COUGHLINPORTERLUNDEEN
STRUCTURAL CIVIL SEISMIC ENGINEERING

STORMWATER DRAINAGE REPORT

Site Work Permit

Issaquah Middle School #6
Talus Parcel 17-B
Issaquah, WA
January 17, 2020

PREPARED FOR:
Issaquah School District
565 NW Holly Street
Issaquah, WA 98027

PREPARED THROUGH:
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Stormwater Drainage Report

Issaquah Middle School #6
Coughlin Porter Lundeen
Project No. C180083-02
January 17, 2020

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I. PROJECT OVERVIEW

GENERAL DESCRIPTION

The following drainage report provides the design analysis for the Issaquah Middle School #6 drainage plan. The storm water design for the project is based on the requirements set forth in the 2017 City of Issaquah Stormwater Design Manual Addendum that references Ecology's 2012 Stormwater Management Manual for Western Washington as amended in 2014. The combined document is considered the City of Issaquah Stormwater Design Manual and will be referenced as the "2017 SDM" throughout this report.

The Issaquah Middle School #6 project is located within the City of Issaquah. The site is bounded by Falcon Way to the west, Talus Drive to the north, and Talus HOA property to the east. The area within the property boundary is 8.96 acres that is mostly undeveloped and located in the Tibbetts Creek drainage basin.

The project proposes to construct a new multi-story middle school and parking garage on the north side of the site and a turf athletic field on the south side of the site. Proposed site amenities include a bus loop, parking and student drop off area, garage vehicle access, and a fire lane/maintenance access to the athletic field. Site improvements include storm conveyance, detention, and water quality facilities as well as all new utility connections. The drainage design described in this report includes stormwater mitigation for the developed area of the project.

EXISTING CONDITIONS

The Issaquah Middle School #6 project site was originally part of the Talus plat development and master plan but was never developed. There is a large existing pond in the southeast corner that was planned as part of the master plan development but does not currently serve any developed area. There is a construction parking lot/staging area with temporary power and lighting as well as some temporary corrugated plastic drainage pipes to safely convey runoff down the existing steep slopes on-site to the pond. Public utilities on-site include a 12'' water main with a 20' easement running east to west through the site.

The site slopes from west to east with approximately 120 feet of elevation difference across the site. The runoff from the site currently sheet flows or is conveyed by corrugated plastic pipes to the existing pond where it infiltrates or discharges through an overflow pipe to a regional detention pond across Talon Drive.

The King County iMap shows possible seismic and erosion hazards on-site according to the 1990 Sensitive Areas Ordinance. The site also contains steep slopes in some areas that are not yet mapped by King County. Slopes greater than 40% have been mapped and are shown in the survey.

PROPOSED CONDITIONS

The project proposes to add or replace 7.09 acres of impervious surface. Storm water runoff from the developed site area will be collected and conveyed to a new detention vault located under the athletic field that has been designed to meet flow control requirements set forth in the 2017 SDM. The artificial turf field area and a small amount of adjacent sidewalk will be mitigated using detention provided by gravel under portions of the playfield.

A modular wetland system will be installed downstream of the detention systems to treat on-site runoff for enhanced water quality treatment. On-site conveyance consists of overland flow, catch basins, and underground pipes and will be designed to meet the conveyance requirements listed in the 2017 SDM. The storm system will discharge to the public storm system running down SR 900, downstream of the regional detention pond that serves the Talus development.

II. MINIMUM REQUIREMENTS

This section addresses the nine minimum requirements set forth in the 2017 SDM. All nine minimum requirements apply, as this is a new development project with greater than 10,000 square feet of added impervious surface and greater than 5,000 square feet of pollution generating impervious surface.

MR #1: PREPARATION OF STORM WATER SITE PLANS

Stormwater plans and reports that address each of the applicable minimum requirements have been prepared by a licensed civil engineer in accordance with city requirements.

MR #2: CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN

A temporary erosion and sediment control (TESC) plan has been prepared and submitted with the stormwater plans. A Stormwater Pollution Prevention Plan (SWPPP) has been prepared.

MR #3: SOURCE CONTROL OF POLLUTION

There will be no pollution-generating, post-development activities onsite that will require source control BMPs.

MR #4: PRESERVATION OF NATURAL DRAINAGE SYSTEM AND OUTFALLS

Stormwater will continue to be discharged to the SR 900 conveyance system as the site does currently.

MR #5: ON-SITE STORM WATER MANAGEMENT

The project will employ On-site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. The project is required to evaluate List #2 BMPs for feasibility within the project and site conditions. The feasibility of these BMPs are discussed in Section V.

MR #6: RUNOFF TREATMENT

The proposed project contains more than 5,000 square feet of pollution generating impervious surface. Therefore, water quality facilities are required for new and replaced pollution generating surfaces. The receiving water body is Tibbetts Creek, which requires enhanced treatment. Enhanced water quality treatment will be provided by a modular wetland system downstream of the flow control facilities. The modular wetland system will be designed by Bio Clean to treat the 2-year peak flow rate as required in the 2017 SDM and will contain an internal bypass designed to convey the 100-year peak flow rate.

MR #7: FLOW CONTROL

The proposed project is a new development with more than 10,000 square feet of new impervious area. Therefore, flow control is required for all new and replaced impervious and pervious surfaces. The combination of a detention vault and detention storage in the field sub-grade will be used to match predeveloped flow rates as required in the 2017 SDM.

MR #8: WETLAND PROTECTION

There are no wetlands located on-site that will require protection.

MR #9: OPERATION AND MAINTENANCE

An operation and maintenance manual for all proposed stormwater facilities and BMPs will be prepared and included at a later date.

III. DRAINAGE ANALYSIS

FIELD INSPECTION

A site visit has been made to gather information about the existing drainage system, including a Level 1 Downstream Analysis. This field visit took place November 6th, 2018. The analysis is described below.

DRAINAGE SYSTEM PROBLEM DESCRIPTIONS

There are no known or observed existing drainage system problems on-site. As such, no drainage problems are anticipated due to previously existing problems.

UPSTREAM ANALYSIS

The proposed site will match the existing grade at the project limits as to not alter flow paths or drainage basins. There are no significant upstream areas that drain onto the project site. Therefore, no drainage problems are anticipated due to upstream flows.

DOWNSTREAM ANALYSIS

Stormwater from the project area currently discharges to the existing stormwater pond on-site. The overflow from the pond discharges through a closed pipe to a regional detention pond across Talus Drive that serves the Talus development. The regional detention pond discharges to the SR 900 public storm system.

The proposed drainage system will not discharge to the regional detention pond but will discharge to the SR 900 public storm system downstream of the regional detention pond. There are no known or observed problems in the downstream system. The project will utilize a detention facility to match pre-developed and post-developed flows, so no drainage problems are anticipated due to the proposed development.

IV. FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

EXISTING SITE HYDROLOGY (PART A)

The existing Issaquah Middle School #6 project site is mostly undeveloped. It was originally part of the Talus plat development and master plan but was never developed. There is a large existing pond in the southeast corner that was planned as part of the master plan development but does not currently serve any developed area. There is a construction parking lot/staging area with temporary power and lighting as well as some temporary corrugated plastic drainage pipes to safely convey runoff down the existing steep slopes on-site to the pond.

The site slopes from west to east with approximately 120 feet of elevation difference across the site. The runoff from the site currently sheet flows or is conveyed by corrugated plastic tight line pipes to the existing pond where it infiltrates or discharges through an overflow pipe to a regional detention pond across Talon Drive.

Table 1 summarizes the land cover characteristics of the existing site area. These areas are shown in Figure 5 – Existing Conditions.

TABLE 1 – EXISTING SITE CONDITIONS AREA BREAKDOWN

Land Cover	Area
Impervious Area	2.05 acres
Pervious Area	6.91 acres
Total Site	8.96 acres
Percent Impervious	23%

DEVELOPED SITE HYDROLOGY (PART B)

The project proposes to add approximately 7.09 acres of impervious surface, including a 5-story building on the north side of the site and a turf athletic field on the south side of the site. Proposed site amenities include a parking garage, bus loop, parking and student drop off area, and a fire lane/maintenance access to the athletic field.

Storm water mitigation is required for construction of all new and replaced impervious and pervious surfaces. Table 2 summarizes the land cover characteristics of the proposed redevelopment. These areas are shown in Figure 6 – Proposed Conditions.

TABLE 2 –DEVELOPED SITE CONDITIONS AREA BREAKDOWN

Land Cover	Area
Impervious Area	7.09 acres
Pervious Area	1.87 acres
Total Site	8.96 acres
Percent Impervious	79.1%

PERFORMANCE STANDARDS AND FLOW CONTROL SYSTEM (PART C AND D)

Flow control will conform to the standards set forth in the 2017 City of Issaquah Stormwater Design Manual. In accordance with the SDM, MGS-Flood, a continuous-modeling software, has been used to model the existing and proposed site conditions. New and replaced impervious surfaces have been modeled as impervious area. New

and replaced landscape areas have been modeled as till pasture (as the replaced soils will satisfy compost-amended soil criteria). Existing conditions have been modeled as forested area to simulate historic conditions.

The project proposes to add or replace 7.09 acres of impervious surface. Storm water runoff from the developed site area will be collected and conveyed to a new detention vault located under the athletic field. The artificial turf field area and a small amount of adjacent sidewalk will be mitigated using detention provided by gravel under portions of the playfield. A small amount of bypass that cannot feasibly be routed to a detention system is accounted for in the design of the detention vault. The two systems each have their own control structures and are designed to mitigate their sub-basin areas independently. The two systems are discussed in detail below.

Detention Vault:
The detention vault will be a cast-in-place concrete vault located below the playfield subgrade. The vault will provide 110,160 cubic-feet of live storage (live storage required is 105,300 cubic-feet) and will receive flows from the building, paving, and landscape on-site, excluding the small amount of bypass area that cannot be reasonably detained. The bypass area has been modeled as such and is accounted for in the detention vault MGS-Flood model. The detention vault calculations are included in Appendix B.

Field Subgrade Detention:
The artificial turf field will provide detention storage within the gravel subgrade. The gravel has been assumed to contain 30% voids and will provide a total of 71,766 cubic-feet of live storage. The required live storage volume is 70,688 cubic-feet. The gravel storage depth varies across the field area, where the north end of the field will provide 12'' of gravel storage depth and the south end of the field will provide 20'' of gravel storage depth. Each side of the field will slope towards the low point near the south 30-yard line where the field will provide 32" of gravel storage depth. At the low point, a drainage collection system will be in place. These areas are labeled on the stormwater plans. An impermeable liner will be provided below the gravel section to keep the water detained and an underdrain system will provide conveyance to the control structure. The field subgrade detention calculations are included in Appendix B.

WATER QUALITY SYSTEM (PART E)

The project will construct more than 5,000 square feet of pollution-generating impervious surface triggering water quality treatment requirements. The analysis of the required treatment facilities follows Chapter V-2 of the 2017 SDM:

Step 1: The receiving water body is Tibbetts Creek flowing to Lake Sammamish.
Step 2: Oil control facilities are not required because the site is not considered "high-use."
Step 3: The site is unsuitable for infiltration based on the geotechnical analysis.
Step 4: Phosphorous control is required for discharge to all Issaquah streams.
Step 5: Enhanced treatment is required as Tibbetts Creek is a fish-bearing water body.

Enhanced water quality treatment and phosphorous control will be provided by a proprietary modular wetland system (MWS). The system has a General Use Level Designation from the Washington State Department of Ecology for enhanced treatment (including heavy metals) and total phosphorous treatment. The modular wetland system will be located downstream of both detention systems and will treat the 2-year release for both facilities. The location of the proposed facility is shown in Figure 7 – Site Map.

Modular wetland systems are biofiltration systems that utilize horizontal flow. Sediment and hydrocarbons are removed from the stormwater in a pre-treatment chamber before reaching the biofiltration chamber. The modular wetland system will be designed and sized by Bio Clean based upon the water quality design flow rate (combined 2-yr release rate from both detention facilities) as modeled by MGS-Flood. The modular wetland system will include an internal bypass system designed for the 100-year mitigated flowrate. See Appendix B for the MGS-Flood modelling results.

V. LOW IMPACT DEVELOPMENT

Low impact development (LID) on the project site has been assessed to meet the minimum requirements set forth in the 2017 SDM. This project is required to evaluate the feasibility of BMPs in List #2 of Volume 1, Section 2.5.5. Alternatively, this project has the option to meet the LID Performance Standard instead of evaluating the BMPs in List #2.

The project has chosen to evaluate the BMPs in List #2 to implement On-Site Stormwater Management. The section below lists the evaluation of each LID BMP considered.

Post-Construction Soil Quality and Depth: Post-construction soil quality and depth will be implemented for all new and replaced landscape areas.

Full Dispersion: Full dispersion has been deemed infeasible for the project because there is no native vegetation that can be retained on-site.

Downspout Full Infiltration: Infiltration has been deemed infeasible on-site per geotechnical recommendations. See the Geotechnical Report submitted with the project for infiltration analysis. Further, there is no feasible location to place infiltrating BMPs on-site without threatening the stability of site walls or steep slopes.

Bioretention Cells, Swales, and Planter Boxes: Infiltration has been deemed infeasible on-site per geotechnical recommendations. See the Geotechnical Report submitted with the project for infiltration analysis. Further, there is no feasible location to place infiltrating BMPs on-site without threatening the stability of site walls or steep slopes.

Downspout Dispersion Systems: Downspout dispersion systems have been deemed infeasible for the project because there is no native vegetation that can be retained on-site.

Perforated Stub-Out Connections: Infiltration has been deemed infeasible on-site per geotechnical recommendations. See the Geotechnical Report submitted with the project for infiltration analysis. Further, there is no feasible location to place infiltrating BMPs on-site without threatening the stability of site walls or steep slopes.

Permeable Pavements: Infiltration has been deemed infeasible on-site per geotechnical recommendations. See the Geotechnical Report submitted with the project for infiltration analysis. Further, there is no feasible location to place infiltrating BMPs on-site without threatening the stability of site walls or steep slopes.

Due to site constraints and infeasibility criteria provided above the project is proposing to provide Onsite Stormwater Management and LID to the maximum extent feasible.

The following are the responses to the site assessment minimum requirements as noted in Section 8.7.5:

1. *A survey prepared by a registered land surveyor showing existing public and private development, including utility infrastructure, on and adjacent to the site, major and minor hydrologic features, including seeps, springs, closed depression areas, drainage swales, and 2-foot contours up to 10 percent slope and 5-foot contours for slopes above 10 percent. Spot elevations shall be at 25-foot intervals.*

   A survey has been prepared by a registered land surveyor meeting the required criteria.
2. *Location of all existing lot lines, lease areas and easements.*

   A survey has been prepared by a registered land surveyor meeting the required criteria.
3. *A soils report prepared by a licensed geotechnical engineer or licensed engineering geologist. The report shall identify:*

   a. Underlying soils on the site utilizing soil pits and soil grain analysis to assess infiltration capability on-site. The frequency and distribution of test pits shall be adequate to direct placement of the roads and structures away from soils that can most effectively infiltrate stormwater;

b. Percolation tests if appropriate or requested by the Stormwater Engineer;

c. Topographic and geologic features that may act as natural stormwater storage or conveyance and underlying soils that provide opportunities for storage and partial infiltration;

d. Depth to wet season high groundwater;

e. Geologic hazard areas and associated buffer requirements as defined in RZC 21.64.060;

f. Distance from site boundaries to any areas within 200 feet of the site identified as landslide hazard areas or having a slope of 40 percent or steeper with a vertical relief of 10 feet or more; [Note: the City may require the applicant to expand the 200 feet to encompass a larger area if there are concerns for downstream geological hazards.]

g. Identification of Wellhead Protection Zone(s); and

h. For previously cleared or graded sites, analysis of topsoil according to the soil

i. requirements in the City of Redmond Standard Specifications, Section 9.14.1.

A geotechnical report has been prepared by Associated Earth Sciences, Inc., a licensed geotechnical engineer. Infiltration has been deemed infeasible on-site due to topographic and soil conditions. A topographic survey has been prepared by a licensed surveyor to meet the remaining required criteria.

4. *A survey of existing native vegetation cover and wildlife habitat by a qualified biologist identifying any forest areas on the site, species and condition of ground cover and shrub layer, and tree species, seral stage, and canopy cover.*

   A survey has been prepared by a registered land surveyor meeting the required criteria.

5. *A streams, wetland, and water body survey and classification report by a qualified biologist showing wetland and buffer boundaries consistent with the requirements of RZC 21.64.030 and Critical Areas Reporting Requirements (RZC Appendix 1).*

   A survey has been prepared by a registered land surveyor meeting the required criteria.

6. *Flood hazard areas on or adjacent to the site.*

   A survey has been prepared by a registered land surveyor. There are no flood hazards on or adjacent to the site.

7. *A preliminary drainage report providing analysis of the existing site hydrologic conditions on the site and recommendations for type, location, and restrictions on LID BMPs.*

   See Appendix B, Drainage Calculations, for a hydrologic analysis of the project site.

8. *Other studies as deemed necessary by the Stormwater Engineer.*

   No other documents have been identified as being necessary for LID assessment.

VI. STORMWATER DISCHARGES TO WETLANDS

There are no wetlands located on-site so no analysis is required for stormwater discharge to wetlands.

VII. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

New conveyance systems and existing conveyance systems with altered flows will adhere to requirements set forth in the 2017 SDM. The 2017 SDM requires that conveyance systems be designed to convey the 50-year peak flow rate without overtopping and the 100-year peak flow rate without flooding roads or structures. The 2017 SDM requires that conveyance systems be designed using an approved continuous modeling program. A full conveyance and backflow analysis will be performed at a later date using AutoCAD Storm and Sanitary Sewer Analysis (SSA).

EXISTING CONDITIONS

No existing storm infrastructure will be retained on-site, so no conveyance analysis of existing systems is required.

DEVELOPED STORM SYSTEM DESCRIPTION

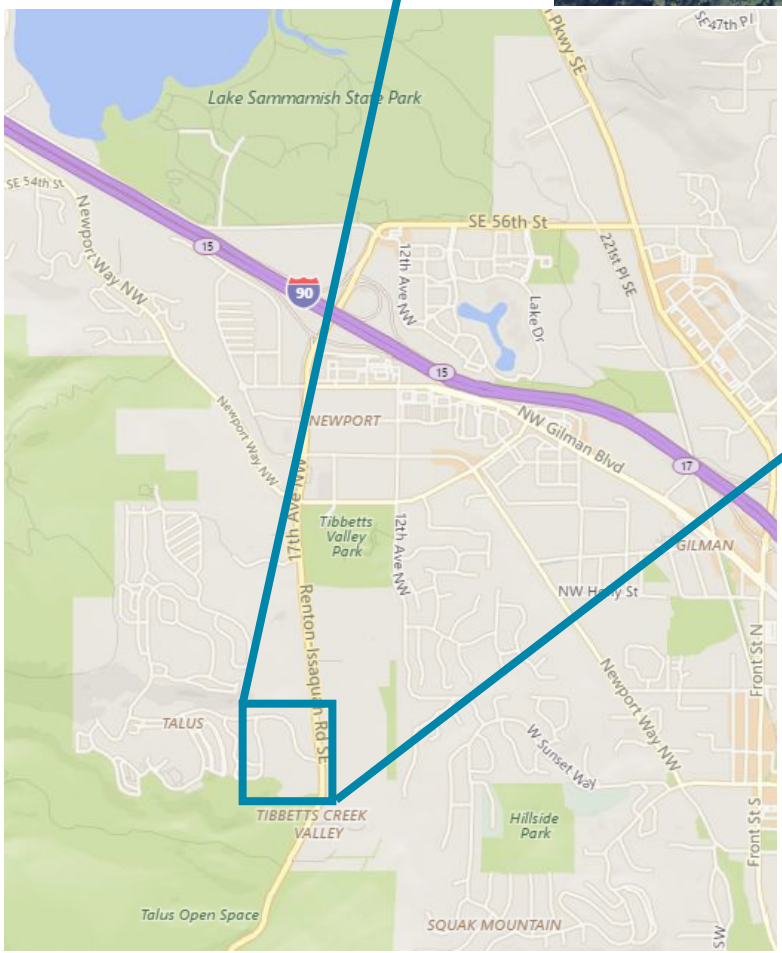
Stormwater runoff from most of the proposed development will be collected using catch basins and conveyed through a closed pipe system to a detention vault with an internal control structure located under the turf playfield. The turf field area and a small amount of surrounding pavement will infiltrate through the permeable turf top layer to a layer of gravel in the field subgrade that has been designed as detention storage. Underdrains in the field subgrade will direct detained runoff to a control structure at the east corner of the field.

The two detention systems discharge to a storm manhole and then the combined flow is conveyed using 18'' PVC pipes to a water quality facility east of the field. The water quality facility will have an internal bypass designed to convey the 100-year peak flow rate. The outlet from the water quality facility is conveyed off-site using 18'' pipes to the existing public storm system in SR 900.

OUTFALLS

The proposed storm system will connect to the existing storm system in SR 900 using a type II catch basin that will be installed on the existing 30'' storm line.

APPENDIX A: FIGURES



SCALE: NTS

FIGURE 1: VICINITY MAP

Project: Issaquah Middle School #6

Project No: C180083-02 Date: 01-17-2020

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Figure 2.3. Flow Chart for Determining Requirements for New Development

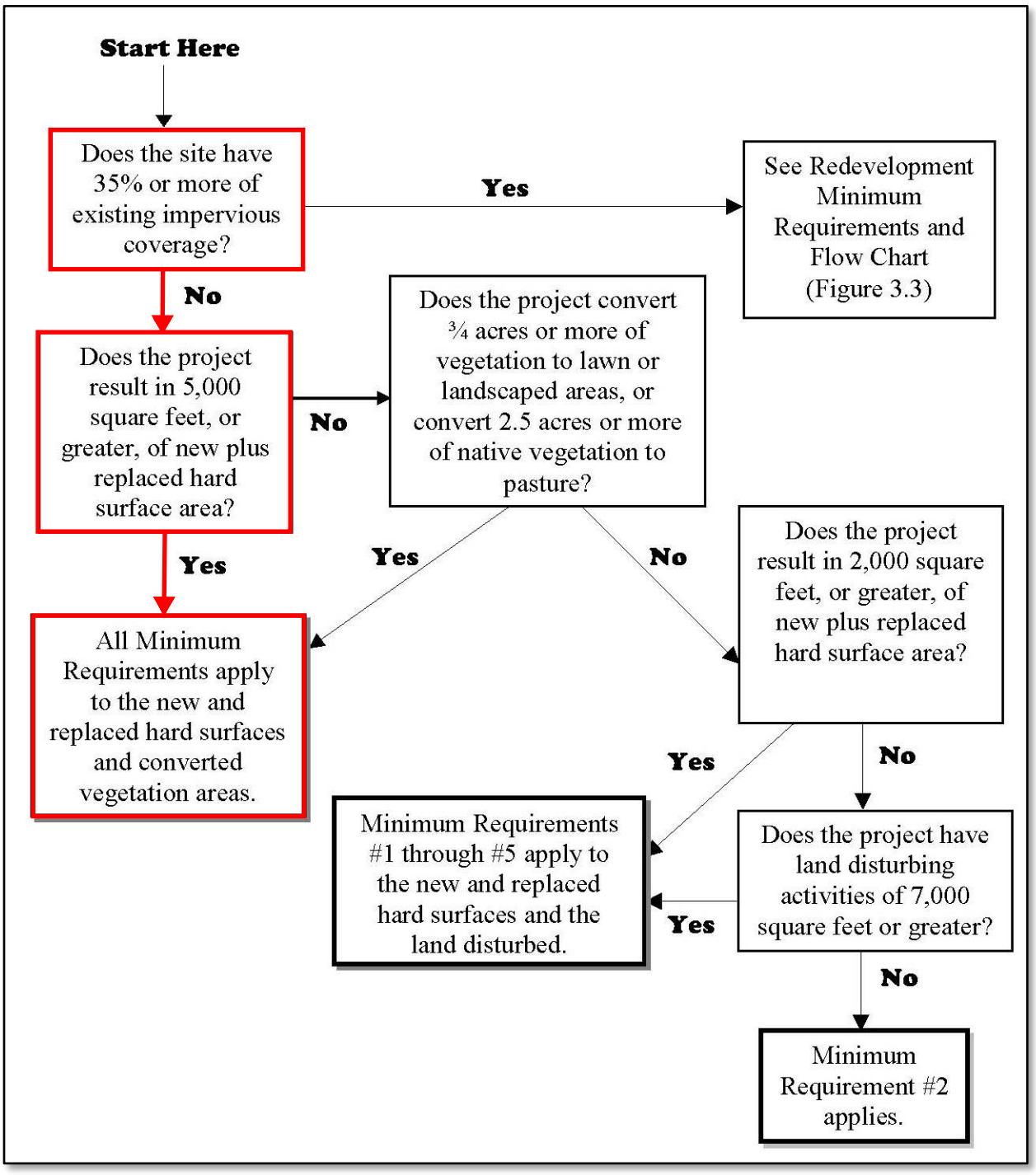
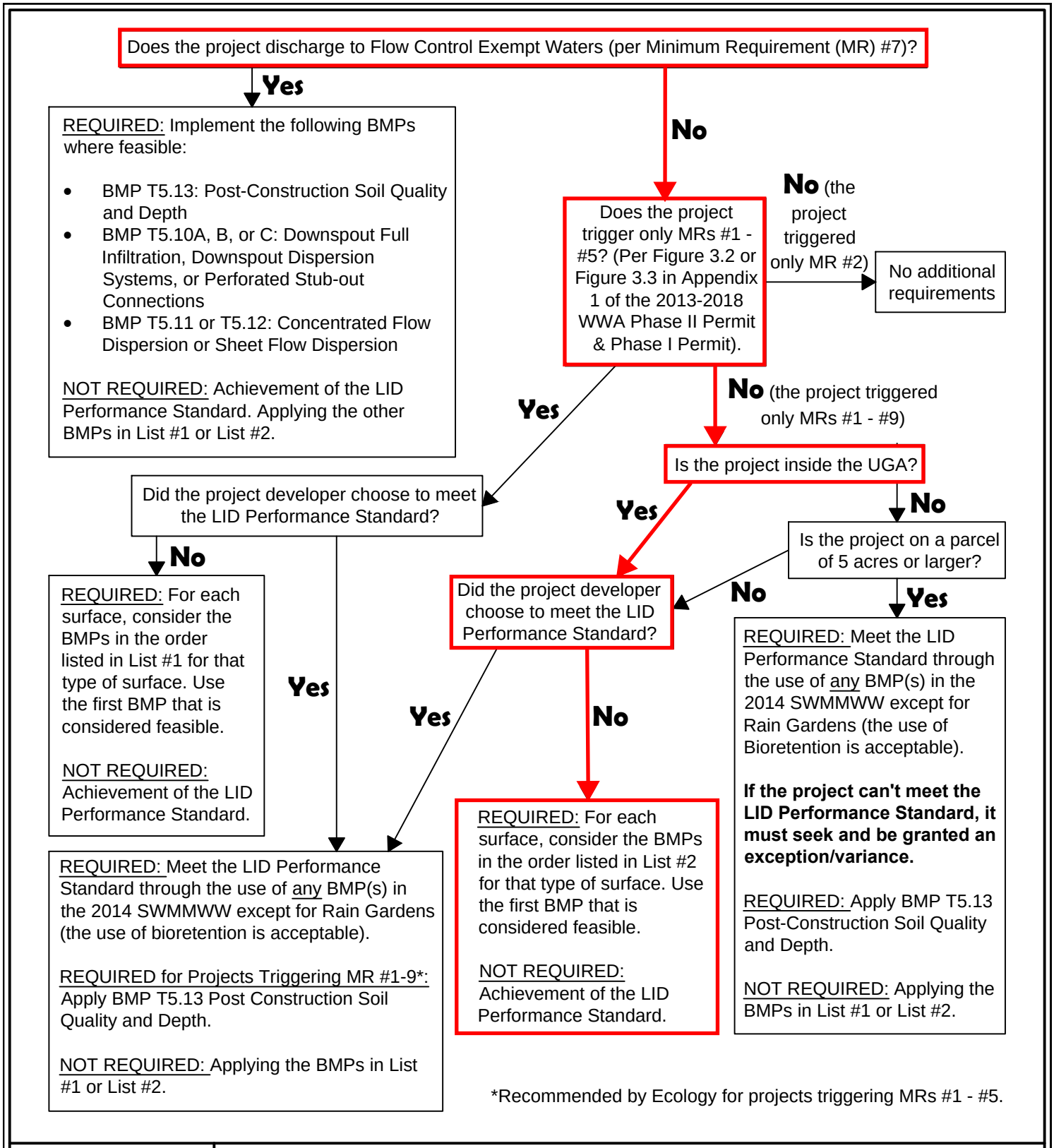


FIGURE 2: FLOW CHART FOR DETERMINING REQUIREMENTS FOR NEW DEVELOPMENT



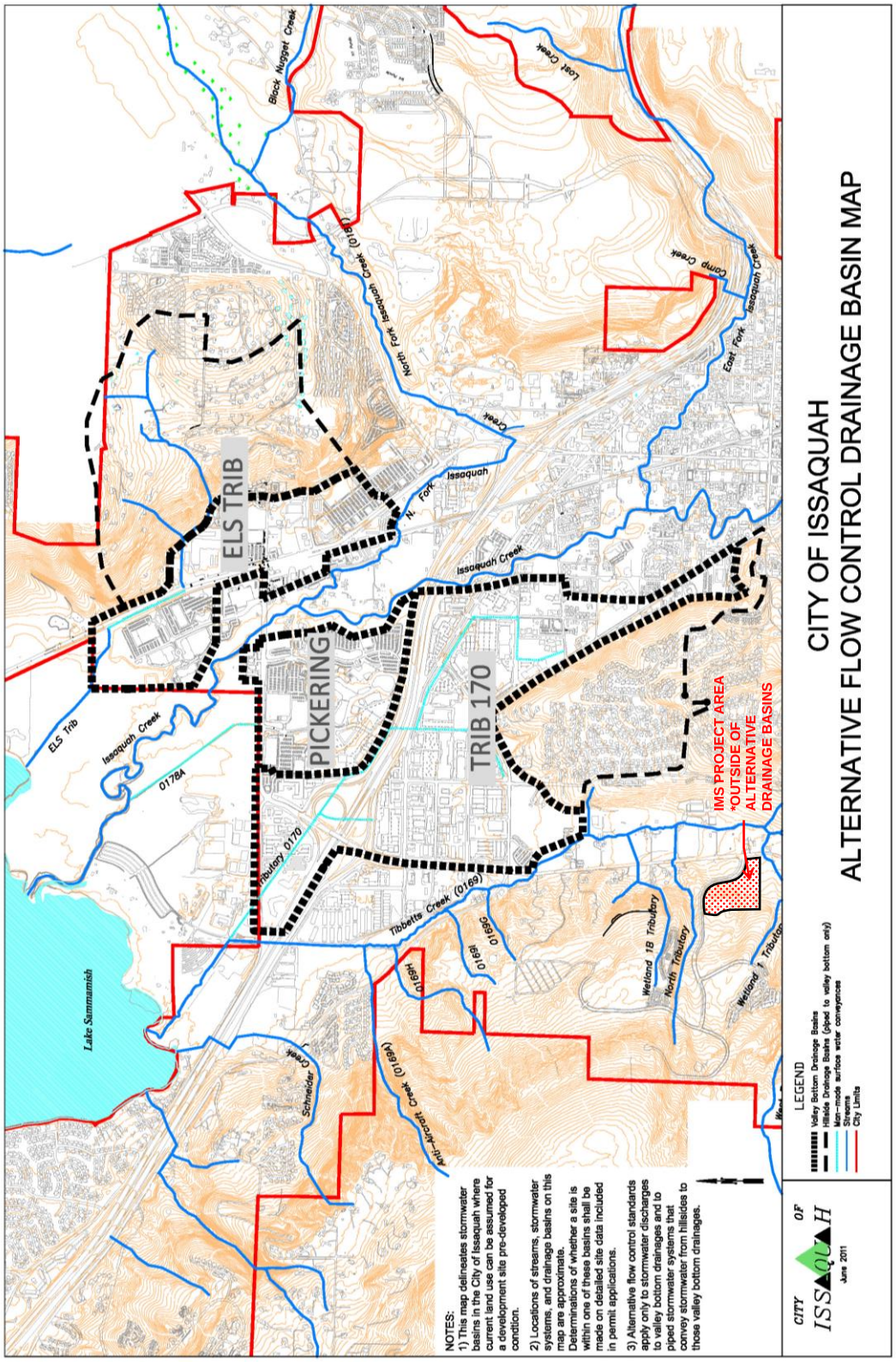
DEPARTMENT OF ECOLOGY
State of Washington

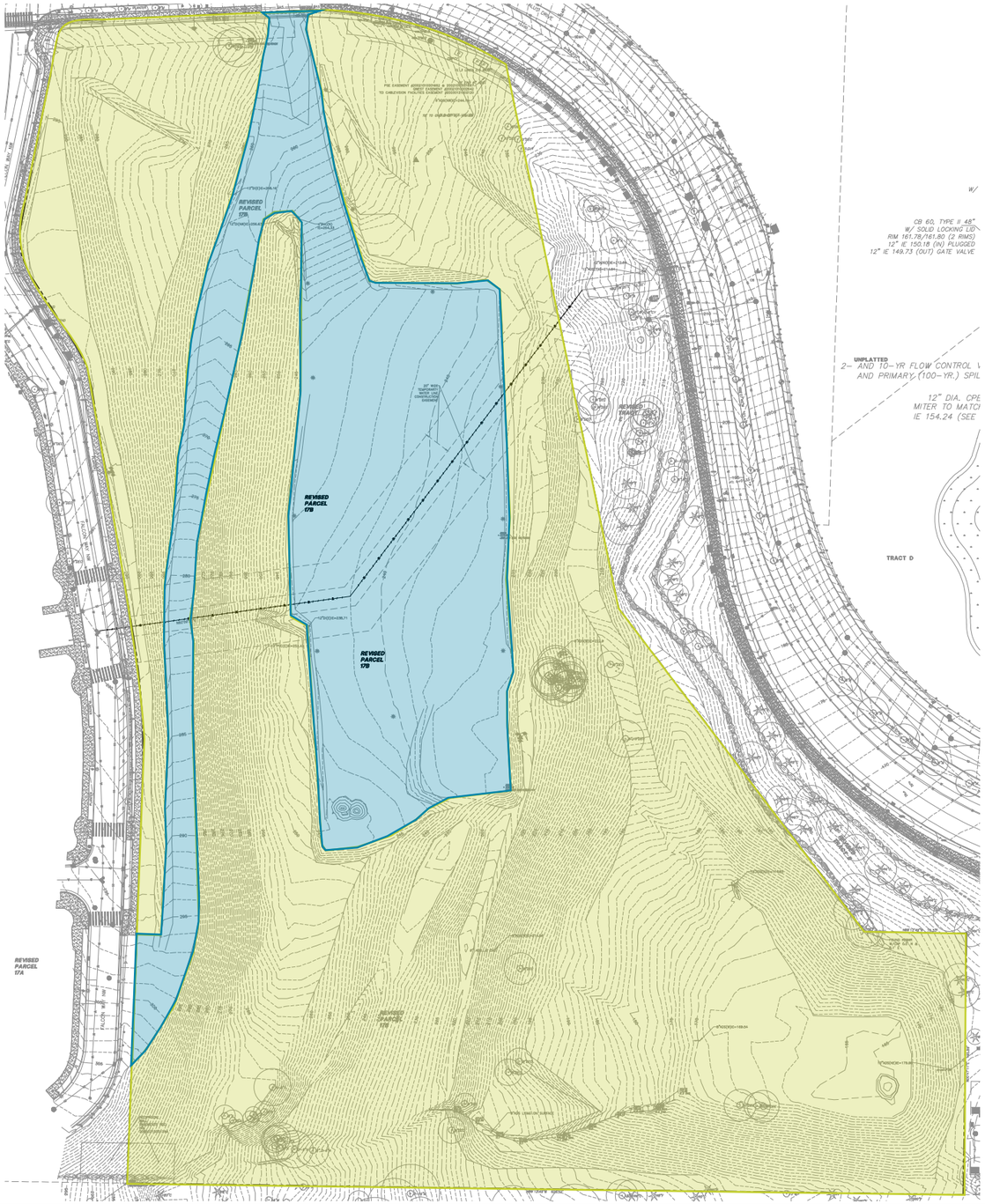
Figure I-2.5.1
Flow Chart for Determining LID MR #5 Requirements

Revised June 2015

FIGURE 3: FLOW CHART FOR DETERMINING LID REQUIREMENTS

Figure 2-5. Central Issaquah Area Alternative Flow Control Standard Map





Scale:
1"=100'

LEGEND

Description	Quantity
Impervious Area	2.05 Acres
Pervious Area	6.91 Acres
Site Area	8.96 Acres

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FIGURE 5: EXISTING CONDITIONS

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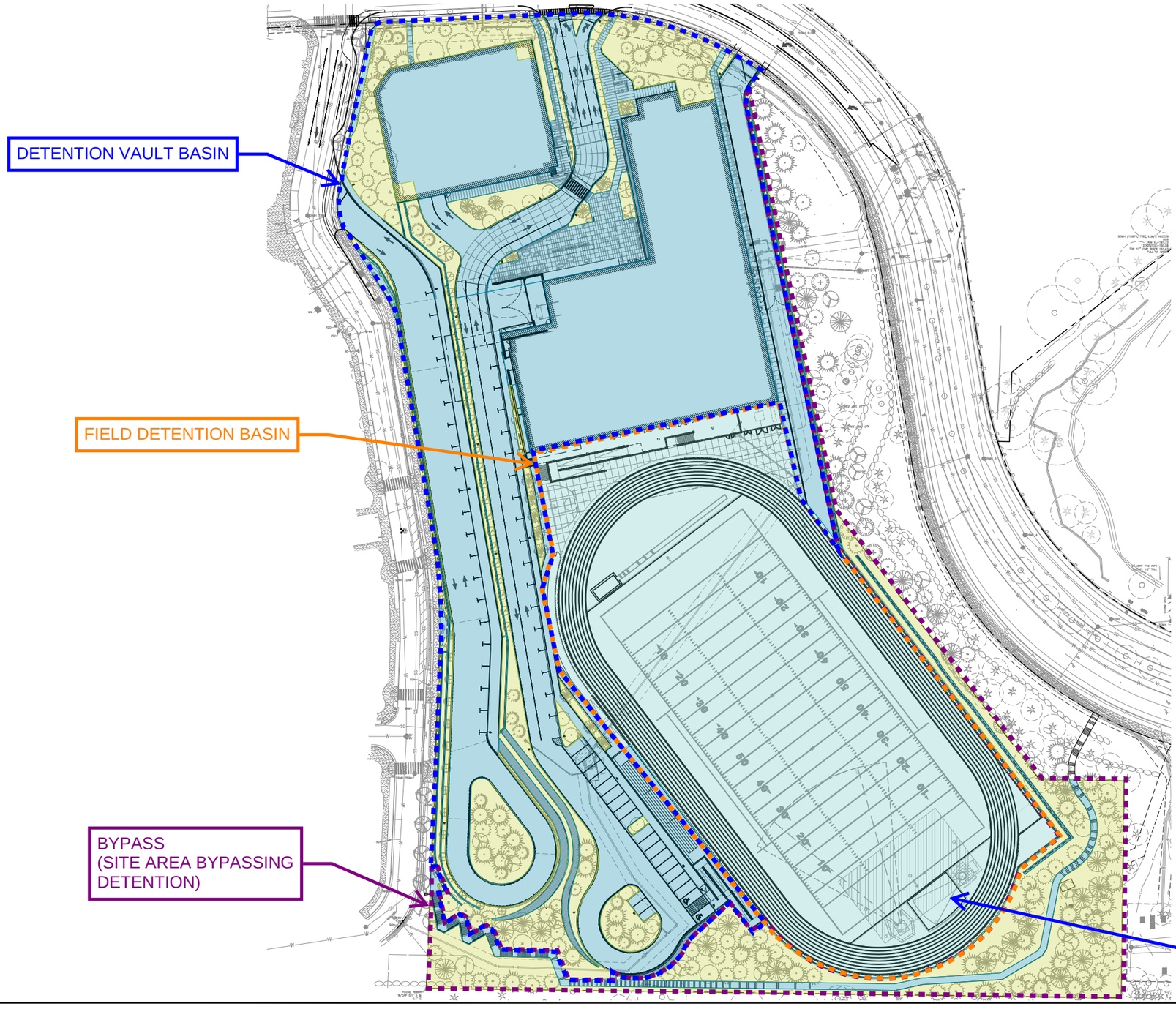

Scale:
1"=100'

NOTE: FIELD SUB-GRADE PROVIDES DETENTION STORAGE FOR FIELD AREA

DETENTION VAULT BASIN

Description	Quantity
Impervious Area	3.81 Acres
Pervious Area	1.02 Acres

BYPASS

Description	Quantity
Impervious Area	0.15 Acres
Pervious Area	0.85 Acres

FIELD DETENTION BASIN

Description	Quantity
Field Area (Impervious)	3.13 Acres

Total Site Area 8.96 Acres

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FIGURE 6: PROPOSED CONDITIONS

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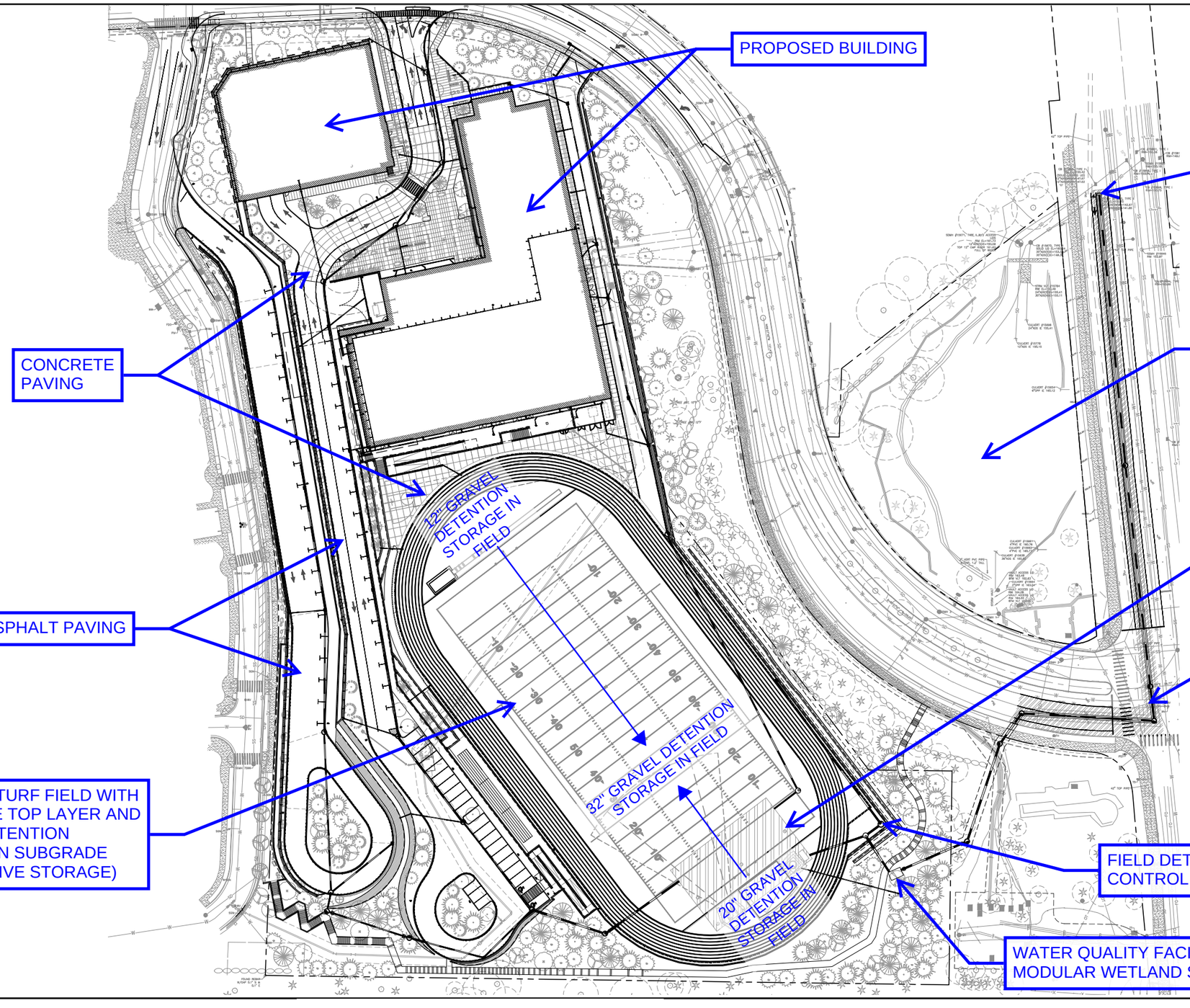

Scale: 1"=100'

FIGURE 7: SITE MAP

Project: Issaquah Middle School #6

Project No: C180083-02 Date: 01-17-2020

Scale:
1"=100'

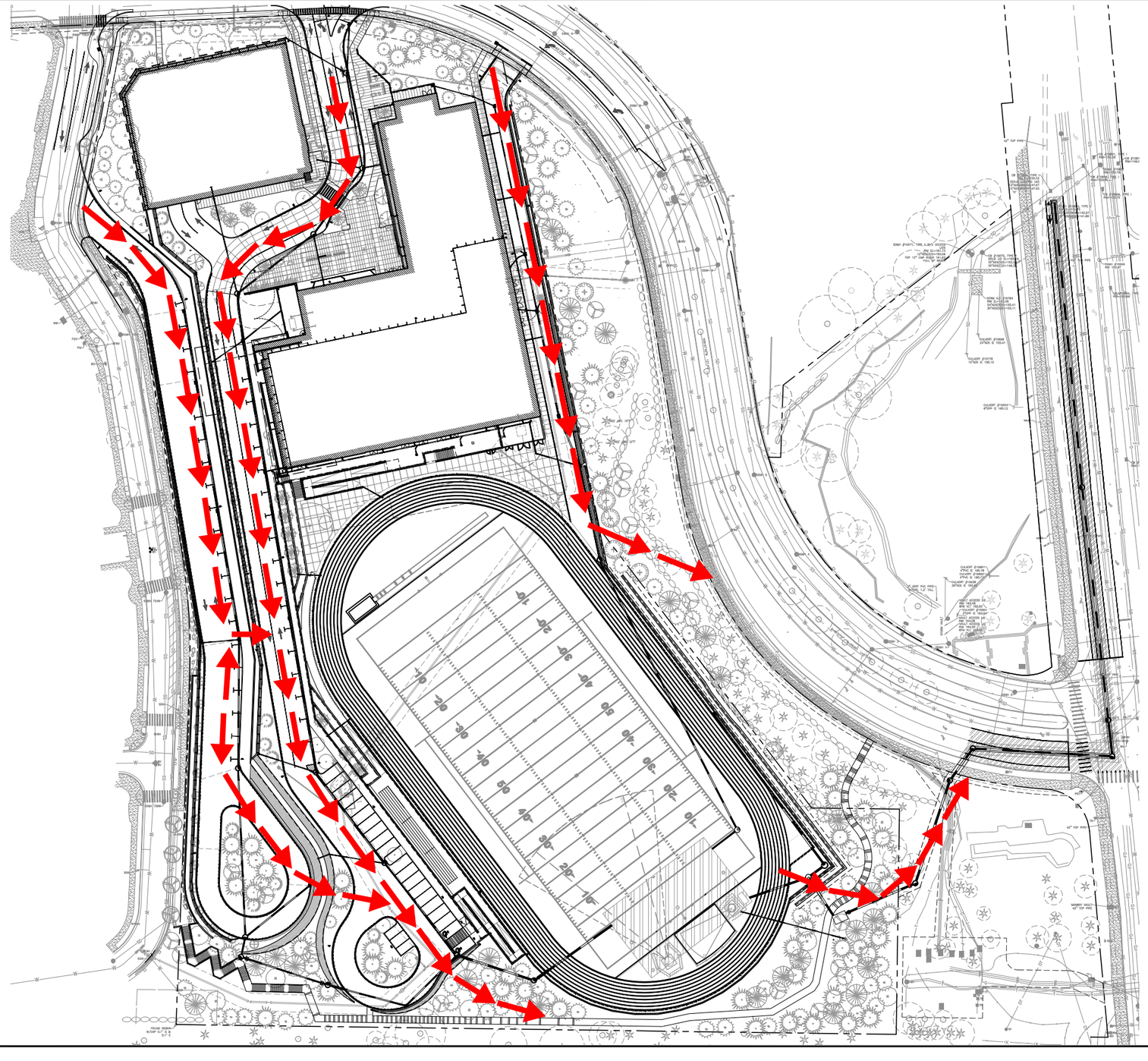

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FIGURE 8: 100 YEAR OVERFLOW PATH

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APPENDIX B: ENGINEERING CALCULATIONS

Flow Control Calculations for Detention Vault
Flow Control Calculations for Field Subgrade Detention

MGS FLOOD
PROJECT REPORT
DETENTION VAULT CALCULATIONS

Program Version: MGSFlood 4.46
Program License Number: 200610002
Project Simulation Performed on: 01/16/2020 11:03 AM
Report Generation Date: 01/16/2020 11:03 AM

Input File Name: Detention Vault.fld
Project Name: New Issaquah Middle School
Analysis Title: SW 2&3 Detention Vault
Comments: Detention vault for all site area other than field area

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)	5.830	5.830	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	5.830	5.830	

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

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

	-------Area (Acres) --------
Till Forest	5.830
Subbasin Total	5.830

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

---------- Subbasin : Detention Vault Basin ----------

	-------Area (Acres) --------
Till Pasture	1.020
Impervious	3.810
Subbasin Total	4.830

---------- Subbasin : Bypass ----------

	-------Area (Acres) --------
Till Pasture	0.850
Impervious	0.150
Subbasin Total	1.000

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

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

Link Name: New Copy Lnk1
Link Type: Copy
Downstream Link: None

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

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

Link Name: Detention Vault
Link Type: Structure
Downstream Link Name: Downstream of Detention

Prismatic Pond Option Used

Pond Floor Elevation (ft)	:	198.00
Riser Crest Elevation (ft)	:	213.00
Max Pond Elevation (ft)	:	213.50
Storage Depth (ft)	:	15.00
Pond Bottom Length (ft)	:	108.0
Pond Bottom Width (ft)	:	65.0
Pond Side Slopes (ft/ft)	:	L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft)	:	7020.
Area at Riser Crest El (sq-ft)	:	7,020.
(acres)	:	0.161
Volume at Riser Crest (cu-ft)	:	105,300.
(ac-ft)	:	2.417
Area at Max Elevation (sq-ft)	:	7020.
(acres)	:	0.161
Vol at Max Elevation (cu-ft)	:	108,810.
(ac-ft)	:	2.498

Massmann Infiltration Option Used

Hydraulic Conductivity (in/hr)	: 0.00
Depth to Water Table (ft)	: 100.00
Bio-Fouling Potential	: Low
Maintenance	: Average or Better

Riser Geometry

Riser Structure Type	: Circular
Riser Diameter (in)	: 18.00
Common Length (ft)	: 0.010

Riser Crest Elevation : 213.00 ft

Hydraulic Structure Geometry

Number of Devices: 3

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 198.00
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 205.50
Diameter (in) : 1.00
Orientation : Vertical
Elbow : No

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 208.00
Diameter (in) : 1.50
Orientation : Horizontal
Elbow : Yes

Link Name: Upstream of Detention
Link Type: Copy
Downstream Link Name: Detention Vault

Link Name: Site Outfall (POC)
Link Type: Copy
Downstream Link: None

Link Name: Downstream of Detention
Link Type: Copy
Downstream Link Name: Site Outfall (POC)

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

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

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

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

Total Predeveloped Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: Subbasin 1		1291.800
Link:	New Copy Lnk1	0.000
Total:		1291.800

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: Detention Vault Basi		214.504
Subbasin: Bypass		178.753
Link:	Detention Vault	Not Computed
Link:	Upstream of Detentio	Not Applicable
Link:	Site Outfall (POC)	0.000
Link:	Downstream of Detent	Not Applicable
Total:		393.257

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 8.176 ac-ft/year, Post Developed: 2.489 ac-ft/year

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

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

Number of Links: 1

********** Link: New Copy Lnk1 **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 1102.75
Inflow Volume Including PPT-Evap (ac-ft): 1102.75
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 1102.75
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Number of Links: 4

********** Link: Site Outfall (POC) **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 2901.14
Inflow Volume Including PPT-Evap (ac-ft): 2901.14
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 2901.14
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Link: New Copy Lnk1
Scenario Postdeveloped Compliance Link: Site Outfall (POC)

***** 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	0.204	2-Year	0.172
5-Year	0.339	5-Year	0.255
10-Year	0.448	10-Year	0.345
25-Year	0.588	25-Year	0.397
50-Year	0.763	50-Year	0.554
100-Year	1.039	100-Year	0.597
200-Year	1.361	200-Year	0.614

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-18.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-18.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-21.4%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT
FIELD SUBGRADE DETENTION CALCULATIONS

Program Version: MGSFlood 4.46
Program License Number: 200610002
Project Simulation Performed on: 01/16/2020 11:09 AM
Report Generation Date: 01/16/2020 11:09 AM

Input File Name: Field Self Detained.fld
Project Name: New Issaquah Middle School
Analysis Title: SW Field Detention
Comments: Field self detained using gravel subgrade with impermeable liner

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)	3.130	3.130	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	3.130	3.130	

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

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

	-------Area (Acres) --------
Till Forest	3.130
Subbasin Total	3.130

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

---------- Subbasin : Turf Playfield ----------

	-------Area (Acres) --------
Impervious	3.130
Subbasin Total	3.130

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

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

Link Name: New Copy Lnk1
Link Type: Copy
Downstream Link: None

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

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

Link Name: Field Subgrade Detention
Link Type: Structure
Downstream Link Name: Downstream POC

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 215.25
Riser Crest Elevation (ft) : 217.25
Max Pond Elevation (ft) : 217.50
Storage Depth (ft) : 2.00
Pond Bottom Length (ft) : 188.0
Pond Bottom Width (ft) : 188.0
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 35344.
Area at Riser Crest El (sq-ft) : 35,344.
(acres) : 0.811
Volume at Riser Crest (cu-ft) : 70,688.
(ac-ft) : 1.623
Area at Max Elevation (sq-ft) : 35344.
(acres) : 0.811
Vol at Max Elevation (cu-ft) : 79,524.
(ac-ft) : 1.826

Massmann Infiltration Option Used
Hydraulic Conductivity (in/hr) : 0.00
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 18.00
Common Length (ft) : 0.010
Riser Crest Elevation : 217.25 ft

Hydraulic Structure Geometry

Number of Devices: 3

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 212.25

Diameter (in) : 1.00
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 216.25
Diameter (in) : 1.75
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 216.75
Diameter (in) : 2.25
Orientation : Horizontal
Elbow : Yes

Link Name: Downstream POC
Link Type: Copy
Downstream Link: None

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

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

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 2

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	693.539
Link: New Copy Lnk1	0.000
Total:	693.539

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Turf Playfield	0.000
Link: Field Subgrade Deten	Not Computed
Link: Downstream POC	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 4.389 ac-ft/year, Post Developed: 0.000 ac-ft/year

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

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

Number of Links: 1

********** Link: New Copy Lnk1 **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 592.04
Inflow Volume Including PPT-Evap (ac-ft): 592.04
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 592.04
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Number of Links: 2

********** Link: Downstream POC **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 5374.02
Inflow Volume Including PPT-Evap (ac-ft): 5374.02
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 5374.02
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Link: New Copy Lnk1
Scenario Postdeveloped Compliance Link: Downstream POC

***** 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	0.110	2-Year	5.271E-02
5-Year	0.182	5-Year	9.418E-02
10-Year	0.241	10-Year	0.140
25-Year	0.316	25-Year	0.175
50-Year	0.410	50-Year	0.186
100-Year	0.558	100-Year	0.192
200-Year	0.731	200-Year	0.249

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-52.2%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-25.6%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-51.0%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS
