

# White Barn Commercial: Lot 6

## Preliminary Drainage Report

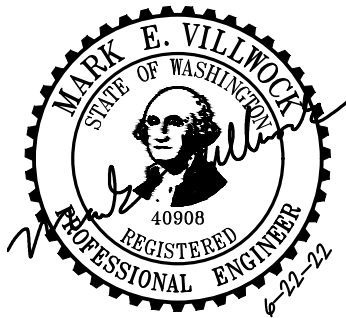
Prepared for

**Land Pro Group**  
10515 20th Street SE, Suite 202  
Lake Stevens, WA 98258

Prepared by

**LDC** | Surveying  
Engineering  
Planning

14201 NE 200<sup>th</sup> Street, #100  
Woodinville, WA 98072  
(425) 806-1869



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## APPENDICES

#	Title
1	Project Overview
3	Resource Review
4	Site Hydrology



## **SECTION I: PROJECT OVERVIEW**

The proposed project is comprised of Lot 6 of the White Barn Commercial development, located on parcel 0059070003180 near the intersection of Soper Hill Road and 87<sup>th</sup> Ave NE in Marysville, WA. The project proposes a boundary line adjustment to Lot 6 as delineated by the White Barn Binding Site Plan (AF No. 202107205003), followed by site development to include a new dental office facility, along with associated parking, accesses, and utilities. Additional improvements, including extension of vehicular/pedestrian access eastward toward the existing White Barn Commercial spine road, are proposed offsite on the southern margin of Lot 5.

Internal access routes between Soper Hill Road and 87<sup>th</sup> Ave NE, as well as water, sewer, and stormwater utility mains and associated connection points will be constructed separately as part of the White Barn Commercial project (permit G21-0053). Two stormwater detention vaults, along with associated flow control risers and downstream water quality structures, are also proposed as part of the stormwater system under this permit. These vaults have been designed with sufficient capacity to mitigate & treat all stormwater flows associated with individual lot development, including the proposed Lot 6 improvements. Additional discussion regarding detention vault design and associated flow/impervious area verification is provided in Section 4.0 of this report.

### **1.1 EXISTING SITE**

Lot 6 encompasses 1.02 acres on the central portion of the White Barn Commercial site. The lot is undeveloped in the existing condition, having been cleared/graded as part of the larger White Barn Commercial development.

Site soils are classified as Tokul gravelly medial loam (0 to 8 percent slopes) which is classified as a Hydrologic Soil Group C and is generally consistent with glacial till deposits. Geotechnical investigation performed by Cobalt Geosciences (dated December 19<sup>th</sup>, 2019) is consistent with these findings, indicating weathered glacial till which transitions to unweathered, dense glacial till at approximately 3-4 feet below

grade, with evidence of perched groundwater. Due to the presence of a confining till deposit at relatively shallow depths, infiltration is not recommended onsite.

Existing site slopes are moderate onsite, with a ridge feature extending through the central portion of the site. The western portion of the site flows generally southwestward to a discharge near the intersection of Soper Hill road and 87<sup>th</sup> Ave NE, while the eastern portion of the site flows generally southeastward to a discharge near the intersection of Soper Hill road and Highway 9. Flows associated with each discharge fail to converge within 0.25 miles downstream of the site. As such, the site is considered to lie within two separate threshold discharge areas.

## **1.2 DOWNSTREAM ANALYSIS**

In the existing condition, stormwater runoff flows both eastward and westward within two separate threshold discharge basins. Flows associated with Threshold Basin A conveys overland as sheet flow to the west/southwest and eventually discharges to the existing Soper Hill Road collection and conveyance system near the southwestern corner of the site. Flow continues westward within the existing Soper Hill Road collection/conveyance system and beyond the 0.25-mile boundary of analysis. Threshold Basin B conveys overland as sheet flow to the east/southeast and eventually discharges to the existing Highway 9 collection/conveyance system at the southeastern corner of the property. Flow continues southward within the existing conveyance system and beyond the 0.25-mile boundary of analysis. Refer to Section 3.0 “Downstream Analysis Report” for a detailed description of downstream flowpaths, as well as Figure 3.0 in Appendix 3 for a visual depiction of the downstream flowpaths.

### **1.3 PROPOSED DEVELOPMENT**

The proposed White Barn Lot 6 project will consist of a boundary line adjustment to the existing Lot 6 as delineated by the White Barn Binding Site Plan (AF No. 202107205003), followed by site development to include a new dental office facility and associated parking, accesses, and utilities. Additional improvements, including extension of vehicular/pedestrian access eastward toward the existing White Barn Commercial spine road, are proposed offsite on the southern margin of Lot 5.

Internal access routes between Soper Hill Road and 87<sup>th</sup> Ave NE, as well as water, sewer, and stormwater utility mains and associated connection points will be constructed separately as part of the White Barn Commercial project (permit G21-0053). Two stormwater detention vaults, along with associated flow control risers and downstream water quality structures, are also proposed as part of the stormwater system under this permit. These facilities have been designed with sufficient capacity to mitigate & treat all stormwater flows associated with individual lot development, including the proposed Lot 6 improvements.

### **1.4 PROPOSED DRAINAGE SYSTEM**

The site is contained within two threshold discharge basins, referred to as Threshold Basin A and Threshold Basin B. Threshold Basin A encompasses 0.77 acres on the western portion of the site, while Threshold Basin B consists of 0.25 acres on the eastern portion of the site. In the developed condition, site flows within Threshold Basin A and will be collected and conveyed to an existing detention vault (Vault A) located on the western portion of the site. Similarly, flows within Threshold Basin B will be collected and conveyed to a second detention vault (Vault B), located immediately offsite to the east. Both detention vault facilities will be constructed as part of the White Barn Commercial project under a separate permit (G21-0053).

### PROPOSED STORMWATER DETENTION/FLOW CONTROL MITIGATION

Detention Vaults A and B were previously designed as part of the White Barn Commercial project (G21-0053). As detailed in the full drainage report and associated calculations submitted under that permit, both vaults were designed in accordance with the 2014 DOE Manual to achieve compliant storage volumes and accomplish compliant release rates/durations for all lots recorded as part of the White Barn Commercial development, assuming a maximum impervious coverage of 85%. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding Vaults A & B, as well as supporting sizing calculations.

As flow control will be provided via the detention vault facilities constructed as part of the separate White Barn Commercial project, no additional facilities are proposed. All stormwater runoff associated with Lot 6 development, as well as offsite improvements extending through Lot 5, will be collected and routed directly to the existing detention facilities in the developed condition. See Section 4.0 for further discussion of predeveloped/developed surfaces and proposed impervious area coverages for capacity verification.

### PROPOSED WATER QUALITY MITIGATION

Two downstream water quality treatment vaults (BioPod A and BioPod B) were designed as part of the White Barn Commercial project (G21-0053) to achieve an enhanced treatment level for all tributary lot areas, inclusive of Lots 6. As detailed in the full drainage report and associated calculations submitted under that permit, both water quality vaults were designed in accordance with the 2014 DOE Manual with sufficient treatment and high-flow bypass capacity for all lots recorded as part of the White Barn Commercial development, assuming a maximum impervious coverage of 85%. As water quality treatment will be provided via the BioPod facilities constructed as part of the separate White Barn Commercial project, no additional treatment is proposed.

Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding BioPod A & BioPod B, as well as supporting sizing documentation.

## **1.5 EROSION/SEDIMENTATION CONTROL**

Erosion control measures that will be utilized during construction will include a combination of silt fence, storm drain inlet protection, interceptor swales, and temporary sediment ponds. See Section 2.0 for discussion of how SWPPP Elements are addressed.

## **1.6 MINIMUM REQUIREMENTS**

Per the 2014 DOE Manual, Minimum Requirements 1-9 apply to the proposed development.

**Minimum Requirement #1: Preparation of Stormwater Site Plans:** This Report, along with the Preliminary Engineering Plans, partially satisfies this requirement. A Full Drainage Report, as well as detailed Construction Plans, will be provided in a forthcoming submittal to fully satisfy this requirement.

**Minimum Requirement #2: Construction Stormwater Pollution Prevention:** See Section 2 of this Report for the SWPPP BMP Elements, and the SWPPP (submitted as a separate document) for a complete discussion of erosion control BMP's and their use specific to the site.

**Minimum Requirement #3: Source Control of Pollution:** Permanent source controls are not required for this project, as the proposed dental office does not fall within the class of facilities requiring source control measures.

**Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls:**

Existing site flows convey eastward and westward across the site within two distinct threshold discharge areas. Detention Vaults A & B, proposed as part of the White Barn Commercial project (G21-0053), have been designed to capture stormwater flows associated with Threshold Discharge Basins A and B, respectively.

In accordance with Minimum Requirement #4, all stormwater runoff associated with Lot 6 development, as well as offsite improvements extending through Lot 5, will be collected and routed to Vaults A & B in a manner consistent with the existing Threshold Discharge Area delineation. All flow conveyed to the detention vault facilities will be released to historic flowpaths at mitigated rates. See Downstream Analysis in Section 3 of this report for further information regarding the location of existing natural outfalls.

**Minimum Requirement #5: Onsite Stormwater Management:**

In accordance with Minimum Requirement #5, the project is required to provide low impact stormwater management BMPs to the extent feasible. LID BMPs were assessed for feasibility in order of appearance within List #2 and selected as applicable for the project. After careful assessment, it was determined that BMP T5.13 (Post-Construction Soil Quality and Depth) is the only LID technique suited to the proposed development due to proposed density and existing soil characteristics. As such, it will be applied to all proposed landscaped areas in the developed condition.

USDA soil mapping classifies site soils as Tokul gravelly medial loam, Hydrologic Group C soils which are generally consistent with glacial till deposits. Geotechnical investigation performed by Cobalt Geosciences (dated December 19<sup>th</sup>, 2019) is consistent with these findings, indicating weathered glacial till which transitions to unweathered, dense glacial till at approximately 3-4 feet below grade. Due to the compacted nature of dense glacial till observed onsite, as well as evidence of perched groundwater, the investigation concludes that infiltration is not feasible. Furthermore, due to the dense nature of commercial development, insufficient landscaped areas are available for dispersion BMPs.

**Minimum Requirement #6: Runoff Treatment:** Due to the commercial nature of the proposed development, “enhanced” treatment is required for proposed pollution generating impervious surfaces (PGIS).

Two downstream water quality treatment vaults (BioPod A and BioPod B) were designed as part of the White Barn Commercial project (G21-0053) to achieve an enhanced treatment level for all tributary lot areas, inclusive of Lot 6 and offsite improvements on Lot 5. As detailed in the full drainage report and associated calculations submitted under that permit, both water quality vaults were designed in accordance with the 2014 DOE Manual with sufficient treatment and high-flow bypass capacity for all lots recorded as part of the White Barn Commercial development, assuming a maximum impervious coverage of 85%. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding BioPod A & BioPod B, as well as supporting sizing documentation.

As water quality treatment will be provided via the BioPod facilities constructed as part of the separate White Barn Commercial project, no additional treatment is proposed.

**Minimum Requirement #7: Flow Control:** Flow control for Onsite Basins A and B, as well as offsite improvements impacting Lot 5, will be provided via Detention Vaults A & B, which were previously designed as part of the White Barn Commercial project (G21-0053) and will be constructed prior to Lot 6 development.

As detailed in the full drainage report and associated calculations submitted under that permit, both vaults were designed in accordance with the 2014 DOE Manual to achieve compliant storage volumes and accomplish compliant release rates/durations for all lots recorded as part of the White Barn Commercial development, assuming a maximum impervious coverage of 85%. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding Vaults A & B, as well as supporting sizing calculations.

As flow control will be provided via the detention vault facilities constructed as part of the separate White Barn Commercial project, no additional facilities are proposed. All stormwater runoff associated with Lot 6 development, as well as offsite improvements extending through Lot 5, will be collected and routed directly to the existing detention facilities in the developed condition. See Section 4.0 for further discussion of predeveloped/developed surfaces and proposed impervious area coverages for capacity verification.

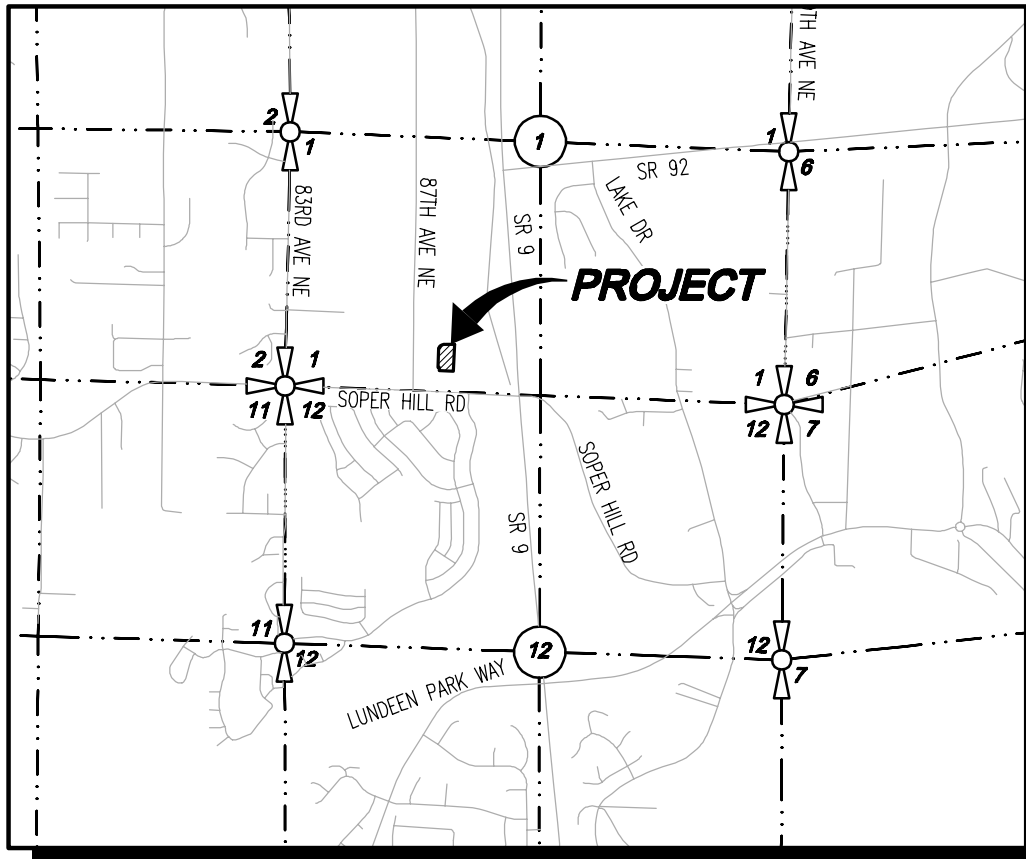
**Minimum Requirement #8: Wetlands Protection:** There are no wetlands onsite.

**Minimum Requirement #9: Operation and Maintenance:** See Operations and Maintenance in Section 5 of this report.



## **Appendix 1: Project Overview**

1. Figure 1.0 - Vicinity Map
2. Figure 2.0 - Existing Conditions Map



**VICINITY MAP**  
SCALE: 1" = 1000'

Drawing: P:\Civil\2022\022-179 Dental Office - White Barn\Drawings\Exhibits\022179E-EX-VLM.dwg Plotted: Jun 22, 2022 - 10:00am

**LDC**

Surveying  
Engineering  
Planning

Kent Woodinville Olympia

20210 142nd Avenue NE  
Woodinville, WA 98072

T 425.806.1869

[www.LDCcorp.com](http://www.LDCcorp.com)

F 425.482.2893

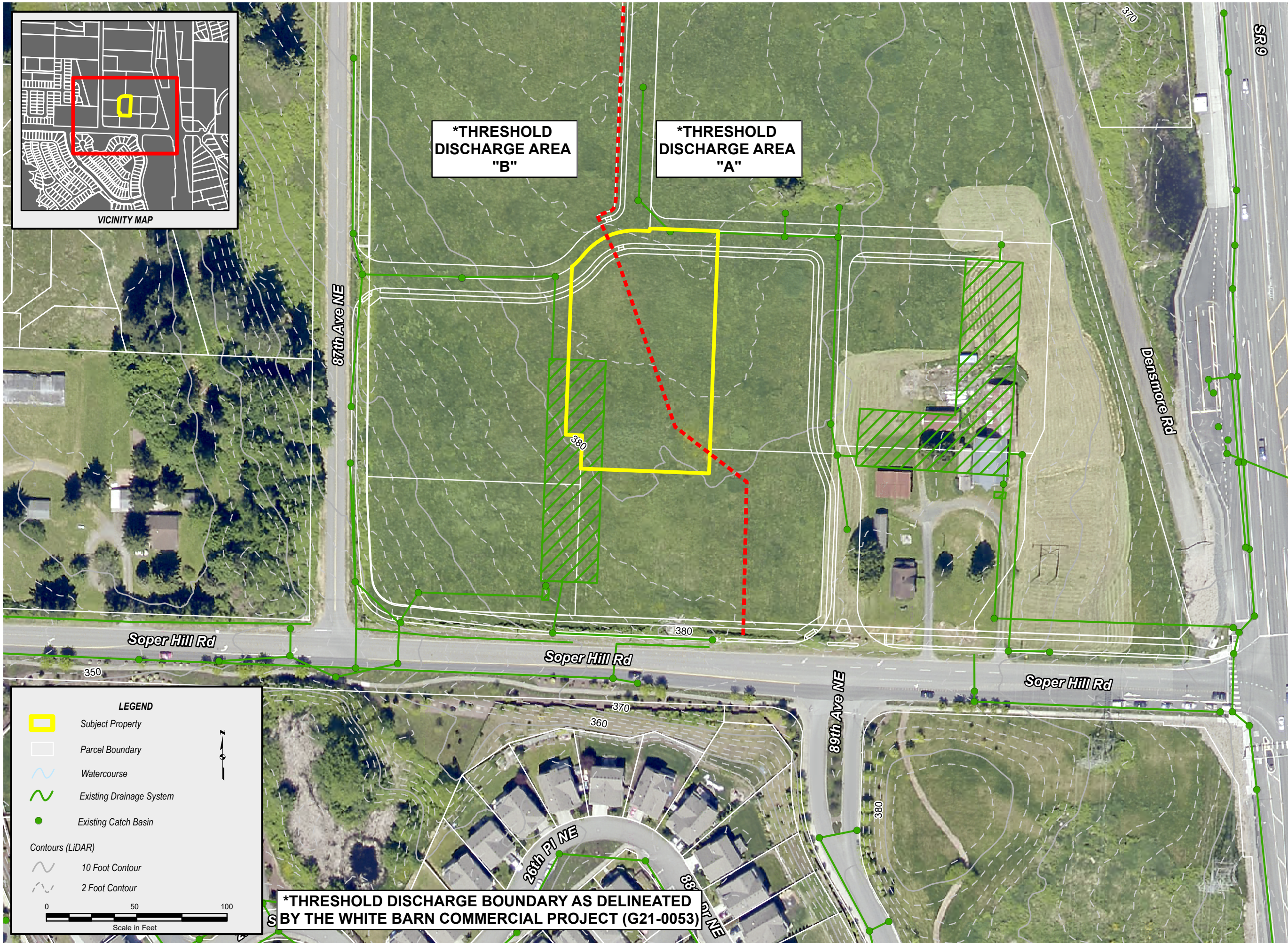
**TITANIUM OFFICE, LLC**

**DENTAL OFFICE - WHITE BARN**

**VICINITY MAP**



2.0 Ex Conditions Map.mxd | MOD: 6/21/2022 | swilson



LAND PRO GROUP, INC.  
**WHITE BARN COMMERCIAL**  
**LOT 6**  
EXISTING CONDITIONS MAP

NAD 1983 HARN STATEPLANE WASHINGTON	
REVISION:	
JOB NUMBER:	C22-179
DRAWING NAME:	C22-179 F2.0
DESIGNER:	SWILSON
DRAWING BY:	SWILSON
DATE:	6/21/2022
SCALE:	AS SHOWN
JURISDICTION:	MARYSVILLE

FIGURE:  
**2.0**

**LDC**  
Surveying  
Engineering  
Planning  
Woodville  
20210 142nd Avenue NE  
Woodville, WA 98072  
P 425.380.1868  
www.LDCcorp.com  
F 425.482.2915

Kent  
1851 Central N.S. #101  
Kent, WA 98030  
www.LDCcorp.com  
F 425.482.2915

SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
SNOMISH COUNTY GIS	PARCEL BOUNDARY
SNOMISH COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
AERIALS EXPRESS	2012 AERIAL IMAGERY



## **SECTION 2: RISK ASSESSMENT ANALYSIS AND TEMPORARY EROSION AND SEDIMENT CONTROL DESIGN**

### **2.1 TEMPORARY EROSION AND SEDIMENT CONTROL**

A Stormwater Pollution Prevention Plan (SWPPP) has been provided as a separate document. The SWPPP report is modeled under the guidelines of Volume II, Section 3 of the 2012 Stormwater Management Manual for Western Washington.

Construction SWPPP Elements #1 through #12 are addressed below.

**Element #1 - Mark Clearing Limits:** All clearing limits will be delineated with high visibility plastic fence or silt fence.

**Element #2 - Establish Construction Access:** A stabilized construction access will be installed at the proposed site access points along the existing White Barn Commercial internal spine road, which will be constructed prior to Lot 6 development.

**Element #3 - Control Flow Rates:** Detention of construction period runoff associated with Threshold Basins A and B will be provided by two separate temporary sediment ponds located on the eastern and western portions of the property.

**Element #4 - Install Sediment Controls:** Silt fence, catch basin protection, the temporary sediment pond, and check dams will be utilized to contain sediments within the project's clearing limits.

**Element #5 - Stabilize Soils:** Exposed soils will be stabilized as specified in the Grading and Erosion Control Notes.

**Element #6 - Protect Slopes:** Slopes are moderate on the subject site. Slopes shall be protected as specified under Element #5.

**Element #7 - Protect Drain Inlets:** Storm drain inlet protection will be utilized to protect all storm drain inlets within the project's immediate vicinity from sedimentation throughout the construction period.

**Element #8 - Stabilize Channels and Outlets:** Temporary interceptor swales shall be stabilized with check dams, as well as mulch or seeding.

**Element #9 - Control Pollutants:** Pollutants shall be controlled as specified in the Pollutant Control Notes.

**Element #10 - Control De-Watering:** If required, disposal options for de-watering water are as specified in the De-Watering Control Notes.

**Element #11 - Maintain BMPs:** Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes.

**Element #12: Manage the Project:** The Grading and Erosion Control Notes specify seasonal work limitations. Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes.

## **SECTION 3: DOWNSTREAM ANALYSIS REPORT**

### **3.1 TASK 1: STUDY AREA DEFINITION AND MAPS**

Snohomish County Bare Earth LiDAR, survey, and 2012 aerial photography were the best topographical references available for the area containing the site. The limits of the downstream analysis extend roughly 0.25 miles beyond the subject property's natural discharge location (See Figure 3.0, Downstream Analysis Map).

### **3.2 TASK 2: RESOURCE REVIEW**

All of the resources below have been reviewed for existing and potential issues near the project site:

- **Adopted Basin Plans**

No Adopted Basin Plans were located that include the project site.

- **Drainage Basin**

This site is located within the Snohomish River drainage basin.

- **Floodplain / Floodway (FEMA) maps**

According to FEMA floodplain mapping, the subject property is not within a floodplain. Reference the FEMA FIS study map 53061C0740E.

- **Critical Areas Map**

No wetlands or critical areas were found onsite.

- **Drainage Complaints**

No drainage complaints have been identified within the downstream flowpath(s).

- **Road Drainage Problems**

No drainage problems were recorded, however, there is notable debris accumulation at various culverts on the downstream path. Refer to Task 3 for more detail.

- **USDA Soil Survey**

Site soils are classified as Tokul gravelly medial loam (0 to 8 percent slopes) which is classified as a Hydrologic Soil Group C and is generally consistent with glacial till deposits. Geotechnical investigation performed by Cobalt Geosciences (dated December 19<sup>th</sup>, 2019) is consistent with these findings, indicating weathered glacial till which transitions to unweathered, dense glacial till at approximately 3-4 feet below grade. See Appendix 3 for USDA Soil Map, Snohomish County Area, Washington and the soil classification description.

- **Wetland Inventory Maps**

There are no wetlands located onsite.

- **Migrating River Studies**

Migrating River Studies are not applicable to the proposed site development.

- **Section 303d List of Polluted Waters**

Washington State Department of Ecology's Water Quality Assessment for Washington shows no impacted or polluted waters within 0.25 miles of the site.

- **Water Quality Problems**

No known water quality problems are present within the site or anywhere within the 0.25-mile downstream flow path.

- **Stormwater Compliance Plans**

Not applicable to the proposed project.

### 3.3 TASK 3: FIELD INSPECTION/DOWNSTREAM ANALYSIS

Drainage from the existing site flows both eastward and westward within two separate threshold discharge basins. Flow associated with Threshold Basin A conveys overland as sheet flow to the west/southwest and eventually discharges to the existing Soper Hill Road collection and conveyance system near the southwestern corner of the site. Flow continues westward within the existing Soper Hill Road collection/conveyance system and beyond the 0.25-mile boundary of analysis. Threshold Basin B conveys overland as sheet flow to the east/southeast and eventually discharges to the existing Highway 9 collection/conveyance system at the southeastern corner of the property. Flow continues southward within the existing conveyance system and beyond the 0.25-mile boundary of analysis. See Figure 3.0, “Downstream Analysis Map” for an illustration of the discharge locations and associated downstream flowpaths. Detailed descriptions of Flowpaths A and B are offered below.

#### **Developed Flow Paths**

*Flow path A:* Surface water flowing from the property to the southwest discharges via overland flow into an intake culvert along the southwest corner of the property ❶. Flows then travel south under Soper Hill Road through the culvert into a catch basin. The catch basin directs flows west along the south side of Soper Hill Rd through a series of open curb inlets connecting via 12-inch pipes ❷. Stormwater continues along Soper Hill Road until conveying southwest just outside of the 0.25-mile boundary.

*Flow path B:* Surface water flowing from the property to the southeast discharges via overland flow towards a swale low point along the southeast corner of the property ❸. Flows are then directed into a culvert intake directing flows underneath Soper Hill Rd ❹. Stormwater flows south along Highway 9 until it is conveyed west to Hulbert Creek just outside of the 0.25-mile boundary ❺.

Following planned development activities on parcel 0059070003180 as part of the White Barn Commercial project (G21-0053), all stormwater flows associated with flowpaths A



and B will be routed to Vaults A and B, respectively. All captured/detained flow will be released into the existing collection and conveyance systems along Soper Hill Road and Highway 9 at mitigated rates, in accordance with the historic flowpaths.

#### **3.4 TASK 4: DRAINAGE SYSTEM DESCRIPTION AND PROBLEM DESCRIPTIONS**

Based on the resources available and the anticipated downstream flow paths, there is no evidence of existing downstream drainage problems. All downstream appurtenances and open channels are adequately sized to sufficiently convey flows resulting from large storm events. Due to debris accumulation at various downstream culverts, debris buildup must be cleared in order to prevent future downstream drainage problems.

#### **3.5 TASK 5: MITIGATION OF EXISTING OR POTENTIAL DRAINAGE PROBLEMS**

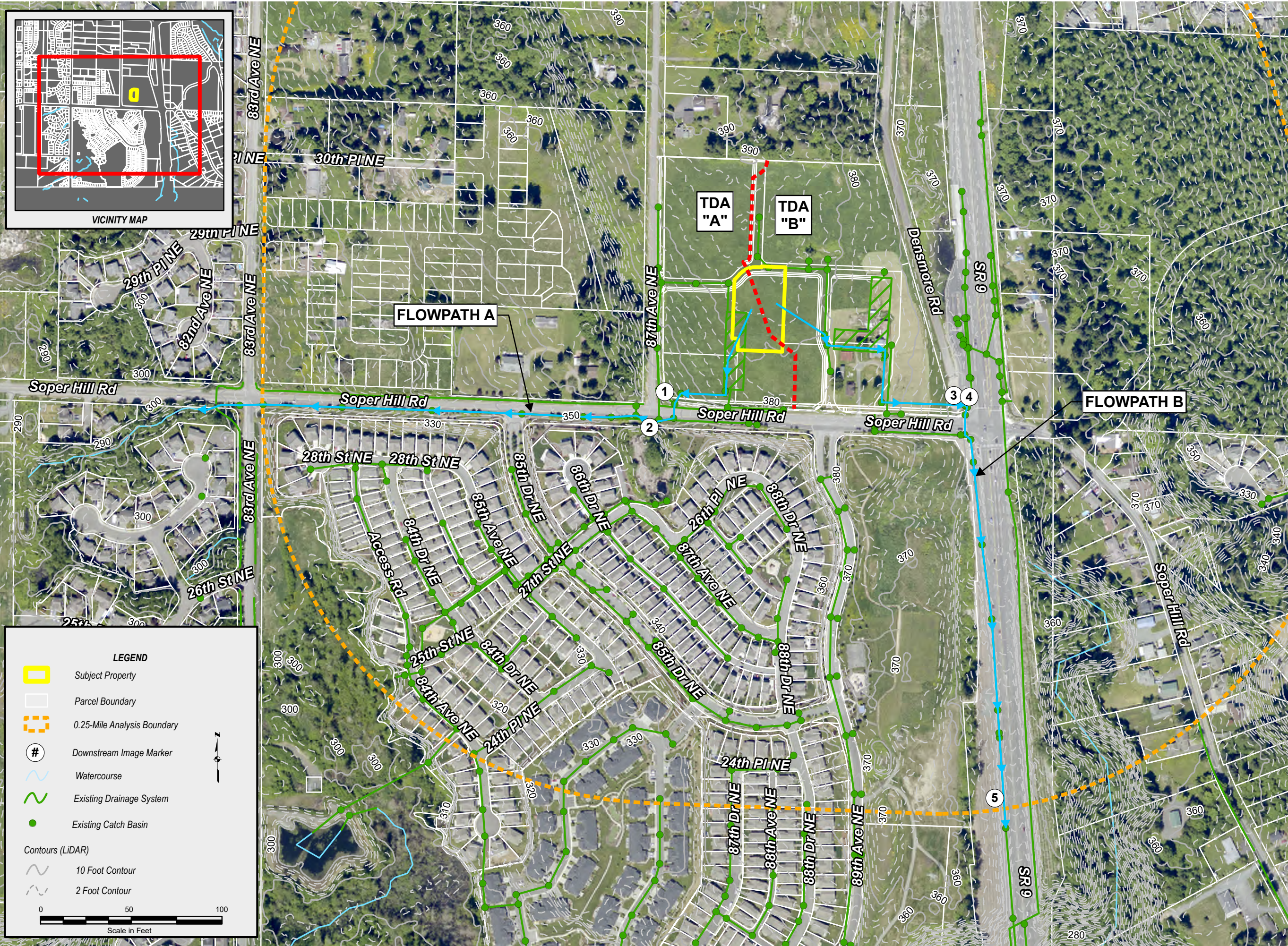
There are no known drainage problems on or immediately downstream of the site.

### **Appendix 3: Resource Review**

1. Figure 3.0 - Downstream Analysis Map
2. Downstream Analysis Photos
3. FEMA Floodplain Map - Panel #53061C0740E
4. USGS Soils Map
5. USGS Soils Description



3.0 Downstream Analysis.mxd | MOD: 6/21/2022 | swilson



LAND PRO GROUP, INC.  
**WHITE BARN COMMERCIAL**  
**LOT 6**  
DOWNSTREAM ANALYSIS MAP

NAD 1983 HARN  
STATEPLANE WASHINGTON

REVISION:  
JOB NUMBER: C22-179  
DRAWING NAME: C22-179 F3.0  
DESIGNER: SWILSON  
DRAWING BY: SWILSON  
DATE: 6/21/2022  
SCALE: AS SHOWN  
JURISDICTION: MARYSVILLE

**FIGURE:**  
**3.0**

**LDC**  
Surveying  
Engineering  
Planning  
Kent  
1851 Central N.S. #101  
Woodinville, WA 98072  
www.LDCcorp.com  
T 425.388.1888 F 425.482.2993

SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
SNOMISH COUNTY GIS	PARCEL BOUNDARY
SNOMISH COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
AERIALS EXPRESS	2012 AERIAL IMAGERY





Image ❶: Facing southward from the southwestern corner of the White Barn Commercial property, at the intersection of Soper Hill Road and 87<sup>th</sup> Ave NE. Flows discharging from Threshold Basin A flow southward through a 12" CMP culvert across Soper Hill Road and enter the existing Soper Hill collection and conveyance system.



Image 2: Facing northward from the southern edge of Soper Hill Road, at its intersection with 87<sup>th</sup> Ave NE. Discharged flows enter the existing Soper Hill collection and conveyance system on the southern edge of the road, and convey westward through closed pipe beyond the 0.25-mile boundary of analysis.



Image ③: Facing northwestward toward the southeast corner of the White Barn Commercial property, where overland flow associated with Threshold Basin B discharges to Soper Hill Road & Highway 9.



Image ④: Discharged flows are collected into an existing CMP culvert and conveyed southeastward to the existing Highway 9 collection and conveyance system.



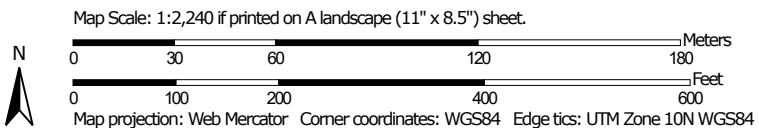
Image ⑤: Facing northward from the western edge of Highway 9. Discharged flows are conveyed to the existing Highway 9 collection and conveyance system and continue southward within that system until crossing beyond the 0.25-mile boundary of analysis.



# Soil Map—Snohomish County Area, Washington



Soil Map may not be valid at this scale.

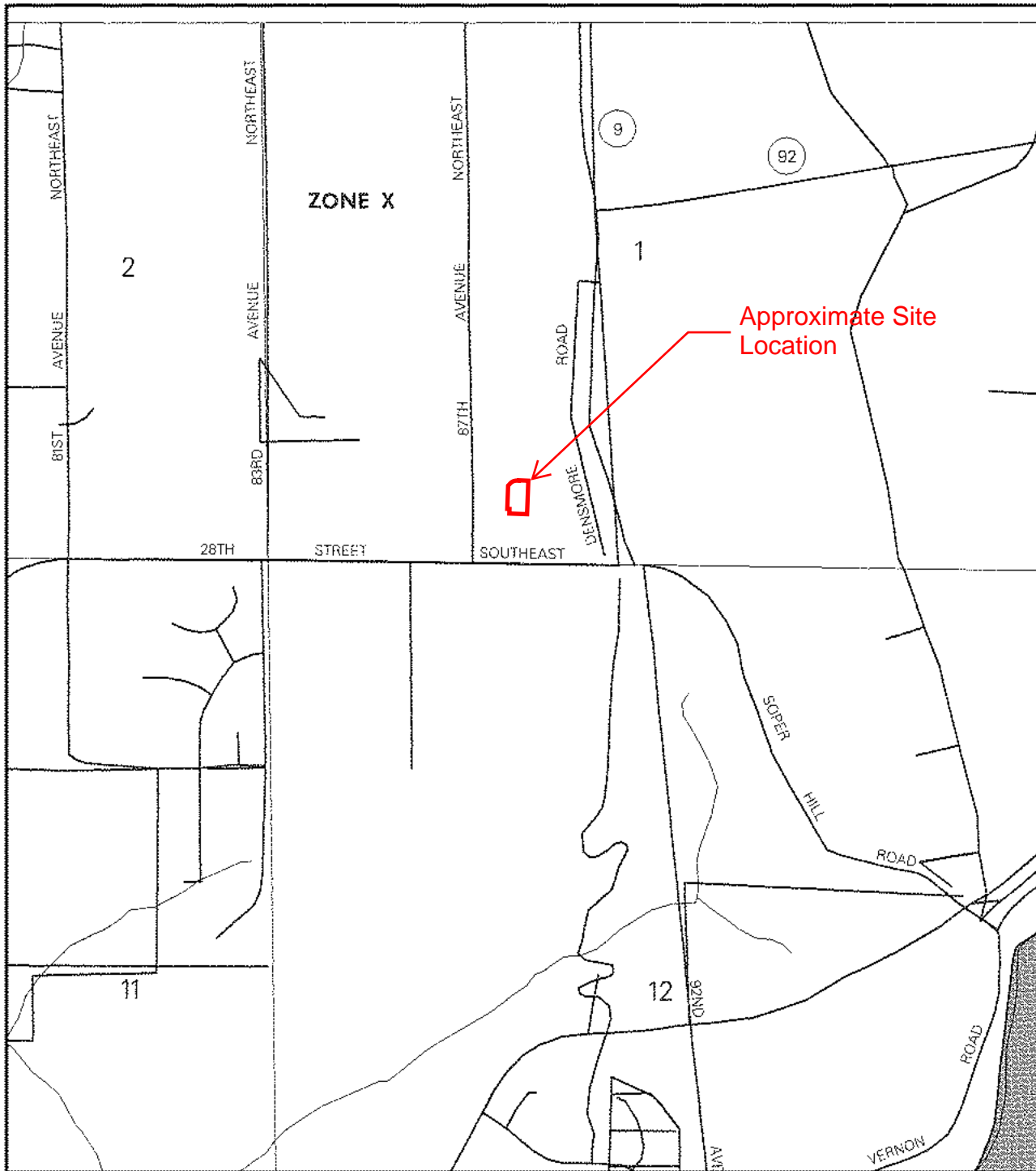


**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

11/1/2019  
Page 1 of 3





APPROXIMATE SCALE IN FEET  
1000 0 1000

**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM  
FLOOD INSURANCE RATE MAP**

**SNOHOMISH COUNTY,  
WASHINGTON AND  
INCORPORATED AREAS**

**PANEL 740 OF 1575**

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
SNOHOMISH COUNTY UNINCORPORATED AREAS	530501	0740	E

SNOHOMISH COUNTY  
UNINCORPORATED AREAS

**MAP NUMBER  
53061C0740 E**

**EFFECTIVE DATE:  
NOVEMBER 8, 1999**



Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

## MAP LEGEND

### Area of Interest (AOI)

Area of Interest (AOI)

### Soils



Soil Map Unit Polygons



Soil Map Unit Lines



Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington

Survey Area Data: Version 21, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2018—Oct 16, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
72	Tokul gravelly medial loam, 0 to 8 percent slopes	17.6	100.0%
<b>Totals for Area of Interest</b>		<b>17.6</b>	<b>100.0%</b>

## Snohomish County Area, Washington

### 72—Tokul gravelly medial loam, 0 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2t61k

*Elevation:* 160 to 1,150 feet

*Mean annual precipitation:* 45 to 70 inches

*Mean annual air temperature:* 46 to 52 degrees F

*Frost-free period:* 140 to 200 days

*Farmland classification:* All areas are prime farmland

#### Map Unit Composition

*Tokul and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Tokul

##### Setting

*Landform:* Till plains, hillslopes

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Side slope, tread

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Volcanic ash mixed with loess over glacial till

##### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material

*Oa - 1 to 2 inches:* highly decomposed plant material

*A - 2 to 6 inches:* gravelly medial loam

*Bs1 - 6 to 9 inches:* gravelly medial loam

*Bs2 - 9 to 17 inches:* gravelly medial loam

*Bs3 - 17 to 24 inches:* gravelly medial loam

*BC - 24 to 33 inches:* gravelly medial fine sandy loam

*2Bsm - 33 to 62 inches:* cemented material

##### Properties and qualities

*Slope:* 0 to 8 percent

*Depth to restrictive feature:* 20 to 39 inches to cemented horizon;  
20 to 39 inches to densic material

*Natural drainage class:* Moderately well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Very  
low to moderately low (0.00 to 0.06 in/hr)

*Depth to water table:* About 18 to 36 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water storage in profile:* Moderate (about 8.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3s  
*Hydrologic Soil Group:* B  
*Forage suitability group:* Limited Depth Soils (G002XN302WA),  
Limited Depth Soils (G002XF303WA)  
*Hydric soil rating:* No

### **Minor Components**

#### **Pastik**

*Percent of map unit:* 5 percent  
*Landform:* Terraces  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

#### **Barneston**

*Percent of map unit:* 5 percent  
*Landform:* Kames, eskers, moraines  
*Landform position (two-dimensional):* Summit, shoulder  
*Landform position (three-dimensional):* Crest, interfluve  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

#### **Norma**

*Percent of map unit:* 3 percent  
*Landform:* Depressions, drainageways  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave, linear  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

#### **Mckenna**

*Percent of map unit:* 2 percent  
*Landform:* Depressions, drainageways  
*Landform position (three-dimensional):* Dip  
*Down-slope shape:* Concave, linear  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

## **Data Source Information**

Soil Survey Area: Snohomish County Area, Washington  
Survey Area Data: Version 21, Sep 16, 2019

## **SECTION 4: FLOW CONTROL AND WATER QUALITY DESIGN ANALYSIS**

Individual flow control facilities associated with Lot 6 development and/or offsite improvements on Lot 5 are not considered applicable, as adequate storage volumes and flow control capabilities for Onsite Basins A and B, and the Offsite Basin are provided within Vaults A and B, which were previously designed as part of the White Barn Commercial project (G21-0053). As detailed in the full drainage report and associated calculations submitted under that permit, both vaults were designed using WWHM2012 in accordance with the 2014 DOE Manual to achieve compliant storage volumes and accomplish compliant release rates/durations for all lots recorded as part of the White Barn Commercial development, inclusive of Lots 5 and 6, assuming a maximum impervious coverage of 85%. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding Vaults A & B, as well as supporting sizing calculations.

As flow control will be provided via the detention vault facilities constructed as part of the separate White Barn Commercial project, no additional facilities are proposed. The following predeveloped and developed hydrology narratives, as well as associated developed surface breakdowns, are for accounting purposes only to verify compliance with the 85% impervious area threshold as dictated by the Vault A and B designs.

### **4.1 PREDEVELOPED HYDROLOGY**

The predeveloped surface breakdowns presented below are for accounting purposes only to verify compliance with the 85% impervious area threshold as dictated by the Vault A and B designs. As such, predeveloped land coverages may be represented as “impervious” or “pasture” rather than the typical historic (forested) condition, to accurately represent conditions expected onsite following clearing/grading and the construction of internal access roads as proposed by the White Barn Commercial project (G21-0053). Representation of the predeveloped site in this manner provides a clearer representation of the “baseline” condition and allows for easier calculation of the impervious allowance for proposed Lot development.

#### 4.1.1 Onsite Basin A (Threshold Discharge Area A)

Onsite Basin A consists of all area within Lot 6 which is tributary to Flowpath A in the predeveloped and developed conditions. For visual representation of the following predeveloped basin(s), see Figure 4.0, “Predeveloped Hydrology Map” located in Appendix 4. In the predeveloped condition, Onsite Basin A reflects the following coverage values in the predeveloped condition:

Table 4-1.1 - Predeveloped Conditions Areas: Onsite Basin A

Predeveloped Conditions - Onsite Basin A		
Basin	Land Cover	Area
Onsite Basin A	Impervious	0.04 AC
	Pasture	0.73 AC
Total		0.77 AC

#### 4.1.2 Onsite Basin B (Threshold Discharge Area B)

Onsite Basin B consists of all area within Lot 2 which is tributary to Flowpath B in the predeveloped and developed conditions. For visual representation of the following predeveloped basin(s), see Figure 4.0, “Predeveloped Hydrology Map” located in Appendix 4. In the predeveloped condition, the Offsite Basin reflects the following coverage values in the predeveloped condition:

Table 4-1.2 - Predeveloped Conditions Areas: Onsite Basin B

Predeveloped Conditions - Onsite Basin B		
Basin	Land Cover	Area
Onsite Basin B	Impervious	0.05 AC
	Pasture	0.20 AC
Total		0.25 AC

#### 4.1.3 Offsite Basin (Threshold Discharge Area B)

The Offsite Basin consists of all area within Lot 5 which is tributary to Flowpath B in the predeveloped and developed conditions. Approximately 0.07 acres of area at the southern margin of Lot 5 will be converted for access improvements in the developed condition. However, as total lot impervious coverage is relevant to verify vault performance, the entirety of Lot 5 is tabulated below. For visual representation of the following predeveloped basin(s), see Figure 4.0, “Predeveloped Hydrology Map” located in Appendix 4. In the predeveloped condition, the Offsite Basin reflects the following coverage values in the predeveloped condition:

Table 4-1.3 - Predeveloped Conditions Areas: Offsite Basin

Predeveloped Conditions - Offsite Basin		
Basin	Land Cover	Area
Onsite Basin B	Impervious	0.22 AC
	Pasture	0.61 AC
Total		0.83 AC

## 4.2 DEVELOPED HYDROLOGY

The proposed White Barn Lot 6 project will consist of a boundary line adjustment to the existing Lot 6 as delineated by the White Barn Binding Site Plan (AF No. 202107205003), followed by site development to include a new dental office facility and associated parking, accesses, and utilities. Additional improvements, including extension of vehicular/pedestrian access eastward toward the existing White Barn Commercial spine road, are proposed offsite on the southern margin of Lot 5.

Internal access routes between Soper Hill Road and 87<sup>th</sup> Ave NE, as well as water, sewer, and stormwater utility mains and associated connection points will be constructed separately as part of the White Barn Commercial project (permit G21-0053). Two stormwater detention vaults, along with associated flow control risers and downstream



water quality structures, are also proposed as part of the stormwater system under this permit. These facilities have been designed with sufficient capacity to mitigate & treat all stormwater flows associated with individual lot development, including the proposed Lot 6 improvements and offsite improvements to Lot 5. As such, additional flow control measures are not required and the following developed surface breakdowns presented below are for accounting purposes only to verify compliance with the 85% impervious area threshold as dictated by the Vault A and B designs.

#### 4.2.1 Threshold Discharge Area A

##### Onsite Basin A:

Onsite Basin A is 0.77 acres in the developed condition and is comprised of all onsite area which will be conveyed to Vault A. In total, Onsite Basin A proposes 0.61 acres of impervious area (new + existing), or approximately **79.4% coverage**. For visual representation of the following developed conditions see Figure 5.0, “Developed Hydrology Map”. In the developed condition, Onsite Basin A reflects the following areas and ground cover designations:

Table 4-2.1 - Developed Conditions Areas: Onsite Basin A

Onsite Basin A	
Land Cover	Area
Impervious	0.61 AC
Pasture	0.16 AC
Total	0.77 AC

As noted in the White Barn Commercial drainage report dated December 2021, up to 85% impervious lot coverage (0.65 AC) is allowed per the Vault A sizing. Onsite Basin A proposes 79.4% coverage (0.61 AC), demonstrates compliance with impervious area limitations as dictated by Vault A sizing.

#### 4.2.2 Threshold Discharge Area B

##### Onsite Basin B:

Onsite Basin B is 0.25 acres in the developed condition and is comprised of all onsite area which will be conveyed to Vault B. In total, Onsite Basin B proposes 0.18 acres of impervious area (new + existing), or approximately **72.9% coverage**. For visual representation of the following developed conditions see Figure 5.0, “Developed Hydrology Map”. In the developed condition, Onsite Basin B reflects the following areas and ground cover designations:

Table 4-2.2 - Developed Conditions Areas: Onsite Basin B

Onsite Basin B	
Land Cover	Area
Impervious	0.18 AC
Pasture	0.07 AC
Total	0.25 AC

As noted in the White Barn Commercial drainage report dated December 2021, up to 85% impervious lot coverage (0.21 AC) is allowed per the Vault B sizing. Onsite Basin A proposes 72.9% coverage (0.18 AC), demonstrating compliance with impervious area limitations as dictated by Vault B sizing.

##### Offsite Basin:

Onsite Basin B is 0.83 acres in the developed condition and is comprised of all onsite area which will be conveyed to Vault B. In total, the Offsite Basin proposes 0.29 acres of impervious area (new + existing), or approximately **34.9% coverage**. For visual representation of the following developed conditions see Figure 5.0, “Developed Hydrology Map”. In the developed condition, Onsite Basin B reflects the following areas and ground cover designations:

Table 4-2.2 - Developed Conditions Areas: Offsite Basin

<b>Offsite Basin</b>	
Land Cover	Area
Impervious (New)	0.07 AC
Impervious (Existing)	0.22 AC
Pasture	0.54 AC
Total	0.83 AC

As noted in the White Barn Commercial drainage report dated December 2021, up to 85% impervious lot coverage (0.71 AC) is allowed per the Vault B sizing. The Offsite Basin proposes 34.9% coverage (0.29 AC) following proposed road improvements, demonstrating compliance with impervious area limitations as dictated by Vault B sizing.

## 4.2 WATER QUALITY TREATMENT

Enhanced water quality treatment for stormwater runoff within Onsite Basins A and B will be provided by means of two individual water quality treatment vaults (BioPod A and BioPod B), designed/constructed downstream of Detention Vaults A and B as part of the White Barn Commercial project (G21-0053). As detailed in the full drainage report and associated calculations submitted under that permit, both water quality vaults were designed in accordance with the 2014 DOE Manual with sufficient treatment and high-flow bypass capacity for all lots recorded as part of the White Barn Commercial development, inclusive of Lot 6 and offsite improvements on Lot 5, assuming a maximum impervious coverage of 85%. As new & existing impervious surfaces within Onsite Basin A (72.4%), Onsite Basin B (72.9%), and the Offsite Basin (34.9%) comply with this limitation, BioPods A and B will provide adequate treatment capacity for all stormwater associated with this development. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding BioPod A & BioPod B, as well as supporting sizing documentation.

### **4.3 DETENTION**

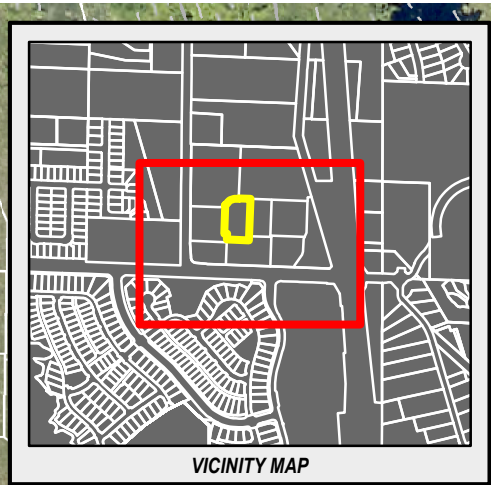
Individual flow control facilities associated with Lot 6 development and associated offsite improvements to Lot 5 are not considered applicable, as adequate storage volumes and flow control capabilities for Onsite Basin A, Onsite Basin B, and the Offsite Basin are provided within Vaults A and B, designed as part of the White Barn Commercial project (G21-0053). As detailed in the full drainage report and associated calculations submitted under that permit, both vaults were designed using WWHM2012 in accordance with the 2014 DOE Manual to achieve compliant storage volumes and accomplish compliant release rates/durations for all lots recorded as part of the White Barn Commercial development, inclusive of Lot 6 and associated offsite improvements to Lot 5, assuming a maximum impervious coverage of 85%. As new & existing impervious surfaces within Onsite Basin A (72.4%), Onsite Basin B (72.9%), and the Offsite Basin (34.9%) comply with this limitation, Vaults A and B will provide adequate storage and no additional flow control facilities are proposed. Please refer to the White Barn Commercial Full Drainage Report, dated December 2021, for more detailed discussion regarding Vaults A & B, as well as supporting sizing calculations.

## **Appendix 4: Detention and Water Quality Analysis Data**

1. Figure 4.0: Predeveloped Hydrology Map
2. Figure 5.0: Developed Hydrology Map



4.0 Predeveloped Hydrology Map.mxd | MOD: 6/21/2022 | swilson



VICINITY MAP

**LEGEND**

- Subject Property
- Parcel Boundary
- Watercourse
- Existing Drainage System
- Existing Catch Basin

Contours (LiDAR)

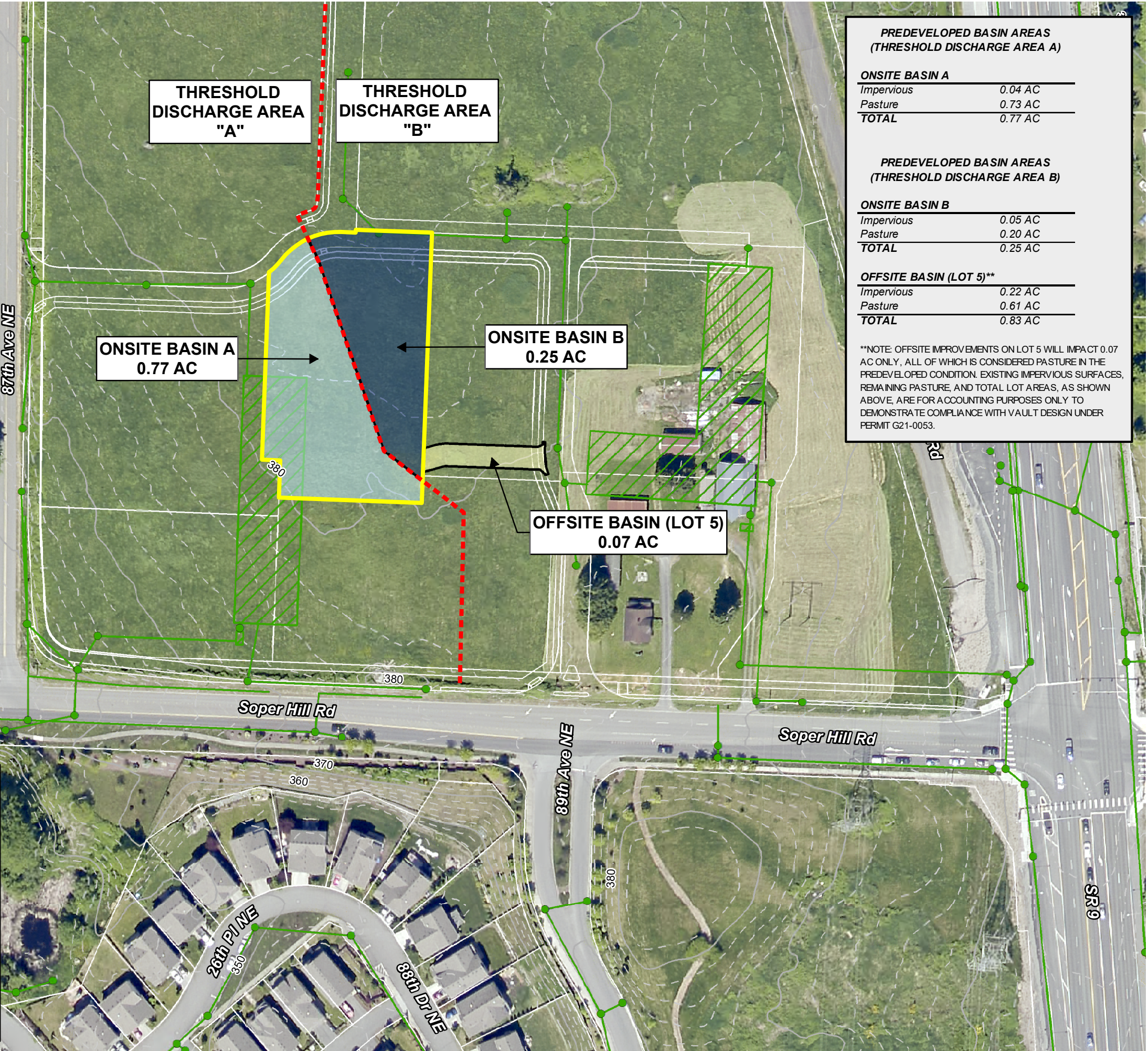
- 10 Foot Contour
- 2 Foot Contour

0

50

100

Scale in Feet



PREDEVELOPED BASIN AREAS (THRESHOLD DISCHARGE AREA A)	
ONSITE BASIN A	
Impervious	0.04 AC
Pasture	0.73 AC
TOTAL	0.77 AC
PREDEVELOPED BASIN AREAS (THRESHOLD DISCHARGE AREA B)	
ONSITE BASIN B	
Impervious	0.05 AC
Pasture	0.20 AC
TOTAL	0.25 AC
OFFSITE BASIN (LOT 5)**	
Impervious	0.22 AC
Pasture	0.61 AC
TOTAL	0.83 AC
**NOTE: OFFSITE IMPROVEMENTS ON LOT 5 WILL IMPACT 0.07 AC ONLY, ALL OF WHICH IS CONSIDERED PASTURE IN THE PREDEVELOPED CONDITION. EXISTING IMPERVIOUS SURFACES, REMAINING PASTURE, AND TOTAL LOT AREAS, AS SHOWN ABOVE, ARE FOR ACCOUNTING PURPOSES ONLY TO DEMONSTRATE COMPLIANCE WITH VAULT DESIGN UNDER PERMIT G21-0053.	

LAND PRO GROUP, INC.

WHITE BARN COMMERCIAL

LOT 6

PREDEVELOPED HYDROLOGY MAP

NAD 1983 HARN STATEPLANE WASHINGTON	
REVISION:	
JOB NUMBER:	C22-179
DRAWING NAME:	C22-179 F4.0
DESIGNER:	SWILSON
DRAWING BY:	SWILSON
DATE:	6/21/2022
SCALE:	AS SHOWN
JURISDICTION:	MARYSVILLE

FIGURE:

4.0

Surveying  
Engineering  
Planning

Woodville  
20210 143rd Avenue NE  
Woodville, WA 98072  
P 425.380.1868

Kent  
1851 Central N.S. #101  
Kent, WA 98030  
P 425.380.1868

www.LDCcorp.com

SOURCE AGENCY

SNOMISH COUNTY GIS

SNOMISH COUNTY GIS

AERIALS EXPRESS

DESCRIPTION

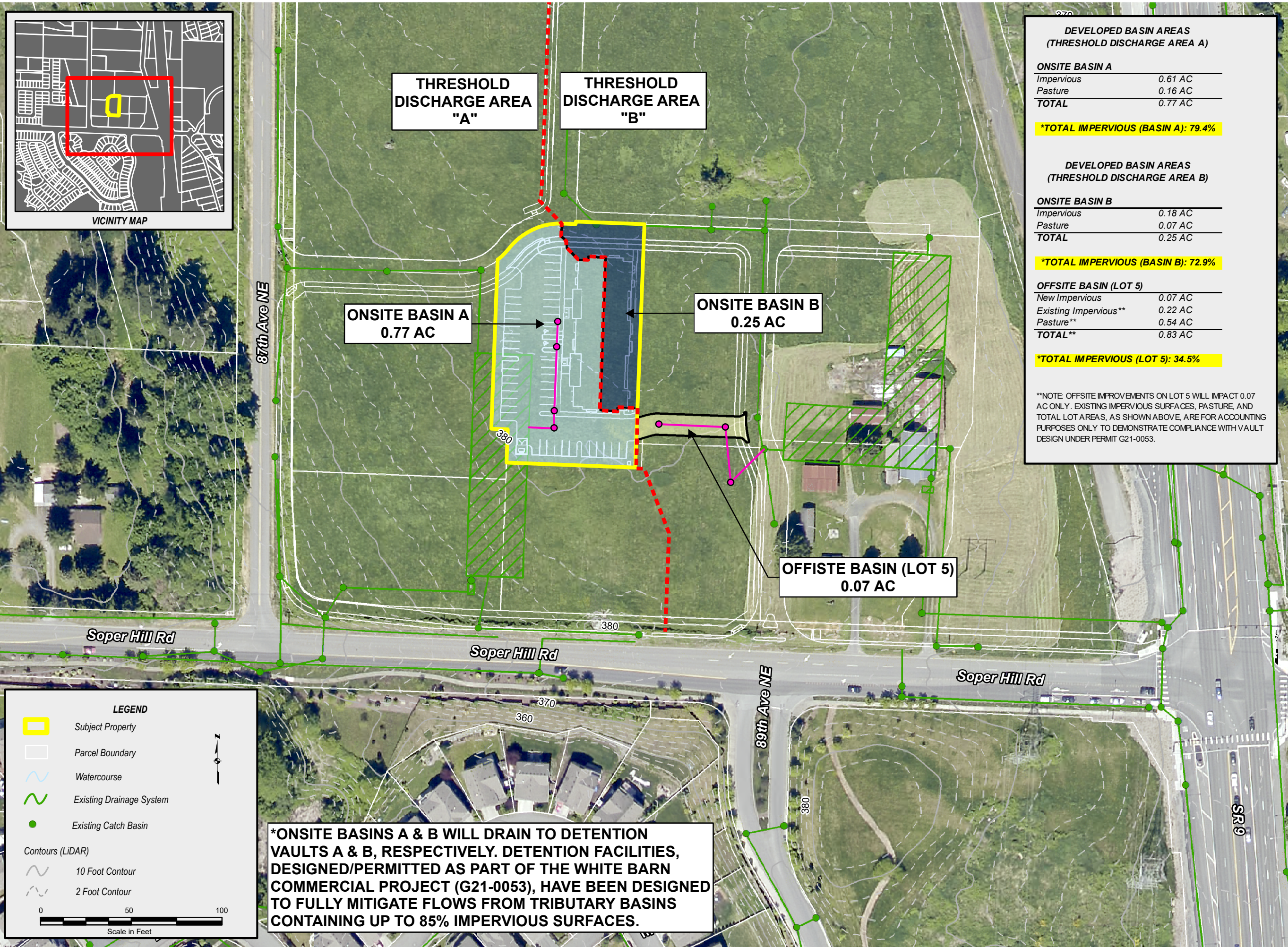
PARCEL BOUNDARY

CONTOURS GENERATED FROM  
BARE EARTH LIDAR (KING COUNTY).  
THIS DATA HAS A STATED VERTICAL  
ACCURACY OF APPROXIMATELY 1 FOOT

2012 AERIAL IMAGERY



S:\0\Developed Hydrology Map.mxd | MOD: 6/21/2022 | swilson



LAND PRO GROUP, INC.

**WHITE BARN COMMERCIAL**

**LOT 6**

DEVELOPED HYDROLOGY MAP

NAD 1983 HARN  
STATEPLANE WASHINGTON

REVISION:  
JOB NUMBER: C22-179  
DRAWING NAME: C22-179 F4.0  
DESIGNER: SWILSON  
DRAWING BY: SWILSON  
DATE: 6/21/2022  
SCALE: AS SHOWN  
JURISDICTION: MARYSVILLE

**FIGURE:**

**5.0**

SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
SNOMISH COUNTY GIS	PARCEL BOUNDARY
SNOMISH COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
AERIALS EXPRESS	2012 AERIAL IMAGERY

Surveying Engineering Planning	LDC	Kent 1851 Central N.S. #101 Kent, WA 98030 T 253.388.1888 www.LDCcorp.com
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## **SECTION 5: CONVEYANCE ANALYSIS AND DESIGN**

### **5.1 CONVEYANCE CAPACITY ANALYSIS**

The proposed stormwater systems are comprised of the primary flow intakes, the detention volumes, the detention outfalls, and control structures. Due to the preliminary nature of this project, a full conveyance capacity analysis, including examination of backwater conditions, is not yet warranted. A full capacity analysis, using the Rational Method with Everett IDF Tables, will be provided as part of a forthcoming Construction Plan submittal to demonstrate adequate capacity in the 50-year, 24-hour design storm event.



## **SECTION 6: OPERATIONS AND MAINTENANCE MANUAL**

The proposed storm drainage system consists of buried pipes, catch basins, detention vaults, and BioPod water quality facilities. These facilities will require periodic maintenance and inspection. Inspection and maintenance procedures are contained on the following pages.

### NO. 3 - CLOSED DETENTION SYSTEMS (PIPES/TANKS)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point with debris and sediment	Vents free of debris and sediment
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ length of tank.	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any crack allowing material to be transported into facility	All joint between tank /pipe sections are sealed
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of it's design shape	Tank/ pipe repaired or replaced to design.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread (may not apply to self-locking lids.)	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying 80lbs of lift. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	King County Safety Office and/or maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks.	Ladder meets design standards allows maintenance person safe access.
Catch Basins		See "Catch Basins" Standards No. 5	See "Catch Basins" Standards No. 5

## NO. 4 - CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Distance between debris build-up and bottom of orifice plate is less than 1-1/2 feet.	All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards..
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole		See "Closed Detention Systems" Standards No. 3	See "Closed Detention Systems" Standards No. 3
Catch Basin		See "Catch Basins" Standards No. 5	See "Catch Basins" Standards No. 5

## NO. 5 - CATCH BASINS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris (Includes Sediment)	Trash or debris of more than 1/2 cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the basin by more than 10%	No Trash or debris located immediately in front of catch basin opening.
		Trash or debris (in the basin) that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		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.
		Deposits of garbage exceeding 1 cubic foot in volume	No condition present which would attract or support the breeding of insects or rodents.
	Structure Damage to Frame and/or Top Slab	Corner of frame extends more than 3/4 inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (intent is to make sure all 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 is sitting flush on top slab.
	Cracks in Basin Walls/ Bottom	Cracks wider than 1/2 inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Cracks 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.	No cracks more than 1/4 inch wide at the joint of inlet/outlet pipe.
	Sediment/ Misalignment	Basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.

## NO. 5 - CATCH BASINS (CONTINUED)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	Fire Hazard	Presence of chemicals such as natural gas, oil and gasoline.	No flammable chemicals present.
	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.
	Pollution	Nonflammable chemicals of more than 1/2 cubic foot per three feet of basin length.	No pollution present other than surface film.
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 on 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 80 lbs. of lift; 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, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)		Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

## NO. 10 - CONVEYANCE SYSTEMS (PIPES & DITCHES)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20% of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
	Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipes.
	Damaged	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.	Pipe repaired or replaced.
		Any dent that decreases the cross section area of pipe by more than 20%.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment	Accumulated sediment that exceeds 20 % of the design depth.	Ditch cleaned/ flushed of all sediment and debris so that it matches design.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion Damage to Slopes	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Rock Lining Out of Place or Missing (If Applicable).	Maintenance person can see native soil beneath the rock lining.	Replace rocks to design standards.
Catch Basins		See "Catch Basins: Standard No. 5	See "Catch Basins" Standard No. 5
Debris Barriers (e.g., Trash Rack)		See "Debris Barriers" Standard No.6	See "Debris Barriers" Standard No. 6

## NO. 11 - GROUNDS (LANDSCAPING)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Weeds (Nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Safety Hazard	Any presence of poison ivy or other poisonous vegetation.	No poisonous vegetation present in landscaped area.
	Trash or Litter	Paper, cans, bottles, totaling more than 1 cubic foot within a landscaped area (trees and shrubs only) of 1,000 square feet.	Area clear of litter.
Trees and Shrubs	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	Tree or shrub in place free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; remove any dead or diseased trees.

## NO. 13 - WATER QUALITY FACILITIES

### G.) BioPod

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
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.	Remove the accumulated material from the facilities.
Below Ground Cartridge type	Compost Media	Drawdown of water through the media takes longer than 1 hour, and/ or overflow occurs frequently.	Replace media cartridges.
	Short Circuiting	Flows do not properly enter filter cartridges.	Replace filter cartridges.
	Damaged Pipes	Any part of the pipes that are crushed, 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, 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 and any evidence of soil particles entering the structure through the cracks, or maintenance/ inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks more than 1/4-inch wide 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.	Repair or replace baffles to specification.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

## **SECTION 7: SPECIAL REPORTS AND STUDIES**

The following studies were conducted in preparation of this Report:

- Geotechnical Investigation, Proposed Commercial Development, 8833 Soper Hill Road, Cobalt Sciences, dated December 19, 2019