EXHIBIT F

Lake Tye Park
All Weather Field Improvements

14964 Fryelands Boulevard

Monroe, WA 98272

Stormwater Site Plan

June 12, 2019

The information contained in this report was prepared by and under the direct supervision of the undersigned:

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LAKE TYE PARK
ALL WEATHER FIELD IMPROVEMENTS
STORMWATER SITE PLAN

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LAKE TYE PARK
ALL WEATHER FIELD IMPROVEMENTS
STORMWATER SITE PLAN
JUNE 12, 2019

SECTION 1 – PROJECT OVERVIEW

This Stormwater Site Plan is for the all-weather field improvements at Lake Tye Park. The project site address is 14964 Fryelands Boulevard in Monroe, Washington, located in Section 2, Township 27 North, Range 6 East, Willamette Meridian. Refer to **Figure 1 – Vicinity Map** for site location. The subject field is the southernmost field in the park.

The proposed project involves the resurfacing of the southernmost playfield (south of the baseball field) with synthetic turf. The resurfaced field will be multipurpose, with the northeast corner purposed as a softball field, while the remaining portions of the field can be utilized for other athletic activities. The existing underdrain system will be replaced and connect to the existing conveyance system northwest of the field. Re-grading will take place such that the field has a consistent slope from southeast to northwest. Paved plaza and walkway areas will be installed south, north, and east of the field. Other proposed amenities include field markings, bleachers, dugouts, bullpens, and lighting.

This stormwater site plan addresses the requirements of the Department of Ecology (DOE) 2012 Stormwater Management Manual for Western Washington (SMMWW) as amended in 2014, which is the manual adopted by the City of Monroe. Refer to the Minimum Requirements section of this report for the project classification and the minimum requirements that are applicable to the project area.

SECTION 2 – MINIMUM REQUIREMENTS

Per Appendix I-G of the 2014 DOE Manual, if the existing lot coverage is less than 35% impervious or higher, the project is classified as a **new development**. The determination of existing impervious surface coverage for the entire park property was based upon an aerial image that was scaled and used in AutoCAD to delineate the existing impervious surfaces. The tennis/basketball courts, building roof areas, and all paved hard surfaces were considered to be impervious. The existing impervious coverage for the entire park property is approximately 26.3%, and therefore this project's minimum requirements for the new development were determined based upon Figure 2.4.1 from the DOE Manual, which is shown below. Refer to **Figure 2 – Existing Impervious Coverage**.

The project involves more than 5,000 square feet (SF) of new plus replaced hard surface. Therefore, based on Figure 2.4.1, all minimum requirements (#1 – #9) will apply to the **new plus replaced hard surfaces** and **converted vegetation areas**.

Figure 2.4.1 from the 2014 DOE Stormwater Management Manual

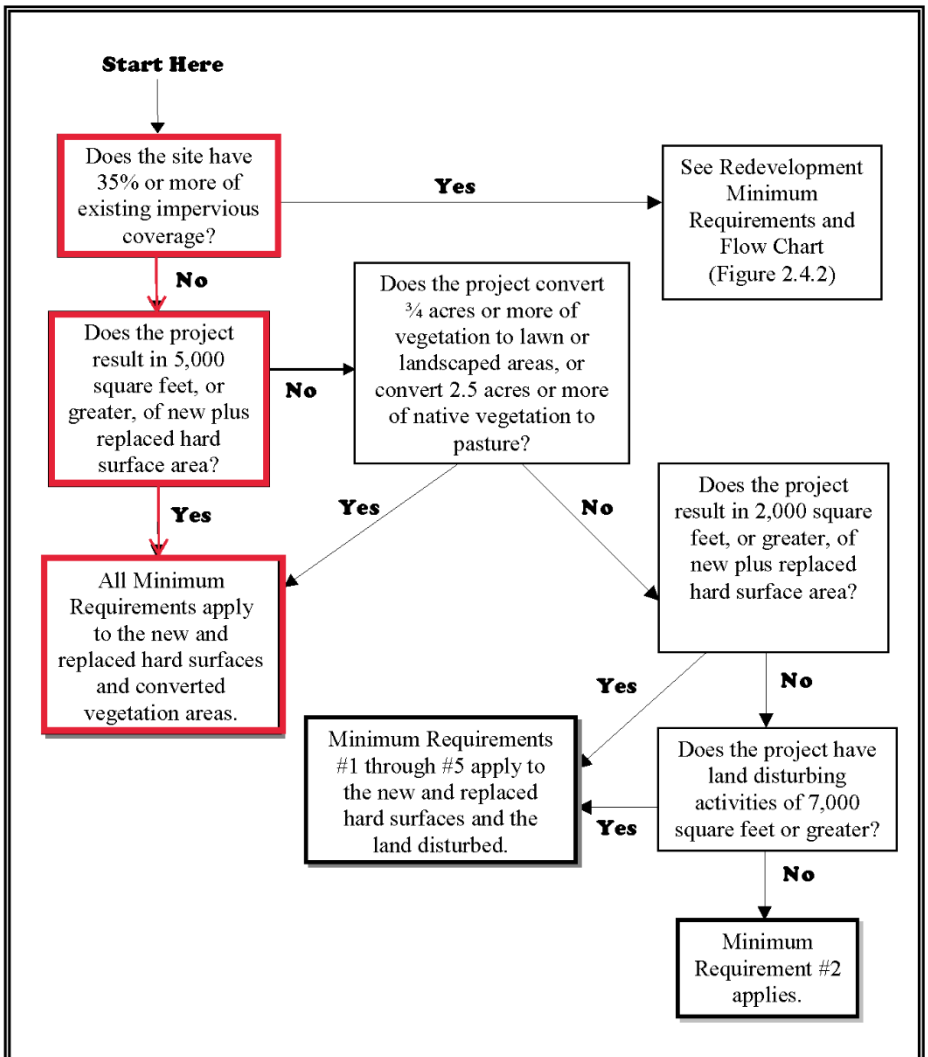


Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

Below is description of each of the minimum requirements and how this project addresses them:

Minimum Requirement #1 – Preparation of Stormwater Site Plans (MR1): This document is the Stormwater Site Plan. It outlines the existing and proposed site and drainage conditions, and presents the stormwater management analysis.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan (SWPPP) (MR2): The construction SWPPP narrative is included in Appendix C of this report.

Minimum Requirement #3 – Source Control of Pollution (MR3): In the proposed conditions, there will be no proposed pollution generating surfaces or applicable activities matching those

listed within Volume IV of the 2014 DOE Manual that will require the use of source control measures.

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls (MR4): In the existing conditions, drainage is generally collected by the field's underdrain system and conveyed westbound to a pipe system along the west side of the field. This piped system conveys flow north, ultimately discharging to Lake Tye. The proposed project involves the resurfacing of the fields and replacement of the underdrain system. However, the drainage will still be routed to the same discharge point near the northwest corner of the field. Therefore, no changes will occur to the drainage patterns as a result of this project. Refer to the Offsite Analysis section of this report for further description of the existing drainage conditions.

Minimum Requirement #5 – On-Site Stormwater Management (MR5): On-site stormwater management will be implemented per section 2.5.5 of the 2014 DOE Manual. Potential on-site stormwater management best management practices (BMPs) that were evaluated based on List #2, since the project is subject to Minimum Requirements #1-9. Based on this evaluation, it was determined that BMPs to be implemented include compost amended soils (BMP T5.13) and sheet flow dispersion. Refer to the Permanent Stormwater Control Plan section of this report for a detailed description of the on-site stormwater management.

Minimum Requirement #6 – Runoff Treatment (MR6): Per coordination with the City of Monroe, the synthetic turf field is considered a pollution-generating surface, and basic water quality treatment will be required. Water quality treatment will be addressed by a StormFilter cartridge system. See Section 5 for more information.

Minimum Requirement #7 **– Flow Control (MR7):** Lake Tye has been verified as a detention facility that has been recently analyzed for capacity. The drainage system for this project is tributary to Lake Tye. Per direct coordination with Tom Gathmann, the City of Monroe, flow control is not required for this project as the Lake Tye has adequate capacity for these improvements.

Minimum Requirement #8 – Wetlands Protection (MR8): There are no existing wetland areas located within or adjacent to the project site. However, the project has been determined to be within a flood hazard zone, therefore facilitating the need for a "Special Flood Hazard Area" permit, which will be permitted directly with the City of Monroe.

Minimum Requirement #9 – Operations and Maintenance (MR9): The Operations and Maintenance Manual for the associated proposed stormwater facilities are included in Appendix D of this report.

SECTION 3 – EXISTING CONDITIONS

The entire school property is located on one parcel (00818700099900) which totals approximately 20.54 acres. The Lake Tye Park property is currently developed with parking areas along the east side of the parcel with vehicular access off Fryelands Boulevard. The playfields that make up the project area are in the southwest corner of the property. North of these playfields is the baseball

field, which as tennis/basketball courts adjacent to the east. To the northeast of the baseball field is a playground area, along with various administrative and restroom buildings. In the northeast corner of the site is the Monroe Skatepark. Lake Tye is located to the north of the park property, which has a sand shore area for park visitors. A paved walkway is located along the western portion of the site, spanning the entire length of the parcel and continuing along Lake Tye.

The project area currently consists of a large natural grass field with surrounding chain link fence. At the southwest corner, there is a compacted dirt softball infield with surrounding field amenities. There are paved walkways on the west, south, and east sides of the field, allowing pedestrian access between the parking lot (east), Lake Tye (north), and the adjacent Fryelands Elementary School (south). To the west of the project area is agricultural land.

Topographically, the field is relatively flat. The southern portion of the field has a high point elevation of 33 on the eastern half. From here, the field slopes at approximately 1% each direction (northwest and southeast). For the northern portion of the field, from the approximate center, the topography slopes northwest and southwest, at an approximate slope of 0.7%. The northeast corner slopes northeast slightly toward an existing swale.

Based upon the Natural Resources Conservation Service Web Soil Survey, the site soils within the project area include Puget silty clay loam in the north portion of the field and Terric Medisaprists, nearly level soils for the south side of the field. A geotechnical report has been prepared for the by Associated Earth Sciences, Inc. dated July 19, 2018. All exploration borings encountered fill, ranging from 2.5 to 8 feet thick, consisting of loose to medium dense silty sand with gravel. Beneath the fill layer, native material consisted of silt with organics underlain by dense interbedded gravel, silty sand, and silt, interpreted as alluvial sediments. See **Figure 3 – Soils Map**.

The project area is located within the Lake Tye drainage basin, which according to City of Monroe mapping is within the French Creek Watershed. The entire field area is currently underdrained, outside of a small portion in the southeast corner. On the south portion of the field, the underdrain system consists of 4-inch perforated lateral lines running east-west, conveying flow west toward an 8-inch collector line at the western edge. For the north portion of the field, the underdrain system is split up, with the western half consisting of 4-inch perforated laterals conveying flow west. The westbound flows split north and south, but eventually are conveyed to the same storm collector system to which the south portion of the field is tributary. For the eastern half of the north portion, 4-inch perforated laterals convey flow westbound to a 6-inch collector in the approximate middle of the field. From here, the flow splits south and north via piped drainage systems that are eventually tributary to the aforementioned drainage system along the west side of the field area.

SECTION 4 – OFFSITE ANALYSIS

The following is an Offsite Analysis in accordance with section I-2.6.2. of the 2014 DOE Manual. The analysis was completed using site survey, as-built drawings from the park redevelopment in 1995, and City of Monroe mapping.

Task 1 – Define and Map Study Area

The project site was mapped by a topographical field survey, provided to LPD Engineering for use in the design of the field improvements. The survey was supplemented by City of Monroe GIS,

aerial mapping, and information obtained from past work at the park site to further define and map the study area in order to prepare the offsite analysis.

Task 2 – Information Review

The site is located within the Lake Tye drainage basin. Per the City of Monroe Shoreline Master Program, Lake Tye and much of its surrounding areas are mapped by FEMA in a 100-year floodplain. Per Department of Ecology flood hazard maps, only the north and west edges of the project area are within the flood hazard area. However, per coordination with the City, a Special Flood Hazard Area Permit will be required for this project.

Task 3 – Field Inspection

Refer to the Existing Conditions Section of this report for a detailed description of the existing project area. In general, stormwater for the field is collected by the existing underdrain system and conveyed west and then north. This is described further in Task 4.

There is a grass swale that separates the northern and southern portion of the field that conveys flow to a catch basin on the west side of the field. Another grass swale is located north of the field area, which wraps around the east side.

There appears to be no significant areas that contribute runoff toward the existing project area. The are some minor areas south of the field that will drain toward the field (such as lawn and walkways), but the parking lot will not due to curbs and additional drainage systems. Therefore, no pollution-generating surfaces will run-on to the field. Detention for this project is not required due to Lake Tye being a detention facility as determined by the City of Monroe.

Task 4 – Drainage System Description and Problem Descriptions

The downstream drainage path was determined based on the site survey, and information gathered from utility as-builts. Refer to **Figure 4 – Downstream Drainage Course**. The entire field area is currently underdrained, outside of a small portion in the southeast corner. On the south portion of the field, the underdrain system consists of 4-inch perforated lateral lines running east-west, conveying flow west toward a 6-inch collector tightline at the western edge. The northern portion of the field also has 4-inch perforated lateral lines running east-west; however, there are two separate 6-inch collectors that both convey flow westbound. From here, the downstream drainage course is as follows:

1. There is a catch basin on the west side of the field, approximately halfway on the length span of the field. Incoming to this catch basin is the 6-inch collector from south portion of field and the two 6-inch tightline collectors from the north portion of the field.
2. From the catch basin, the system becomes an 8-inch pipe conveying flow northbound to another catch basin approximately 280 feet away located between the project area and the adjacent baseball field.
3. The system becomes 12-inch and continues to convey flow for approximately 290 feet to the north to another catch basin. This catch basin receives flow form the baseball field underdrain system.
4. Form this catch basin, the system becomes a 15-inch piped system that conveys flow north for about 210 feet, discharging into Lake Tye. This discharge point is less than a quarter-mile away from the project site.

Based on past analyses of Lake Tye and coordination with the City of Monroe, Lake Tye has been sized as a detention facility and does have adequate capacity. There are no known downstream drainage issues from the project area.

SECTION 5 – PERMANENT STORMWATER CONTROL PLAN

As mentioned previously, the project is required to comply with Minimum Requirement #7 – Flow Control. However, the site runoff discharges directly to Lake Tye, which is a regional detention facility as determined by the City of Monroe. Lake Tye has been analyzed for capacity in the recent past. It has been determined via correspondence with City of Monroe personnel that detention facilities will not be required for this project.

This project involves underdrained synthetic turf field surface and standard pavement for the surrounding walkways and plaza. The DOE Manual does not explicitly define the surface classification for underdrained turf sports fields, in terms of stormwater modeling. Based on correspondence with the City of Monroe, it was acknowledged that the underdrained field is not 100% impervious, such as a traditional paved surface. Nor can it be modeled as 100% grass, as a non-underdrained pervious surface would be. It was allowed for the field to be modeled as 100% impervious with a 0.01 in/hr infiltration rate. This infiltration/absorption rate has been supported with various geotechnical consultants, as an effective rate into the base soils below the field where non-infiltrative till/fill soils are present and where the facilities used an underdrain to manage stormwater. For this particular project, the modeling classification is only applicable when determining the water quality flow and for conveyance pipe sizing. Note that the underdrained fields are not considered hard surface for the determination of minimum requirements, but will be considered 100% impervious for stormwater modeling purposes. Table 1 below lists the total quantities of surfacing.

Table 1 – New Plus Replaced Impervious Surfaces

	Square Feet	Acres
Underdrained Synthetic Turf Surface *(100% effective impervious)*	183,829	4.220
Standard Pavement *(100% effective impervious)*	18,740	0.430
Total New Plus Replaced Surface	**202,569**	**4.650**

Refer to **Figure 5 – Proposed Conditions** for a visual representation of the proposed areas. The total proposed surfacing for the project is 4.650 acres. Target surfaces are not applicable on this project because no flow control facilities are required.

Existing Site Hydrology

Refer to the Offsite Analysis section of this report for a detailed description of the existing drainage conditions. In general, stormwater runoff is collected by the field underdrain system, and routed west to a piped system along the west side of the field area. This piped system conveys flow north, ultimately discharging to Lake Tye.

Proposed Site Hydrology

Stormwater will percolate vertically and horizontally through the base crushed rock layer to the perforated flat drain pipe system. Refer to the field cross section on Sheet F-2.1 in Appendix A. In the proposed conditions, a new underdrain system will be constructed consisting of 12”x1” flat drains running east-west. These flat drains will convey flow west to 8-inch collector drain lines. The field system will be divided with one collector at the center of the field, and the other along the west edge. These 8-inch collector drain lines will convey flow north, combining at a catch basin near the northwest corner of the field. The stormwater will then flow north to a water quality facility and then follow the downstream course to Lake Tye as previously described.

Rain falling upon the proposed synthetic turf and permeable pavement areas will be collected in an underdrain system. No surface runoff is anticipated from these surfaces because of the permeable nature of the materials. The synthetic turf surface includes a tufted fiber and woven synthetic backing that is perforated to allow a minimum vertical infiltration rate of approximately 20 inches per hour. The synthetic turf is infilled with a mixture of rounded sand particles and granulated rubber that do not interlock and are also highly permeable, and has a minimum vertical infiltration rate of approximately 20 inches per hour. Below the synthetic turf surface is a top course and base course permeable crushed aggregate constructed of a specially graded sand and gravel mixture that results in a permeable base below the field. The vertical infiltration rates through the synthetic turf are tested by an independent third party testing agency after manufacture of the turf. Testing of the permeable aggregate occurs on site after placement and compaction.

Flow Control

Flow control will not be required for this site, as the drainage system is tributary to Lake Tye, which is directly north of the park property. Per direct coordination with Tom Gathmann, the City of Monroe, Lake Tye has been designed as a detention facility that has recently been examined for capacity. Therefore, no flow control facilities have been proposed for this project.

Water Quality Treatment

The proposed synthetic turf field is considered a pollution-generating surface exceeding the 5,000 SF threshold of pollution-generating hard surface (PGHS) or the 3/4-acre threshold of pollution-generating pervious surface (PGPS). Therefore, water quality treatment facilities will be required. The paved and other hard surfaces associated with this project are not pollution-generating.

Basic water quality treatment will be required. Volume V of the 2014 DOE Manual requires that the water quality flow shall be “the flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated.” This water quality is obtained through MGS Flood. Per direct coordination with the City of Monroe, the underdrained field was allowed to be modeled as 100% impervious with a 0.01 inch per hour (in/hr) infiltration rate. To simulate this in the MGS Flood model, the impervious basin was routed to a simulated vault element (with same volume as field) in order for the infiltration rate to be applied. The water quality flow rate was found to be 0.757 cubic feet per second (cfs). The associated MGS Flood output for this exercise is attached in Appendix B.

Water quality treatment will be addressed with a StormFilter cartridge system. Sizing of the StormFilter structure was completed by Contech Engineered Solutions based on the water quality flow; their sizing information and Department of Ecology approval for basic treatment are attached in Appendix B. Based on Contech's design, the project will require a 28 StormFilter cartridges (Phosphosorb media) within an 8'x14' vault. This StormFilter structure will be located near the northwest corner of the field, with its outlet connecting to the existing storm system.

On-Site Stormwater Management

Since the project triggers minimum requirements #1-9, the project must provide on-site stormwater management for the new plus replaced hard surfaces. There is not enough infiltration potential for the proposed facilities to meet the Low Impact Development (LID) Performance Standard. Therefore, the project must provide on-site stormwater management according to List #2 of section 2.4.5 of the 2014 DOE Manual. Table 2 through the on-site stormwater management best management practices (BMPs) and evaluates their feasibility for this project. Note that there are no roof surfaces associated with this project, and therefore BMPs for roof surfaces were not evaluated.

Table 2 – On-site Stormwater Management BMP Evaluation

BMP	Feasibility	Explanation
Lawn/Landscaped Areas		
Post-Construction Soil Quality and Depth	Yes	Post-Construction Soil Quality and Depth per BMP T5.13 will be utilized for all disturbed pervious areas that will be restored with lawn or grass.
Other Hard Surfaces		
Full Dispersion	No	A 65 to 10 ratio of forested or native vegetation area to impervious area cannot be achieved.
Permeable Pavement	No	Permeable pavement will not be utilized for this project. In the areas where it would be placed, there would be at least 5 feet of fill according to geotechnical borings. Therefore, at bottom of the pavement section, fill material would be present, inhibiting the intended function of permeable pavement. However, it should be noted that the underdrained synthetic turf surfacing is similar in function to a permeable pavement, as a vertically-draining surface that increases the time of concentration of runoff from a typical impervious surface. That being said, the underdrained turf surface does not count as an on-site stormwater management BMP.
Bioretention	No	Bioretention area cannot be implemented due to the depth required for the soil section and underdrain system, which would not allow the stormwater to gravity flow to the outlet point. The drainage system along the west side of the field is already shallow and would not be able to drain to Lake Tye without pumping.
Sheet Flow Dispersion	Yes	Sheet flow dispersion can be implemented for a portion of the walkway north of the fields, which do have an adequate vegetated flow path to the north that is greater than 10 feet. For the paved walkways on the east side of the project, vegetated flow path requirements cannot be met to the east and the turf field itself cannot be utilized because it is a vertically-draining surface. For the paved walkway south of the field, positive drainage cannot be provided to the adjacent lawn, as this area slopes down toward the field.

Conveyance System Analysis and Design

An analysis of the onsite conveyance systems was performed for three pipe systems, including both 8-inch collector pipes (each conveying roughly half of the underdrained field) and the overall 12-inch discharge pipe (conveying the entire field area). Refer to the Conveyance Analysis Spreadsheet and MGS Flood output included in Appendix B.

At a minimum, the new pipe system must be able to convey the 25-year peak runoff event. The 25-year peak runoff rate from each of the tributary areas was determined using MGS Flood with 15-minute time steps. These values were compared to the full flow capacity of the conveyance pipes, which was determined using Manning's equation. As ascertained in the water quality section, the field is modeled as a 100% impervious surface with 0.01 inch per hour infiltration rate in the same fashion as the water quality model.

There is some limited upstream area that will be tributary to the field underdrain system, including the proposed walkway and slope to the south. The walkways along the north and east sides sheet flow away from the field. The east collector conveys approximately half of the field (plus tributary upstream area) while the west collectors conveys the approximate west half.

Each collector pipe will consist of an 8-inch pipe (n=0.011) at a 0.5% slope, which gives a full-flow capacity of 1.01 cubic feet per second (cfs). According to the MGS Flood model, the 25-year peak flows for the west collector and midfield collector are 0.92 cfs and 0.89 cfs, respectively. Therefore, each pipe will have adequate conveyance capacity for the proposed conditions.

The outlet drainage pipe from a catch basin at the northwest corner of the project area conveys flow from the entire underdrain system. This pipe is a 12-inch pipe (n=0.012, ductile iron) at 0.5% slope, which gives a full-flow capacity of 2.74 cfs for the pipe. The 25-year peak flow from MGS Flood was found to be 1.24 cfs, which means that this pipe will have sufficient conveyance capacity.

SECTION 6 – CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A SWPPP narrative for the project has been included in Appendix C. The SWPPP is based on Volume II of the 2014 DOE Surface Water Management Manual requirements. An NPDES permit from the Washington State Department of Ecology will be required for the project because it will disturb over one (1) acre of land area.

The TESC plan includes temporary sediment settling tanks. A minimum volume was calculated using the methodology from the 2014 DOE manual, with the 2-year developed flow rate from MGS Flood. A volume of an equivalent sediment trap was calculated to find the necessary volume for a sediment tank for this project. A copy of the Sediment Facility Sizing Calculations worksheet and associated MGS Flood output used for this exercise is attached in Appendix B. Stormwater runoff from the project work area will be directed toward an existing catch basin to be utilized as a temporary. Stormwater will then be pumped to the temporary sediment settling tanks.

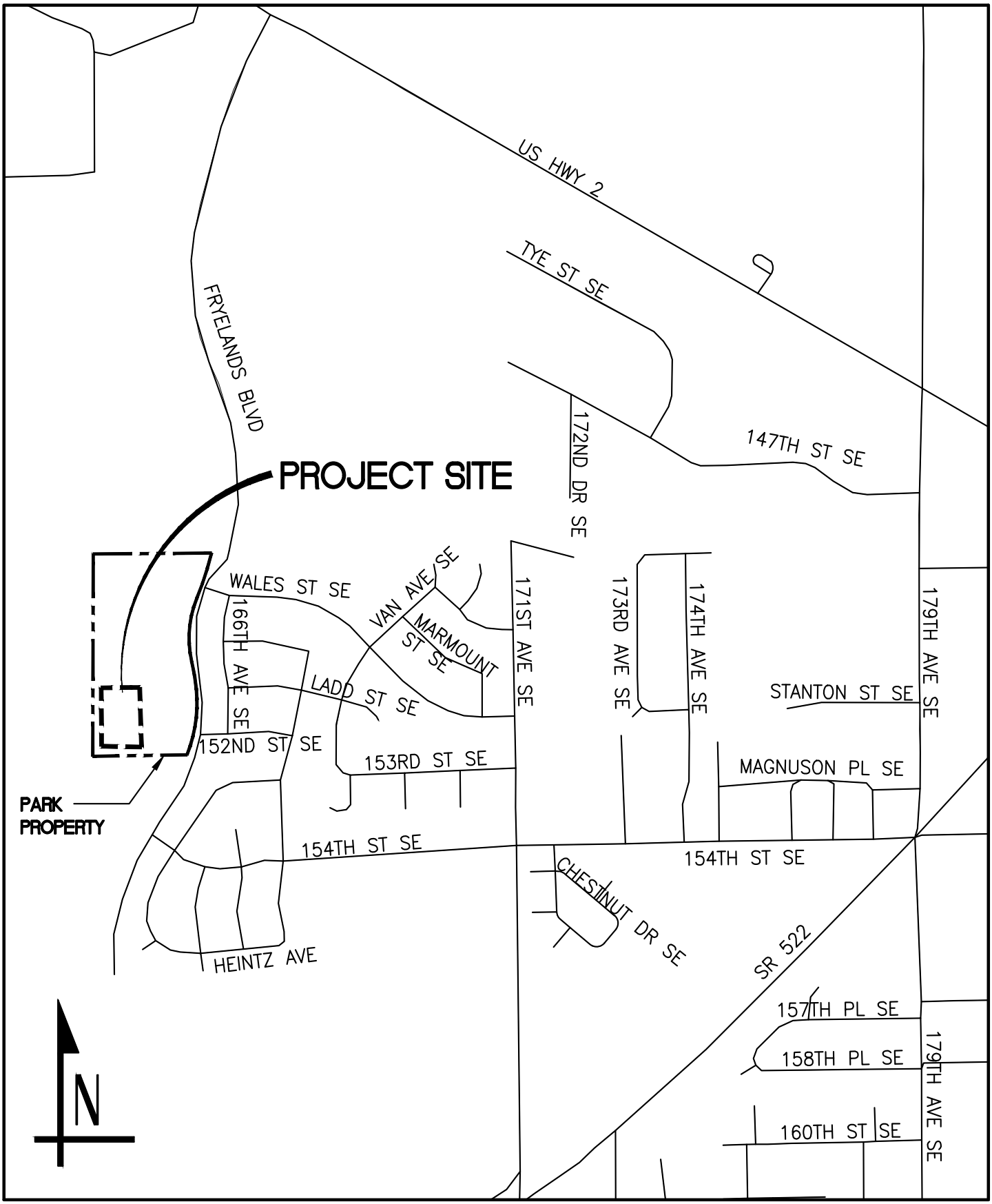
In addition to the sediment settling tanks, TESC elements in the project include the following:

- Temporary Stabilized Construction Entrances, per BMP C105
- Storm Drain Inlet Protection, per BMP C220
- Silt Fence, per BMP C233
- Temporary Interceptor Swales, per BMP C200
- Tree Protection Fencing

The TESC elements shown are intended to be the minimum allowable. The NPDES permit will require periodic inspection of the TESC elements to confirm they are holding up and continuing to function as intended. During construction, the contractor is responsible for upgrading these facilities as necessary. The implementation of the TESC plan and construction maintenance, replacement and upgrading of the TESC facilities are the responsibility of the contractor, per the contract documents. The TESC facilities will be constructed prior to and in conjunction with all clearing and grading activity and in a manner in which sediment or sediment laden water does not leave the project site, enter the drainage system, or violate applicable water quality standards.

FIGURES

Figure 1: Vicinity Map
Figure 2: Existing Impervious Coverage
Figure 3: Soils Map
Figure 4: Downstream Drainage Course
Figure 5: Proposed Conditions



LAKE TYE PARK ALL-WEATHER FIELD IMPROVEMENTS

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DESCRIPTION

VICINITY MAP

JUNE 12, 2019

FIGURE

1

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EXISTING IMPERVIOUS AREA	
Existing Impervious	5.41 AC
Total Property Area	20.54 AC
Percentage of Site Impervious	26.3%

LAKE TYE PARK ALL-WEATHER FIELD IMPROVEMENTS

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DESCRIPTION

JUNE 12, 2019

EXISTING IMPERVIOUS COVERAGE

FIGURE

2

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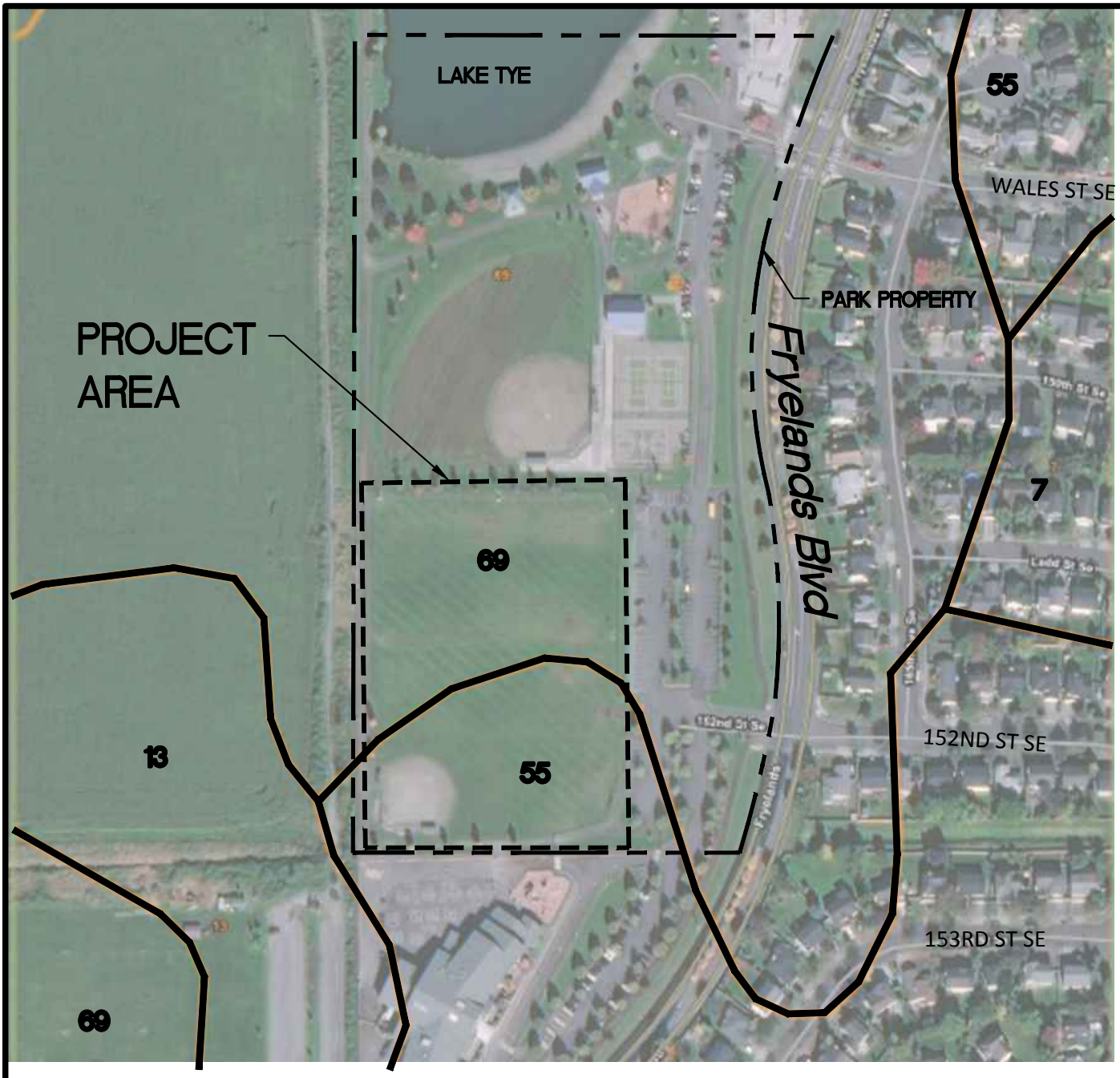

SNOHOMISH COUNTY AREA, WASHINGTON (WA661)

MAP UNIT SYMBOL	MAP UNIT NAME
69	Terric Medisaprists, nearly level
55	Puget silty clay loam
13	Custer fine sandy loam
7	Bellingham silty clay loam

N

LAKE TYE PARK

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DESCRIPTION

SOILS MAP

JUNE 12, 2019

FIGURE

3

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Scale 1"= 150'

LAKE TYE PARK ALL WEATHER FIELD IMPROVEMENTS

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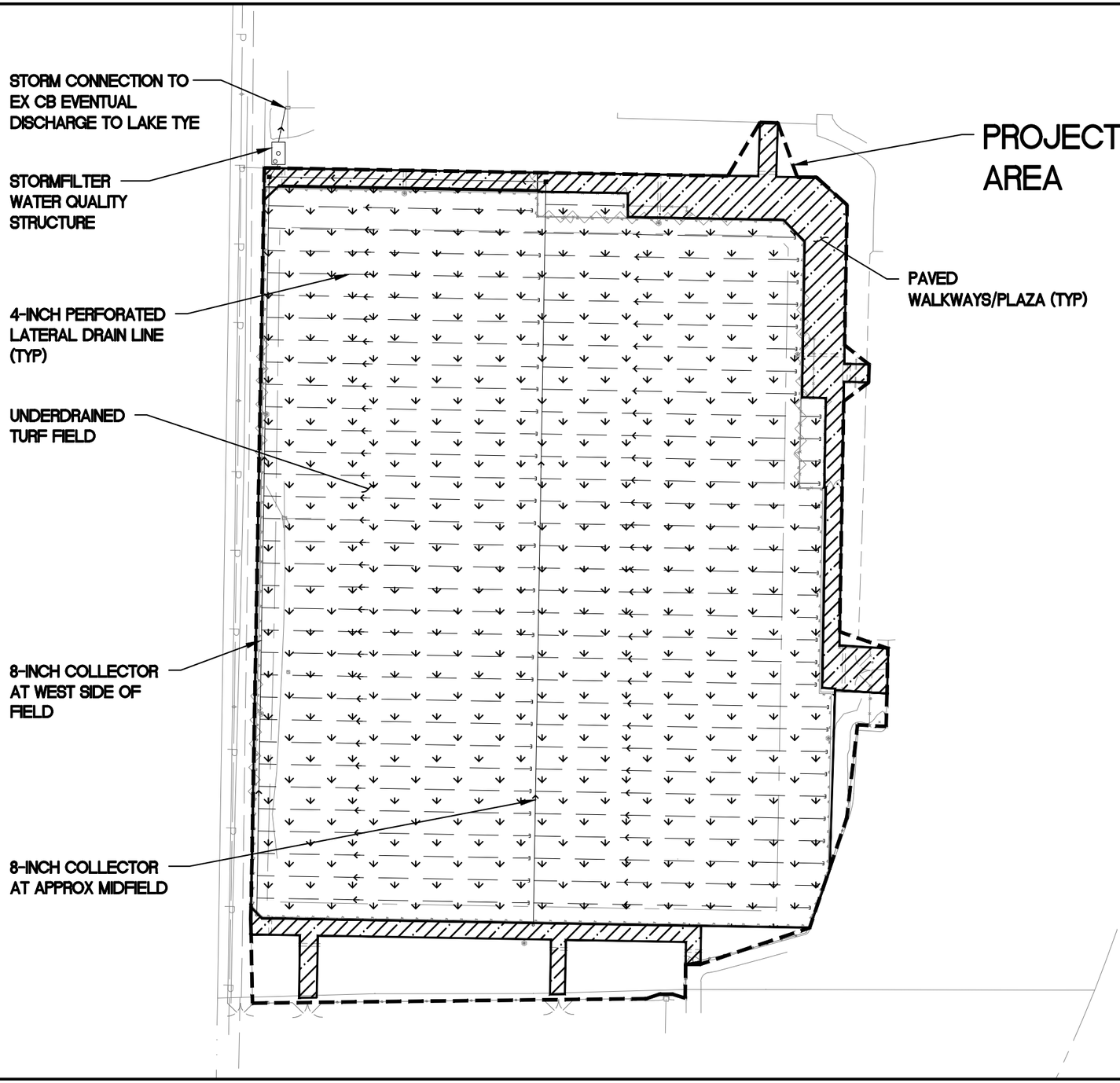
JUNE 12, 2019

DOWNSTREAM DRAINAGE COURSE

FIGURE

4



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Area Summary

UNDERDRAINED SYNTHETIC TURF FIELD (100% EFFECTIVE IMPERVIOUS)	183,829 SF (4.220 AC)
STANDARD PAVEMENT (100% EFFECTIVE IMPERVIOUS)	18,740 SF (0.430 AC)
TOTAL NEW PLUS REPLACED HARD SURFACE	202,569 SF (4.650 AC)

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LAKE TYE PARK ALL WEATHER FIELD IMPROVEMENTS

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DESCRIPTION

PROPOSED CONDITIONS

JUNE 12, 2019

FIGURE

5

APPENDIX A

Design Drawings

GOV LOT 4, SECTION 2, TOWNSHIP 27 NORTH, RANGE 6 EAST, W.M.

SURVEY NOTES:

1) SURVEY PROCEDURES & EQUIPMENT:
SECTION CONTROL: TOPCON GNSS GR-3 RECEIVERS.
ON SITE CONTROL AND STAKING: TOPCON GNSS GR-3 RECEIVERS AND/OR FIELD TRAVERSE & 10" TOTAL STATION.

2) THE GPS SURVEY PERFORMED FOR THIS SURVEY MEETS OR EXCEEDS THOSE STANDARDS CONTAINED IN WAC 332-130-160. THE FIELD TRAVERSES USED IN THIS SURVEY MEET OR EXCEED THOSE STANDARDS CONTAINED IN WAC 332-130-090.

3) GPS CONTROL: WASHINGTON STATE REFERENCE NETWORK (WSRN) GPS NETWORK. HORIZONTAL DATUM IS NAD83 (NA2011) EPOCH 2010.00. VERTICAL DATUM IS NAVD88 GEOID 12A.

3) DISTANCES ARE IN FEET AND DECIMALS THEREOF.

4) ALL CONTROLLING MONUMENTS SHOWN ARE OF RECORD, ARE LOCALLY ACCEPTED AS REPRESENTATIVE OF THEIR PURPORTED POSITIONS, AND WERE VISITED DURING THE COURSE OF THIS SURVEY UNLESS OTHERWISE NOTED.

5) THIS SURVEY DOES NOT PURPORT TO SHOW ALL EASEMENTS.

LEGAL DESCRIPTION:

TRACT B, PLAT OF FRYELANDS DIVISION NO. 2 RECORDED IN VOLUME 55 OF PLATS, PAGES 132-138, AUDITOR'S FILE NO. 9306285003, RECORDS OF SNOHOMISH COUNTY, WASHINGTON.

SITUATE IN COUNTY OF SNOHOMISH, STATE OF WASHINGTON.

UTILITY NOTE:

ALL UNDERGROUND UTILITY LOCATIONS ARE BASED ON STRUCTURES LOCATED BY FIELD MEASUREMENTS IN MAY/JUNE 2018 AND LOCATIONS PROVIDED BY:

APPLIED PROFESSIONAL SERVICES
43530 SE NORTH BEND WAY
NORTH BEND, WA 98045
(425) 888-2590

NO UNDERGROUND WATER WAS DETECTED IN THE GRASS AREAS. AS-BUILT PLANS INDICATE PVC PIPE USED, WHICH IS UNDETECTABLE BY APS.

THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION PROVIDED. ALL EXISTING UTILITIES SHOWN ON PLANS ARE TO BE VERIFIED HORIZONTALLY AND VERTICALLY PRIOR TO ANY CONSTRUCTION.

SURVEYOR'S CERTIFICATION:

LOCATIONS SHOWN ON THIS MAP ARE BASED ON A FIELD SURVEY BY HARMSEN AND ASSOCIATES ON MAY 23 THROUGH JUNE 1, 2018 AND RECORDED IN FIELDBOOK 1132. BOUNDARY INFORMATION IS BASED UPON THE PLAT OF FRYELANDS DIVISION NO. 2 AUDITOR'S FILE NO. 9306285003, RECORDS OF SNOHOMISH COUNTY, WASHINGTON. LOCATION SURVEY WAS PERFORMED UNDER MY SUPERVISION IN CONFORMANCE WITH APPLICABLE STATE AND INDUSTRY STANDARDS AT THE REQUEST OF CITY OF MONROE IN MAY 2018.

6/21/18

RICHARD F. CARPENTER, PROFESSIONAL LAND SURVEYOR (DATE)
REGISTRATION NO. 34137

LEGEND

FOUND MONUMENT IN CASE	FENCE LINE
FOUND PLAT MONUMENT	POWER LINE
GATE POST	WATER LINE
CATCH BASIN	WATER LINE DERIVED FROM A/B DATA
IRRIGATION CONTROL VALVE	2 SHEET INDEX
SPRINKLER HEAD	RIGHT-OF-WAY
MAPLE TREE	PROPERTY LINE
OAK TREE	RIGHT-OF-WAY CENTER LINE
POWER POLE W/ U.G. FEED	ASPHALT PAVING
POWER POLE	GRAVEL DRIVEWAY
FIRE HYDRANT	CULVERT
GROUND SHOT	EASEMENT
	SWALE

NOTE:
1. STAMPED/ SIGNED SURVEY ON FILE
2. NOT ALL UTILITIES SHOWN ARE FIELD VERIFIED - D.A. HOGAN HAS MODIFIED THE SURVEY IN SOME INSTANCES TO INCLUDE AS-BUILT UTILITY INFORMATION PROVIDED BY THE OWNER. FIELD VERIFY AT INITIAL SITE PREPARATION WHERE NOTED

DWN. BY: MMC
CHK. BY: RFC
DATE: 6/21/18
JOB NO. 18-085
FB # 1132
SCALE 1" = 20'

CITY OF MONROE
806 WEST MAIN STREET
MONROE, WA 98272

TOPOGRAPHIC SURVEY
APN: 00818700099900

HARMSEN & ASSOCIATES INC ENGINEERS SURVEYORS
125 EAST MAIN STREET, SUITE 104
P.O. BOX 516
MONROE, WA 98272
(360) 794-7811
(206) 343-5903
FAX: (360) 805-9732

File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliuM Date: 11-Jun-19 4:05:51pm

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER
FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

NORTH
0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	-
CHECKED	-

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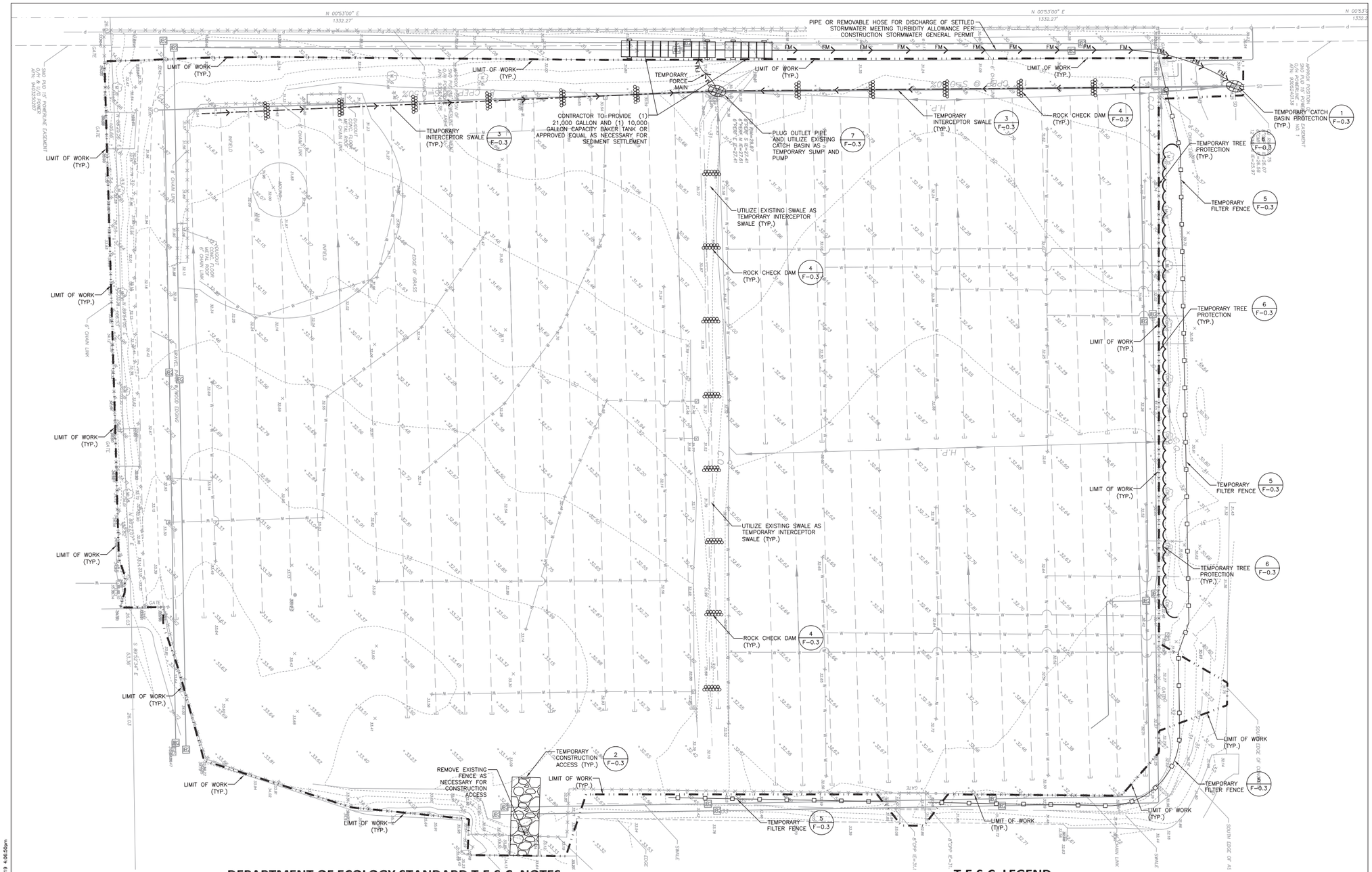
TOPOGRAPHICAL SURVEY

SHEET
F-0.1



DEPARTMENT OF ECOLOGY STANDARD T.E.S.C. NOTES

1. APPROVAL OF THIS EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES,UTILITIES, ETC.)
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT/CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
6. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE APPLICANT/CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
7. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 48 HOURS FOLLOWING A MAJOR STORM EVENT.
8. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A TRAPPED CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT LADEN WATER INTO THE DOWNSTREAM SYSTEM.
9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

T.E.S.C. LEGEND

- FILTER FENCE 5 / F-0.3
- TEMPORARY INTERCEPTOR SWALE 3 / F-0.3
- ROCK CHECK DAM 4 / F-0.3
- FORCE MAIN
- CATCH BASIN PROTECTION 1 / F-0.3
- TEMPORARY CONSTRUCTION ENTRANCE 2 / F-0.3
- TEMPORARY TREE PROTECTION FENCE 6 / F-0.3
- LIMIT OF WORK
- TEMPORARY SEDIMENT SETTLEMENT TANK

INSTALL CATCH BASIN PROTECTION AT ALL INLETS DOWNSTREAM OF THE SITE WITHIN 300' OF PROJECT LIMITS

811 Know what's below. Call before you dig.

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK ALL WEATHER FIELD IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT

NORTH
0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	CPW
CHECKED	EJG

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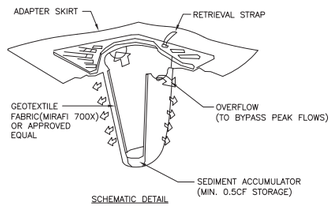
TESC PLAN

SHEET
F-0.2

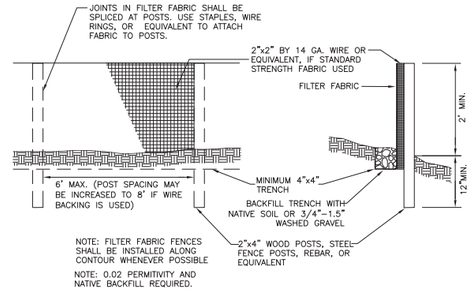
File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliaW Date: 12-Jun-19 4:06:50pm



SCHEMATIC DETAIL

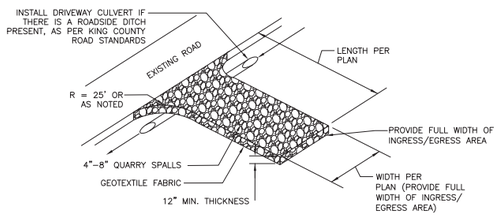
PROVIDE "STREAMGUARD SEDIMENT CATCH BASIN INSERT" OR APPROVED EQUAL

MANUFACTURER'S NAME: BOWHEAD ENVIRONMENTAL & SAFETY
ADDRESS: PO BOX 375 PRESTON, WA 98050
TELEPHONE: FOR INFORMATION: (800) 909-3677
WWW.SHOPBOWHEAD.COM



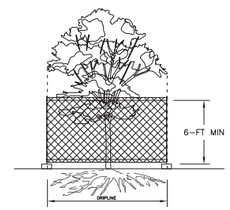
5 / F-0.3 TEMPORARY FILTER FABRIC FENCE

NOT TO SCALE



2 / F-0.3 STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE

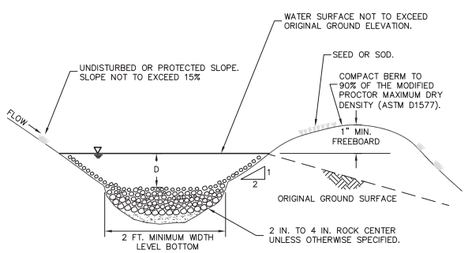


NOTES:

1. 6-FT. HIGH TEMPORARY CHAIN LINK FENCE SHALL BE PLACED AT THE DRIPLINE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE THE TREE(S). INSTALL FENCE POSTS USING PIER BLOCKS ONLY. AVOID DRIVING POSTS OR STAKES INTO MAJOR ROOTS.
2. FOR ROOTS OVER 1-IN DIA. THAT ARE DAMAGED DURING CONSTRUCTION, MAKE A CLEAN, STRAIGHT CUT TO REMOVE THE DAMAGED PORTION. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING, AND SHALL BE COVERED WITH SOIL AS SOON AS POSSIBLE.
3. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.

6 / F-0.3 TREE PROTECTION

NOT TO SCALE

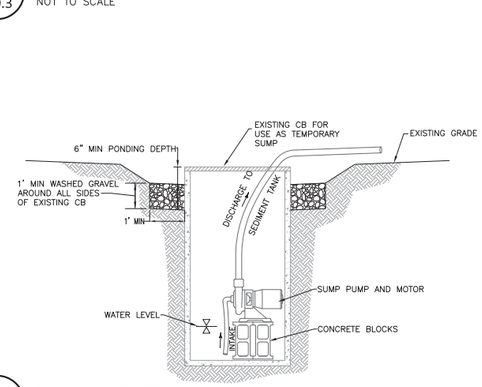


NOTES:

1. DIMENSIONS: 1 FT. MINIMUM DEPTH (D) BY 2 FT. MINIMUM BOTTOM WIDTH.
2. SWALE GRADES SHOULD NOT EXCEED 5% SIDE SLOPES SHOULD BE 2:1 OR LESS.
3. OUTLET SHALL CONSIST OF RIPRAP DISCHARGING TO STABILIZED OUTLET, SEDIMENT POND OR LEVEL SPREADER.

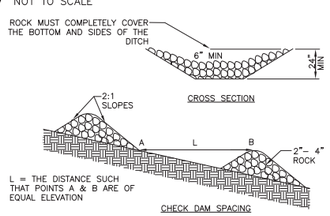
3 / F-0.3 INTERCEPTOR SWALE

NOT TO SCALE



7 / F-0.3 SUMP & PUMP DETAIL

NOT TO SCALE



CROSS SECTION

CHECK DAM SPACING

MAINTENANCE STANDARDS

1. ANY SEDIMENT DEPOSITION OF MORE THAN 0.5 FEET SHALL BE REMOVED SO THAT THE CHANNEL IS RESTORED TO ITS DESIGN CAPACITY.
2. IF THE CHANNEL CAPACITY IS INSUFFICIENT FOR THE DESIGN STORM, IT MUST BE DETERMINED WHETHER THE PROBLEM IS LOCAL (E.G., A CONSTRICTION OR BEND) OR THE CHANNEL IS UNDERDESIGNED. IF THE PROBLEM IS UNDERDESIGN, THE DESIGN ENGINEER SHALL BE NOTIFIED AND THE CHANNEL REDESIGNED TO A MORE CONSERVATIVE STANDARD TO BE APPROVED BY THE ENGINEER.
3. THE CHANNEL SHALL BE EXAMINED FOR SIGNS OF SCOURING AND EROSION OF THE BED AND BANKS. IF SCOURING OR EROSION HAS OCCURRED, AFFECTED AREAS SHALL BE PROTECTED BY RIP-RAP OR AN EROSION

4 / F-0.3 ROCK CHECK DAM

NOT TO SCALE

File: F-0.3 TESC Details & Notes.dwg Plotted by: CorneliusW Date: 11-Jun-19 3:35:00pm

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
EAIG J. GOLD
LANDSCAPE ARCHITECT
Exp. 10/21/20

PERMIT SET

DATE	6-17-19
SCALE	NTS
DRAWN	REF
CHECKED	EJG

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TESC DETAILS

SHEET

F-0.3

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

DEMOLITION NOTES

1. CONTRACTOR PRE-CONSTRUCTION REQUIREMENTS:

1.1. CALL 8-1-1 48 HOURS PRIOR TO MOBILIZATION. CONTRACTOR SHALL PERFORM A COMMERCIAL UTILITY LOCATE THROUGHOUT THE LIMIT OF SITE DISTURBANCE AND ADJACENT AREA. DOCUMENT ALL UTILITIES NOT OTHERWISE IDENTIFIED IN THE CONTRACT DOCUMENTS.

1.2. PRIOR TO PERFORMING ANY SITE DISTURBING ACTIVITIES THE CONTRACTOR SHALL COMPLETE A PRE-CONSTRUCTION CONFERENCE WITH THE DISTRICT AND HAVE PRIOR APPROVAL OF THE INSTALLATION OF ALL TEMPORARY FACILITIES INCLUDING EROSION CONTROL, SECURITY, AND SANITATION.

1.3. PRIOR TO PERFORMING ANY SITE DISTURBING ACTIVITIES THE CONTRACTOR SHALL SCHEDULE AN OPERATIONAL TEST WITH DISTRICT STAFF OF THE AUTOMATIC IRRIGATION SYSTEM(S) ON THE PROJECT SITE AND ADJACENT LANDSCAPE AREAS. CONTRACTOR SHALL DOCUMENT ALL OBSERVED DEFICIENCIES OF OPERATION AND SITE COVERAGE AND TRANSMIT TO THE ENGINEER FOR ACTION.

2. COORDINATE THE LIMIT OF DEMOLITION WORK WITH THE LAYOUT OF THE NEW WORK.

3. ALL WORK SHALL BE PERFORMED IN CONFORMANCE WITH THE REQUIREMENTS OF LOCAL AND STATE PERMITS AND THE CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP).

(4) PROTECT EXISTING TREES TO REMAIN.

(5) STRIP AREA WITHIN LIMITS OF DISTURBANCE OF EXISTING SOD, ORGANIC MATERIALS, AND EXCESS SOIL TO APPROXIMATELY 12" DEPTH AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSE OF OFF SITE. EXISTING SAND FIELD MATERIALS MAY BE INCORPORATED INTO THE EARTHWORK AFTER REMOVAL AND DISPOSAL OF THE ORGANIC MATERIALS.

(6) PROTECT EXISTING CHAIN LINK FENCE TO REMAIN. REMOVE FABRIC AS NECESSARY FOR CURB AND TURF INSTALLATION. REINSTALL AFTER COMPLETION OF TURF AND CURB.

(7) REMOVE EXISTING DRAINAGE LATERALS. REMOVE EXISTING CATCH BASIN AND STORM DRAINAGE OUTFALL TO NEXT DOWNSTREAM STRUCTURE AND PLUG PENETRATION.

8. REMOVE EXISTING IRRIGATION CONTROL VALVES AND CORRESPONDING BOXES AND DELIVER TO THE OWNER ON SITE UNLESS OTHERWISE NOTED. CAP AND PROTECT EXISTING IRRIGATION MAINLINE TO REMAIN.

(9) REMOVE EXISTING IRRIGATION SPRINKLER HEADS AND RISER ASSEMBLIES, CLEAN, PACKAGE AND DELIVER TO THE OWNER ONSITE UNLESS OTHERWISE NOTED. BACKFILL ALL VOIDS WITH STRUCTURAL FILL OR EXISTING PEA GRAVEL.

10. SELECTIVE DEMOLITION OF ALL IRRIGATION EQUIPMENT DOWNSTREAM OF EXISTING IRRIGATION POINT OF CONNECTION.

11. PROTECT ALL UTILITIES TO REMAIN.

(12) REMOVE EXISTING FENCING, POST AND FOOTING. BACKFILL WITH STRUCTURAL FILL AND COMPACT TO 95%.

(13) REMOVE EXISTING TREE INCLUDING STUMP AND DISPOSE OF OFF SITE. EXACT TREES/SHRUBS SHALL BE FIELD VERIFIED WITH THE LANDSCAPE ARCHITECT PRIOR TO REMOVAL. BACKFILL AND COMPACT EXCAVATED AREAS.

(14) REMOVE EXISTING CONCRETE PAVING AND DISPOSE OFF OF SITE.

15. BACKFILL ALL VOIDS WITH APPROVED MATERIAL AND COMPACT TO 95%.

16. REMOVE EXISTING PLATES AND ANCHORS AND DELIVER TO OWNER ON SITE

DEMOLITION LEGEND

- EXISTING NATURAL TURF TO BE REMOVED AND DISPOSED OF OFF SITE
- REMOVE EXISTING INFIELD SOIL.
- GRAVEL AND WOOD EDGER TO BE REMOVED AND DISPOSED OF OFF SITE
- CONCRETE PAVING TO BE REMOVED AND DISPOSED OF OFFSITE
- LIMIT OF WORK
- EXISTING CONCRETE CURBING TO BE REMOVED AND DISPOSED OF OFF SITE
- EXISTING CHAINLINK FENCING TO BE REMOVED AND DISPOSED OF OFF SITE

811 Know what's below. Call before you dig.

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER
FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
LANDSCAPE ARCHITECT

NORTH

0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	CPW
CHECKED	EJG

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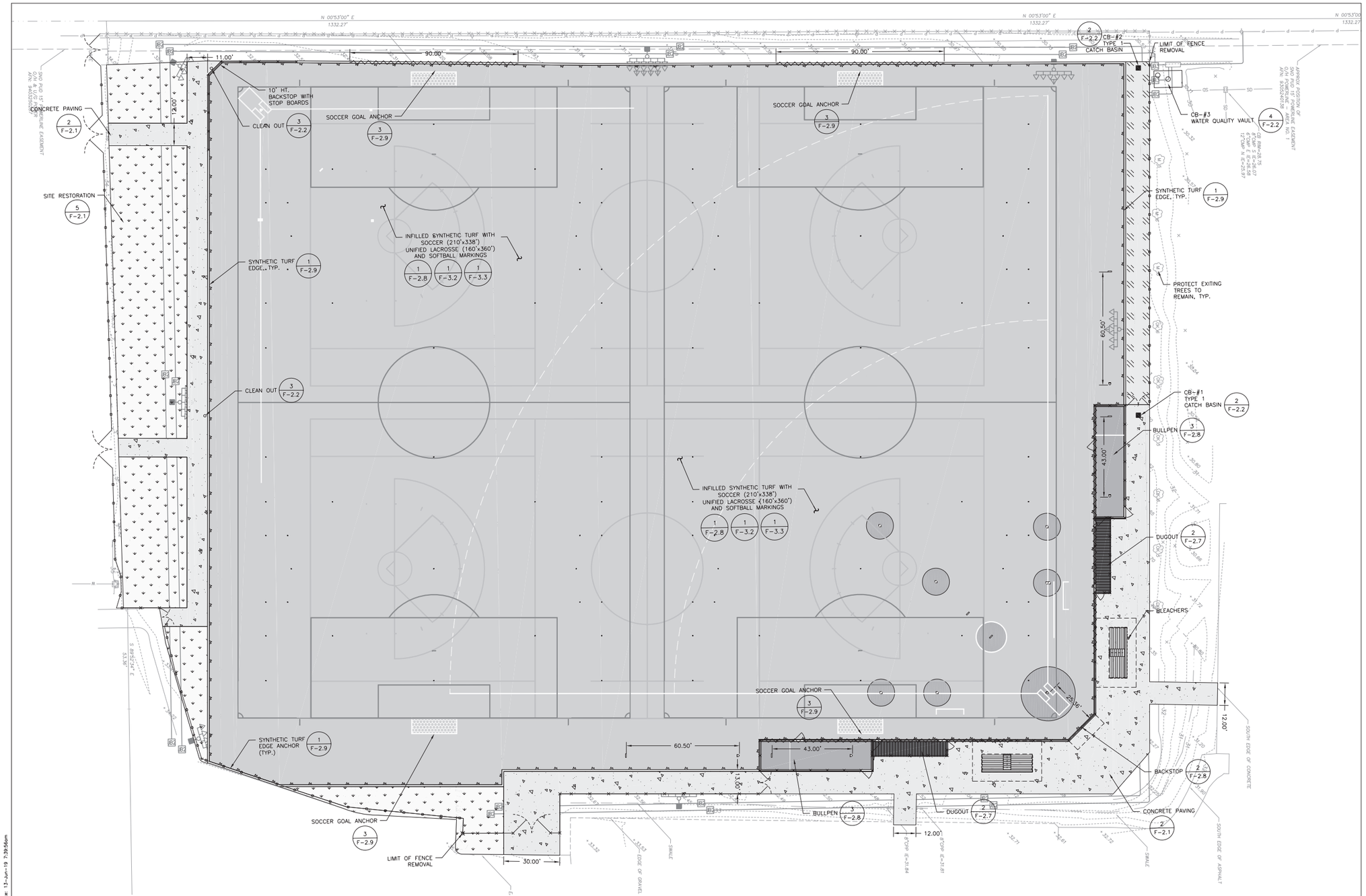
DEMOLITION PLAN

SHEET
F-0.4

File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliuW Date: 11-Jun-19 3:34:29pm



LAYOUT NOTES

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3. (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

1. 181,785SF NEW VERTICALLY DRAINING SYNTHETIC TURF SURFACING
2. 17,650SF NEW OR REPLACED PEDESTRIAN HARDSCAPE (ASPHALT/CONCRETE)
3. ±20,000SF RESTORED NATURAL GRASS SURFACE / LANDSCAPE
4. SEE FENCING PLAN F-1.5 FOR FENCING AND GATE INFORMATION

LAYOUT LEGEND

- GREEN SYNTHETIC TURF AND PERMEABLE AGGREGATE
- BROWN SYNTHETIC TURF AND PERMEABLE AGGREGATE
- ASPHALT PAVING
- CONCRETE PAVING
- SITE RESTORATION
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE
- EXISTING CHAINLINK FENCE TO REMAIN
- CONCRETE CURBING
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR
- CATCH BASIN INLET (C.B.I.) TYPE 1
- CATCH BASIN INLET (C.B.I.) TYPE 2

File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:39:56am

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER
FIELD
IMPROVEMENTS

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Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
LANDSCAPE ARCHITECT

NORTH

0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	REF
CHECKED	EJG

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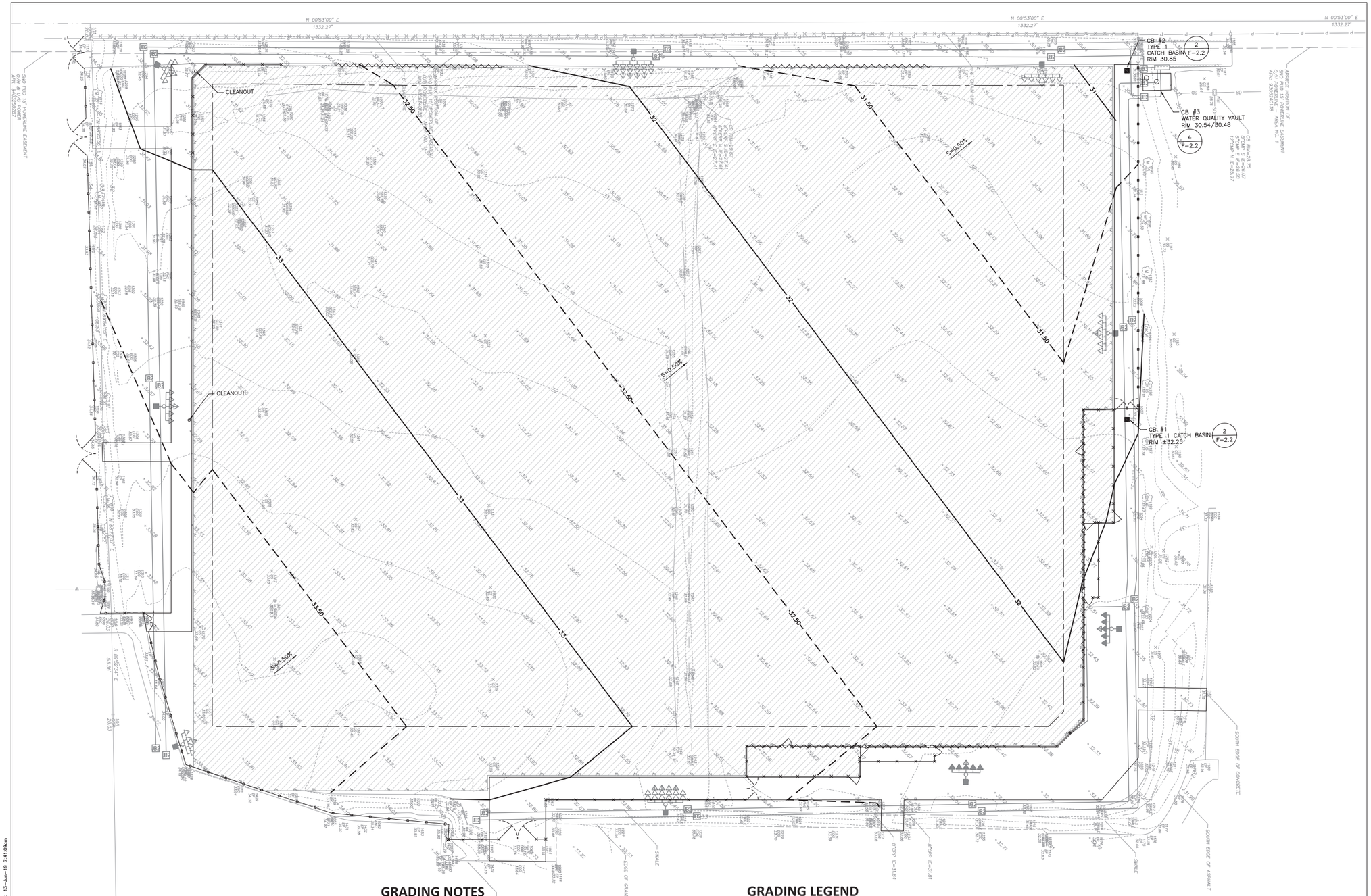
LAYOUT PLAN

SHEET

F-1.1



GRADING NOTES

1. THE CONTRACTOR SHALL CALL AND NOTIFY DIGALERT AT 8-1-1 A MINIMUM OF 2 WORKING DAYS BEFORE DEMOLITION, DIGGING, OR GRADING OPERATIONS OCCUR.
2. NEW CONTOURS SHOWN ARE FINISH GRADE ELEVATIONS.
3. BACKFILL AND COMPACT EXCAVATED AREAS RESULTING FROM DEMOLITION ACTIVITIES WITH SELECT FILL TO 95% WITH 12" MAX LIFTS.
4. STRIP FIELD AREA OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL EXCESS AND UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OR DISCOVERY OF POOR SOILS, GROUNDWATER OR DISCREPANCIES IN THE EXISTING CONDITIONS AS NOTED ON THE PLANS.
6. ALL PERIMETER PAVING SHALL MEET AND MATCH ADJACENT SURFACES.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
③ (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

GRADING LEGEND

110	EXISTING CONTOUR LINES	■	CATCH BASIN INLET (C.B.I.) TYPE 1
411.52	SPOT ELEVATION	◙	CATCH BASIN INLET (C.B.I.) TYPE 2
411	NEW CONTOUR LINES		CHAINLINK FENCE AND CONCRETE CURB
411.5	NEW HALF CONTOUR LINES		CHAINLINK FENCE
S=2.0%	SURFACE SLOPE		
c	CONSTANT SURFACE SLOPE		
	MATCH TO EXISTING		
	LIMIT OF PERMEABLE AGGREGATE		

811. Know what's **below.** **Call** before you dig.

REVISION	DATE

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Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ELDON J. GUILD
REGISTERED
LANDSCAPE ARCHITECT
EXP. 10/27/19

NORTH

0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	REF
CHECKED	EJG

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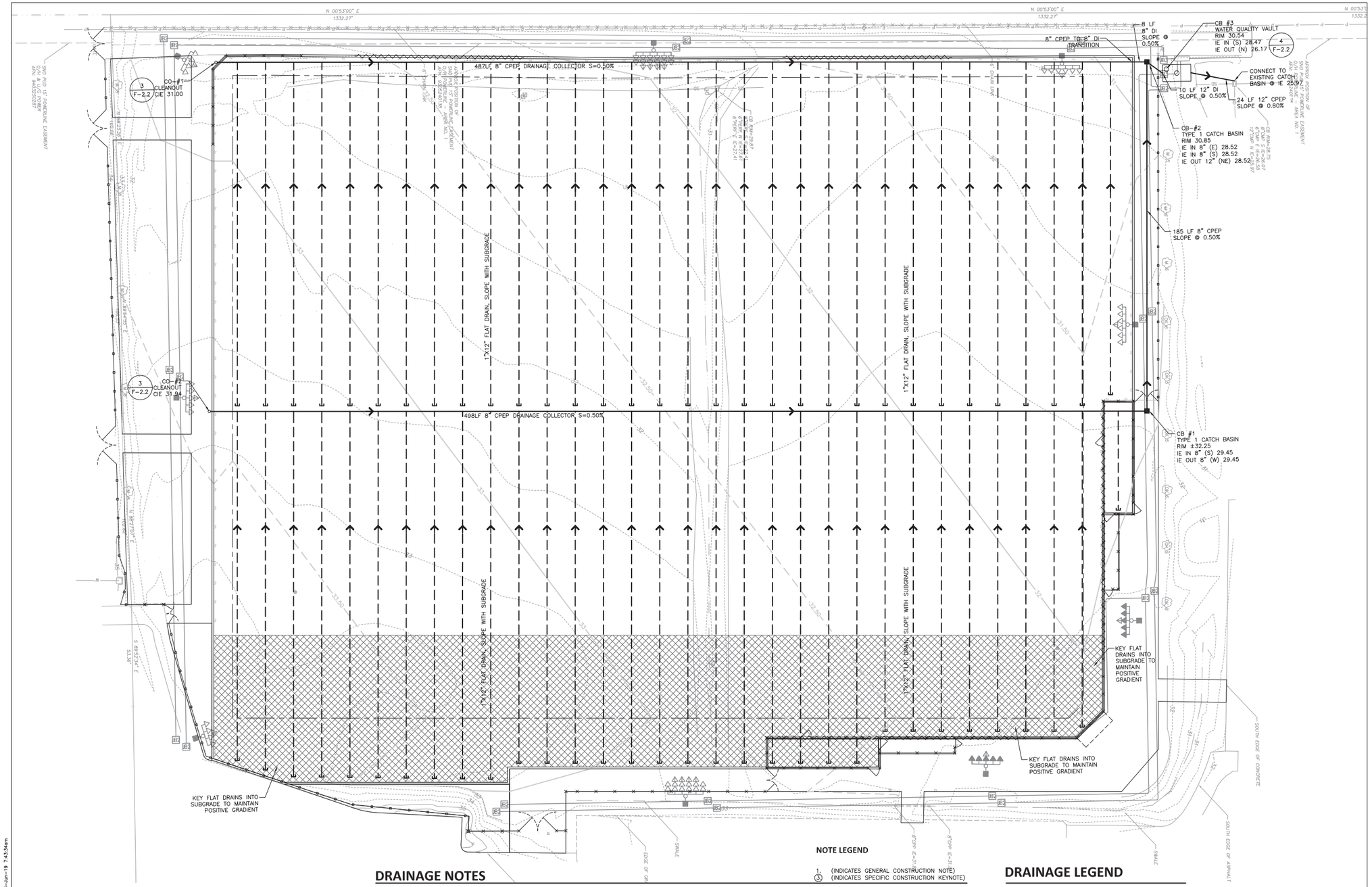
GRADING PLAN

SHEET
F-1.2

File: F-01 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:41:09am



DRAINAGE NOTES

1. SUBSURFACE DRAINAGE COLLECTOR PIPE CAN BE INSTALLED PRIOR TO FINAL ACCEPTANCE OF THE FIELD SUBGRADE.
2. COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
3. TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
4. NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
5. SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA PRIOR TO COMMENCING ON THE NEXT ADJACENT TRENCH. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
6. PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE TO BE COMPACTED TO 95%. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
7. EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.
8. NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
9. THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
10. ALL TRENCHES TO HAVE BACKFILL MATERIAL "CROWNED" A MINIMUM OF 2" ABOVE SUBGRADE TO PROTECT FROM FOREIGN MATERIAL AND PROVIDE FOR EASE OF LOCATION IDENTIFICATION. CROWNS WITH FOREIGN MATERIAL CONTAMINATION SHALL BE REMOVED PRIOR TO PLACEMENT OF BASE AGGREGATE.
11. DURING PLACEMENT OF SPECIFIED TRENCH BACKFILL, PIPE MUST BE HELD IN PLACE TO PREVENT DISPLACEMENT AND PROVIDE FOR ACHIEVING SPECIFIED INVERT ELEVATION. DO NOT DAMAGE PIPE OR ALLOW PIPE TO BE DISPLACED BY PLACEMENT OF BACKFILL MATERIAL.
12. CAP THE ENDS OF ALL LATERAL RUNS. ALL OPEN ENDS DURING CONSTRUCTION ARE TO BE TEMPORARILY CAPPED OR PLUGGED.
13. CONNECTION OF LATERALS TO COLLECTOR DRAINS SHALL BE MADE WITH A COMBINATION REDUCING TEE AND REDUCING SADDLE TEE.
14. NO TRUCKS OR EQUIPMENT WILL BE ALLOWED TO DRIVE OVER THE TOP OF THE TRENCHES EXCEPT TRACK-EQUIPPED MACHINERY UTILIZED IN SPREADING BASE AGGREGATE. BACKFILLED TRENCHES ARE TO BE STAKED AND FLAGGED 3' ABOVE GRADE AT MAXIMUM 30' SPACING FOR IDENTITY.
15. COORDINATE SUBSURFACE DRAINAGE COLLECTOR LOCATION TO AVOID FENCE POST LOCATIONS.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3 (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

DRAINAGE LEGEND

- END CAP
- 1"x12" FLAT DRAIN TUBING
- CPEP SUBSURFACE DRAINAGE COLLECTOR OR STORM DRAIN PIPE
- FLOW DIRECTION
- IE 33.19 — INVERT ELEVATION
- CIE 32.89 — COLLECTOR INVERT ELEVATION
- WATER QUALITY VAULT
- CATCH BASIN INLET (CBI) TYPE 1
- CLEANOUT
- EXISTING CATCH BASIN INLET
- GRADE BREAK
- FLAT DRAIN TUBING TO BE KEYED INTO SUBGRADE TO MAINTAIN POSITIVE GRADIENT

File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:43:34am

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER
FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
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p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
LANDSCAPE ARCHITECT

NORTH

0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	REF/ CPW
CHECKED	EJG

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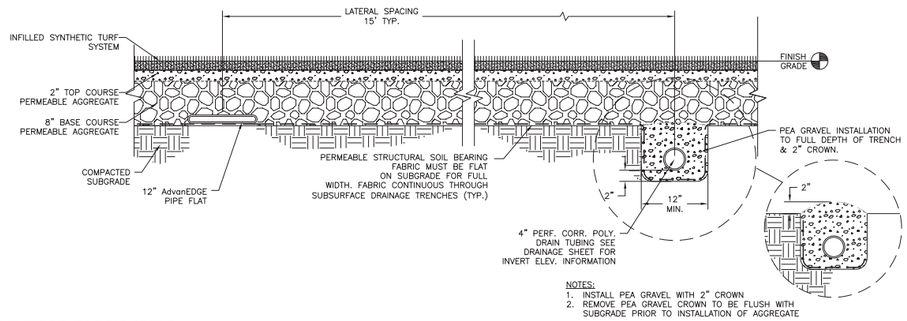
DRAINAGE PLAN

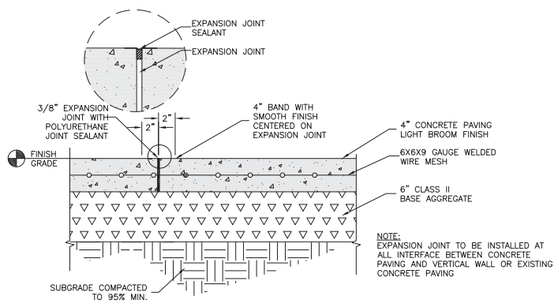
SHEET

F-1.3

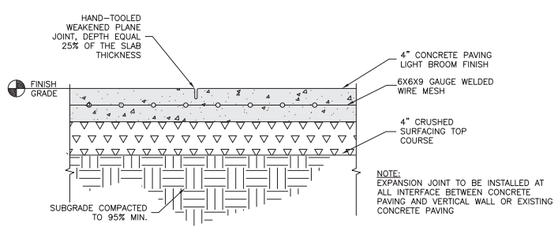


1 / F-2.1 SYNTHETIC TURF FIELD SECTION

NOT TO SCALE



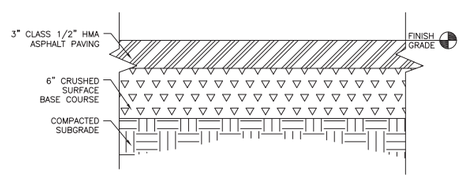
A: CONCRETE PAVING AT EXPANSION JOINT



B: CONCRETE PAVING WITH WEAKENED PLANE JOINT

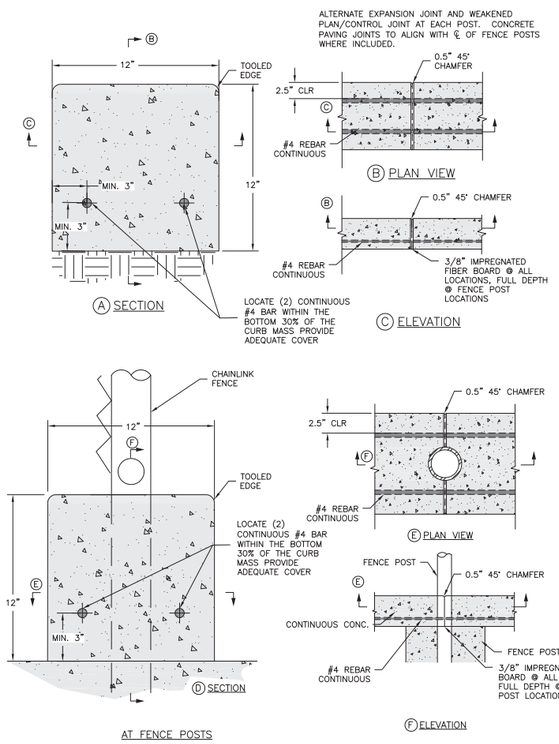
2 / F-2.1 CONCRETE PAVING

NOT TO SCALE



3 / F-2.1 ASPHALT PAVING SECTION

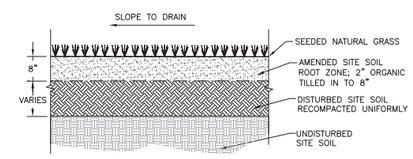
NOT TO SCALE



AT FENCE POSTS

4 / F-2.1 CONCRETE CURB & EXPANSION JOINT

NOT TO SCALE



5 / F-2.1 SEEDED SITE SOIL RESTORATION

NOT TO SCALE

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER FIELD
IMPROVEMENTS

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STATE OF WASHINGTON
ERIC J. GIBBS
LANDSCAPE ARCHITECT
EXP. 9/1/2020

PERMIT SET	
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DRAWN	REF
CHECKED	EJG

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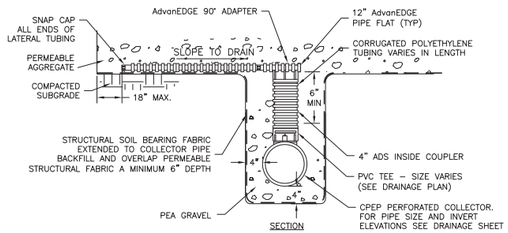
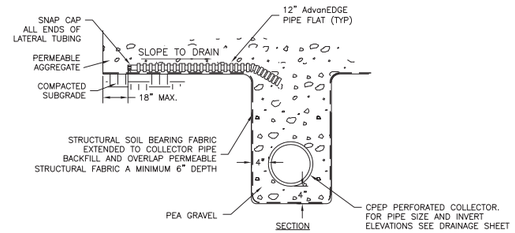
TYPICAL SECTIONS

SHEET

F-2.1

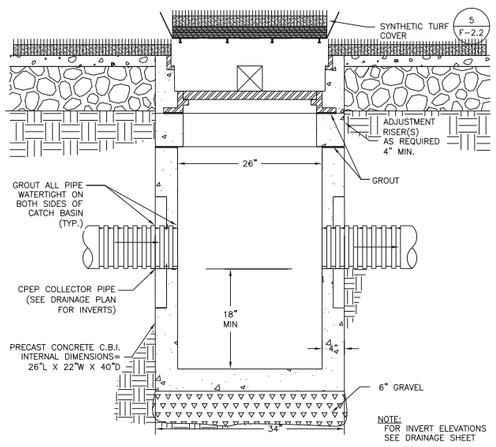
File: F-2.1 Typical Sections.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:28:35am





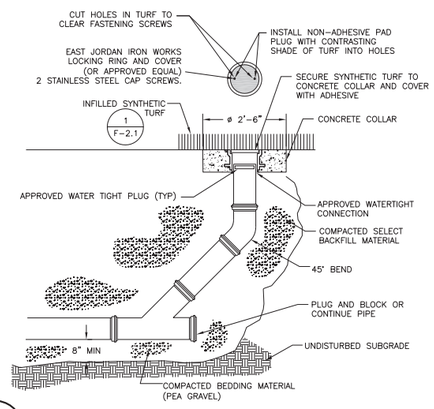
1 / F-2.2 SUBSURFACE DRAINAGE SIDE INLET FLAT

NOT TO SCALE



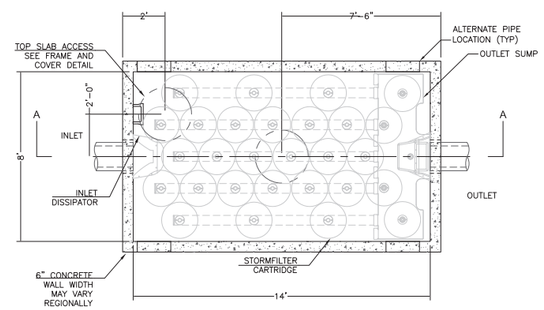
2 / F-2.2 TYPE 1 CATCH BASIN

NOT TO SCALE



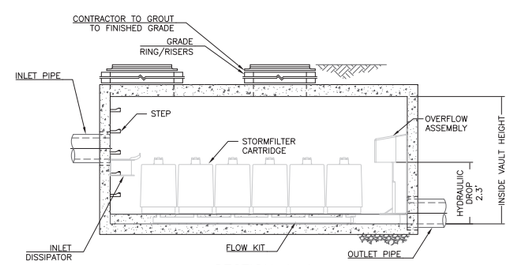
3 / F-2.2 CLEANOUT

NOT TO SCALE



PLAN VIEW

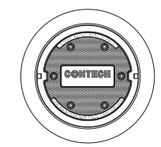
VAULT STYLE: OUTLET SUMP (NIB)



SECTION A–A

4 / F-2.2 STORMFILTER WATER QUALITY VAULT

NOT TO SCALE



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			CB#3
WATER QUALITY FLOW RATE (cfs)			0.757
PEAK FLOW RATE (cfs)			0.902
RETURN PERIOD OF PEAK FLOW (yrs)			100–YR
CARTRIDGE HEIGHT (22" 18", LOW DROP(LD)) 18"			
NUMBER OF CARTRIDGES REQUIRED			28
CARTRIDGE FLOW RATE			12.53
MEDIA TYPE (PERLITE, ZPG, PSORB)			PSORB
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	28.47	DI	12"
INLET PIPE #2	*	*	*
OUTLET PIPE	26.17	CPEP	12"
UPSTREAM RIM ELEVATION			30.54
DOWNSTREAM RIM ELEVATION			30.48
ANTI–FLOTATION BALLAST		WIDTH	HEIGHT
		N/A	N/A
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' – 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. FILTER CARTRIDGES SHALL BE MEDIA–FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7–INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONFORMING TO ASTM C–857 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

A. ANY SUB–BASE, BACKFILL DEPTH, AND/OR ANTI–FLOTATION PROVISIONS ARE SITE–SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER VAULT (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL VAULT SECTIONS AND ASSEMBLE VAULT.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION–RELATED EROSION RUNOFF.

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER FIELD
IMPROVEMENTS

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f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
NO. 690 EXP. 10/21/19
LANDSCAPE ARCHITECT

PERMIT SET	
DATE	6-17-19
SCALE	1"=20'
DRAWN	REF
CHECKED	EJG

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DRAINAGE DETAILS

SHEET

F-2.2

File: F-2.2 Drainage Details.dwg Plotted by: CornelisW Date: 13-Jun-19 7:31:57am

APPENDIX B

Design Calculations and Supporting Information

MGS FLOOD
PROJECT REPORT – WATER QUALITY FLOW

Program Version: MGSFlood 4.46
Program License Number: 201410003
Project Simulation Performed on: 05/24/2019 4:12 PM
Report Generation Date: 05/24/2019 4:15 PM

Input File Name: Lake Tye - WQ Flow.fld
Project Name: Lake Tye Park
Analysis Title: Water Quality Flow
Comments: No Detention

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 18

Full Period of Record Available used for Routing
Precipitation Station : 96005205 Puget East 52 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961052 Puget East 52 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	4.222	4.222	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	4.222	4.222	

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

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

	-------Area (Acres) --------
Impervious	4.222
Subbasin Total	4.222

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

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

	-------Area (Acres) --------
Impervious	4.222
Subbasin Total	4.222

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

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

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

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: Dummy Vault to apply infil rate
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used

Pond Floor Elevation (ft)	:	100.00
Riser Crest Elevation (ft)	:	100.67
Max Pond Elevation (ft)	:	101.00
Storage Depth (ft)	:	0.67
Pond Bottom Length (ft)	:	480.6
Pond Bottom Width (ft)	:	382.5
Pond Side Slopes (ft/ft)	:	L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft)	:	183830.
Area at Riser Crest El (sq-ft)	:	183,830.
(acres)	:	4.220
Volume at Riser Crest (cu-ft)	:	123,165.
(ac-ft)	:	2.827
Area at Max Elevation (sq-ft)	:	183830.
(acres)	:	4.220
Vol at Max Elevation (cu-ft)	:	183,829.
(ac-ft)	:	4.220

Constant Infiltration Option Used
Infiltration Rate (in/hr): 0.01

Riser Geometry

Riser Structure Type	: Circular
Riser Diameter (in)	: 12.00
Common Length (ft)	: 0.000
Riser Crest Elevation	: 100.67 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 10.00 ← to simulate no control structure
Orientation : Horizontal
Elbow : Yes

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

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

Number of Links: 0

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

Number of Links: 1

********** Link: Dummy Vault to apply infil rate **********

Basic Wet Pond Volume (91% Exceedance): 23458. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 35187. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.757 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.431 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 2564.96
Inflow Volume Including PPT-Evap (ac-ft): 2564.96
Total Runoff Infiltrated (ac-ft): 339.79, 13.25%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 2228.26
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 13.25%

WASHINGTON STATE DEPARTMENT OF ECOLOGY

April 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS) AND PHOSPHORUS TREATMENT
For
CONTECH Engineered Solutions
Stormwater Management StormFilter®
with PhosphoSorb® media

Ecology's Decision:

1. **Based on Contech Engineered Solutions application, Ecology hereby issues the following use level designation for the Stormwater Management StormFilter® using PhosphoSorb® media cartridges:**
   - **General Use Level Designation (GULD) for Basic Treatment (total suspended solids) and for Phosphorus (total phosphorus) treatment.**
     - **Sized at a hydraulic loading rate of no greater than 1.67 gallon per minute (gpm) per square foot (sq ft.) of media surface, per Table 1.**
     - **Using Contech's PhosphoSorb media. Specifications for the media shall match the specifications provided by the manufacturer and approved by Ecology.**

Table 1. StormFilter cartridge design flow rates for 18-inch diameter cartridges with PhosphoSorb media operating at 1.67 gpm/sq ft.

Effective cartridge height (in)	Cartridge flow rate (gpm/cartridge)
12	8.35
18	12.53
27	18.79

2. **Ecology approves StormFilter systems containing PhosphoSorb media for treatment at the cartridge flow rate shown in Table 1, and sized based on the water quality design flow rate for an off-line system. Contech designs their StormFilter systems to maintain treatment of the water quality design flow while routing excess flows around the treatment chamber during periods of peak bypass. Calculate the water quality design flow rates using the following procedures:**
   - **Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**
   - **Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**
   - **Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**
3. **The GULD designation has no expiration date but it may be amended or revoked by Ecology and is subject to the conditions specified below.**

<u>Ecology's Conditions of Use:</u>

StormFilter systems containing PhosphoSorb media shall comply with these conditions:

1. **Design, assemble, install, operate, and maintain StormFilter systems containing PhosphoSorb media in accordance with applicable Contech Engineered Solutions manuals, documents, and the Ecology Decision.**
2. **Use sediment loading capacity, in conjunction with the water quality design flow rate, to determine the target maintenance interval.**
3. **Owners shall install StormFilter systems in such a manner that bypass flows exceeding the water quality treatment rate or flows through the system will not re-suspend captured sediments.**
4. **Pretreatment of TSS and oil and grease may be necessary, and designers shall provide pre-treatment in accordance with the most current versions of the CONTECH *Product Design Manual* or the applicable Ecology Stormwater Manual. Design pre-treatment using the performance criteria and pretreatment practices provided in the Stormwater Management Manual for Western Washington (SWMMWW), the Stormwater Management Manual for Eastern Washington (SWMMEW), or on Ecology's "Evaluation of Emerging Stormwater Treatment Technologies" website.**
5. **Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.**
   - **Typically, CONTECH designs StormFilter systems for a target filter media replacement interval of 12 months. Maintenance includes removing accumulated**

sediment from the vault, and replacing spent cartridges with recharged cartridges.

- **Indications of the need for maintenance include the effluent flow decreasing to below the design flow rate, as indicated by the scumline above the shoulder of the cartridge.**
- **Owners/operators must inspect StormFilter with PhosphoSorb media for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the *SWMMWW*, the wet season in western Washington is October 1 to April 30. According to *SWMMEW*, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.**
- **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**
- **When inspections are performed, the following findings typically serve as maintenance triggers:**
    - **Accumulated vault sediment depths exceed an average of 2 inches, or**
    - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
    - **Standing water remains in the vault between rain events, or**
    - **Bypass during storms smaller than the design storm.**
- **Note: If excessive floatables (trash and debris) are present, perform a minor maintenance consisting of gross solids removal, not cartridge replacement.**

6. **Discharges from the StormFilter systems containing PhosphoSorb media shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant:	CONTECH Engineered Solutions
Applicant's Address:	11835 NE Glenn Widing Dr. Portland, OR 97220

Application Documents:

- The Stormwater Management StormFilter, PhosphoSorb at a Specific Flow Rate of 1.67 gpm/ft^2, Conditional Use Level Designation Application. August 2012.
- Quality Assurance Project Plan The Stormwater Management StormFilter® PhosphoSorb® at a Specific Flow Rate of 1.67 gpm/ft^2 Performance Evaluation. August 2012.
- The Stormwater Management StormFilter® PhosphoSorb® at a Specific Flow Rate of 1.67 gpm/ft^2, General Use Level Designation, Technical Evaluation Report. October 2015.

Applicant's Use Level Request:

- General use level designation as a basic (TSS) and phosphorus (total phosphorus) treatment device in accordance with Table 2 of Ecology's 2011 *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE).*

Applicant's Performance Claims:

Based on results from laboratory and field-testing, the applicant claims:

- The Stormwater Management StormFilter® with PhosphoSorb® media operating at 1.67 gpm/ft^2 is able to remove 80% of Total Suspended Solids (TSS) for influent concentrations greater than 100 mg/L, is able to remove greater than 80% TSS for influent concentrations greater than 200 mg/L, and achieve a 20 mg/L effluent for influent concentrations less than 100 mg/L.
- The StormFilter with PhosphoSorb media is able to remove 50% or greater total phosphorus for influent concentrations between 0.1 to 0.5 mg/L.

Recommendations:

Ecology finds that:

- CONTECH Engineered Solutions has shown Ecology, through laboratory and field testing, that the Stormwater Management StormFilter® with PhosphoSorb® media is capable of attaining Ecology's Basic and Total Phosphorus treatment goals.

Findings of Fact:

Laboratory testing

- A Phosphosorb StormFilter cartridge test unit, operating at 28 L/min (equivalent to 1.0 gpm/ sq. ft.), and subject to SSC with a silt loam texture (25% sand, 65% silt, and 10% clay by mass) originating from SCS 106 provides a mean SSC removal efficiency of 88%;
- A Phosphosorb StormFilter cartridge test unit, operating at 56 L/min (equivalent to 2.0 gpm/sq. ft.), and subject to SSC with a silt loam texture (25% sand, 65% silt, and 10% clay by mass) originating from SCS 106 provides a mean turbidity reduction of 82%;

- Laboratory testing of PhosphoSorb media in a Horizontal Flow Column (HFC; a 1/24th scale of a full cartridge) resulted in 50 percent dissolved phosphorus removal for the first 1,000 bed volumes. Granular activated carbon (GAC) tested under the same conditions resulted in 30 percent removal of dissolved phosphorus.

Field testing

- Contech conducted monitoring of a StormFilter® with PhosphoSorb® media at a site along Lolo Pass Road in Zigzag, Oregon between February 2012 and February 2015. The manufacturer collected flow-weighted influent and effluent composite samples during 17 separate storm events. The system treated approximately 96 percent of the flows recorded during the monitoring period. The applicant sized the system at 1.67 gpm/sq. ft.
    - Influent TSS concentrations for qualifying sampled storm events ranged from 40 to 780 mg/L. For influent concentrations less than 100 mg/L (n=2) the effluent concentration was less than 10 mg/L. For influent concentrations greater than 100 mg/L the bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean TSS reduction was 85%.
    - Total phosphorus removal for 16 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 75 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 67 percent.

Other StormFilter system with PhosphoSorb media items the Company should address:

1. Conduct testing to obtain information about maintenance requirements in order to come up with a maintenance cycle.
2. Conduct loading tests on the filter to determine maximum treatment life of the system.

Technology Description: Download at: http://www.conteches.com/Products/Stormwater-Management/Treatment/Stormwater-Management-StormFilter®.aspx

Contact Information:

Applicant: Jeremiah Lehman
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Applicant website: www.conteches.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
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Revision History

Date	**Revision**
December 2012	Original use-level-designation document: CULD for basic and phosphorus treatment.
January 2013	Revised document to match standard formatting
August 2014	Revised TER and expiration dates
November 2015	Approved GULD designation for Basic and Phosphorus treatment
November 2016	Revised Contech contact information
April 2017	Revised sizing language to note sizing based on Off-line calculations

Size and Cost Estimate

Prepared by Jelena Vandenhaak on May 28, 2019

Lake Tye
Monroe, WA

Information provided:
- Presiding agency = City of Monroe (Ecology)

Structure ID	SF Vault
Water Quality Flow Rate (cfs)	0.757
Peak Flow Rate (cfs)	< 1
Number of cartridges	28
Cartridge flow rate (gpm)	12.53
Media type	PSORB
Structure size	8x14
Approximate Price	$73,000

Assumptions:
- Media = PSORB cartridges
- Cartridge flow rate = 12.53 gpm
- Drop required from inlet to outlet = 2.3' minimum

Size and cost estimates:
The StormFilter is a flow-based system, and is therefore sized by calculating the peak water quality flow rate associated with the design storm. The water quality flow rate was calculated by the consulting engineer using WWHM and was provided to Contech Engineered Solutions LLC for the purposes of developing this estimate.

The StormFilter for this site was sized based on the above water quality flow rate. To accommodate this flow rate, Contech Engineered Solutions recommends using (28) – 18" cartridge with PSORB media in 8x14 vault. The estimated cost of this system is shown in the above table; this estimate includes a complete system delivered to the job site. The final system cost will depend on the actual depth of the units and whether extras like doors rather than castings are specified. The contractor is responsible for setting the StormFilter manhole and all external plumbing.

Typically the StormFilter manhole has an internal bypass capacity of 9.6 cfs. Since the peak discharge is expected not to exceed this rate, the unit can be placed online.

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CONTECH ENGINEERED SOLUTIONS

Project Name:	Lake Tye Park		
Site Designation:		Date:	5/24/19
County or Independent City:	Monroe	Designer:	JV
State:	WA		

Flow Based Data:

Peak Design Flow (cfs)	0.90
Water Quality Flow (cfs)	0.757
Annual Rainfall (inches)	38
Total Drainage Area, A (ac)	4.22
Post Development Impervious Area, A_I (ac)	4.22
Pervious Area, A_P (ac)	0.00

Flow Based Filter Sizing:

Filter Type	StormFilter
Structure Type	Vault
Cartridge Height	18''
Media Type	Phosphosorb
Cartridge Flow Rate, gpm/sf	1.67 gpm/sf
Cartridges Required	28
Recommended Model	8'x14' Vault
Maximum Water Quality Flow	0.78 cfs

Lake Tye Park All Weather Field Improvements
Conveyance Analysis Spreadsheet

6/12/2019

Pipe Run	Size *(inches)*	Mannings N	Plan Slope *(ft/ft)*	Qfull *(cfs)*	Tributary Basins	Total Tributary Area	Tributary Impervious Area	Tributary Pervious Area *(acres)*	Qtrib, 25-year (MGS Flood, 15 min) *(cfs)*	% Full
West Collector	8	0.011	0.005	**1.01**	Approximate West Half of Underdrained Turf Field	2.378	2.201	0.177	**0.92**	**90%**
Midfield Collector	8	0.011	0.005	**1.01**	Approximate East Half of Underdrained Turf Field	2.244	2.119	0.125	**0.89**	**88%**
Field Outlet	12	0.012	0.005	**2.74**	Underdrained Turf Field Area + Upstream area to south	4.622	4.320	0.302	**1.24**	**45%**

MGS FLOOD
PROJECT REPORT – CONVEYANCE WEST COLLECTOR

Program Version: MGSFlood 4.46
Program License Number: 201410003
Project Simulation Performed on: 05/24/2019 4:50 PM
Report Generation Date: 05/24/2019 4:50 PM

Input File Name: Conveyance - West Collector.fld
Project Name: Lake Tye Park
Analysis Title: Conveyance
Comments: West Collector

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 18

Full Period of Record Available used for Routing
Precipitation Station : 96005205 Puget East 52 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961052 Puget East 52 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	2.378	2.378	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	2.378	2.378	

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

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

	-------Area (Acres) --------
Till Grass	0.177
Impervious	2.201
Subbasin Total	2.378

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

---------- Subbasin : Field Basin ----------
-------Area (Acres) --------
Impervious 2.141

Subbasin Total 2.141

---------- Subbasin : Upstream Areas ----------
-------Area (Acres) --------
Till Grass 0.177
Impervious 0.060

Subbasin Total 0.237

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

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

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

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

Link Name: New Structure Lnk1
Link Type: Structure
Downstream Link Name: New Copy Lnk2

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 100.67
Max Pond Elevation (ft) : 101.00
Storage Depth (ft) : 0.67
Pond Bottom Length (ft) : 145.1
Pond Bottom Width (ft) : 192.8
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 27976. ← Reduced bottom area to account for 30% void ratio of base course section
Area at Riser Crest El (sq-ft) : 27,976.
(acres) : 0.642
Volume at Riser Crest (cu-ft) : 18,744.
(ac-ft) : 0.430
Area at Max Elevation (sq-ft) : 27976.
(acres) : 0.642
Vol at Max Elevation (cu-ft) : 27,976.
(ac-ft) : 0.642

Constant Infiltration Option Used

Infiltration Rate (in/hr): 0.01

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 100.67 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 10.00 ← Large orifice to simulate no control structure
Orientation : Horizontal
Elbow : Yes

Link Name: New Copy Lnk2
Link Type: Copy
Downstream Link: None

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

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

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

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk2

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.957	2-Year	0.590
5-Year	1.221	5-Year	0.715
10-Year	1.438	10-Year	0.773
25-Year	1.735	25-Year	0.915
50-Year	2.174	50-Year	0.985
100-Year	2.713	100-Year	1.033
200-Year	2.739	200-Year	1.045

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

MGS FLOOD
PROJECT REPORT – CONVEYANCE MIDFIELD COLLECTOR

Program Version: MGSFlood 4.46
Program License Number: 201410003
Project Simulation Performed on: 05/24/2019 4:42 PM
Report Generation Date: 05/24/2019 4:42 PM

Input File Name: Conveyance - Midfield Collector.fld
Project Name: Lake Tye Park
Analysis Title: Conveyance
Comments: Midfield Collector

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 18

Full Period of Record Available used for Routing
Precipitation Station : 96005205 Puget East 52 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961052 Puget East 52 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	2.244	2.244	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	2.244	2.244	

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

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

	-------Area (Acres) --------
Till Grass	0.125
Impervious	2.119
Subbasin Total	2.244

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

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

	-------Area (Acres) --------
Impervious	2.079
Subbasin Total	2.079

---------- Subbasin : Upstream Areas ----------

	-------Area (Acres) --------
Till Grass	0.125
Impervious	0.040
Subbasin Total	0.165

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

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

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

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

Link Name: Dummy Vault to apply infil rate
Link Type: Structure
Downstream Link Name: New Copy Lnk2

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 100.67
Max Pond Elevation (ft) : 101.00
Storage Depth (ft) : 0.67
Pond Bottom Length (ft) : 139.8
Pond Bottom Width (ft) : 194.4
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 27172. ← Reduced bottom area to account for 30% void ratio of base course section
Area at Riser Crest El (sq-ft) : 27,172.
(acres) : 0.624
Volume at Riser Crest (cu-ft) : 18,205.
(ac-ft) : 0.418
Area at Max Elevation (sq-ft) : 27172.
(acres) : 0.624
Vol at Max Elevation (cu-ft) : 27,172.
(ac-ft) : 0.624

Constant Infiltration Option Used
Infiltration Rate (in/hr): 0.01

Riser Geometry

Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 100.67 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 10.00 ← Large orifice to simulate no control structure
Orientation : Horizontal
Elbow : Yes

Link Name: New Copy Lnk2
Link Type: Copy
Downstream Link: None

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

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

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

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk2

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.913	2-Year	0.572
5-Year	1.161	5-Year	0.690
10-Year	1.369	10-Year	0.747
25-Year	1.657	25-Year	0.888
50-Year	2.064	50-Year	0.946
100-Year	2.578	100-Year	0.996
200-Year	2.603	200-Year	1.011

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

MGS FLOOD
PROJECT REPORT – CONVEYANCE FIELD OUTLET

Program Version: MGSFlood 4.46
Program License Number: 201410003
Project Simulation Performed on: 05/24/2019 4:27 PM
Report Generation Date: 05/24/2019 4:28 PM

Input File Name: Conveyance - Field Outlet.fld
Project Name: Lake Tye Park
Analysis Title: Conveyance
Comments: Field Outlet

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 18

Full Period of Record Available used for Routing
Precipitation Station : 96005205 Puget East 52 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961052 Puget East 52 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	4.622	4.622	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	4.622	4.622	

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

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

	-------Area (Acres) --------
Till Grass	0.302
Impervious	4.320
Subbasin Total	4.622

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

---------- Subbasin : Upstream Areas ----------

	-------Area (Acres) --------
Till Grass	0.302
Impervious	0.098
Subbasin Total	0.400

---------- Subbasin : Field Basin ----------

	-------Area (Acres) --------
Impervious	4.222
Subbasin Total	4.222

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

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

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

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

Link Name: Dummy Vault to apply infil rate
Link Type: Structure
Downstream Link Name: New Copy Lnk2

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 100.67
Max Pond Elevation (ft) : 101.00
Storage Depth (ft) : 0.67
Pond Bottom Length (ft) : 144.2
Pond Bottom Width (ft) : 382.5
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 55149. ← Reduced bottom area to account for 30% void ratio of base course section
Area at Riser Crest El (sq-ft) : 55,149.
(acres) : 1.266
Volume at Riser Crest (cu-ft) : 36,950.
(ac-ft) : 0.848
Area at Max Elevation (sq-ft) : 55149.
(acres) : 1.266
Vol at Max Elevation (cu-ft) : 55,149.
(ac-ft) : 1.266

Constant Infiltration Option Used

Infiltration Rate (in/hr): 0.01

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 121.00
Common Length (ft) : 0.000
Riser Crest Elevation : 100.67 ft

Hydraulic Structure Geometry

Number of Devices: 1

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 10.00 ← Large orifice to simulate no control structure
Orientation : Horizontal
Elbow : Yes

Link Name: New Copy Lnk2
Link Type: Copy
Downstream Link: None

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

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

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

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk2

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.870	2-Year	0.845
5-Year	2.382	5-Year	1.000
10-Year	2.807	10-Year	1.108
25-Year	3.392	25-Year	1.242
50-Year	4.239	50-Year	1.309
100-Year	5.291	100-Year	1.324
200-Year	5.342	200-Year	1.426

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

Sediment Tank Sizing Calculations

Per Volume II of the 2014 DOE Manual

Project Name: Lake Tye Park All Weather Field Improvements

Required Sediment Trap Surface Area (SA):

SA =2*Q/Vsed

Where:

Q = 2-year developed flow rate from MGS Flood

Vsed = Settling Velocity (0.00096 ft/sec)

Calculation:

multiplier =	2	
Q =	0.8560	cfs
Vsed =	0.00096	fps
Required SA =	**1783.3**	**square feet**

Equivalent Sediment Trap Volume:

To determine the minimum sediment tank volume, an equivalent sediment trap was sized based upon the required surface area.

Length of Top Surface Area =	43	feet
Width of Top Surface Area =	42	feet
Surface Area Provided =	1806	square feet
Side Slope =	3	(H:1V)
Total Depth of Sediment Trap =	3.5	feet
Bottom Length of Sediment Trap =	22	feet
Bottom Width of Sediment Trap =	21	feet
Total pond Volume =	**3969.00**	cubic feet
	29688.12	gallons

MGS FLOOD
PROJECT REPORT – TESC SEDIMENT SIZING

Program Version: MGSFlood 4.46
Program License Number: 201410003
Project Simulation Performed on: 05/17/2019 11:29 AM
Report Generation Date: 05/17/2019 11:29 AM

Input File Name: Lake Tye - TESC Sizing.fld
Project Name: Lake Tye Park
Analysis Title: TESC Sediment Sizing
Comments:

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 18

Full Period of Record Available used for Routing
Precipitation Station : 96005205 Puget East 52 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961052 Puget East 52 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	4.641	4.641	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	4.641	4.641	

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

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

	-------Area (Acres) --------
Till Grass	4.222
Impervious	0.419
Subbasin Total	4.641

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

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

	-------Area (Acres) --------
Till Grass	4.222
Impervious	0.419
Subbasin Total	4.641

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

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

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

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Subbasin: Subbasin 1

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.856	2-Year	0.856
5-Year	1.225	5-Year	1.225
10-Year	1.597	10-Year	1.597
25-Year	2.083	25-Year	2.083
50-Year	3.094	50-Year	3.094
100-Year	3.577	100-Year	3.577
200-Year	3.619	200-Year	3.619

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

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APPENDIX C

Construction Stormwater Pollution Prevention Plan (SWPPP)

LAKE TYE PARK
ALL WEATHER FIELD IMPROVEMENTS
CONSTRUCTION SWPPP NARRATIVE
JUNE 12, 2019

The following Construction Storm Water Pollution Prevention Plan (SWPPP) narrative is Lake Tye Park All Weather Field Improvements project. The site is located at 14964 Fryelands Boulevard in Monroe, Washington. The narrative supplements the Temporary Erosion and Sediment Control (TESC) plan. This narrative and the drawings address the requirements of Volume II of the Department of Ecology (DOE) 2012 Stormwater Management Manual for Western Washington (SMMWW), amended in 2014. Refer to the TESC plans (Sheet F-0.2) and TESC details (Sheet F-0.3) for more information regarding any erosion or sedimentation control measures involved in this project.

1. CONSTRUCTION STORMWATER POLLUTION PREVENTION ELEMENTS

1) **Mark Clearing Limits:** Clearing limits will be delineated on the TESC and Site Demolition plan. The actual limits of clearing will likely be smaller than the limit of work, but this identifies the maximum extent of the clearing limits. Areas impacted and not anticipated to be covered with final measures shall be stabilized using approved permanent TESC methods.

2) **Establish Construction Access:** Construction access will be provided from the existing asphalt parking lot to the east of the fields, with temporary quarry spall construction entrance (BMP C105) at the existing access points as necessary. The Contractor shall provide wheel wash if necessary.

3) **Control Flow Rates:** Stormwater flow control during construction will be mitigated by routing runoff to temporary sediment settling tanks. Refer to the Sediment Tank Sizing calculations and the associated MGS Flood output included within Appendix B of the project's Stormwater Site Plan. Permanent flow control facilities are not proposed as part of this project,

4) **Install Sediment Controls:** DOE approved BMPs for sediment controls are shown on the TESC plan. Sediment will be controlled using silt fence (BMP C233) and storm drain inlet protection (BMP C220).

5) **Stabilize Soils:** It is possible that some of the earthwork and grading may occur in wet weather conditions. The site must be stabilized and no soils will be allowed to remain unstabilized for more than two days between October 1st and April 30th. From May 1 through September 30, install cover measures to protect disturbed areas that will remain unworked for seven days or more. By October 8, seed all areas that will remain unworked from October 1 through April 30. Mulch all seeded areas.

   Exposed slopes will be protected by DOE-approved coverage methods. BMPs including, but not limited to: C101, Preserving Natural Vegetation; C121, Mulching; C123, Plastic Covering; C130, Surface Roughening; C140, Dust Control; and T5.13 Post Construction Soil Amendment will be used to stabilize on-site soils during construction.

6) **Protect Slopes:** The DOE-approved BMPs for slope protection will be utilized during construction. Concentrated discharges shall not be allowed to flow over the top of steep slopes. BMPs including, but not limited to C101, Preserving Natural Vegetation; C121, Mulching; C123, Plastic Covering; C130, Surface Roughening; C140, Dust Control; C208, Triangular Silt Dike; C207, Check Dams; and C233, Silt Fence are to be utilized to protect slopes during construction.

7) **Protect Drain Inlets:** Drainage structures in areas where no work occurs will remain and will be protected; discharge points to the public storm drain main line will also be protected. To prevent discharge of turbid water downstream, all existing catch basins located within the disturbance area and outside of the disturbance area within approximately 300 feet downstream of the site will be protected with storm drain inlet protection (BMP C220). The Contractor shall remove inlet protection at the end of the project without releasing captured sediment into the storm system.

8) **Stabilize Channels and Outlets:** DOE-approved BMPs for channel stabilization will be utilized during construction, including, but not limited to: C200, Interceptor Dike and Swale; and C207, Check Dams.

9) **Control Pollutants:** Temporary protection of the disturbed soils provides the first level of protection for pollution control (cover measures such as BMP C122, 123) and perimeter measures downstream will mitigate the remaining pollutants. The temporary protection of disturbed soils may be mitigated with a temporary sump and pump facility to provide the second level of interception of pollutants. This collection system filters sediments prior to the pump system. The pump system will then route stormwater via force mains into the temporary sediment settling facility. Construction debris will be removed from the site. The Contractor will be responsible for managing their construction equipment per DOE-approved BMPs. If a truck wheel wash is required, truck wheel wash water and concrete truck washout water shall be collected and discharged to the public sanitary sewer (SS) system. To apply for and obtain a SS release, contact the local sewer purveyors for authorization.

10) **Control De-Watering:** The majority of the earthwork on the project will be constructed during the dry season, therefore it is not anticipated that groundwater will be encountered in the excavations for this project. In the event that perched groundwater is encountered during any wet season construction, the Contractor shall route it to the sediment settling facility by pumping it out of the excavation.

11) **Maintain BMPs:** DOE-approved standard BMP maintenance will be required in accordance with the DOE standard erosion control plan notes (Sheet F-0.3).

12) **Manage the Project:** All phases of construction will be managed by the Contractor. The site must be stabilized and no soils will be allowed to remain exposed and unworked for more than two days between October 1st and April 30th and for more than seven days between May 1st and September 30th. The Contractor will provide maintenance and monitoring of TESC BMPs. Work of all contractors will be coordinated to minimize the duration of disturbance on the site. The best management practices shown on the TESC plan are minimum requirements. Failure to maintain SWPPP measures in accordance with adopted standards may result in the work being performed at the City's direction and the costs assessed as a lien against the property where such facilities are located.

1) 13) **Protect Low-Impact Development BMPs:** This project does not propose any LID BMPs that require protection, such as bioretention or permeable pavement. The project does propose sheet flow dispersion, and the vegetated flow path is not expected to be disturbed by construction traffic. Also, adhere to section 5.3.1 of the current DOE LID Manual for compost-amended soils. This includes defining soil and vegetation protection zones to ensure the topsoil does not become compacted by construction equipment.

2. Project Description

The proposed project involves the resurfacing of the southernmost playfield (south of the baseball field) with synthetic turf. The resurfaced field will be multipurpose, with the northeast corner purposed as a softball field, while the remaining portions of the field can be utilized for other athletic activities. The existing underdrain system will remain. Re-grading will take place such that the field has a consistent slope from southeast to northwest. Paved plaza and walkway areas will be installed south, north, and east of the field. Other proposed amenities include field markings, bleachers, dugouts, bullpens, and lighting.

The project proposes 202,569 square feet (4.65 acres) of new plus replaced hard surface, including underdrained turf field surface. The total project disturbance is 5 acres. Flow control facilities will not be required for this project. Water quality for the synthetic field surface will be provided by a StormFilter cartridge system containing PhosphoSorb media. Refer to the project's Stormwater Site Plan for more information.

3. Existing Site Conditions

The Lake Tye Park property currently consists of playfields on the west side of the site with parking along the east side. There are tennis/basketball courts north of the main parking lot and paved walkways around the fields. Northwest of the baseball field is a playground area, along with various buildings. Lake Tye is north of the site with a beach area on park property. The Monroe Skatepark is located at the northeast corner of the site.

Topographically, the field is relatively flat. The southern portion of the field has a high point elevation of 33 on the eastern half. From here, the field slopes at approximately 1% each direction (northwest and southeast). For the northern portion of the field, from the approximate center, the topography slopes northwest and southwest, at an approximate slope of 0.7%. The northeast corner slopes northeast slightly toward the existing swale. There is a grass-lined swale in the approximate middle of the field, running east to west.

The project site is within the Lake Tye Drainage Basin. Stormwater from the site is generally collected by the field's underdrain system and conveyed to a solid pipe system along the west side of the playfields. This piped system conveys stormwater north, eventually discharging into Lake Tye north of the park property.

4. Adjacent Areas

The project area is bounded by the play area of Fryelands Elementary School to the south, parking to the east, the baseball field to the north, and agricultural land to the west. Vehicular access to the site is from Fryelands Boulevard to the east of the parking lot.

5. Critical Areas

Per Department of Ecology Flood Hazard Maps, the northern and western edges of the project extents are within a 100-year flood hazard zone. According to City of Monroe and Snohomish County mapping, there are no other environmental critical areas on the project site.

6. Soils

Based upon the Natural Resources Conservation Service Web Soil Survey, the site soils within the project area include Puget silty clay loam in the north portion of the field and Terric Medisaprists, nearly level soils for the south side of the field. A geotechnical report has been prepared for the by Associated Earth Sciences, Inc. dated July 19, 2018. All exploration borings encountered fill, ranging from 2.5 to 8 feet thick, consisting of loose to medium dense silty sand with gravel. Beneath the fill layer, native material consisted of silt with organics underlain by dense interbedded gravel, silty sand, and silt, interpreted as alluvial sediments.

7. Potential Erosion Problem Areas

The site is not within an erosion hazard area. Per the proposed contract documents, the contractor is to provide protection for soils to limit the exposure to erosion. The limitation of disturbance, adequate cover practices, seasonal work limitation, and runoff control are the most effective methods for reduction of turbidity in stormwater runoff. Any runoff that occurs will be directed to the temporary sump via a temporary interceptor swale, and then pumped to the proposed sediment settling tank. Areas that have not been permanently stabilized will be addressed using DOE-approved BMPs, per the construction documents.

8. Construction Phasing

This project is not expected to be formally phased. The contractor is responsible for coordinating work of all subcontractors to keep the duration of site disturbance limited to the maximum extent possible.

9. Construction Schedule

Construction of this Project is expected to begin in Summer of 2020 and be completed by Fall of 2020.

Earthwork activities are not expected to take place in the wet season, October 1st to April 30th. Should any wet weather conditions occur during construction, the contractor shall implement the de-watering procedures outlined in this SWPPP and applicable BMPs including, but not limited to C123, Plastic Covering; C121, Mulching; C122, Nets and Blankets; C126, Polyacrylamide for Soil Erosion Protection; C130, Surface Roughening.

10. Financial/Ownership Responsibilities

This property is owned and operated by the City of Monroe. The accepted low bidder on the project will be responsible for posting a performance and payment bond with the City of Monroe, and thus will be the responsible party for any liability associated with erosion and sedimentation impact.

11. Engineering Calculations

A copy of any calculations performed during design of the project and relevant storm drainage modeling discussions is included in the project's Stormwater Site Plan.

APPENDIX D

Operations and Maintenance Manual

Lake Tye Park
All Weather Field Improvements

Operations & Maintenance Manual

June 12, 2019

Prepared by:

LPD Engineering, PLLC
1932 1st Avenue, Suite 201
Seattle, WA 98101
206.725.1211

Operations & Maintenance Manual

Project Overview

This Operations and Maintenance Manual is for the all-weather field improvements at Lake Tye Park located at 14964 Fryelands Boulevard in Monroe, Washington. The proposed project involves resurfacing of the existing natural grass playfields (and compacted dirt softball infield) with synthetic turf, along with the installation of paved walkway accesses and other field amenities. These fields are located in the southwest portion of the park site, and the existing baseball field to the north will not be disturbed. The existing underdrain system will be removed and replaced.

Stormwater System Overview

This project does not propose any flow control structures. The existing underdrain system located underneath the entire field will be replaced. The new system will include 4-inch perforated lateral drain lines conveying flow east to west. There are two 8-inch collector drain lines, one along the west side of the field, and the other at approximately midfield.

The proposed synthetic turf surface will be permeable and will allow vertical drainage. Rainfall landing upon these surfaces will percolate vertically through the surface materials and into the permeable gravel base materials and will be collected by the existing underdrain system. Refer to the Figure A – Stormwater Facilities Site Map and the Drainage Plan sheet F-1.3 included with this manual for proposed stormwater facilities.

The synthetic turf surface is considered a pollution generating surface, and therefore, water quality treatment is required. For this project, Contech's StormFilter cartridge system with Phosphosorb media will be used to address water quality. Stormwater from the field underdrain system will be collected by the StormFilter prior to connecting to the existing piped storm system.

Field Underdrain System Maintenance

Rainfall landing upon the synthetic turf will percolate through the surface into the top course gravel layer, and then continue down into the base layers before it reaches the underdrain system. The layers of permeable aggregate material will provide filtration of the stormwater before it reaches the underdrain pipe network. Therefore little to no sedimentation is expected within the subsurface drainage system. The field drainage system will only handle rainfall that lands on the field; no upstream flows are expected to run-on to these underdrained surfaces. See attached Typical Sections Sheet F-2.1 for detail of the underdrained field section.

Maintenance (cleaning) will be done if necessary, during the replacement of the synthetic turf material. The synthetic turf fields generally have an expected life cycle of approximately 8-10 years. Due to the filtration of stormwater percolating vertically through the system, the maintenance interval for the field aggregate base layers and the pipe network is expected to be greater than the life cycle of the synthetic turf field surface.

In the event that one of the perforated lateral drain lines becomes plugged, flows will migrate down-gradient and be collected by the adjacent perforated lateral drain line within the system. Only in the highly unlikely event of a major failure of the underdrain system would there be a need to

partially remove and replace the field surface to access the drainage system for maintenance and cleaning/repair.

StormFilter Maintenance

As mentioned earlier, there is a StormFilter cartridge system with Phosphosorb media located downstream of the field underdrain system. Refer to the attached maintenance guidelines for the StormFilter. In general, inspection and maintenance should take place at least once a year. The maintenance procedure includes cartridge replacement and sediment removal and requires maintenance personnel to enter the vault to perform maintenance. Filter cartridge replacement should occur during dry weather. If base flows are occurring, it may be necessary to plug the filter inlet pipe. Refer to the attached maintenance guidelines from Contech for a StormFilter. A detail of this system is on the attached Sheet F-2.2. Additionally, attached are the maintenance guidelines (No. 15) from Volume V of the 2014 Department of Ecology Stormwater Management Manual for Western Washington.

Catch Basin Maintenance

Refer to the attached maintenance guidelines (No. 5) from Volume V of the 2014 DOE Stormwater Management Manual for Western Washington.

Maintenance Responsibility

In order limit the contribution of the pollutants to the storm drainage system, there shall be no use of disinfecting chemicals, cleaning products or other chemical agents used on the synthetic turf surface. Equipment used for field maintenance shall be kept in good working order, to limit leaks or spills of contaminates from machinery. Also, pet/animal usage of the field should be restricted to limit any potential for any animal wastes from damaging the synthetic turf field surface and potentially polluting stormwater runoff.

This Operations and Maintenance Manual shall be kept in the City of Monroe Parks and Recreation department main office. This manual must be made readily available for inspection by City of Monroe personnel. The City of Monroe is the responsible organization for maintenance of the on-site storm systems. The City of Monroe Operations and Maintenance department can be contacted at (360) 794-6100.

The maintenance activity log shall be kept up date with the most current O&M actions by the City of Monroe and shall be made available for inspection upon request.

Attachments:

- Exhibit A - Stormwater Facilities Site Map
- Drainage Plan Sheet F-1.3; Typical Sections Sheet F-2.1; Drainage Details Sheet F-2.2
- StormFilter Inspection and Maintenance Procedures
- Operation and Maintenance Guidelines form the 2014 Department of Ecology Stormwater Management Manual
- Sample Maintenance Activity Log

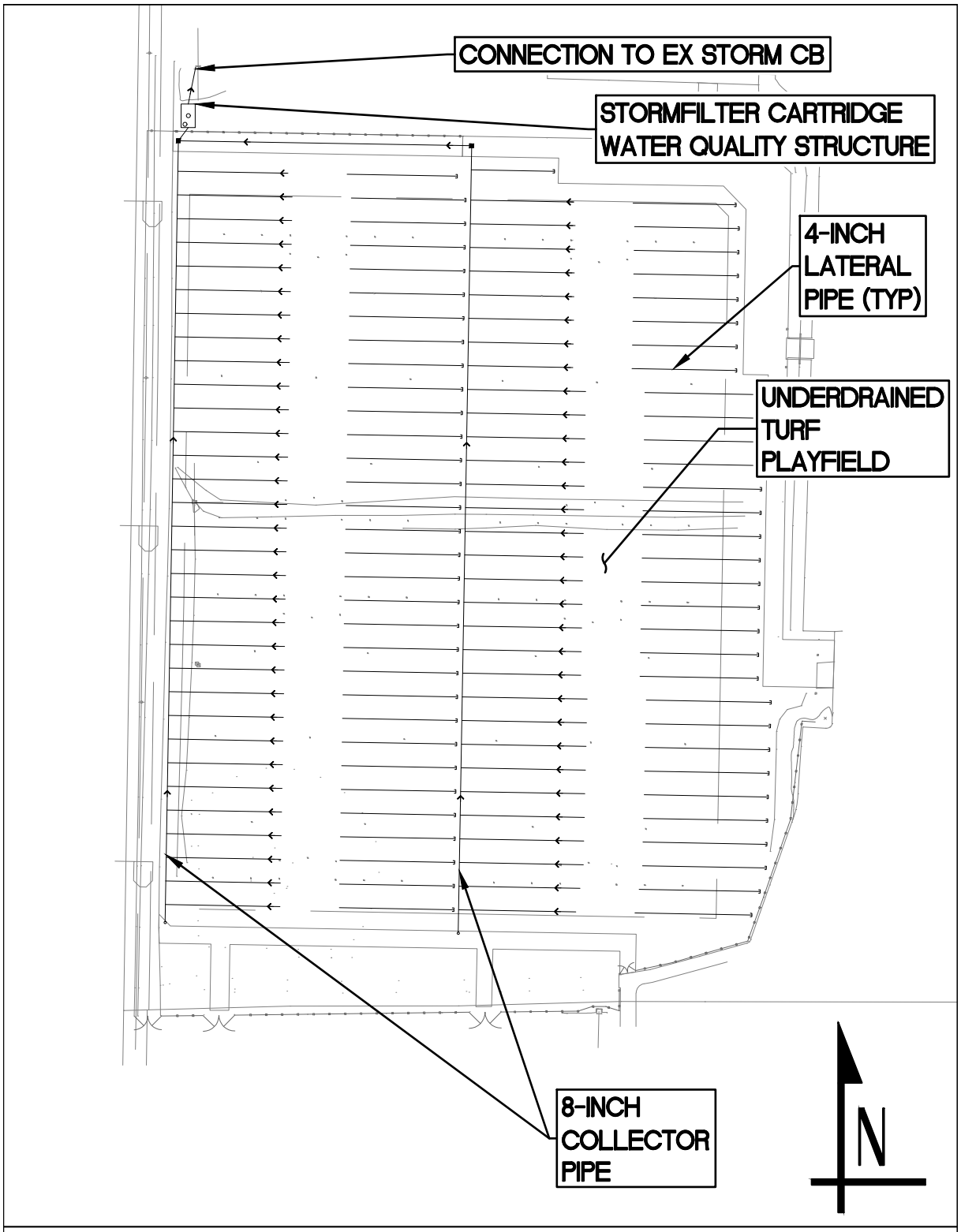
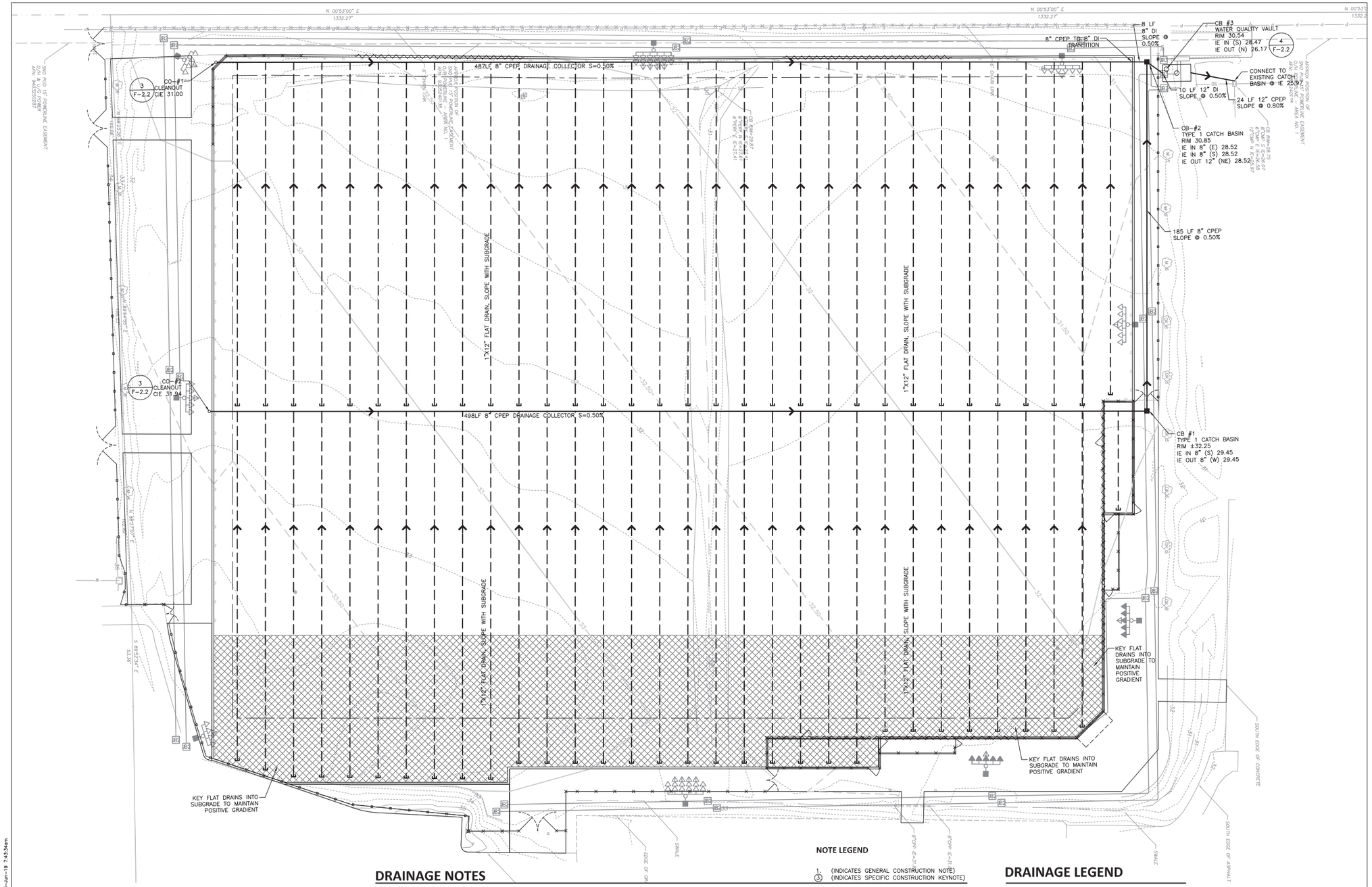


EXHIBIT A - STORMWATER FACILITIES SITE MAP
LAKE TYE PARK



DRAINAGE NOTES

1. SUBSURFACE DRAINAGE COLLECTOR PIPE CAN BE INSTALLED PRIOR TO FINAL ACCEPTANCE OF THE FIELD SUBGRADE.
2. COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
3. TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
4. NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
5. SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA PRIOR TO COMMENCING ON THE NEXT ADJACENT TRENCH. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
6. PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE TO BE COMPACTED TO 95%. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
7. EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.
8. NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
9. THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
10. ALL TRENCHES TO HAVE BACKFILL MATERIAL "CROWNED" A MINIMUM OF 2" ABOVE SUBGRADE TO PROTECT FROM FOREIGN MATERIAL AND PROVIDE FOR EASE OF LOCATION IDENTIFICATION. CROWNS WITH FOREIGN MATERIAL CONTAMINATION SHALL BE REMOVED PRIOR TO PLACEMENT OF BASE AGGREGATE.
11. DURING PLACEMENT OF SPECIFIED TRENCH BACKFILL, PIPE MUST BE HELD IN PLACE TO PREVENT DISPLACEMENT AND PROVIDE FOR ACHIEVING SPECIFIED INVERT ELEVATION. DO NOT DAMAGE PIPE OR ALLOW PIPE TO BE DISPLACED BY PLACEMENT OF BACKFILL MATERIAL.
12. CAP THE ENDS OF ALL LATERAL RUNS. ALL OPEN ENDS DURING CONSTRUCTION ARE TO BE TEMPORARILY CAPPED OR PLUGGED.
13. CONNECTION OF LATERALS TO COLLECTOR DRAINS SHALL BE MADE WITH A COMBINATION REDUCING TEE AND REDUCING SADDLE TEE.
14. NO TRUCKS OR EQUIPMENT WILL BE ALLOWED TO DRIVE OVER THE TOP OF THE TRENCHES EXCEPT TRACK-EQUIPPED MACHINERY UTILIZED IN SPREADING BASE AGGREGATE. BACKFILLED TRENCHES ARE TO BE STAKED AND FLAGGED 3' ABOVE GRADE AT MAXIMUM 30' SPACING FOR IDENTITY.
15. COORDINATE SUBSURFACE DRAINAGE COLLECTOR LOCATION TO AVOID FENCE POST LOCATIONS.

NOTE LEGEND

1. (INDICATES GENERAL CONSTRUCTION NOTE)
3 (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

DRAINAGE LEGEND

- END CAP
- 1"x12" FLAT DRAIN TUBING
- CPEP SUBSURFACE DRAINAGE COLLECTOR OR STORM DRAIN PIPE
- FLOW DIRECTION
- IE 33.19 — INVERT ELEVATION
- CIE 32.89 — COLLECTOR INVERT ELEVATION
- WATER QUALITY VAULT
- CATCH BASIN INLET (CBI) TYPE 1
- CLEANOUT
- EXISTING CATCH BASIN INLET
- GRADE BREAK
- FLAT DRAIN TUBING TO BE KEYED INTO SUBGRADE TO MAINTAIN POSITIVE GRADIENT

File: F-0.1 Lake Tye Park CURRENT 30x42.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:43:34am

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER
FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
LANDSCAPE ARCHITECT

NORTH

0 20' 40'
SCALE: 1" = 20'

PERMIT SET

DATE	6-17-19
SCALE	1"=20'
DRAWN	REF/ CPW
CHECKED	EJG

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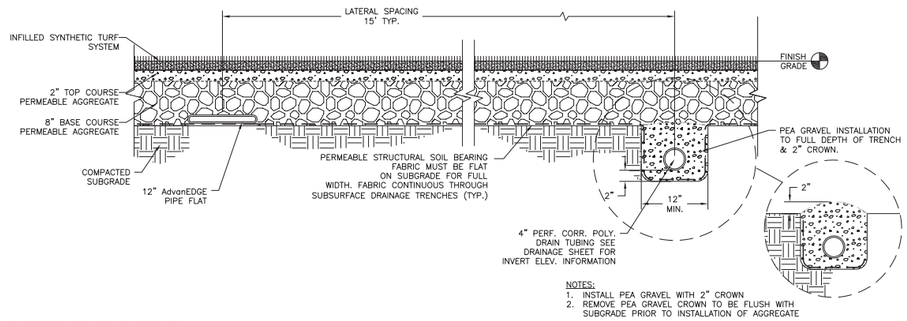
DRAINAGE PLAN

SHEET

F-1.3



1 / F-2.1 SYNTHETIC TURF FIELD SECTION

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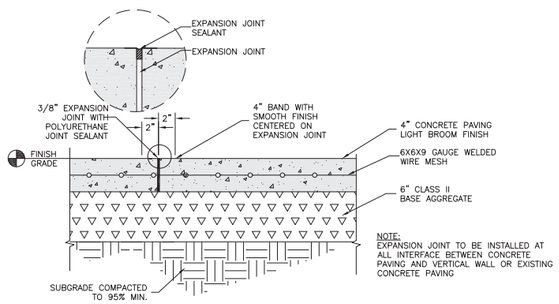
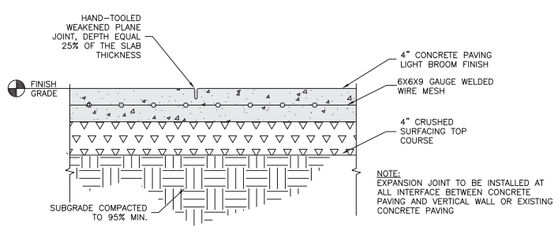


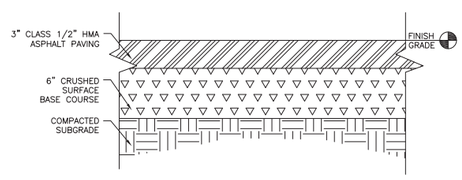
A: CONCRETE PAVING AT EXPANSION JOINT



B: CONCRETE PAVING WITH WEAKENED PLANE JOINT

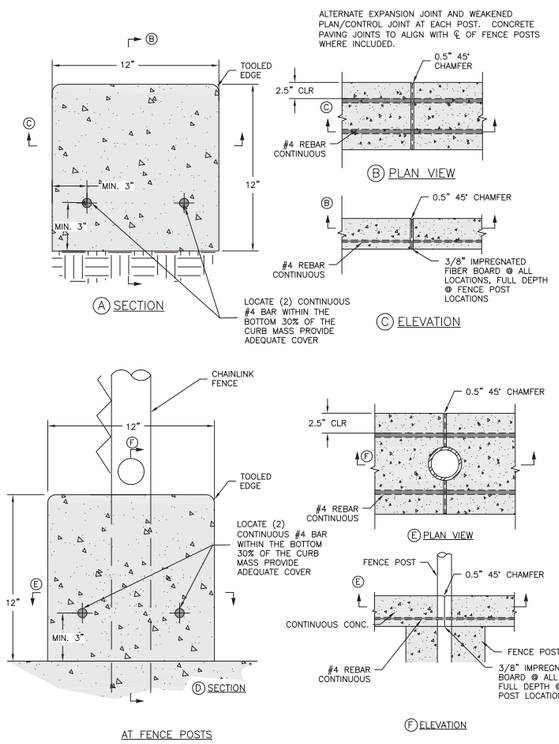
2 / F-2.1 CONCRETE PAVING

NOT TO SCALE



3 / F-2.1 ASPHALT PAVING SECTION

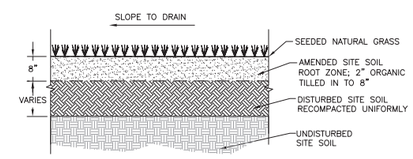
NOT TO SCALE



AT FENCE POSTS

4 / F-2.1 CONCRETE CURB & EXPANSION JOINT

NOT TO SCALE



5 / F-2.1 SEEDED SITE SOIL RESTORATION

NOT TO SCALE

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER FIELD
IMPROVEMENTS

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STATE OF WASHINGTON
ERIC J. GIBBS
LANDSCAPE ARCHITECT
EXP. 9/1/2020

PERMIT SET	
DATE	6-17-19
SCALE	NTS
DRAWN	REF
CHECKED	EJG

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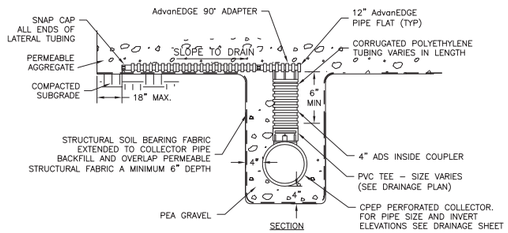
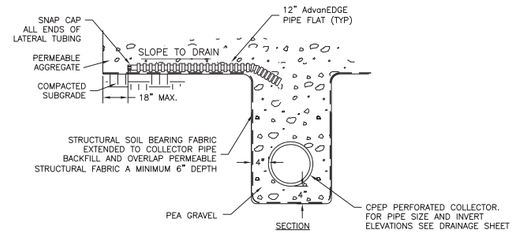
TYPICAL SECTIONS

SHEET

F-2.1

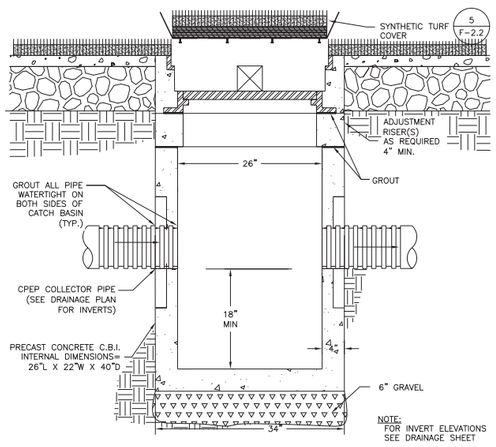
File: F-2.1 Typical Sections.dwg Plotted by: CorneliaW Date: 13-Jun-19 7:28:35am





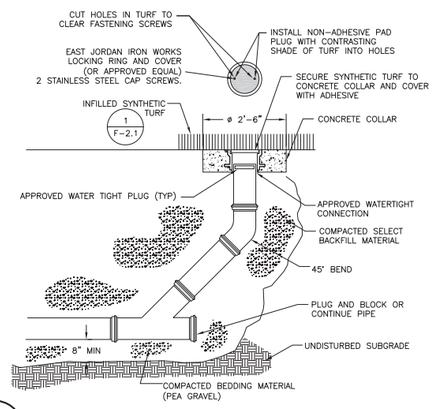
1 / F-2.2 SUBSURFACE DRAINAGE SIDE INLET FLAT

NOT TO SCALE



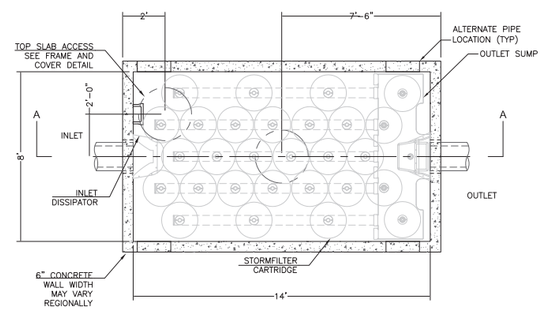
2 / F-2.2 TYPE 1 CATCH BASIN

NOT TO SCALE



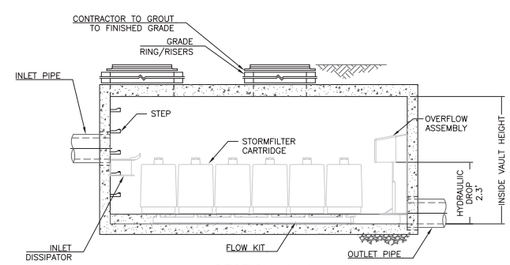
3 / F-2.2 CLEANOUT

NOT TO SCALE



PLAN VIEW

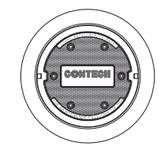
VAULT STYLE: OUTLET SUMP (NIB)



SECTION A–A

4 / F-2.2 STORMFILTER WATER QUALITY VAULT

NOT TO SCALE



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			CB#3
WATER QUALITY FLOW RATE (cfs)			0.757
PEAK FLOW RATE (cfs)			0.902
RETURN PERIOD OF PEAK FLOW (yrs)			100–YR
CARTRIDGE HEIGHT (22" 18", LOW DROP(LD)) 18"			
NUMBER OF CARTRIDGES REQUIRED			28
CARTRIDGE FLOW RATE			12.53
MEDIA TYPE (PERLITE, ZPG, PSORB)			PSORB
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	28.47	DI	12"
INLET PIPE #2	*	*	*
OUTLET PIPE	26.17	CPEP	12"
UPSTREAM RIM ELEVATION			30.54
DOWNSTREAM RIM ELEVATION			30.48
ANTI–FLOTATION BALLAST		WIDTH	HEIGHT
		N/A	N/A
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' – 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. FILTER CARTRIDGES SHALL BE MEDIA–FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7–INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONFORMING TO ASTM C–857 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

A. ANY SUB–BASE, BACKFILL DEPTH, AND/OR ANTI–FLOTATION PROVISIONS ARE SITE–SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER VAULT (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL VAULT SECTIONS AND ASSEMBLE VAULT.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION–RELATED EROSION RUNOFF.

REVISION	DATE

MONROE WASHINGTON

LAKE TYE PARK
ALL WEATHER FIELD
IMPROVEMENTS

DA HOGAN
119 1st Avenue South, Suite 110
Seattle, Washington 98104
p. 206.285.0400
f. 206.285.0480

STATE OF WASHINGTON
ERIC J. GOLD
NO. 690 EXP. 10/21/19
LANDSCAPE ARCHITECT

PERMIT SET	
DATE	6-17-19
SCALE	1"=20'
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DRAINAGE DETAILS

SHEET

F-2.2

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CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management
StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-3 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.
8. Calendar Lifecycle.
   a. If system has not been maintained for 3 years maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

> **Important**: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

> **Warning**: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

> **Important:** Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: Personnel:

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

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_____

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No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 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.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 15 – Manufactured Media Filters)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Maintenance Activity Log

To be completed by maintenance staff and provided to the City of Monroe upon request.

Property Name/Owner:	Site Address:
Property Manager/Contact:	Phone:
Facility Type:	Location on Property:
Requirement met by Facility (circle all that apply): On-site Stormwater Management Treatment/Water Quality Flow Control	

Date	Reason for Inspection/Action (circle one)	Condition Observed	Action Taken	Initials
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			
	Complaint or Problem Regular Maintenance			