	Pass
5.8142	5	0	0	Pass
5.9127	5	0	0	Pass
6.0111	5	0	0	Pass
6.1095	5	0	0	Pass
6.2079	5	0	0	Pass
6.3063	5	0	0	Pass
6.4047	5	0	0	Pass
6.5032	5	0	0	Pass

6.6016	4	0	0	Pass
6.7000	4	0	0	Pass
6.7984	4	0	0	Pass
6.8968	4	0	0	Pass
6.9953	4	0	0	Pass
7.0937	4	0	0	Pass
7.1921	3	0	0	Pass
7.2905	3	0	0	Pass
7.3889	3	0	0	Pass
7.4874	3	0	0	Pass
7.5858	3	0	0	Pass
7.6842	3	0	0	Pass
7.7826	3	0	0	Pass
7.8810	3	0	0	Pass
7.9795	2	0	0	Pass
8.0779	2	0	0	Pass
8.1763	2	0	0	Pass
8.2747	2	0	0	Pass
8.3731	2	0	0	Pass
8.4716	2	0	0	Pass
8.5700	2	0	0	Pass
8.6684	2	0	0	Pass
8.7668	2	0	0	Pass
8.8652	2	0	0	Pass
8.9637	2	0	0	Pass
9.0621	2	0	0	Pass
9.1605	2	0	0	Pass
9.2589	2	0	0	Pass
9.3573	2	0	0	Pass
9.4557	2	0	0	Pass
9.5542	2	0	0	Pass
9.6526	2	0	0	Pass
9.7510	2	0	0	Pass
9.8494	2	0	0	Pass
9.9478	2	0	0	Pass
10.0463	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #9
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Percent Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Comment
Infiltration Pond 4C POC	N	107.91			N	
100.00						
Sand Filter 4C	N	2213.23			N	
Percent Volume Infiltrated	Water Quality Treated					

0.00
Total Volume Infiltrated 2321.13 0.00 0.00 4.65
0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #10
Total Pervious Area:21
Total Impervious Area:0

Mitigated Landuse Totals for POC #10
Total Pervious Area:20.5
Total Impervious Area:0.5

Flow Frequency Return Periods for Predeveloped. POC #10

Return Period	Flow(cfs)
2 year	0.329018
5 year	1.038509
10 year	1.893855
25 year	3.594252
50 year	5.437045
100 year	7.88952

Flow Frequency Return Periods for Mitigated. POC #10

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #10

Year	Predeveloped	Mitigated
1949	0.607	0.000
1950	2.498	0.000
1951	0.810	0.000
1952	0.274	0.000
1953	0.226	0.000
1954	0.495	0.000
1955	0.230	0.000
1956	0.232	0.000
1957	0.408	0.000
1958	0.120	0.000
1959	0.238	0.000
1960	0.206	0.000
1961	0.466	0.000
1962	0.017	0.000

1963	1.021	0.000
1964	1.043	0.000
1965	0.115	0.000
1966	0.042	0.000
1967	0.500	0.000
1968	0.140	0.000
1969	0.247	0.000
1970	0.510	0.000
1971	0.480	0.000
1972	0.547	0.000
1973	0.135	0.000
1974	0.301	0.000
1975	0.387	0.000
1976	0.189	0.000
1977	0.017	0.000
1978	0.261	0.000
1979	0.059	0.000
1980	0.229	0.000
1981	0.833	0.000
1982	0.130	0.000
1983	0.738	0.000
1984	2.483	0.000
1985	0.070	0.000
1986	0.400	0.000
1987	0.687	0.000
1988	0.116	0.000
1989	0.259	0.000
1990	1.126	0.000
1991	3.885	0.000
1992	0.086	0.000
1993	0.128	0.000
1994	0.037	0.000
1995	0.131	0.000
1996	2.416	0.000
1997	3.560	0.000
1998	0.054	0.000
1999	4.338	0.000
2000	0.098	0.000
2001	0.017	0.000
2002	0.605	0.000
2003	0.553	0.000
2004	0.749	0.000
2005	0.259	0.000
2006	0.506	0.000
2007	7.389	0.000
2008	2.902	0.000
2009	0.723	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #10

Rank	Predeveloped	Mitigated
1	7.3895	0.0000
2	4.3383	0.0000
3	3.8846	0.0000
4	3.5604	0.0000
5	2.9024	0.0000

6	2.4979	0.0000
7	2.4829	0.0000
8	2.4160	0.0000
9	1.1265	0.0000
10	1.0429	0.0000
11	1.0208	0.0000
12	0.8333	0.0000
13	0.8099	0.0000
14	0.7486	0.0000
15	0.7384	0.0000
16	0.7229	0.0000
17	0.6873	0.0000
18	0.6067	0.0000
19	0.6055	0.0000
20	0.5529	0.0000
21	0.5469	0.0000
22	0.5100	0.0000
23	0.5058	0.0000
24	0.5005	0.0000
25	0.4947	0.0000
26	0.4798	0.0000
27	0.4660	0.0000
28	0.4085	0.0000
29	0.3996	0.0000
30	0.3865	0.0000
31	0.3005	0.0000
32	0.2744	0.0000
33	0.2614	0.0000
34	0.2592	0.0000
35	0.2589	0.0000
36	0.2474	0.0000
37	0.2375	0.0000
38	0.2316	0.0000
39	0.2300	0.0000
40	0.2288	0.0000
41	0.2261	0.0000
42	0.2063	0.0000
43	0.1893	0.0000
44	0.1398	0.0000
45	0.1354	0.0000
46	0.1309	0.0000
47	0.1301	0.0000
48	0.1276	0.0000
49	0.1203	0.0000
50	0.1156	0.0000
51	0.1145	0.0000
52	0.0979	0.0000
53	0.0862	0.0000
54	0.0704	0.0000
55	0.0587	0.0000
56	0.0540	0.0000
57	0.0417	0.0000
58	0.0370	0.0000
59	0.0169	0.0000
60	0.0168	0.0000
61	0.0167	0.0000

Stream Protection Duration
POC #10
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1645	310	0	0	Pass
0.2178	220	0	0	Pass
0.2710	155	0	0	Pass
0.3243	132	0	0	Pass
0.3775	107	0	0	Pass
0.4308	90	0	0	Pass
0.4841	77	0	0	Pass
0.5373	61	0	0	Pass
0.5906	56	0	0	Pass
0.6438	49	0	0	Pass
0.6971	46	0	0	Pass
0.7503	37	0	0	Pass
0.8036	36	0	0	Pass
0.8569	33	0	0	Pass
0.9101	32	0	0	Pass
0.9634	30	0	0	Pass
1.0166	29	0	0	Pass
1.0699	26	0	0	Pass
1.1232	26	0	0	Pass
1.1764	23	0	0	Pass
1.2297	22	0	0	Pass
1.2829	21	0	0	Pass
1.3362	19	0	0	Pass
1.3894	19	0	0	Pass
1.4427	19	0	0	Pass
1.4960	19	0	0	Pass
1.5492	18	0	0	Pass
1.6025	18	0	0	Pass
1.6557	14	0	0	Pass
1.7090	14	0	0	Pass
1.7622	14	0	0	Pass
1.8155	14	0	0	Pass
1.8688	14	0	0	Pass
1.9220	12	0	0	Pass
1.9753	12	0	0	Pass
2.0285	12	0	0	Pass
2.0818	12	0	0	Pass
2.1351	12	0	0	Pass
2.1883	12	0	0	Pass
2.2416	12	0	0	Pass
2.2948	12	0	0	Pass
2.3481	12	0	0	Pass
2.4013	11	0	0	Pass
2.4546	10	0	0	Pass
2.5079	8	0	0	Pass
2.5611	8	0	0	Pass
2.6144	8	0	0	Pass
2.6676	8	0	0	Pass
2.7209	8	0	0	Pass

2.7741	8	0	0	Pass
2.8274	8	0	0	Pass
2.8807	8	0	0	Pass
2.9339	7	0	0	Pass
2.9872	6	0	0	Pass
3.0404	6	0	0	Pass
3.0937	6	0	0	Pass
3.1470	5	0	0	Pass
3.2002	5	0	0	Pass
3.2535	5	0	0	Pass
3.3067	5	0	0	Pass
3.3600	5	0	0	Pass
3.4132	5	0	0	Pass
3.4665	5	0	0	Pass
3.5198	5	0	0	Pass
3.5730	4	0	0	Pass
3.6263	4	0	0	Pass
3.6795	4	0	0	Pass
3.7328	4	0	0	Pass
3.7860	4	0	0	Pass
3.8393	4	0	0	Pass
3.8926	3	0	0	Pass
3.9458	3	0	0	Pass
3.9991	3	0	0	Pass
4.0523	3	0	0	Pass
4.1056	3	0	0	Pass
4.1589	3	0	0	Pass
4.2121	3	0	0	Pass
4.2654	3	0	0	Pass
4.3186	3	0	0	Pass
4.3719	2	0	0	Pass
4.4251	2	0	0	Pass
4.4784	2	0	0	Pass
4.5317	2	0	0	Pass
4.5849	2	0	0	Pass
4.6382	2	0	0	Pass
4.6914	2	0	0	Pass
4.7447	2	0	0	Pass
4.7979	2	0	0	Pass
4.8512	2	0	0	Pass
4.9045	2	0	0	Pass
4.9577	2	0	0	Pass
5.0110	2	0	0	Pass
5.0642	2	0	0	Pass
5.1175	2	0	0	Pass
5.1708	2	0	0	Pass
5.2240	2	0	0	Pass
5.2773	2	0	0	Pass
5.3305	2	0	0	Pass
5.3838	2	0	0	Pass
5.4370	2	0	0	Pass

Water Quality BMP Flow and Volume for POC #10
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**

Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality	Comment
Infiltration Pond 5 POC	N	881.92			N	100.00	
Total Volume Infiltrated		881.92	0.00	0.00			
100.00	0.00	0%	No Treat. Credit				

Compliance with LID Standard 8
Duration Analysis Result = Passed

POC #11 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**
No changes have been made.

Table 1. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 1A WQ Pond

Required Pond Volume	0.33	ac-ft								
Required Pond Volume	14,227	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	14,227	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	4,268	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	42	ft	Total Bottom Area:	252	sq ft
Side Slopes XH:1V	3				Bottom Width:	6.0	ft	Total Top Area:	1,980	sq ft
					WQ Length	54.0				
					WQ Width	18.0				
					Top Length	66.0				
					Top Width	30.0				
								Volume Calculated:	4,464	Good? YES
Total Volume Required for Cell 2	9,958.7	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	72	ft	Total Bottom Area:	1,152	sq ft
Side Slopes XH:1V	3				Bottom Width:	16	ft	Total Top Area:	3,840	sq ft
					WQ Length	84				
					WQ Width	28				
					Top Length	96				
					Top Width	40				
								Volume Calculated:	9,984	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
14,448

Primary Overflow Surface	4.35
Emergency Overflow Surface	5.05

Table 2. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 1B WQ Pond

Required Pond Volume	3.63	ac-ft								
Required Pond Volume	158,240	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	158,240	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	47,472	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	177	ft	Total Bottom Area:	9,027	sq ft
Side Slopes XH:1V	3				Bottom Width:	51.0	ft	Total Top Area:	15,075	sq ft
					WQ Length	189.0				
					WQ Width	63.0				
					Top Length	201.0				
					Top Width	75.0				
								Volume Calculated:	48,204	Good? YES
Total Volume Required for Cell 2	110,768.3	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	276	ft	Total Bottom Area:	23,184	sq ft
Side Slopes XH:1V	3				Bottom Width:	84	ft	Total Top Area:	32,400	sq ft
					WQ Length	288				
					WQ Width	96				
					Top Length	300				
					Top Width	108				
								Volume Calculated:	111,168	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
159,372

Primary Overflow Surface	4.91
Emergency Overflow Surface	5.91

Table 3. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 2 WQ Pond

Required Pond Volume	3.21	ac-ft								
Required Pond Volume	139,932	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	139,932	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	41,980	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	165	ft	Total Bottom Area:	7,755	sq ft
Side Slopes XH:1V	3				Bottom Width:	47.0	ft	Total Top Area:	13,419	sq ft
					WQ Length	177.0				
					WQ Width	59.0				
					Top Length	189.0				
					Top Width	71.0				
								Volume Calculated:	42,348	Good? YES
Total Volume Required for Cell 2	97,952.5	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	261	ft	Total Bottom Area:	20,619	sq ft
Side Slopes XH:1V	3				Bottom Width:	79	ft	Total Top Area:	29,355	sq ft
					WQ Length	273				
					WQ Width	91				
					Top Length	285				
					Top Width	103				
								Volume Calculated:	99,948	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
142,296

Primary Overflow Surface	4.80
Emergency Overflow Surface	5.80

Table 4. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 3A WQ Pond

Required Pond Volume	2.06	ac-ft								
Required Pond Volume	89,668	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	89,668	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	26,900	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	129	ft	Total Bottom Area:	4,515	sq ft
Side Slopes XH:1V	3				Bottom Width:	35.0	ft	Total Top Area:	9,027	sq ft
					WQ Length	141.0				
					WQ Width	47.0				
					Top Length	153.0				
					Top Width	59.0				
								Volume Calculated:	27,084	Good? YES
Total Volume Required for Cell 2	62,767.8	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	204	ft	Total Bottom Area:	12,240	sq ft
Side Slopes XH:1V	3				Bottom Width:	60	ft	Total Top Area:	19,152	sq ft
					WQ Length	216				
					WQ Width	72				
					Top Length	228				
					Top Width	84				
								Volume Calculated:	62,784	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
89,868

Primary Overflow Surface	4.56
Emergency Overflow Surface	5.56

Table 5. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 3B WQ Pond

Required Pond Volume	2.62	ac-ft								
Required Pond Volume	113,940	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	113,940	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	34,182	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	147	ft	Total Bottom Area:	6,027	sq ft
Side Slopes XH:1V	3				Bottom Width:	41.0	ft	Total Top Area:	11,115	sq ft
					WQ Length	159.0				
					WQ Width	53.0				
					Top Length	171.0				
					Top Width	65.0				
								Volume Calculated:	34,284	Good? YES
Total Volume Required for Cell 2	79,757.9	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	232.5	ft	Total Bottom Area:	16,159	sq ft
Side Slopes XH:1V	3				Bottom Width:	69.5	ft	Total Top Area:	23,983	sq ft
					WQ Length	244.5				
					WQ Width	81.5				
					Top Length	256.5				
					Top Width	93.5				
								Volume Calculated:	80,283	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
114,567

Primary Overflow Surface	4.70
Emergency Overflow Surface	5.70

Table 6. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 3C WQ Pond

Required Pond Volume	2.21	ac-ft								
Required Pond Volume	96,346	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	96,346	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	28,904	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	135	ft	Total Bottom Area:	4,995	sq ft
Side Slopes XH:1V	3				Bottom Width:	37.0	ft	Total Top Area:	9,699	sq ft
					WQ Length	147.0				
					WQ Width	49.0				
					Top Length	159.0				
					Top Width	61.0				
								Volume Calculated:	29,388	Good? YES
Total Volume Required for Cell 2	67,442.2	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	213	ft	Total Bottom Area:	13,419	sq ft
Side Slopes XH:1V	3				Bottom Width:	63	ft	Total Top Area:	20,619	sq ft
					WQ Length	225				
					WQ Width	75				
					Top Length	237				
					Top Width	87				
								Volume Calculated:	68,076	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
97,464

Primary Overflow Surface	4.55
Emergency Overflow Surface	5.55

Table 7. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 4A WQ Pond

Required Pond Volume	2.40	ac-ft								
Required Pond Volume	104,457	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	104,457	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	31,337	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	141	ft	Total Bottom Area:	5,499	sq ft
Side Slopes XH:1V	3				Bottom Width:	39.0	ft	Total Top Area:	10,395	sq ft
					WQ Length	153.0				
					WQ Width	51.0				
					Top Length	165.0				
					Top Width	63.0				
								Volume Calculated:	31,788	Good? YES
Total Volume Required for Cell 2	73,119.8	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	222	ft	Total Bottom Area:	14,652	sq ft
Side Slopes XH:1V	3				Bottom Width:	66	ft	Total Top Area:	22,140	sq ft
					WQ Length	234				
					WQ Width	78				
					Top Length	246				
					Top Width	90				
								Volume Calculated:	73,584	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
105,372

Primary Overflow Surface	4.57
Emergency Overflow Surface	5.57

Table 8. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 4B WQ Pond

Required Pond Volume	2.55	ac-ft								
Required Pond Volume	111,187	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	111,187	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	33,356	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	147	ft	Total Bottom Area:	6,027	sq ft
Side Slopes XH:1V	3				Bottom Width:	41.0	ft	Total Top Area:	11,115	sq ft
					WQ Length	159.0				
					WQ Width	53.0				
					Top Length	171.0				
					Top Width	65.0				
								Volume Calculated:	34,284	Good? YES
Total Volume Required for Cell 2	77,830.8	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	231	ft	Total Bottom Area:	15,939	sq ft
Side Slopes XH:1V	3				Bottom Width:	69	ft	Total Top Area:	23,715	sq ft
					WQ Length	243				
					WQ Width	81				
					Top Length	255				
					Top Width	93				
								Volume Calculated:	79,308	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
113,592

Primary Overflow Surface	4.61
Emergency Overflow Surface	5.61

Table 9. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 4C WQ Pond

Required Pond Volume	1.27	ac-ft								
Required Pond Volume	55,391	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	55,391	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	16,617	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	99	ft	Total Bottom Area:	2,475	sq ft
Side Slopes XH:1V	3				Bottom Width:	25.0	ft	Total Top Area:	6,027	sq ft
					WQ Length	111.0				
					WQ Width	37.0				
					Top Length	123.0				
					Top Width	49.0				
								Volume Calculated:	17,004	Good? YES
Total Volume Required for Cell 2	38,773.6	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	157.5	ft	Total Bottom Area:	7,009	sq ft
Side Slopes XH:1V	3				Bottom Width:	44.5	ft	Total Top Area:	12,433	sq ft
					WQ Length	169.5				
					WQ Width	56.5				
					Top Length	181.5				
					Top Width	68.5				
								Volume Calculated:	38,883	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:
55,887

Primary Overflow Surface	4.45
Emergency Overflow Surface	5.35

Table 10. Wetpond Design Summary

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Mine 5 WQ Pond

Required Pond Volume	0.61	ac-ft								
Required Pond Volume	26,476	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	26,476	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	7,943	cu ft								
Depth Cell 1	4	ft	Length to Width Ratio:	3	Bottom Length:	63	ft	Total Bottom Area:	819	sq ft
Side Slopes XH:1V	3				Bottom Width:	13.0	ft	Total Top Area:	3,219	sq ft
					WQ Length	75.0				
					WQ Width	25.0				
					Top Length	87.0				
					Top Width	37.0				
								Volume Calculated:	8,076	Good? YES
Total Volume Required for Cell 2	18,533.0	cu ft								
Depth Cell 2	4	ft	Length to Width Ratio:	3	Bottom Length:	105	ft	Total Bottom Area:	2,835	sq ft
Side Slopes XH:1V	3				Bottom Width:	27	ft	Total Top Area:	6,579	sq ft
					WQ Length	117				
					WQ Width	39				
					Top Length	129				
					Top Width	51				
								Volume Calculated:	18,828	Good? YES

Notes

Yellow shading represents user input
Gray shading prepresents volume check for capacity
ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Max Treatment Volume:			99	33
	26,904			
Primary Overflow Surface		4.45		
Emergency Overflow Surface		5.25		

Reverse Slope Pipe Design

Pond	WQ Design Flow
1A	0.66

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
1A	HDPE	12	0.045	22.25	2.00	4.00	0.012	0.7

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
1A	0.79	0.8	0.011	4.67	0.01	4.68	0.7	0.01	0.01	4.69	0.51	2.51	**4.69**	1.69	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
1A	0.34	0.9	2.48	142.09	0.23	1.00	0.67	2.82

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
1B	2.77

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
1B	HDPE	12	0.04	26	2.00	4	0.012	2.8

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
1B	0.79	3.5	0.193	4.86	0.13	4.99	0.7	0.14	0.19	5.32	1.18	3.18	**5.32**	2.32	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
1B	0.71	0.9	4.02	230.52	0.60	1.00	0.86	4.62

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
2	2.38

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
2	HDPE	12	0.04	26	2.00	4	0.012	2.4

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
2	0.79	3.0	0.143	4.83	0.10	4.93	0.7	0.10	0.14	5.17	1.07	3.07	**5.17**	2.17	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
2	0.66	0.9	3.79	217.43	0.55	1.00	0.83	4.33

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
3A	1.45

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
3A	HDPE	12	0.04	22.25	2.00	4.00	0.012	1.5

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
3A	0.79	1.8	0.053	4.76	0.03	4.79	0.7	0.04	0.05	4.88	0.79	2.79	**4.88**	1.88	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
3A	0.51	1.0	3.18	182.38	0.40	1.00	0.76	3.60

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
3B	1.98

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
3B	HDPE	12	0.04	22.25	2.00	4.00	0.012	2.0

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
3B	0.79	2.5	0.099	4.80	0.06	4.86	0.7	0.07	0.10	5.03	0.96	2.96	**5.03**	2.03	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
3B	0.60	1.0	3.55	203.29	0.49	1.00	0.80	4.03

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
3C	1.39

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
3C	HDPE	12	0.04	26	2.00	4	0.012	1.4

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
3C	0.79	1.8	0.048	4.75	0.03	4.78	0.7	0.03	0.05	4.86	0.77	2.77	**4.86**	1.86	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
3C	0.50	1.0	3.13	179.59	0.39	1.00	0.75	3.55

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
4A	1.48

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
4A	HDPE	12	0.04	26	2.00	4	0.012	1.5

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
4A	0.79	1.9	0.055	4.76	0.04	4.80	0.7	0.04	0.06	4.89	0.80	2.80	**4.89**	1.89	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
4A	0.52	1.0	3.21	183.67	0.41	1.00	0.76	3.63

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
4B	1.65

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
4B	HDPE	12	0.04	26	2.00	4	0.012	1.6

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
4B	0.79	2.1	0.068	4.77	0.05	4.82	0.7	0.05	0.07	4.94	0.85	2.85	**4.94**	1.94	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
4B	0.55	1.0	3.32	190.35	0.44	1.00	0.77	3.76

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
4C	1.01

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
4C	HDPE	12	0.04	22.25	2.00	4.00	0.012	1.0

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
4C	0.79	1.3	0.026	4.71	0.02	4.73	0.7	0.02	0.03	4.77	0.64	2.64	**4.77**	1.77	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
4C	0.42	1.0	2.83	162.11	0.32	1.00	0.71	3.21

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Reverse Slope Pipe Design

Pond	WQ Design Flow
5	1.02

PIPE INFORMATION

Pipe No.	Pipe Material	Pipe Size in INCH	Pipe Slope in FT/FT	Pipe Length in FT	Pipe Inlet Elevation in FT	Pipe Outlet Elevation in FT	Manning's n	Design Flow in CFS
5	HDPE	12	0.04	26	2.00	4	0.012	1.0

BACKWATER FLOW CALCULATIONS (CONFIRM PIPE SIZE)

Pipe No.	Barrel Area in SF	Barrel Velocity in FPS	Barrel Velocity Head in FT	Tailwater Elevation in FT	Friction Head Loss in FT	Entrance HGL in FT	Ke	Entrance Head Loss in FT	Exit Head Loss in FT	Outlet Control Elevation in FT	Inlet Control Depth in FT	Inlet Control Elevation in FT	Headwater Elevation in FT	Depth Above Crown in FT	Type of Flow Control
5	0.79	1.3	0.026	4.71	0.02	4.73	0.7	0.02	0.03	4.77	0.64	2.64	**4.77**	1.77	OUTLET

DETERMINING CRITICAL DEPTH

Pipe No.	Critical Depth (Dc)	Wetted Top Width (T) in FT	Angle Formed By T (Theta) in RAD	Theta in DEG	Area in SF	Q^2T/gA^3	(D+Dc)/2	Critical Velocity in FPS
5	0.42	1.0	2.84	162.53	0.32	1.00	0.71	3.21

Note:
Critical Depth is determined by iterating Dc (using Excel tool Goal Seek) so that Q^2T/gA^3 is equal to 1.0.

Connecting Spillway Sizing Calculations - Pond 1A

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**17.80 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**0.7 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**7.8 ft**
Top Length	**15.8 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 1B

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**136.47 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**1.0 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**40.1 ft**
Top Length	**50.0 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 2

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**107.26 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**1.0 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**31.0 ft**
Top Length	**40.9 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 3A

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**86.89 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**1.0 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**24.7 ft**
Top Length	**34.5 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 3B

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property
Aspect Engineer:	O.Reese, PE
	C.Pineda, EIT
Date:	February 23, 2023

Q_{WQ} Peak Flow	**86.98**	**cfs**	
Discharge Coeffcient (C)	**0.60**		
Gravity	**32.20**	**ft/sec^2**	
Height	**1.0**	**ft**	Height of water over weir
Tan(ɵ)	**3**		Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5**	**ft**	0.5-ft min.

Bottom Length	**24.7**	**ft**
Top Length	**34.5**	**ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 3C

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**79.52 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**1.0 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**22.4 ft**
Top Length	**32.2 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 4A

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property
Aspect Engineer:	O.Reese, PE
	C.Pineda, EIT
Date:	February 23, 2023

Q_{WQ} Peak Flow	**81.36**	**cfs**	
Discharge Coeffcient (C)	**0.60**		
Gravity	**32.20**	**ft/sec^2**	
Height	**1.0**	**ft**	Height of water over weir
Tan(ɵ)	**3**		Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5**	**ft**	0.5-ft min.

Bottom Length	**22.9**	**ft**
Top Length	**32.8**	**ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 4B

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**89.30 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**1.0 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**25.4 ft**
Top Length	**35.3 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 4C

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	52.92 cfs	
Discharge Coeffcient (C)	0.60	
Gravity	32.20 ft/sec^2	
Height	0.9 ft	Height of water over weir
Tan(ɵ)	3	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	0.5 ft	0.5-ft min.

Bottom Length	**17.2 ft**
Top Length	**26.4 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

Connecting Spillway Sizing Calculations - Pond 5

Project No. 220395, Cumberland Property
Cumberland Grading and Drainage Design, Cumberland, WA

Project:	Cumberland Property	
Aspect Engineer:	O.Reese, PE	
	C.Pineda, EIT	
Date:	February 23, 2023	
Q_{WQ} Peak Flow	**30.73 cfs**	
Discharge Coeffcient (C)	**0.60**	
Gravity	**32.20 ft/sec^2**	
Height	**0.8 ft**	Height of water over weir
Tan(ɵ)	**3**	Tan(theta) = 10 (for 10:1 side slopes)
Freeboard	**0.5 ft**	0.5-ft min.

Bottom Length	**11.5 ft**
Top Length	**20.1 ft**

See 2021 KCSWDM Section 5.1.1.2 equations for sizing emergency spillways.

APPENDIX D

Conveyance Calculations

WWHM2012
PROJECT REPORT

Project Name: Cumberland Property - Ditch Design
Site Name: Cumberland Property
Site Address: Cumberland - Kanaskat Road
City : King County
Report Date: 5/30/2023
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.14
Version Date: 2021/08/18
Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

Low Flow Threshold for POC 3 : 50 Percent of the 2 Year

High Flow Threshold for POC 3: 50 year

Low Flow Threshold for POC 4 : 50 Percent of the 2 Year

High Flow Threshold for POC 4: 50 year

Low Flow Threshold for POC 5 : 50 Percent of the 2 Year

High Flow Threshold for POC 5: 50 year

Low Flow Threshold for POC 6 : 50 Percent of the 2 Year

High Flow Threshold for POC 6: 50 year

Low Flow Threshold for POC 7 : 50 Percent of the 2 Year

High Flow Threshold for POC 7: 50 year

Low Flow Threshold for POC 8 : 50 Percent of the 2 Year

High Flow Threshold for POC 8: 50 year

Low Flow Threshold for POC 9 : 50 Percent of the 2 Year

High Flow Threshold for POC 9: 50 year

Low Flow Threshold for POC 10 : 50 Percent of the 2 Year

High Flow Threshold for POC 10: 50 year

Low Flow Threshold for POC 11 : 50 Percent of the 2 Year

High Flow Threshold for POC 11: 50 year

Low Flow Threshold for POC 12 : 50 Percent of the 2 Year

High Flow Threshold for POC 12: 50 year

Low Flow Threshold for POC 13 : 50 Percent of the 2 Year

High Flow Threshold for POC 13: 50 year

Low Flow Threshold for POC 14 : 50 Percent of the 2 Year

High Flow Threshold for POC 14: 50 year

Low Flow Threshold for POC 15 : 50 Percent of the 2 Year

High Flow Threshold for POC 15: 50 year

Low Flow Threshold for POC 16 : 50 Percent of the 2 Year

High Flow Threshold for POC 16: 50 year

Low Flow Threshold for POC 17 : 50 Percent of the 2 Year

High Flow Threshold for POC 17: 50 year

Low Flow Threshold for POC 18 : 50 Percent of the 2 Year

High Flow Threshold for POC 18: 50 year

Low Flow Threshold for POC 19 : 50 Percent of the 2 Year

High Flow Threshold for POC 19: 50 year

PREDEVELOPED LAND USE

Name : Ditch 2 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	3.33
Pervious Total	**3.33**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**3.33**

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 1 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	55
A B, Forest, Mod	4.22
Pervious Total	**59.22**

Impervious Land Use	acre

Impervious Total	**0**
Basin Total	**59.22**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 4 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Flat	**7.28**
A B, Forest, Mod	**.81**
A B, Forest, Steep	**.2**
Pervious Total	**8.29**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**8.29**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 3 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Flat	**3.45**
Pervious Total	**3.45**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**3.45**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 6 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	7.28
A B, Forest, Mod	.81
A B, Forest, Steep	.2
Pervious Total	8.29

Impervious Land Use	acre
Impervious Total	0
Basin Total	8.29

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 5 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	6.88
Pervious Total	6.88

Impervious Land Use	acre
Impervious Total	0
Basin Total	6.88

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 8 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	1.33
A B, Forest, Mod	4.59
Pervious Total	5.92

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.92

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 7 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	3.68
Pervious Total	3.68

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.68

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 10 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	13.78
A B, Forest, Mod	2.84
A B, Forest, Steep	6.63
Pervious Total	23.25

Impervious Land Use	acre
Impervious Total	0
Basin Total	23.25

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 9 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	1.66
Pervious Total	1.66

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.66

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 11
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.8

Pervious Total	1.8

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.8

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 12
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.08
Pervious Total	1.08

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.08

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 13
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.94
Pervious Total	0.94

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.94

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 14
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**1.1**
Pervious Total	**1.1**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**1.1**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 15
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**1.9**
Pervious Total	**1.9**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**1.9**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 16
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.45
Pervious Total	1.45

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.45

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 17
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.19
Pervious Total	0.19

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.19

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 18
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.5
Pervious Total	0.5

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.5

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 19
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.65
Pervious Total	0.65

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.65

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Ditch 1 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	55
A B, Forest, Mod	4.22

Pervious Total	59.22

Impervious Land Use	acre
Impervious Total	0
Basin Total	59.22

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 2 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS FLAT	3.33
Impervious Total	3.33
Basin Total	3.33

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 4 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	7.28
A B, Forest, Mod	.81
A B, Forest, Steep	.2
Pervious Total	8.29

Impervious Land Use	acre
Impervious Total	0

Basin Total	**8.29**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 3 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
Pervious Total	**0**

Impervious Land Use	**acre**
ROADS FLAT	**3.45**
Impervious Total	**3.45**
Basin Total	**3.45**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 6 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Flat	**7.28**
A B, Forest, Mod	**.81**
A B, Forest, Steep	**.2**
Pervious Total	**8.29**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**8.29**

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 5 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS FLAT	6.88
Impervious Total	6.88
Basin Total	6.88

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 8 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	1.33
A B, Forest, Mod	4.59
Pervious Total	5.92

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.92

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 7 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	**0**

Impervious Land Use	acre
ROADS FLAT	**3.68**
Impervious Total	**3.68**
Basin Total	**3.68**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 10 - Bypass
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	**13.78**
A B, Forest, Mod	**2.84**
A B, Forest, Steep	**6.63**
Pervious Total	**23.25**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**23.25**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 9 - Mine SW
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS FLAT	1.66
Impervious Total	1.66
Basin Total	1.66

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 11
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS MOD	1.8
Impervious Total	1.8
Basin Total	1.8

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 12
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS MOD	1.08

Impervious Total	**1.08**
Basin Total	**1.08**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 13
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
Pervious Total	**0**

Impervious Land Use	**acre**
ROADS MOD	**0.94**
Impervious Total	**0.94**
Basin Total	**0.94**

Element Flows To:

Surface	**Interflow**	**Groundwater**

Name : Ditch 14
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
Pervious Total	**0**

Impervious Land Use	**acre**
ROADS MOD	**1.1**
Impervious Total	**1.1**
Basin Total	**1.1**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 15
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
Pervious Total	**0**

Impervious Land Use	**acre**
ROADS MOD	**1.9**
Impervious Total	**1.9**
Basin Total	**1.9**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 16
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
Pervious Total	**0**

Impervious Land Use	**acre**
ROADS MOD	**1.45**
Impervious Total	**1.45**
Basin Total	**1.45**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Ditch 17
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS MOD	0.19
Impervious Total	0.19
Basin Total	0.19

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 18
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS MOD	0.5
Impervious Total	0.5
Basin Total	0.5

Element Flows To:

Surface	Interflow	Groundwater

Name : Ditch 19
Bypass: No

GroundWater: No

Pervious Land Use	acre

Pervious Total	0

Impervious Land Use	acre
ROADS MOD	0.65
Impervious Total	0.65
Basin Total	0.65

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:59.22
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:59.22
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.764719
5 year	2.444175
10 year	4.545018
25 year	8.893933
50 year	13.797242
100 year	20.554863

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.764719
5 year	2.444175
10 year	4.545018
25 year	8.893933
50 year	13.797242
100 year	20.554863

Stream Protection Duration
<<Stream Protection Duration Results Omitted - N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment Percent Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:8.29
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:8.29
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.109539
5 year	0.350192
10 year	0.651279
25 year	1.274641
50 year	1.977548
100 year	2.946364

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0.109539
5 year	0.350192
10 year	0.651279
25 year	1.274641
50 year	1.977548
100 year	2.946364

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment? Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Infiltrated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #3
Total Pervious Area:8.29
Total Impervious Area:0

Mitigated Landuse Totals for POC #3
Total Pervious Area:8.29
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	Flow(cfs)
2 year	0.109539
5 year	0.350192
10 year	0.651279
25 year	1.274641
50 year	1.977548
100 year	2.946364

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	Flow(cfs)
2 year	0.109539
5 year	0.350192
10 year	0.651279
25 year	1.274641
50 year	1.977548
100 year	2.946364

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #3
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #4
Total Pervious Area:5.92
Total Impervious Area:0

Mitigated Landuse Totals for POC #4
Total Pervious Area:5.92
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	Flow(cfs)
2 year	0.096837
5 year	0.306454
10 year	0.559619
25 year	1.063617
50 year	1.61045
100 year	2.338845

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	Flow(cfs)
2 year	0.096837
5 year	0.306454
10 year	0.559619
25 year	1.063617
50 year	1.61045

100 year 2.338845

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #4
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #5
Total Pervious Area:23.25
Total Impervious Area:0

Mitigated Landuse Totals for POC #5
Total Pervious Area:23.25
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	Flow(cfs)
2 year	0.363838
5 year	1.147762
10 year	2.092468
25 year	3.969926
50 year	6.004095
100 year	8.710738

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	Flow(cfs)
2 year	0.363838
5 year	1.147762

10 year	2.092468
25 year	3.969926
50 year	6.004095
100 year	8.710738

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #5
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #6
Total Pervious Area:3.33
Total Impervious Area:0

Mitigated Landuse Totals for POC #6
Total Pervious Area:0
Total Impervious Area:3.33

Flow Frequency Return Periods for Predeveloped. POC #6

Return Period	**Flow(cfs)**
2 year	0.041956
5 year	0.134046
10 year	0.24921
25 year	0.487555
50 year	0.756235
100 year	1.12647

Flow Frequency Return Periods for Mitigated. POC #6

Return Period	Flow(cfs)
2 year	2.024019
5 year	2.934193
10 year	3.636107
25 year	4.643786
50 year	5.487323
100 year	6.414923

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #6
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Infiltrated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #7
Total Pervious Area:3.45
Total Impervious Area:0

Mitigated Landuse Totals for POC #7
Total Pervious Area:0
Total Impervious Area:3.45

Flow Frequency Return Periods for Predeveloped. POC #7

Return Period	Flow(cfs)

2 year	0.043468
5 year	0.138877
10 year	0.258191
25 year	0.505125
50 year	0.783487
100 year	1.167064

Flow Frequency Return Periods for Mitigated. POC #7

Return Period	**Flow(cfs)**
2 year	2.096958
5 year	3.03993
10 year	3.767139
25 year	4.81113
50 year	5.685065
100 year	6.646092

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #7
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00
0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #8
Total Pervious Area:6.88
Total Impervious Area:0

Mitigated Landuse Totals for POC #8
Total Pervious Area:0
Total Impervious Area:6.88

Flow Frequency Return Periods for Predeveloped. POC #8

Return Period	Flow(cfs)
2 year	0.086684
5 year	0.276948
10 year	0.514884
25 year	1.007321
50 year	1.56243
100 year	2.32736

Flow Frequency Return Periods for Mitigated. POC #8

Return Period	Flow(cfs)
2 year	4.181759
5 year	6.062235
10 year	7.512437
25 year	9.594366
50 year	11.337167
100 year	13.253648

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #8
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00
0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #9
Total Pervious Area:3.68
Total Impervious Area:0

Mitigated Landuse Totals for POC #9
Total Pervious Area:0
Total Impervious Area:3.68

Flow Frequency Return Periods for Predeveloped. POC #9

Return Period	Flow(cfs)
2 year	0.046366
5 year	0.148135
10 year	0.275403
25 year	0.5388
50 year	0.835719
100 year	1.244868

Flow Frequency Return Periods for Mitigated. POC #9

Return Period	Flow(cfs)
2 year	2.236755
5 year	3.242592
10 year	4.018283
25 year	5.131874
50 year	6.064072
100 year	7.089169

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #9
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs	Volume Through	Infiltration Volume	Cumulative Volume	Percent Water Quality	Comment

	Treatment	Facility	(ac-ft.)	Infiltration	Infiltrated	Treated
	(ac-ft)	(ac-ft)		Credit		
Total Volume Infiltrated	0.00	0.00	0.00	0.00	0.00	0%

No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #10
Total Pervious Area:1.66
Total Impervious Area:0

Mitigated Landuse Totals for POC #10
Total Pervious Area:0
Total Impervious Area:1.66

Flow Frequency Return Periods for Predeveloped. POC #10

Return Period	Flow(cfs)
2 year	0.020915
5 year	0.066822
10 year	0.124231
25 year	0.243046
50 year	0.376982
100 year	0.561544

Flow Frequency Return Periods for Mitigated. POC #10

Return Period	Flow(cfs)
2 year	1.008971
5 year	1.462691
10 year	1.812594
25 year	2.31492
50 year	2.735422
100 year	3.197829

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #10
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**

Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Percent Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #11
Total Pervious Area:1.8
Total Impervious Area:0

Mitigated Landuse Totals for POC #11
Total Pervious Area:0
Total Impervious Area:1.8

Flow Frequency Return Periods for Predeveloped. POC #11

Return Period	Flow(cfs)
2 year	0.031966
5 year	0.099735
10 year	0.178481
25 year	0.328812
50 year	0.485393
100 year	0.686632

Flow Frequency Return Periods for Mitigated. POC #11

Return Period	Flow(cfs)
2 year	1.357133
5 year	2.043235
10 year	2.587923
25 year	3.388476
50 year	4.07262
100 year	4.837397

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #11
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment?	Volume Needs Treatment (ac-ft)	Infiltration Through Facility (ac-ft)	Volume (ac-ft.)	Cumulative Infiltration Volume Credit	Percent Infiltrated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #12
Total Pervious Area:1.08
Total Impervious Area:0

Mitigated Landuse Totals for POC #12
Total Pervious Area:0
Total Impervious Area:1.08

Flow Frequency Return Periods for Predeveloped. POC #12

Return Period	Flow(cfs)
2 year	0.01918
5 year	0.059841
10 year	0.107088
25 year	0.197287
50 year	0.291236
100 year	0.41198

Flow Frequency Return Periods for Mitigated. POC #12

Return Period	Flow(cfs)
2 year	0.81428
5 year	1.225942
10 year	1.552755
25 year	2.033088
50 year	2.443575
100 year	2.902442

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #12
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #13
Total Pervious Area:0.94
Total Impervious Area:0

Mitigated Landuse Totals for POC #13
Total Pervious Area:0
Total Impervious Area:0.94

Flow Frequency Return Periods for Predeveloped. POC #13

Return Period	Flow(cfs)
2 year	0.016694
5 year	0.052084
10 year	0.093207
25 year	0.171713
50 year	0.253483
100 year	0.358575

Flow Frequency Return Periods for Mitigated. POC #13

Return Period	Flow(cfs)
2 year	0.708725
5 year	1.067023
10 year	1.351471
25 year	1.769538
50 year	2.126814
100 year	2.526198

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #13
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Infiltrated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #14
Total Pervious Area:1.1
Total Impervious Area:0

Mitigated Landuse Totals for POC #14
Total Pervious Area:0
Total Impervious Area:1.1

Flow Frequency Return Periods for Predeveloped. POC #14

Return Period	Flow(cfs)

2 year	0.019535
5 year	0.060949
10 year	0.109072
25 year	0.200941
50 year	0.296629
100 year	0.419609

Flow Frequency Return Periods for Mitigated. POC #14

Return Period	**Flow(cfs)**
2 year	0.829359
5 year	1.248644
10 year	1.581508
25 year	2.070735
50 year	2.488823
100 year	2.956187

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #14
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment? Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00
0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #15
Total Pervious Area:1.9
Total Impervious Area:0

Mitigated Landuse Totals for POC #15
Total Pervious Area:0
Total Impervious Area:1.9

Flow Frequency Return Periods for Predeveloped. POC #15

Return Period	Flow(cfs)
2 year	0.033742
5 year	0.105276
10 year	0.188396
25 year	0.34708
50 year	0.51236
100 year	0.724779

Flow Frequency Return Periods for Mitigated. POC #15

Return Period	Flow(cfs)
2 year	1.43253
5 year	2.156748
10 year	2.731697
25 year	3.576725
50 year	4.298878
100 year	5.106143

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #15
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00
0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #16
Total Pervious Area:1.45
Total Impervious Area:0

Mitigated Landuse Totals for POC #16
Total Pervious Area:0
Total Impervious Area:1.45

Flow Frequency Return Periods for Predeveloped. POC #16

Return Period	Flow(cfs)
2 year	0.025751
5 year	0.080342
10 year	0.143776
25 year	0.264877
50 year	0.391011
100 year	0.553121

Flow Frequency Return Periods for Mitigated. POC #16

Return Period	Flow(cfs)
2 year	1.093246
5 year	1.64594
10 year	2.084716
25 year	2.729606
50 year	3.280722
100 year	3.896793

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #16
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs	Volume Through	Infiltration Volume	Cumulative Volume	Percent Water Quality	Comment

	Treatment (ac-ft)	Facility (ac-ft)	(ac-ft.)	Infiltration Credit	Infiltrated	Treated
Total Volume Infiltrated	0.00	0.00	0.00		0.00	0.00

0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #17
Total Pervious Area:0.19
Total Impervious Area:0

Mitigated Landuse Totals for POC #17
Total Pervious Area:0
Total Impervious Area:0.19

Flow Frequency Return Periods for Predeveloped. POC #17

Return Period	Flow(cfs)
2 year	0.003374
5 year	0.010528
10 year	0.01884
25 year	0.034708
50 year	0.051236
100 year	0.072478

Flow Frequency Return Periods for Mitigated. POC #17

Return Period	Flow(cfs)
2 year	0.143253
5 year	0.215675
10 year	0.27317
25 year	0.357673
50 year	0.429888
100 year	0.510614

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #17
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**

Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Percent Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Comment Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #18
Total Pervious Area:0.5
Total Impervious Area:0

Mitigated Landuse Totals for POC #18
Total Pervious Area:0
Total Impervious Area:0.5

Flow Frequency Return Periods for Predeveloped. POC #18

Return Period	Flow(cfs)
2 year	0.00888
5 year	0.027704
10 year	0.049578
25 year	0.091337
50 year	0.134832
100 year	0.190731

Flow Frequency Return Periods for Mitigated. POC #18

Return Period	Flow(cfs)
2 year	0.376982
5 year	0.567566
10 year	0.718868
25 year	0.941244
50 year	1.131284
100 year	1.343722

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #18
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment?	Volume Needs Treatment (ac-ft)	Infiltration Through Facility (ac-ft)	Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Volume Infiltrated	Comment Water Quality Treated
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #19
Total Pervious Area:0.65
Total Impervious Area:0

Mitigated Landuse Totals for POC #19
Total Pervious Area:0
Total Impervious Area:0.65

Flow Frequency Return Periods for Predeveloped. POC #19

Return Period	Flow(cfs)
2 year	0.011543
5 year	0.036015
10 year	0.064451
25 year	0.118738
50 year	0.175281
100 year	0.24795

Flow Frequency Return Periods for Mitigated. POC #19

Return Period	Flow(cfs)
2 year	0.490076
5 year	0.737835
10 year	0.934528
25 year	1.223617
50 year	1.47067
100 year	1.74684

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #19
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes
No changes have been made.

Ditch 1 Bypass - 25Yr Flow (8.89 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	1.79 %
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	8.890000 cfs

Results	
Normal Depth	0.9 ft
Flow Area	2.7 ft²
Wetted Perimeter	6.0 ft
Hydraulic Radius	0.4 ft
Top Width	5.67 ft
Critical Depth	0.9 ft
Critical Slope	2.53 %
Velocity	3.32 ft/s
Velocity Head	0.17 ft
Specific Energy	1.12 ft
Froude Number	0.851
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.9 ft
Critical Depth	0.9 ft
Channel Slope	1.79 %
Critical Slope	2.53 %

Ditch 2 Mine SW - 25Yr Flow (4.64 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	1.51 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	4.640000 cfs

Results	
Normal Depth	0.8 ft
Flow Area	1.8 ft²
Wetted Perimeter	4.9 ft
Hydraulic Radius	0.4 ft
Top Width	4.59 ft
Critical Depth	0.7 ft
Critical Slope	2.76 %
Velocity	2.64 ft/s
Velocity Head	0.11 ft
Specific Energy	0.87 ft
Froude Number	0.754
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.8 ft
Critical Depth	0.7 ft
Channel Slope	1.51 %
Critical Slope	2.76 %

Ditch 3 Mine SW - 25Yr Flow (4.81 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.60 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	4.810000 cfs

Results	
Normal Depth	0.9 ft
Flow Area	2.5 ft²
Wetted Perimeter	5.9 ft
Hydraulic Radius	0.4 ft
Top Width	5.53 ft
Critical Depth	0.7 ft
Critical Slope	2.75 %
Velocity	1.89 ft/s
Velocity Head	0.06 ft
Specific Energy	0.98 ft
Froude Number	0.490
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.9 ft
Critical Depth	0.7 ft
Channel Slope	0.60 %
Critical Slope	2.75 %

Ditch 4 Bypass - 25Yr Flow (1.27 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.44 %
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	1.270000 cfs

Results	
Normal Depth	0.6 ft
Flow Area	1.1 ft²
Wetted Perimeter	3.8 ft
Hydraulic Radius	0.3 ft
Top Width	3.56 ft
Critical Depth	0.4 ft
Critical Slope	3.28 %
Velocity	1.20 ft/s
Velocity Head	0.02 ft
Specific Energy	0.62 ft
Froude Number	0.390
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.6 ft
Critical Depth	0.4 ft
Channel Slope	0.44 %
Critical Slope	3.28 %

Ditch 5 Mine SW- 25Yr Flow (9.59 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.68 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	9.590000 cfs

Results	
Normal Depth	1.2 ft
Flow Area	4.1 ft²
Wetted Perimeter	7.4 ft
Hydraulic Radius	0.6 ft
Top Width	7.00 ft
Critical Depth	0.9 ft
Critical Slope	2.50 %
Velocity	2.35 ft/s
Velocity Head	0.09 ft
Specific Energy	1.25 ft
Froude Number	0.542
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.2 ft
Critical Depth	0.9 ft
Channel Slope	0.68 %
Critical Slope	2.50 %

Ditch 6 Bypass - 25Yr Flow (1.27 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.68 %
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	1.270000 cfs

Results	
Normal Depth	0.5 ft
Flow Area	0.9 ft²
Wetted Perimeter	3.5 ft
Hydraulic Radius	0.3 ft
Top Width	3.28 ft
Critical Depth	0.4 ft
Critical Slope	3.28 %
Velocity	1.42 ft/s
Velocity Head	0.03 ft
Specific Energy	0.58 ft
Froude Number	0.478
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.5 ft
Critical Depth	0.4 ft
Channel Slope	0.68 %
Critical Slope	3.28 %

Ditch 7 Mine SW - 25Yr Flow (5.13 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.67 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	5.130000 cfs

Results	
Normal Depth	0.9 ft
Flow Area	2.6 ft²
Wetted Perimeter	5.9 ft
Hydraulic Radius	0.4 ft
Top Width	5.55 ft
Critical Depth	0.7 ft
Critical Slope	2.72 %
Velocity	2.00 ft/s
Velocity Head	0.06 ft
Specific Energy	0.99 ft
Froude Number	0.518
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.9 ft
Critical Depth	0.7 ft
Channel Slope	0.67 %
Critical Slope	2.72 %

Ditch 8 Bypass - 25Yr Flow (1.06 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.31 %
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	1.060000 cfs

Results	
Normal Depth	0.6 ft
Flow Area	1.0 ft²
Wetted Perimeter	3.8 ft
Hydraulic Radius	0.3 ft
Top Width	3.55 ft
Critical Depth	0.4 ft
Critical Slope	3.36 %
Velocity	1.01 ft/s
Velocity Head	0.02 ft
Specific Energy	0.61 ft
Froude Number	0.327
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.6 ft
Critical Depth	0.4 ft
Channel Slope	0.31 %
Critical Slope	3.36 %

Ditch 9 Mine SW - 25Yr Flow (2.31 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	3.65 %
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	2.310000 cfs

Results	
Normal Depth	0.5 ft
Flow Area	0.7 ft²
Wetted Perimeter	3.2 ft
Hydraulic Radius	0.2 ft
Top Width	2.99 ft
Critical Depth	0.5 ft
Critical Slope	3.03 %
Velocity	3.09 ft/s
Velocity Head	0.15 ft
Specific Energy	0.65 ft
Froude Number	1.092
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Channel Slope	3.65 %
Critical Slope	3.03 %

Ditch 10 Bypass - 25Yr Flow (3.97 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	3.52 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	3.970000 cfs

Results	
Normal Depth	0.6 ft
Flow Area	1.1 ft²
Wetted Perimeter	3.9 ft
Hydraulic Radius	0.3 ft
Top Width	3.69 ft
Critical Depth	0.6 ft
Critical Slope	2.82 %
Velocity	3.49 ft/s
Velocity Head	0.19 ft
Specific Energy	0.81 ft
Froude Number	1.110
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.6 ft
Critical Depth	0.6 ft
Channel Slope	3.52 %
Critical Slope	2.82 %

Ditch 11 - 25Yr Flow (3.38 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.08 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	3.380000 cfs

Results	
Normal Depth	0.5 ft
Flow Area	0.7 ft²
Wetted Perimeter	3.0 ft
Hydraulic Radius	0.2 ft
Top Width	2.85 ft
Critical Depth	0.6 ft
Critical Slope	2.88 %
Velocity	4.98 ft/s
Velocity Head	0.39 ft
Specific Energy	0.86 ft
Froude Number	1.799
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.5 ft
Critical Depth	0.6 ft
Channel Slope	10.08 %
Critical Slope	2.88 %

Ditch 12 - 25Yr Flow (2.03 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	9.36 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.030000 cfs

Results	
Normal Depth	0.4 ft
Flow Area	0.5 ft²
Wetted Perimeter	2.5 ft
Hydraulic Radius	0.2 ft
Top Width	2.39 ft
Critical Depth	0.5 ft
Critical Slope	3.08 %
Velocity	4.27 ft/s
Velocity Head	0.28 ft
Specific Energy	0.68 ft
Froude Number	1.685
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	0.5 ft
Channel Slope	9.36 %
Critical Slope	3.08 %

Ditch 13 - 25Yr Flow (1.77 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.00 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	1.770000 cfs

Results	
Normal Depth	0.4 ft
Flow Area	0.4 ft²
Wetted Perimeter	2.4 ft
Hydraulic Radius	0.2 ft
Top Width	2.24 ft
Critical Depth	0.5 ft
Critical Slope	3.14 %
Velocity	4.22 ft/s
Velocity Head	0.28 ft
Specific Energy	0.65 ft
Froude Number	1.722
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	0.5 ft
Channel Slope	10.00 %
Critical Slope	3.14 %

Ditch 14 - 25Yr Flow (2.07 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.52 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.070000 cfs

Results	
Normal Depth	0.4 ft
Flow Area	0.5 ft²
Wetted Perimeter	2.5 ft
Hydraulic Radius	0.2 ft
Top Width	2.36 ft
Critical Depth	0.5 ft
Critical Slope	3.07 %
Velocity	4.48 ft/s
Velocity Head	0.31 ft
Specific Energy	0.70 ft
Froude Number	1.781
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	0.5 ft
Channel Slope	10.52 %
Critical Slope	3.07 %

Ditch 15 - 25Yr Flow (3.58 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.00 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	3.580000 cfs

Results	
Normal Depth	0.5 ft
Flow Area	0.7 ft²
Wetted Perimeter	3.1 ft
Hydraulic Radius	0.2 ft
Top Width	2.92 ft
Critical Depth	0.6 ft
Critical Slope	2.86 %
Velocity	5.04 ft/s
Velocity Head	0.39 ft
Specific Energy	0.88 ft
Froude Number	1.799
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.5 ft
Critical Depth	0.6 ft
Channel Slope	10.00 %
Critical Slope	2.86 %

Ditch 16 - 25Yr Flow (2.73 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.00 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.730000 cfs

Results	
Normal Depth	0.4 ft
Flow Area	0.6 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	0.2 ft
Top Width	2.64 ft
Critical Depth	0.6 ft
Critical Slope	2.96 %
Velocity	4.71 ft/s
Velocity Head	0.34 ft
Specific Energy	0.78 ft
Froude Number	1.769
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	0.6 ft
Channel Slope	10.00 %
Critical Slope	2.96 %

Ditch 17 - 25Yr Flow (.36 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.30 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	0.360000 cfs

Results	
Normal Depth	0.2 ft
Flow Area	0.1 ft²
Wetted Perimeter	1.3 ft
Hydraulic Radius	0.1 ft
Top Width	1.23 ft
Critical Depth	0.2 ft
Critical Slope	3.88 %
Velocity	2.87 ft/s
Velocity Head	0.13 ft
Specific Energy	0.33 ft
Froude Number	1.580
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.2 ft
Critical Depth	0.2 ft
Channel Slope	10.30 %
Critical Slope	3.88 %

Ditch 18 - 25Yr Flow (.94 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.00 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	0.940000 cfs

Results	
Normal Depth	0.3 ft
Flow Area	0.3 ft²
Wetted Perimeter	1.9 ft
Hydraulic Radius	0.1 ft
Top Width	1.77 ft
Critical Depth	0.4 ft
Critical Slope	3.41 %
Velocity	3.60 ft/s
Velocity Head	0.20 ft
Specific Energy	0.50 ft
Froude Number	1.655
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.3 ft
Critical Depth	0.4 ft
Channel Slope	10.00 %
Critical Slope	3.41 %

Ditch 19 - 25Yr Flow (1.22 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	10.00 %
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	1.220000 cfs

Results	
Normal Depth	0.3 ft
Flow Area	0.3 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	0.2 ft
Top Width	1.95 ft
Critical Depth	0.4 ft
Critical Slope	3.30 %
Velocity	3.85 ft/s
Velocity Head	0.23 ft
Specific Energy	0.56 ft
Froude Number	1.682
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.3 ft
Critical Depth	0.4 ft
Channel Slope	10.00 %
Critical Slope	3.30 %

WWHM2012
PROJECT REPORT

Project Name: Cumberland Property - Culvert Design
Site Name: Cumberland Property
Site Address: Cumberland - Kanaskat Road
City : King County
Report Date: 5/31/2023
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.14
Version Date: 2021/08/18
Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

PREDEVELOPED LAND USE

Name : Culvert 2
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	4.46
Pervious Total	4.46

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.46

Element Flows To:

Surface	Interflow	Groundwater

Name : Culvert 1

Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	55
A B, Forest, Mod	4.22
Pervious Total	59.22

Impervious Land Use	acre
Impervious Total	0
Basin Total	59.22

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Culvert 2
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	0

Impervious Land Use	acre
ROADS FLAT	4.46
Impervious Total	4.46
Basin Total	4.46

Element Flows To:

Surface	Interflow	Groundwater

Name : Culvert 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Flat	55
A B, Forest, Mod	4.22
Pervious Total	59.22

Impervious Land Use	acre
Impervious Total	0
Basin Total	59.22

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:59.22
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:59.22
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.764719
5 year	2.444175
10 year	4.545018
25 year	8.893933
50 year	13.797242
100 year	20.554863

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.764719
5 year	2.444175
10 year	4.545018
25 year	8.893933
50 year	13.797242
100 year	20.554863

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.717 **acre-feet**
On-line facility target flow: 1.0251 **cfs.**
Adjusted for 15 min: 1.0251 **cfs.**
Off-line facility target flow: 0.5791 **cfs.**
Adjusted for 15 min: 0.5791 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:4.46
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:0
Total Impervious Area:4.46

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.056194
5 year	0.179533
10 year	0.333777
25 year	0.653002
50 year	1.012855
100 year	1.508726

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	2.710849
5 year	3.92988
10 year	4.869982
25 year	6.219605

50 year 7.349387
100 year 8.591758

Stream Protection Duration
<<Stream Protection Duration Results Omitted – N/A for Conveyance Design>>

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 0.1436 **acre-feet**
On-line facility target flow: 0.2046 **cfs.**
Adjusted for 15 min: 0.2046 **cfs.**
Off-line facility target flow: 0.1155 **cfs.**
Adjusted for 15 min: 0.1155 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Volume	Comment
Total Volume Infiltrated		0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes
No changes have been made.

Culvert 1 - 25Yr Flow (8.89 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.010	
Channel Slope	0.50	%
Diameter	24.0	in
Discharge	8.890000	cfs

Results		
Normal Depth	0.9	ft
Flow Area	1.4	ft^2
Wetted Perimeter	3.0	ft
Hydraulic Radius	0.5	ft
Top Width	1.99	ft
Critical Depth	1.1	ft
Percent Full	45.7	%
Critical Slope	0.30	%
Velocity	6.36	ft/s
Velocity Head	0.63	ft
Specific Energy	1.54	ft
Froude Number	1.338	
Maximum Discharge	22.368501	cfs
Discharge Full	20.794254	cfs
Slope Full	0.09	%
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.0	ft
Length	0.0	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	45.7	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.9	ft
Critical Depth	1.1	ft
Channel Slope	0.50	%
Critical Slope	0.30	%

Culvert 2 - 25Yr Flow (6.22 cfs)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	11.70 %
Diameter	12.0 in
Discharge	6.220000 cfs

Results	
Normal Depth	0.4 ft
Flow Area	0.3 ft²
Wetted Perimeter	1.4 ft
Hydraulic Radius	0.2 ft
Top Width	0.99 ft
Critical Depth	1.0 ft
Percent Full	43.5 %
Critical Slope	1.57 %
Velocity	18.97 ft/s
Velocity Head	5.59 ft
Specific Energy	6.03 ft
Froude Number	5.814
Maximum Discharge	17.041121 cfs
Discharge Full	15.841803 cfs
Slope Full	1.80 %
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	43.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	1.0 ft
Channel Slope	11.70 %
Critical Slope	1.57 %

APPENDIX E

Bond Quantity Worksheet

Site Improvement Bond Quantity Worksheet

King County

Department of Permitting & Environmental Review
35030 SE Douglas Street, Suite 210
Snoqualmie, Washington 98065-9266
206-296-6600 TTY Relay 711

For alternate formats, call 206-296-6600.

Project Name: Cumberland Gravel Mine
Location: Cumberland-Kanaskat Road SE, King County, WA
Date: 5/24/2023
Project No.:
Activity No.:

Clearing greater than or equal to 5,000 board feet of timber?

____X____ yes _____ no

If yes,
Forest Practice Permit Number: TBD
(RCW 76.09)

Note: All prices include labor, equipment, materials, overhead and profit. Prices are from RS Means data adjusted for the Seattle area or from local sources if not included in the RS Means database.

Unit prices updated: 3/2/2015
Version: 3/2/2015
Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

		Reference #	Unit Price	Unit	Quantity	# of Applications	Cost
EROSION/SEDIMENT CONTROL	**Number**						
Backfill & compaction-embankment	**ESC-1**		$ 6.00	CY			
Check dams, 4" minus rock	**ESC-2**	SWDM 5.4.6.3	$ 80.00	Each	100	1	8000
Crushed surfacing 1 1/4" minus	**ESC-3**	WSDOT 9-03.9(3)	$ 95.00	CY			
Ditching	**ESC-4**		$ 9.00	CY			
Excavation-bulk	**ESC-5**		$ 2.00	CY			
Fence, silt	**ESC-6**	SWDM 5.4.3.1	$ 1.50	LF	2000	1	3000
Fence, Temporary (NGPE)	**ESC-7**		$ 1.50	LF			
Hydroseeding	**ESC-8**	SWDM 5.4.2.4	$ 0.80	SY	48400	1	38720
Jute Mesh	**ESC-9**	SWDM 5.4.2.2	$ 3.50	SY			
Mulch, by hand, straw, 3" deep	**ESC-10**	SWDM 5.4.2.1	$ 2.50	SY			
Mulch, by machine, straw, 2" deep	**ESC-11**	SWDM 5.4.2.1	$ 2.00	SY	4840	1	9680
Piping, temporary, CPP, 6"	**ESC-12**		$ 12.00	LF			
Piping, temporary, CPP, 8"	**ESC-13**		$ 14.00	LF			
Piping, temporary, CPP, 12"	**ESC-14**		$ 18.00	LF			
Plastic covering, 6mm thick, sandbagged	**ESC-15**	SWDM 5.4.2.3	$ 4.00	SY			
Rip Rap, machine placed; slopes	**ESC-16**	WSDOT 9-13.1(2)	$ 45.00	CY			
Rock Construction Entrance, 50'x15'x1'	**ESC-17**	SWDM 5.4.4.1	$ 1,800.00	Each			
Rock Construction Entrance, 100'x15'x1'	**ESC-18**	SWDM 5.4.4.1	$ 3,200.00	Each			
Sediment pond riser assembly	**ESC-19**	SWDM 5.4.5.2	$ 2,200.00	Each			
Sediment trap, 5' high berm	**ESC-20**	SWDM 5.4.5.1	$ 19.00	LF			
Sed. trap, 5' high, riprapped spillway berm section	**ESC-21**	SWDM 5.4.5.1	$ 70.00	LF			
Seeding, by hand	**ESC-22**	SWDM 5.4.2.4	$ 1.00	SY			
Sodding, 1" deep, level ground	**ESC-23**	SWDM 5.4.2.5	$ 8.00	SY			
Sodding, 1" deep, sloped ground	**ESC-24**	SWDM 5.4.2.5	$ 10.00	SY			
TESC Supervisor	**ESC-25**		$ 110.00	HR			
Water truck, dust control	**ESC-26**	SWDM 5.4.7	$ 140.00	HR			
WRITE-IN-ITEMS ** (see page 9)**							
				Each			

ESC SUBTOTAL:	$ 59,400.00
30% CONTINGENCY & MOBILIZATION:	$ 17,820.00
ESC TOTAL:	$ 77,220.00
COLUMN:	**A**

Unit prices updated: 3/2/2015
Version: 3/2/2015

Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

				Existing Right-of-Way		Future Public Right of Way & Drainage Facilities		Private Improvements		
		Unit Price	Unit	Quant.	Cost	Quant.	Cost	Quant.	Cost	
GENERAL ITEMS	**No.**									
Backfill & Compaction- embankment	GI - 1	$ 6.00	CY							
Backfill & Compaction- trench	GI - 2	$ 9.00	CY							
Clear/Remove Brush, by hand	GI - 3	$ 1.00	SY							
Clearing/Grubbing/Tree Removal	GI - 4	$10,000.00	Acre							
Excavation - bulk	GI - 5	$ 2.00	CY					14514	$ 29,028	Pond 3B
Excavation - Trench	GI - 6	$ 5.00	CY							
Fencing, cedar, 6' high	GI - 7	$ 20.00	LF							
Fencing, chain link, vinyl coated, 6' high	GI - 8	$ 20.00	LF							
Fencing, chain link, gate, vinyl coated, 20'	GI - 9	$ 1,400.00	Each							
Fencing, split rail, 3' high	GI - 10	$ 15.00	LF							
Fill & compact - common barrow	GI - 11	$ 25.00	CY							
Fill & compact - gravel base	GI - 12	$ 27.00	CY							
Fill & compact - screened topsoil	GI - 13	$ 39.00	CY							
Gabion, 12" deep, stone filled mesh	GI - 14	$ 65.00	SY							
Gabion, 18" deep, stone filled mesh	GI - 15	$ 90.00	SY							
Gabion, 36" deep, stone filled mesh	GI - 16	$ 150.00	SY							
Grading, fine, by hand	GI - 17	$ 2.50	SY					8194.44	$ 20,486	Pond 3B
Grading, fine, with grader	GI - 18	$ 2.00	SY					4840	9,680.00	1 acre misc. grading
Monuments, 3' long	GI - 19	$ 250.00	Each							
Sensitive Areas Sign	GI - 20	$ 7.00	Each							
Sodding, 1" deep, sloped ground	GI - 21	$ 8.00	SY							
Surveying, line & grade	GI - 22	$ 850.00	Day							
Surveying, lot location/lines	GI - 23	$ 1,800.00	Acre							
Traffic control crew (2 flaggers)	GI - 24	$ 120.00	HR							
Trail, 4" chipped wood	GI - 25	$ 8.00	SY							
Trail, 4" crushed cinder	GI - 26	$ 9.00	SY							
Trail, 4" top course	GI - 27	$ 12.00	SY							
Wall, retaining, concrete	GI - 28	$ 55.00	SF							
Wall, rockery	GI - 29	$ 15.00	SF							
		SUBTOTAL							$ 59,194	

*KCC 27A authorizes only one bond reduction.

li-wks-sbq-xls

Unit prices updated: 03/02/2015
Version: 03/02/2015
Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

				Existing Right-of-way		Future Public Right of Way & Drainage Facilities		Private Improvements		
		Unit Price	Unit	Quant.	Cost	Quant.	Cost	Quant.	Cost	
ROAD IMPROVEMENT	**No.**									
AC Grinding, 4' wide machine < 1000sy	RI - 1	$ 30.00	SY							
AC Grinding, 4' wide machine 1000-2000s	RI - 2	$ 16.00	SY							
AC Grinding, 4' wide machine > 2000sy	RI - 3	$ 10.00	SY							
AC Removal/Disposal	RI - 4	$ 35.00	SY							
Barricade, type III (Permanent)	RI - 6	$ 56.00	LF							
Curb & Gutter, rolled	RI - 7	$ 17.00	LF							
Curb & Gutter, vertical	RI - 8	$ 12.50	LF							
Curb and Gutter, demolition and disposal	RI - 9	$ 18.00	LF							
Curb, extruded asphalt	RI - 10	$ 5.50	LF							
Curb, extruded concrete	RI - 11	$ 7.00	LF							
Sawcut, asphalt, 3" depth	RI - 12	$ 1.85	LF							
Sawcut, concrete, per 1" depth	RI - 13	$ 3.00	LF							
Sealant, asphalt	RI - 14	$ 2.00	LF							
Shoulder, AC, (see AC road unit price)	RI - 15	$ -	SY							
Shoulder, gravel, 4" thick	RI - 16	$ 15.00	SY							
Sidewalk, 4" thick	RI - 17	$ 38.00	SY							
Sidewalk, 4" thick, demolition and disposal	RI - 18	$ 32.00	SY							
Sidewalk, 5" thick	RI - 19	$ 41.00	SY							
Sidewalk, 5" thick, demolition and disposal	RI - 20	$ 40.00	SY							
Sign, handicap	RI - 21	$ 85.00	Each							
Striping, per stall	RI - 22	$ 7.00	Each							
Striping, thermoplastic, (for crosswalk)	RI - 23	$ 3.00	SF							
Striping, 4" reflectorized line	RI - 24	$ 0.50	LF							

SUBTOTAL _____ _____ _____

*KCC 27A authorizes only one bond reduction.

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Unit prices updated: 03/02/2015
Version: 03/02/2015
Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

				Existing Right-of-way		Future Public Right of Way & Drainage Facilities		Private Improvements		
		Unit Price	Unit	Quant.	Cost	Quant.	Cost	Quant.	Cost	
ROAD SURFACING	**No.**	(4" Rock = 2.5 base & 1.5" top course) 9 1/2" Rock= 8" base & 1.5" top course)								
Additional 2.5" Crushed Surfacing	RS - 1	$ 3.60	SY							
HMA 1/2" Overlay, 1.5"	RS - 2	$ 14.00	SY							
HMA 1/2" Overlay 2"	RS - 3	$ 18.00	SY							
HMA Road, 2", 4" rock, First 2500 SY	RS - 4	$ 28.00	SY							
HMA Road, 2", 4" rock, Qty. over 2500 SY	RS - 5	$ 21.00	SY							
HMA Road, 3", 9 1/2" Rock, First 2500 SY	RS - 6	$ 42.00	SY							
HMA Road, 3", 9 1/2" Rock, Qty Over 250	RS - 7	$ 35.00	SY							
Not Used	RS - 8									
Not Used	RS - 9									
HMA Road, 6" Depth, First 2500 SY	RS - 10	$ 33.10	SY							
HMA Road, 6" Depth, Qty. Over 2500 SY	RS - 11	$ 30.00	SY							
HMA 3/4" or 1", 4" Depth	RS - 12	$ 20.00	SY							
Gravel Road, 4" rock, First 2500 SY	RS - 13	$ 15.00	SY							
Gravel Road, 4" rock, Qty. over 2500 SY	RS - 14	$ 10.00	SY							
PCC Road (Add Under Write-Ins w/Desig	RS - 15									
Thickened Edge	RS - 17	$ 8.60	LF							

SUBTOTAL _____ _____ _____

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Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

				Existing Right-of-way		Future Public Right of Way & Drainage Facilities		Private Improvements		
		Unit Price	Unit	Quant.	Cost	Quant.	Cost	Quant.	Cost	
DRAINAGE (CPP = Corrugated Plastic Pipe, N12 or Equivalent)		For Culvert prices, Average of 4' cover was assumed. Assume perforated PVC is same price as solid pipe.								
Access Road, R/D	D - 1	$ 21.00	SY							
Bollards - fixed	D - 2	$ 240.74	Each							
Bollards - removable	D - 3	$ 452.34	Each							
* (CBs include frame and lid)										
CB Type I	D - 4	$ 1,500.00	Each							
CB Type IL	D - 5	$ 1,750.00	Each							
CB Type II, 48" diameter	D - 6	$ 2,300.00	Each							
for additional depth over 4'	D - 7	$ 480.00	FT							
CB Type II, 54" diameter	D - 8	$ 2,500.00	Each							
for additional depth over 4'	D - 9	$ 495.00	FT							
CB Type II, 60" diameter	D - 10	$ 2,800.00	Each							
for additional depth over 4'	D - 11	$ 600.00	FT							
CB Type II, 72" diameter	D - 12	$ 3,600.00	Each							
for additional depth over 4'	D - 13	$ 850.00	FT							
Through-curb Inlet Framework (Add)	D - 14	$ 400.00	Each							
Cleanout, PVC, 4"	D - 15	$ 150.00	Each							
Cleanout, PVC, 6"	D - 16	$ 170.00	Each							
Cleanout, PVC, 8"	D - 17	$ 200.00	Each							
Culvert, PVC, 4"	D - 18	$ 10.00	LF							
Culvert, PVC, 6"	D - 19	$ 13.00	LF							
Culvert, PVC, 8"	D - 20	$ 15.00	LF							
Culvert, PVC, 12"	D - 21	$ 23.00	LF							
Culvert, CMP, 8"	D - 22	$ 19.00	LF							
Culvert, CMP, 12"	D - 23	$ 29.00	LF					60	$ 1,740	Reverse Slope Pipe - Pond 3B
Culvert, CMP, 15"	D - 24	$ 35.00	LF							
Culvert, CMP, 18"	D - 25	$ 41.00	LF							
Culvert, CMP, 24"	D - 26	$ 56.00	LF							
Culvert, CMP, 30"	D - 27	$ 78.00	LF							
Culvert, CMP, 36"	D - 28	$ 130.00	LF							
Culvert, CMP, 48"	D - 29	$ 190.00	LF							
Culvert, CMP, 60"	D - 30	$ 270.00	LF							
Culvert, CMP, 72"	D - 31	$ 350.00	LF							

SUBTOTAL $ 1,740

*KCC 27A authorizes only one bond reduction.

li-wks-sbq-xls

Unit prices updated: 03/02/2015
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Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

DRAINAGE CONTINUED				Existing Right-of-way		Future Public Right of Way & Drainage Facilities		Private Improvements		
	No.	Unit Price	Unit	Quant.	Cost	Quant.	Cost	Quant.	Cost	
Culvert, Concrete, 8"	D - 32	$ 25.00	LF							
Culvert, Concrete, 12"	D - 33	$ 36.00	LF							
Culvert, Concrete, 15"	D - 34	$ 42.00	LF							
Culvert, Concrete, 18"	D - 35	$ 48.00	LF							
Culvert, Concrete, 24"	D - 36	$ 78.00	LF							
Culvert, Concrete, 30"	D - 37	$ 125.00	LF							
Culvert, Concrete, 36"	D - 38	$ 150.00	LF							
Culvert, Concrete, 42"	D - 39	$ 175.00	LF							
Culvert, Concrete, 48"	D - 40	$ 205.00	LF							
Culvert, CPP, 6"	D - 41	$ 14.00	LF							
Culvert, CPP, 8"	D - 42	$ 16.00	LF							
Culvert, CPP, 12"	D - 43	$ 24.00	LF							
Culvert, CPP, 15"	D - 44	$ 35.00	LF							
Culvert, CPP, 18"	D - 45	$ 41.00	LF							
Culvert, CPP, 24"	D - 46	$ 56.00	LF							
Culvert, CPP, 30"	D - 47	$ 78.00	LF							
Culvert, CPP, 36"	D - 48	$ 130.00	LF							
Ditching	D - 49	$ 9.50	CY							
Flow Dispersal Trench (1,436 base+)	D - 50	$ 28.00	LF							
French Drain (3' depth)	D - 51	$ 26.00	LF							
Geotextile, laid in trench, polypropylene	D - 52	$ 3.00	SY							
Mid-tank Access Riser, 48" dia, 6' deep	D - 54	$ 2,000.00	Each							
Pond Overflow Spillway	D - 55	$ 16.00	SY					400	$ 6,400	Pond 3B
Restrictor/Oil Separator, 12"	D - 56	$ 1,150.00	Each							
Restrictor/Oil Separator, 15"	D - 57	$ 1,350.00	Each							
Restrictor/Oil Separator, 18"	D - 58	$ 1,700.00	Each							
Riprap, placed	D - 59	$ 42.00	CY							
Tank End Reducer (36" diameter)	D - 60	$ 1,200.00	Each							
Trash Rack, 12"	D - 61	$ 350.00	Each							
Trash Rack, 15"	D - 62	$ 410.00	Each							
Trash Rack, 18"	D - 63	$ 480.00	Each							
Trash Rack, 21"	D - 64	$ 550.00	Each							

SUBTOTAL $ 6,400

*KCC 27A authorizes only one bond reduction.

li-wks-sbq-xls

Unit prices updated: 03/02/2015
Version: 03/02/2015
Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

				Existing Right-of-way		Future Public Right of Way & Drainage Facilities		Private Improvements		
		Unit Price	Unit	Quant.	Price	Quant.	Cost	Quant.	Cost	
PARKING LOT SURFACING					Not To Be Used For Roads Or Shoulders					
	No.									
2" AC, 2" top course rock & 4" borrow	PL - 1	$ 21.00	SY	NA		NA				
2" AC, 1.5" top course & 2.5" base cours	PL - 2	$ 28.00	SY	NA		NA				
4" select borrow	PL - 3	$ 5.00	SY	NA		NA				
1.5" top course rock & 2.5" base course	PL - 4	$ 14.00	SY	NA		NA				
UTILITY POLES & STREET LIGHTING					Utility pole relocation costs must be accompanied by **Franchise Utility's Cost Estimate**					
Utility Pole(s) Relocation	UP-1	Lump Sum								
Street Light Poles w/Luminaires	UP-2	$ 7,500.00	Each							
WRITE-IN-ITEMS										
(Such as detention/water quality vaults.)	No.									
Stormwater Vault	WI - 1	#########	Each							
Block Wall	WI - 2	$ 16.00	SY							
Yard Drain	WI - 3	$ 225.00	CY							
Sand Filter Media	WI - 4	$ 40.00	CY					625	$ 25,000	Pond 3B
	WI - 5									
	WI - 6									
	WI - 7									
	WI - 8									
	WI - 9									
	WI - 10									

SUBTOTAL			
SUBTOTAL (SUM ALL PAGES):			92,333.89
30% CONTINGENCY & MOBILIZATION:			27,700.17
GRANDTOTAL:			120,034.06
COLUMN:	**B**	**C**	**D**

*KCC 27A authorizes only one bond reduction.

li-wks-sbq-xls

Unit prices updated: 03/02/2015
Version: 03/02/2015
Report Date: 5/24/2023

Site Improvement Bond Quantity Worksheet

Web date: 04/03/2015

Original bond computations prepared by:

Name:	Owen G. Reese, III	**Date:**	5/24/2023
PE Registration Number:	38380	**Tel. #:**	206-838-5844
Firm Name:	Aspect Consulting, LLC		
Address:	710 2nd Avenue, Suite 550, Seattle, WA 98104	**Project No:**	

FINANCIAL GUARANTEE REQUIREMENTS

		PERFORMANCE BOND* AMOUNT	MINIMUM BOND* AMOUNT REQUIRED FOR RECORDING OR TEMPORARY OCCUPANCY AT SUBSTANTIAL COMPLETION ***	PUBLIC ROAD & DRAINAGE MAINTENANCE/DEFECT BOND*
Stabilization/Erosion Sediment Control (ESC)	(A)	$ 77,220.0		
Existing Right-of-Way Improvements	(B)	$ -		
Future Public Right of Way & Drainage Facilities	(C)	$ -		
Private Improvements	(D)	$ 120,034.1		
Calculated Quantity Completed				
Total Right-of Way and/or Site Restoration Bond*/** (First $7,500 of bond* shall be cash.)	(A+B)	$ 77,220.0		
Performance Bond* Amount (A+B+C+D) = TOTAL	(T)	$ 197,254.1 (Minimum is $2000.)	T x 0.30 $ 59,176.2 (Minimum is $2000.)	
Maintenance/Defect Bond* Total				(B+C) x 0.25 = $ - (Minimum is $2000.)

NAME OF PERSON PREPARING BOND* REDUCTION: _____ Date: _____

*** NOTE:** The word "bond" as used in this document means a financial guarantee acceptable to King County.

**** NOTE:** KCC 27A authorizes right of way and site restoration bonds to be combined when both are required. The restoration requirement shall include the total cost for all TESC as a minimum, not a maximum. In addition, corrective work, both on- and off-site needs to be included. Quantities shall reflect worse case scenarios not just minimum requirements. For example, if a salmonid stream may be damaged, some estimated costs for restoration needs to be reflected in this amount. The 30% contingency and mobilization costs are computed in this quantity.

***** NOTE:** Per KCC 27A, total bond amounts remaining after reduction shall not be less than 30% of the original amount (T) or as revised by major design changes.

REQUIRED BOND* AMOUNTS ARE SUBJECT TO REVIEW AND MODIFICATION BY KING COUNTY

Check out the DDES Web site at www.kingcounty.gov/permits

Unit prices updated: 03/02/2015
Version: 03/02/2015
Report Date: 5/24/2023

li-wks-sbq-xls

APPENDIX F

Operation and Maintenance Manual

NO. 2 – INFILTRATION FACILITIES

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.
Infiltration Pond, 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 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 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.
Infiltration Pond, Tank, Vault, Trench, or Small Basin Storage Area	Sediment accumulation	If two inches or more sediment is present or a percolation test indicates facility is working at or less than 90% of design.	Facility infiltrates as designed.
	Liner damaged (If Applicable)	Liner is visible or pond does not hold water as designed.	Liner repaired or replaced.
Infiltration Tank Structure	Plugged air vent	Any blockage of the vent.	Tank or vault freely vents.
	Tank bent out of shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape.	Tank repaired or replaced to design.
	Gaps between sections, damaged joints or cracks or tears in wall	A gap wider than ½-inch at the joint of any tank sections or any evidence of soil particles entering the tank at a joint or through a wall.	No water or soil entering tank through joints or walls.
Infiltration Vault Structure	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch, any evidence of soil entering the structure through cracks or qualified inspection personnel determines that the vault is not structurally sound.	Vault is sealed and structurally sound.

NO. 2 – INFILTRATION FACILITIES

Maintenance Component	Defect or Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Inlet/Outlet Pipes	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.
Access Manhole	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open manhole requires immediate maintenance.**	Manhole access covered.
	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.
	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Large access doors/plate	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can opened as designed.
	Gaps, doesn't cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat; covers access opening completely.
	Lifting Rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.
Infiltration Pond, Tank, Vault, Trench, or Small Basin Filter Bags	Plugged	Filter bag more than $^1/_2$ full.	Replace filter bag or redesign system.
Infiltration Pond, Tank, Vault, Trench, or Small Basin Pre-settling Ponds and Vaults	Sediment accumulation	6" or more of sediment has accumulated.	Pre-settling occurs as designed
Infiltration Pond, Rock Filter	Plugged	High water level on upstream side of filter remains for extended period of time or little or no water flows through filter during heavy rain storms.	Rock filter replaced evaluate need for filter and remove if not necessary.
Infiltration Pond Emergency Overflow Spillway	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.
	Tree growth	Tree growth impedes flow or threatens stability of spillway.	Trees removed.

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. 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.

NO. 19 – SAND FILTER POND

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
Site	Trash and debris	Trash and debris accumulated on facility site.	Trash and debris removed from facility 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 (not in the treatment area)	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Pre-Treatment (if applicable)	Sediment accumulation	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	Cell empty, doesn't hold water.	Water retained in first cell for most of the year.
	Algae mats	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.)
Pond Area	Sediment accumulation	Sediment or crust depth exceeds ½-inch over 10 % of surface area of sand filter.	No sediment or crust deposit on sand filter that would impede permeability of the filter section.
	Grass (if applicable)	Grass becomes excessively tall (greater than 6 inches) or when nuisance weeds and other vegetation start to take over or thatch build up occurs.	Mow vegetation and/or remove nuisance vegetation.
Side Slopes of Pond	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 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.

NO. 19 – SAND FILTER POND

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance Is Performed
Sand Filter Media	Plugging	Drawdown of water through the sand filter media, takes longer than 24 hours, and/or flow through the overflow pipes occurs frequently. A sieve analysis of >4% -100 or >2% -200 requires replacing sand filter media.	Sand filter media surface is aerated or the surface is scraped and replaced, and drawdown rate is normal.
	Prolonged flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Excess flows bypassed or confined to small portion of filter media surface.
	Short circuiting	Flows become concentrated over one section of the sand filter rather than dispersed or drawdown rate of pool exceeds 12 inches per hour.	Flow and percolation of water through the sand filter is uniform and dispersed across the entire filter area and drawdown rate is normal.
	Media thickness	Sand thickness is less than 18 inches.	Rebuild sand thickness to a minimum of 18 inches.
Underdrains and Clean-Outs	Sediment/debris	Underdrains or clean-outs partially plugged or filled with sediment and/or debris. Junction box/cleanout wyes not watertight.	Underdrains and clean-outs free of sediment and debris and are watertight.
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.
Rock Pad	Missing or out of place	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad restored to design standards.
Flow spreader	Concentrated flow	Flow from spreader not uniformly distributed across sand filter.	Flows spread evenly over sand filter.