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Preliminary Technical Information Report

Brickyard Ridge

CPH Project No. 0067-13-002

Prepared for:
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CITY OF WOODINVILLE
DEVELOPMENT SERVICES

May 30, 2013

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PRELIMINARY TECHNICAL INFORMATION REPORT
FOR
BRICKYARD RIDGE

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SECTION 1 – PROJECT OVERVIEW

This Technical Information Report (TIR) is provided to describe the stormwater conditions and proposed drainage improvements for the single-family residential development of Brickyard Ridge. The TIR summarizes the analysis criteria of the proposed storm drain collection and conveyance systems as well as the stormwater detention and water quality facilities. It also documents the basis of design of temporary erosion control and sediment retention facilities to be implemented during construction to limit impacts to downstream resources. Figure 1 provides the completed King County TIR worksheet for this project.

The proposed project site is located at 15215 Woodinville-Duvall Road, Woodinville, Washington. More generally, the site is approximately 7.12 acres located in Section 11 of Township 26 North, Range 5 East, in King County, Washington (see Figure 2, Vicinity Map). It is in the Sammamish River Watershed, Little Bear Creek Basin in King County, Washington and is zoned R-6 (KC Parcel No. 3244500135 and 3244500137) and R-1 (KC Parcel No. 1126059152 and 1156059156).

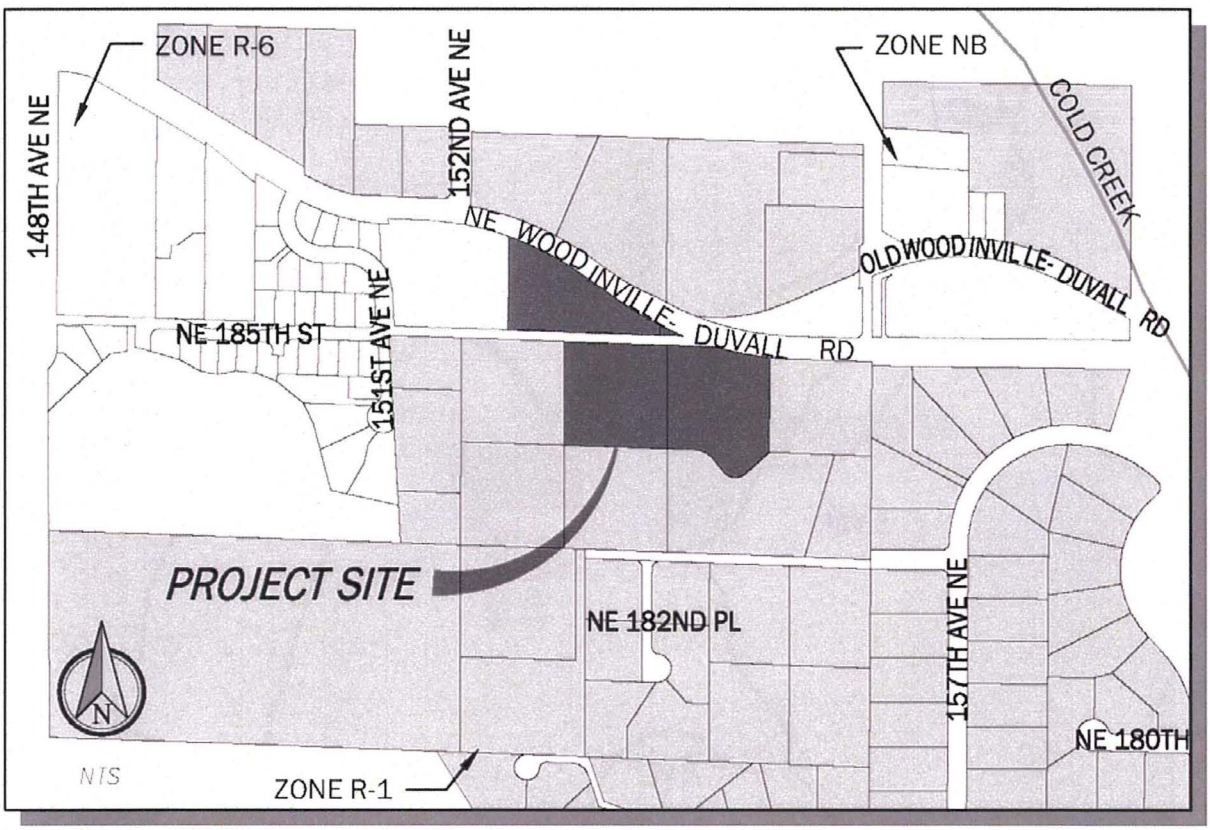

Figure 2 – Vicinity Map

The project proposes to subdivide the site into 13 single-family residential lots within the City of Woodinville. The existing southwestern parcel will not be part of the project following pending boundary line adjustment. The existing houses, driveways, and various out buildings are to be removed (see Figure 5, Developed Site Characteristics). The clearing and grading efforts proposed for this project will modify existing on-site slopes to facilitate the future construction of single-family residences and the associated access road in accordance with current City of Woodinville (COW) standards. An extension of the public road (NE 185th Court) is proposed to extend from the proposed Woodridge project improvements at the westerly boundary and serve the residential lots associated with the

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project. This street will be designed to current City of Woodinville Infrastructure Standards. NE 185th Court bisects the site from west to east and terminates at a new, hammerhead turnaround located on the adjacent to the storm drainage and recreation tract on the site. A private roadway will serve the remaining four proposed lots and provide an emergency access connection at Woodinville-Duvall road.

Infrastructure improvements for this project include roads, sidewalks, storm drainage, domestic water, fire, and sanitary sewer services. Water and sanitary sewer service will be provided to the project by the Woodinville Water District. These services will extend on-site from existing main line utility systems either at NE 185th Court or Woodinville-Duvall Road.

Site Soil Conditions

The soils on the site are characterized as AgC (Alderwood gravelly, sandy loam) per the Natural Resources Conservation Service Soil Survey for King County (see Figure 3, Site *Soils Conditions*). These glacial till soil units are moderately to poorly draining and are identified as Type C Hydrologic Soils. The Type C category consists primarily of soils with a layer that impedes downward movement of water, or soils with moderate to fine textures.

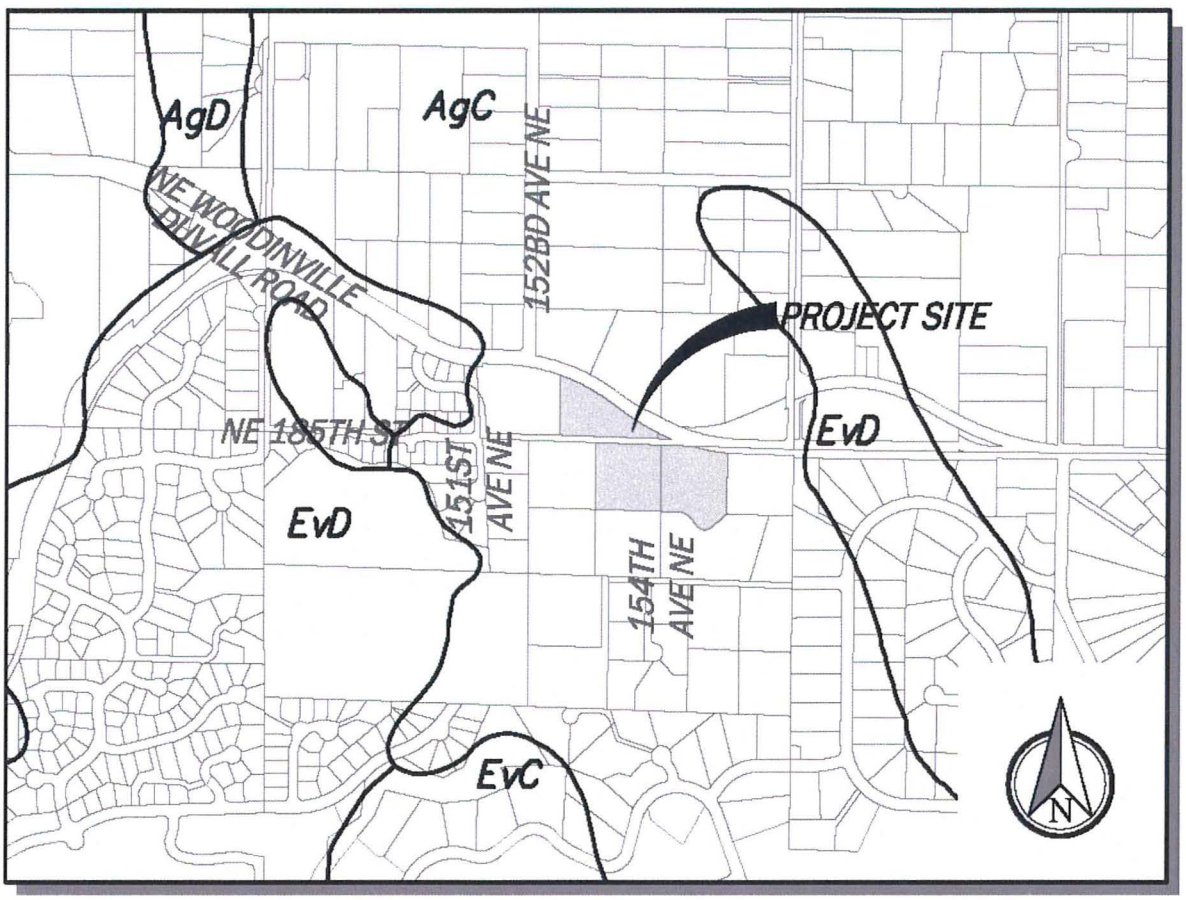

Figure 3 – Site Soils Conditions (source: NRCS Soils Survey for King County)

SECTION 2 – CONDITIONS AND REQUIREMENTS SUMMARY

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Compliance with Project Drainage Requirements

The King County Surfacewater Design Manual (KCSWDM, 2009) specifies that eight core requirements and five special requirements shall be met for the project. The stormwater design criteria for the project are listed below.

KCSWDM Core Requirements

1. **Discharge at Natural Location:** The proposed development will maintain the current natural discharge patterns of the project site. These existing conditions are described in the Tasks of Section 3, Offsite Analysis.

2. **Offsite Analysis:** Summarized in Section 3, Offsite Analysis.

3. **Flow Control:** A detention vault with an outlet control riser is proposed as described in Section 4, Flow Control and Water Quality Facility Analysis and Design to provide Conservation Flow Control in accordance with KCSWDM.

4. **Conveyance System:** Summarized in Section 5, Conveyance System Analysis and Design.

5. **Erosion and Sediment Control:** Described in Section 8, Erosion and Sedimentation Control Analysis and Design.

6. **Maintenance and Operations:** Described in Section 10, Maintenance and Operations Manual.

7. **Financial Guarantees and Liability:** See Section 9, Bond Quantity Worksheet, Facilities Summaries, and Declaration of Covenant.

8. **Water Quality:** An integrated wetvault is proposed as part of the detention vault to provide basic water quality and is described in Section 4, Flow Control and Water Quality Facility Analysis and Design.

KCSWDM Special Requirements

1. **Other Adopted Area-Specific Requirements:** No area-specific requirements apply to this project site.

2. **Flood Hazard Area Delineation:** The limits of this project are not located within or in proximity to a 100-year floodplain.

3. **Flood Protection Facilities:** Not applicable.

4. **Source Control:** Not applicable.

5. **Oil Control:** Not applicable.

SECTION 3 – OFFSITE ANALYSIS

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Task 1: Study Area Definition and Maps

The proposed project site is fronted by Woodinville-Duvall Road along its north property line.The site is currently occupied by two single-family residences with gravel and asphalt driveways, and various out buildings (see Figure 4, Existing Site Characteristics). The remaining ground cover consists mostly of forest, dense undergrowth and limited residential landscaped areas. The existing site topography consists of slopes ranging from 0-40%. These existing site conditions are shown on Figure 4 of this report.

The property contains topographic highs along the South property boundary. This general north-to-south climbing topography continues onto the properties south of the site. The stormwater flows northerly across the site and flows into existing roadside drainage facilities along the southerly edge of Woodinville-Duvall Road and portions of NE 185th Court.

Task 2: Resource Review

The site is listed as both a medium and high Critical Area Ordinance (CAO) Basin Condition area according to available King County GIS information. The proposed site also contains some isolated steep slope hazard areas that are to be modified with the proposed site grading. There were no King County drainage complaints directly related to the proposed site.

Task 3: Field Inspection

A field inspection of the project site was performed on Wednesday May 29, 2013, on an overcast day with a temperature of approximately 55 degrees and occasional light showers. This investigation included observations of current land use, ground cover, topographic conditions, and existing drainage patterns upstream and downstream of the project site. A completed Off-site Analysis Drainage Table for the project is included in Appendix A. The narrative provided with Task 4 of the off-site analysis describes the observations made of the existing storm drainage system during the initial site visit and subsequent field investigations.

Task 4: Drainage System Description

Downstream Basin

The existing topography of the site has slopes ranging from 0 to 40+ percent, generally tending from south to north. The property is comprised of a single drainage basin that drains northerly. The runoff from this basin is currently dispersed through forested ground cover and two overgrown home sites collected by an existing ditch and a series of existing catch basins along Woodinville-Duvall Road. These catch basins are connected by underground pipes that convey the water west and away from the site. No drainage complaints have been recorded on this property or downstream in the last ten years. A map listing the current drainage system features is provided in Appendix A of this report.

Upstream Basin

Large lot single-family residential developments exist to the north and east of the project. West of the project consists of the R-6 zoned Woodridge short plot. Runoff contributions to the site from upstream properties are limited due to the existing drainage system along NE 185th Court. No drainage complaints have been recorded for the neighboring sites within the last ten years.

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Task 5: Mitigation of Existing or Potential Problems

The Off-site Analysis Table provided in Appendix A lists the components of the downstream drainage system and conditions of each individual reach. Development of the proposed site will be in accordance with current City of Woodinville and King County standards. The proposed storm water collection, conveyance, detention, and water quality systems will provide adequate measures to collect and convey increased surface water runoff and mitigate potential downstream systems.

Potential for severe erosion problems will be mitigated with the proposed conveyance system and flow control facilities design. The system will be designed to contain runoff rates generated by a 100 year storm event. Potential erosion or failure of on-site steep slope areas will be further protected with the conveyance of runoff generated by roofs and portions of on-site landscape areas to the proposed roadway system. Since on-site storm water will discharge to an existing storm drainage system within Woodinville-Duvall Road, no adverse impacts to downstream sensitive slope areas should be expected.

Potential flooding problems will be mitigated with the installation and maintained performance of the on-site flow control and drainage conveyance systems. No storm water runoff will be directed to unimproved off-site drainage systems.

Temporary Erosion and Sedimentation Control (TESC) measures will be installed during the construction phase to further mitigate any potential erosion problems. These measures will be continually monitored and maintained in accordance to City of Woodinville Standards.

SECTION 4 – FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

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The hydrologic analysis of the runoff conditions for the project site is based on drainage area characteristics such as basin area, soil type, and land use (i.e., pervious, impervious, density). The King County Runoff Time Series (KCRTS) software was used to evaluate the stormwater runoff conditions and to design the flow control facilities for the project.

Existing Site Hydrology

The existing on-site drainage basins and associated contributing areas are shown on Figure 4 of this report. Runoff from the existing development of the site is denoted as PRE in the KCRTS model. The topography within this on-site basin tends northerly. Runoff from the Existing Basin travels as overland sheet and shallow concentrated flows toward the ditches along the north side of the property.

Historic site conditions (i.e., fully forested) were considered in the analysis of the pre-developed site in accordance with KCSWDM standards for Conservation Flow Control. Table 4.1 summarizes the basin area and KCRTS input parameters for the existing (i.e., pre-developed) site conditions.

Table 4.1 - Existing Drainage Area Summary, On-site

Basin ID	Total Area (acres)	Land Cover (acres)		
		Impervious	Till Grass	Till Forest
PRE	6.537	0.00	0.00	6.537

Developed Site Hydrology

The site will be graded to accommodate the proposed single-family residential improvements. The grading, and associated drainage collection and conveyance systems, will maintain the general discharge patterns of the existing site conditions. Figure 5 shows the general drainage conditions and basin delineation for the developed site conditions.

There are two sub-basins associated with the developed site conditions of the site. The sub-basin denoted as POST in the KCRTS model covers the majority of the site and is the sub-basin which will be directed to the onsite detention vault for flow control. The sub-basin denoted as BYPASS in the KCRTS model covers the area associated with the ROW dedication along Woodinville-Duvall Road. The BYPASS sub-basin has an elevation which makes it impractical to route to the onsite detention vault as a result the vault has been designed to over detain the POST sub-basin in order to meet flow requirements for the site. As a result the point of compliance for the site is considered to be downstream of both the detention vault outlet and the BYPASS sub basin.

The POST sub-basin covers 6.098 acres of the site. This sub-basin includes all of the building lots, access roads, sidewalks, and buffer strips. Lots one through nine have been assumed to be fully developed to a condition consisting of 4,000sf impervious and the rest being landscaped. The storm tract and open space tract are considered landscaped. Lots 10 through13 have been assumed to be forested except for a 10,000sf clearing limit of which 4,000sf are considered impervious and 6,000sf are considered landscaped. The BYPASS sub-basin covers 0.439 acres of the site and consists of the 20ft ROW dedication. Of the 20ft ROW dedication, 6ft is considered impervious and 14ft is considered landscaped.

Summaries of the measured pervious and impervious areas for each basin under developed site conditions are shown below in Table 4.2. The total on-site impervious area shown in this table

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represents roadway, sidewalks, and building roofs. On-site pervious areas have been considered as "grass" or forested as described above for this preliminary analysis.

Table 4.2 - Developed Drainage Area Summary, On-site

Basin ID	Total Area (acres)	Land Cover (acres)		
		Impervious	Till Grass	Till Forest
POST	6.098	1.785	1.349	2.963
BYPASS	0.439	0.053	0.386	0.000

Performance Standards

Storm drainage controls for this project are proposed in accordance with current King County Surface Water Design Manual (KCSWDM, 2009) standards. These standards require Conservation Flow Control per Table 1.2.3.A and on-site water quality treatment facilities will be designed to provide Basic Water Quality Treatment standards.

The project proposes the use of a detention vault with an integrated wetpond for on-site runoff. A series of on-site catch basin inlets and underground pipes will collect and convey on-site runoff to this vault facility. The on-site flow control facility is designed such that the vault discharge compensates, or over-detains collected runoff for the undetained flows from the frontage improvements (i.e., no net increase in flow rates to downstream facilities). The attached *Conceptual Drainage Plan* (Figure 5) illustrates these storm drainage concepts.

Table 4.3 summarizes the design criteria for the on-site detention and water quality facilities.

Table 4.3 - Performance Standards

Facility	Flow Control Standard	Water Quality Treatment Standard
Pond w/ wetpond	Conservation Flow Control	Basic Water Quality Treatment

Flow Control Facilities

A flow control riser is proposed within the on-site detention vault to limit the release rate of stormwater to the offsite, downstream systems to Conservation Flow Control standards. This vault facility will be located on-site in a manner that will maintain the general pre-developed discharge patterns for the project site.

Separate flow control facilities are not proposed for the limited frontage improvements along Woodinville-Duvall Road (basin BYPASS). Instead, the on-site flow control facilities will be designed to "over-detain" flows to mitigate for any increased peak runoff rates from these limited bypass areas to maintain Point of Compliance (POC) standards for the overall project in accordance with KCWDM section 1.2.3.2(E). All five conditions of this section of the KCSWDM are met for the bypass areas. The point of convergence for each of the individual basin areas are well within a ¼ mile downstream of the facility discharge. The limited area of pollution generating impervious surfaces within these bypass areas is less than 5,000 square feet and the area of pollution generating pervious surface area is less than 35,000 square feet therefore, the bypassed area does not require separate water quality treatment facilities.

Table 4.4 provides a summary of the preliminary sizing criteria for the on-site detention facilities.

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*Table 4.4 – Detention Vault Sizing Summary**

Vault	Min. Required Detention Volume (cf)	Design Detention Volume (cf)	Allowable Release Rates (cfs)	
			2-Year	25-Year
VAULT	36,450	36,454	0.143	0.397

*See Section 4.1 for detailed KCRTS model results

Water Quality Facilities

Section 1.2.8.1(A) of the KCSWDM describes the criteria, intent, and treatment goals of the Basic Water Quality Menu for stormwater treatment for the project. Basic water quality treatment will be provided for the project by an integrated wetvault volume within the designed on-site vault. This wetvault provide dead storage in the vault to facilitate settling of pollution created by pollution generating surfaces on-site. The calculations for the wetpond sizing design as suggested by the KCSWDM are provided in Appendix B. The required wetvault geometry is based on the analysis summarized below in Table 4.5.

*Table 4.5 – Wetvault Geometry Summary**

Wetpond	Length x Width (ft)	Depth (ft)	Required Volume (sf)	Provided Volume (sf)
Wetpond	100 x 35	4.00	11,420	14,000

* See Appendix B for worksheet calculations

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SECTION 5 – CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Conveyance system for the site is proposed to consist of catch basins and below grade conveyance piping leading to the proposed stormwater detention vault. Catch basins and below grade piping will also be provided along the frontage of Woodinville-Duvall Road to facilitate capture of the bypass sub-basin and outflow from the stormwater detention vault to the existing publicly maintained stormwater system. A formal analysis of the proposed stormwater conveyance system will be provided as part of the final TIR.

SECTION 6 – SPECIAL REPORTS AND STUDIES

Copies of the Preliminary Geotechnical Engineering Report are to be provided under a separate cover.

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SECTION 7 – OTHER PERMITS

A list of permits to be obtained prior to City of Woodinville approval will be supplied as part of the final TIR.

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SECTION 8 – CSWPPP ANALYSIS AND DESIGN

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TESC Plan Analysis and Design

Site specific details and provisions for temporary erosion and sediment control (TESC) facilities are provided with the site improvement plans that accompany this TIR. The proposed facilities have been selected and sized in accordance with KCSWDM standards. Appendix D of this report contains specific calculations and/or details related to the TESC facilities for this project. In addition to the site-specific TESC measures, the following general Best Management Practices (BMPs) for sediment control shall also be implemented in accordance with the provisions of the KCSWDM:

1. Clearing Limits

To prevent disturbance of project areas not designated for construction, a construction clearing limits fence or silt fence will be installed by the Contractor along the entire project corridor. These fences will be installed in accordance with the KCSWDM Section D.4.1.1 prior to clearing and grading activities where appropriate.

2. Cover Measures

Temporary and permanent cover measures will be provided by the Contractor to protect disturbed areas. Mulching will be used in accordance with KCSWDM Section D.4.2.1 to provide temporary protection from erosion and to enhance plant growth. Plastic covering may be used following KCSWDM Section D.4.2.3 in order to protect cut and fill slopes and stockpiles, and/or to encourage grass growth in newly seeded areas. Disturbed areas will be seeded and mulched to provide permanent cover measure and to reduce erosion within seven days, if not worked.

3. Perimeter Protection

In order to reduce the transport of sediment offsite, the Contractor will install silt fences as indicated on the drawings prior to any up slope clearing, grading and trenching activities.

4. Traffic Area Stabilization

Stabilized pads of quarry spalls will be installed by the Contractor at all egress points from the project site to reduce the amount of sediment transported onto paved roads or other offsite areas by motor vehicles.

5. Sediment Retention

Sediment retention will be provided by rock check dams, silt traps, and silt fencing at the locations and dimensions shown on the drawings, with maintenance in accordance with KCSWDM Section D.4.5.

6. Surface Water Control

Surface water control will include ditches, check dams, and outlet protection at the locations and dimensions shown on the drawings, and maintained according to KCSWDM Section D.4.6. All proposed stormwater ponds will be constructed an operational prior to site grading activities to provide temporary sediment collection and surface water control.

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Dust Control

Water will be used by the Contractor according to KCSWDM Section D.4.7 to prevent wind transport of soil. Exposed soils will be sprayed until wet and
re-sprayed as needed. At the Contractor's option, a tackifier may be used with approval from the Engineer.

8. Wet Season Requirements

If soils are exposed during the period of October 1 to March 31, the Contractor will mulch and seed as much disturbed area as possible by the first week of October, in order to provide grass cover for the wet season. The Contractor will also conform to the following wet season special provisions:

A. Apply cover measures to disturbed areas that are to remain unworked for more than two days.
B. Protect stockpiles that are to remain unworked for more than 12 hours. No area is to be left uncovered/denuded longer than 12 hours during the winter months.
C. Provide onsite stockpiles of cover materials sufficient to cover all disturbed areas.
D. Seed all areas that are to be unworked during the wet season by the end of the first week of October.
E. Apply mulch to all seeded areas for protection.
F. Provide onsite storage of 50 linear feet of silt fence (and the necessary stakes) for every acre of disturbed area. Straw bales are to be stockpiled onsite for use in an emergency.
G. Provide construction road and parking lot stabilization areas for all sites.
H. Provide additional sediment retention as required by the King County Engineer.
I. Provide additional surface water controls as required by the King County Engineer.
J. Implement construction phasing and more conservative BMPs for construction activity near surface waters (to be evaluated).
K. Review and maintain TESC measures on a weekly basis and within 24-hours after any runoff-producing event.

9. Sensitive Areas Restrictions

The project does not require any disturbance of soils within the steep slope and erosion hazard areas. Construction shall be limited to the dry season (April 1 to September 30). If weather or construction conditions result in erosion or sediment discharge, or if additional sensitive areas are identified during construction, the Contractor will install additional controls to meet the requirements of Section D.5.3, and as approved by the Engineer.

10. Maintenance Requirements

All TESC measures will be maintained and reviewed on a regular basis following the maintenance requirements listed for each BMP in Section D.5.4. of the KCSWDM. A TESC supervisor will be designated by the Contractor and the name, address and phone number of the TESC supervisor will be given to the County prior to the start of construction. A sign will be posted at the primary entrance to the project site identifying the TESC supervisor and his/her phone number.

The TESC supervisor will inspect the site at least once a month during the dry season, weekly during the wet season, and within 24 hours of each runoff-producing storm. A standard TESC maintenance report will be used as a written record of all maintenance.

The Contractor will be responsible for phasing of erosion and sediment controls during construction so that they are coordinated with construction activities. The Contractor will also be responsible for maintenance of temporary controls during construction, including removal of accumulated sediment, and for the removal of the controls and remaining accumulated sediment at the completion of construction.

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11. Final Stabilization

Prior to obtaining final construction approval, the site shall be stabilized, the structural ESC measures removed and drainage facilities cleaned. To obtain final construction approval, the following conditions must be met as required by Section D.5.5 C Final Stabilization:

All disturbed areas of the site should be vegetated or otherwise permanently stabilized in accordance with project BMPs. At a minimum, disturbed areas should be seeded and mulched to provide a high likelihood that sufficient cover will develop shortly after final approval. The plans include erosion control notes and specifications for hydro-seeding and mulching disturbed areas.

Structural measures such as silt fences, pipe slope drains, storm drain inlet protection and sediment traps and ponds shall be removed once the proposed improvements are complete and vegetated areas are stabilized. All permanent surface water facilities shall be cleaned completely and restored to working order prior to removal of TESC facilities.

SECTION 9 – BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

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To be submitted as part of the final TIR.

SECTION 10 – OPERATIONS AND MAINTENANCE MANUAL

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The storm drainage collection and conveyance systems located on the site will be publicly maintained. All systems have been designed in accordance with KCSWDM standards. Copies of the applicable portions of the *Maintenance Requirements, Flow Control, Conveyance, and WQ Facilities* section of the KCSWDM (Appendix A) will be included with the facility sketches in Appendix F of the final TIR.

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FIGURES

Site Planning
Civil Engineering
Project Management
Land Development Consulting

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TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner:	Brickyard Ridge, LLC
Phone:	(425) 417-3455
Address:	10257 NE 64th Street
	Kirkland, WA 98033
Project Engineer:	Jamie Schroeder
Phone:	(425) 285-2392

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name:	Brickyard Ridge	
DDES Permit #:		
Location:	Township:	26N
	Range:	5E
	Section:	11
Site Address:	15215 NE Woodinville-Duvall Rd	
	Woodinville, WA 98072	

Part 3 TYPE OF PERMIT APPLICATION

- ☒ Landuse Services
  Subdivison / Short Subd. / UPD
- ☐ Building Services
  M/F / Commerical / SFR
- ☒ Clearing and Grading
- ☒ Right-of-Way Use
- ☐ Other _____

Part 4 OTHER REVIEWS AND PERMITS

- ☐ DFW HPA
- ☐ COE 404
- ☐ DOE Dam Safety
- ☐ FEMA Floodplain
- ☐ COE Wetlands
- ☐ Shoreline Management
- ☒ Structural Rockery/Vault/ Walls
- ☐ ESA Section 7
- ☒ Other See Section 7 of TIR

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report	Site Improvement Plan (Engr. Plans)
Type of Drainage Review (circle): (Full) / Targeted / Large Site	Type (circle one): (Full) / Modified / Small Site
Date (include revision dates): _____	Date (include revision dates): _____
Date of Final: _____	Date of Final: _____

Part 6 ADJUSTMENT APPROVALS

Type (circle one): Standard / Complex / Preapplication / Experimental / Blanket

Description: (include conditions in TIR Section 2)
N/A

Date of Approval: _____

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TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS

Monitoring Required: Yes / (No)
Start Date:
Completion Date:

Describe:

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan: North Shore
Special District Overlays: N/A

Drainage Basin: Little Bear Creek
Stormwater Requirements: Conservation FC, Basic WQ

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

- ☐ River/Stream
- ☐ Lake
- ☐ Wetlands
- ☐ Closed Depression
- ☐ Floodplain
- ☐ Other
- ☒ Steep Slope
- ☐ Erosion Hazard
- ☐ Landslide Hazard
- ☐ Coal Mine Hazard
- ☐ Seismic Hazard
- ☐ Habitat Protection

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
AgC	6 – 15%	Moderate

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

☐ Additional Sheets Attached

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

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Part 11 DRAINAGE DESIGN LIMITATIONS

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

☐ Additional Sheets Attached

Part 12 TIR SUMMARY SHEET

(provide one TIR Summary Sheet per Threshold Discharge Area)

Threshold Discharge Area: (name or description)	
Core Requirements (all 8 apply)	
Discharge at Natural Location	Number of Natural Discharge Locations: 1
Offsite Analysis	Level: (1) / 2 / 3 Dated: 5/30/2013
Flow Control (include a facility summary sheet)	Level: 1 / (2) / 3 or Exemption Number _____ Small Site BMP's: _____
Conveyance System	Spill containment located at:
Erosion and Sediment Control	ESC Site Supervisor: TBD Contact Phone: After Hours Phone:
Maintenance and Operation	Responsibility: Private / (Public) If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: (Yes) / No
Water Quality (include facility summary sheet)	Type: (Basic) / Sens. Lake / Enhanced Basicm / Bog or Exemption No. _____ Landscape Management Plan: Yes / No
Special Requirements (as applicable)	
Area Specific Drainage Requirements	Type: CDA / SDO / MDP / BP / LMP / Shared Fac / (None) Name: _____
Floodplain/Floodway Delineation	Type: Major / Minor / Exemption / (None) 100-year Base Flood Elevation (or range): _____ Datum:
Flood Protection Facilities	Description: Closed Conveyance System (Proposed and existing)
Source Control (comm./industrial landuse)	Describe landuse: SFR Describe any structural controls: None
Oil Control	High-use Site: Yes / (No) Treatment BMP: _____ Maintenance Agreement: Yes / (No) with whom?:
Other Drainage Structures	
Describe:	

EXHIBIT 9
PAGE 13 OF 28

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 13 EROSION AND SEDIMNET CONTROL REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☒ Clearing Limits	☒ Stabilize Exposed Surfaces
☒ Cover Measures	☒ Remove and Restore Temporary ESC Facilities
☒ Perimeter Protection	☒ Clean and Remove All Silt and Debris Ensure Operation of Permanent Facilities
☒ Traffic Area Stabilization	☐ Flag Limits of SAO and open space preservation areas
☒ Sediment Retention	☐ Other _____
☒ Surface Water Control	
☒ Dust Control	
☒ Construction Sequence	

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

Flow Control	Type/Description	Water Quality	Type/Description
☒ Detention	Vault	☐ Biofiltration	
☐ Infiltration		☒ Wetpool	Vault
☐ Regional Facility		☐ Media Filtration	
☐ Shared Facility		☐ Oil Control	
☐ Small Site BMP's		☐ Spill Control	
☐ Other		☐ Small Site BMP's	
		☐ Other	

Part 15 EASEMENTS / TRACTS

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

Part 16 STRUCTURAL ANALYSIS

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

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER

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

Jamie B Shu
Signed

5/30/2013
Date

CSIT0670312
OTOP0670312
ORD0670312

FIGURE 4: EXISTING CONDITIONS

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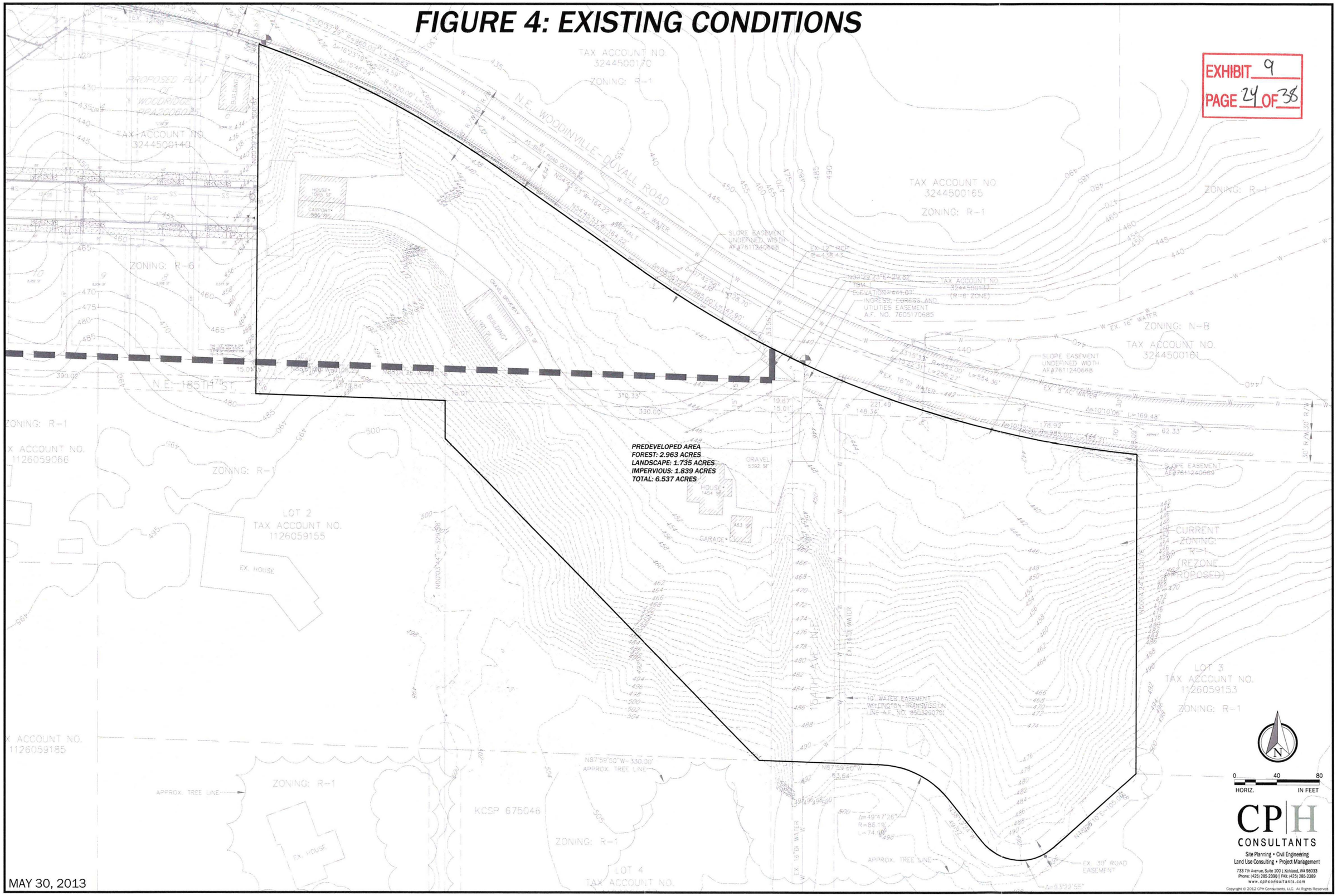

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FIGURE 5: DEVELOPED CONDITIONS

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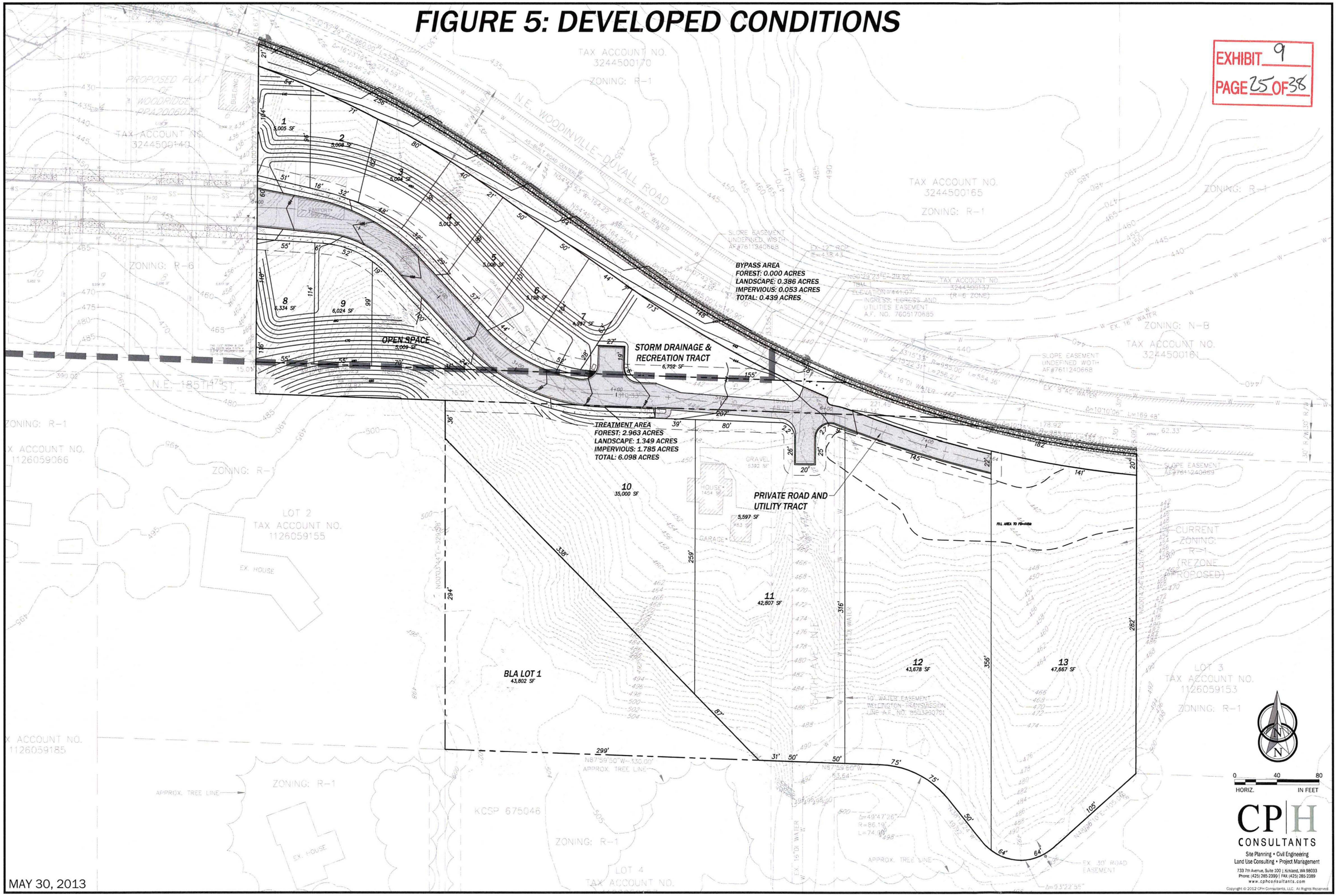

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APPENDIX A

OFFSITE ANALYSIS – LEVEL 1 DOWNSTREAM

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OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE
SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin: Brickyard Ridge **Subbasin Name: On-site** **Subbasin Number: 1**

Symbol	Drainage Component Type, Name, and Size	Drainage Component Description	Slope	Distance from site discharge	Existing Problems	Potential Problems	Observations of field inspector, resource reviewer, or resident
see map	Type: sheet flow, swale, stream, channel, pipe, pond; Size: diameter, surface area	drainage basin, vegetation, cover, depth, type of sensitive area, volume	%	¼ ml = 1,320 ft.	constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion		tributary area, likelihood of problem, overflow pathways, potential impacts
1	Overland sheet flow	Forest and native ground cover	0-15	0-520	None observed	Sedimentation	No problems observed
2	Overland sheet flow	Forest and native ground cover	15-30	0-520	None observed	Sedimentation	No problems observed
3	Overland sheet flow	Forest and native ground cover	30-40	100	None observed	Sedimentation and Erosion	No problems observed
4	Overland sheet flow	Asphalt, gravel and managed landscape	30	150-200	None observed	Sedimentation	No problems observed
5	Storage pond	Aquatic vegetation	0	20	None observed	Sedimentation	No problems observed
6	Closed pipe flow	Existing storm drainage system	4	30	None observed	Clogging due to sedimentation	No problems observed

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APPENDIX B

STORMWATER CALCULATIONS

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APPENDIX B.1

WATER QUALITY CALCULATIONS

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Project Management
Land Development Consulting

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Client/Project BRICKYARD RIDGE Project No. 2067-13-002

Subject COMBINED WETVAULT

Prepared by GG Date 4/19/13 Checked by _____ Date _____

EXHIBIT 9
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$V_R = [.9 A_I + .25 A_{TG} + .10 A_{TF} + .01 A_O] R$

$V_R = [.9(1.785_{AC} \cdot 43560_{FT^2/AC}) + .25(1.349_{AC} \cdot 43560_{FT^2/AC}) + .10(2.963_{AC} \cdot 43560_{FT^2/AC})] \times .039_{FT}$

$V_R = 3805.50_{CF}$

$V_B = 3(3805.5_{CF}) = 11,416.5_{CF}$

V_{VAULT}: 100' x 35' x 3.26'

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EXHIBIT 9
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APPENDIX B.2

DETENTION CALCULATIONS

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EXHIBIT 9
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Retention/Detention Facility

Type of Facility:	Detention Vault	
Facility Length:	64.00	ft
Facility Width:	64.00	ft
Facility Area:	4096.	sq. ft
Effective Storage Depth:	8.90	ft
Stage 0 Elevation:	0.00	ft
Storage Volume:	36454.	cu. ft
Riser Head:	8.90	ft
Riser Diameter:	18.00	inches
Number of orifices:	3	

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	1.09	0.119	
2	5.00	1.95	0.302	4.0
3	6.50	1.22	0.107	4.0

Top Notch Weir: None
Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	Storage (ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	0.00	0.	0.000	0.000	0.00
0.01	0.01	41.	0.001	0.003	0.00
0.02	0.02	82.	0.002	0.005	0.00
0.03	0.03	123.	0.003	0.006	0.00
0.05	0.05	205.	0.005	0.007	0.00
0.06	0.06	246.	0.006	0.008	0.00
0.07	0.07	287.	0.007	0.008	0.00
0.08	0.08	328.	0.008	0.009	0.00
0.09	0.09	369.	0.008	0.010	0.00
0.27	0.27	1106.	0.025	0.017	0.00
0.44	0.44	1802.	0.041	0.022	0.00
0.61	0.61	2499.	0.057	0.025	0.00
0.79	0.79	3236.	0.074	0.029	0.00
0.96	0.96	3932.	0.090	0.032	0.00
1.14	1.14	4669.	0.107	0.035	0.00
1.31	1.31	5366.	0.123	0.037	0.00
1.49	1.49	6103.	0.140	0.040	0.00
1.66	1.66	6799.	0.156	0.042	0.00
1.84	1.84	7537.	0.173	0.044	0.00
2.01	2.01	8233.	0.189	0.046	0.00
2.19	2.19	8970.	0.206	0.048	0.00
2.36	2.36	9667.	0.222	0.050	0.00
2.53	2.53	10363.	0.238	0.052	0.00
2.71	2.71	11100.	0.255	0.053	0.00
2.88	2.88	11796.	0.271	0.055	0.00
3.06	3.06	12534.	0.288	0.057	0.00
3.23	3.23	13230.	0.304	0.058	0.00

EXHIBIT 9
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3.41	3.41	13967.	0.321	0.060	0.00
3.58	3.58	14664.	0.337	0.061	0.00
3.76	3.76	15401.	0.354	0.063	0.00
3.93	3.93	16097.	0.370	0.064	0.00
4.10	4.10	16794.	0.386	0.066	0.00
4.28	4.28	17531.	0.402	0.067	0.00
4.45	4.45	18227.	0.418	0.069	0.00
4.63	4.63	18964.	0.435	0.070	0.00
4.80	4.80	19661.	0.451	0.071	0.00
4.98	4.98	20398.	0.468	0.072	0.00
5.00	5.00	20480.	0.470	0.073	0.00
5.02	5.02	20562.	0.472	0.073	0.00
5.04	5.04	20644.	0.474	0.076	0.00
5.06	5.06	20726.	0.476	0.080	0.00
5.08	5.08	20808.	0.478	0.086	0.00
5.10	5.10	20890.	0.480	0.093	0.00
5.12	5.12	20972.	0.481	0.101	0.00
5.14	5.14	21053.	0.483	0.110	0.00
5.16	5.16	21135.	0.485	0.115	0.00
5.34	5.34	21873.	0.502	0.135	0.00
5.51	5.51	22569.	0.518	0.150	0.00
5.69	5.69	23306.	0.535	0.163	0.00
5.86	5.86	24003.	0.551	0.175	0.00
6.04	6.04	24740.	0.568	0.185	0.00
6.21	6.21	25436.	0.584	0.195	0.00
6.38	6.38	26132.	0.600	0.204	0.00
6.50	6.50	26624.	0.611	0.209	0.00
6.51	6.51	26665.	0.612	0.210	0.00
6.53	6.53	26747.	0.614	0.212	0.00
6.54	6.54	26788.	0.615	0.214	0.00
6.55	6.55	26829.	0.616	0.217	0.00
6.56	6.56	26870.	0.617	0.220	0.00
6.58	6.58	26952.	0.619	0.224	0.00
6.59	6.59	26993.	0.620	0.226	0.00
6.60	6.60	27034.	0.621	0.227	0.00
6.61	6.61	27075.	0.622	0.229	0.00
6.79	6.79	27812.	0.638	0.245	0.00
6.96	6.96	28508.	0.654	0.258	0.00
7.14	7.14	29245.	0.671	0.270	0.00
7.31	7.31	29942.	0.687	0.281	0.00
7.49	7.49	30679.	0.704	0.292	0.00
7.66	7.66	31375.	0.720	0.302	0.00
7.84	7.84	32113.	0.737	0.312	0.00
8.01	8.01	32809.	0.753	0.321	0.00
8.18	8.18	33505.	0.769	0.330	0.00
8.36	8.36	34243.	0.786	0.338	0.00
8.53	8.53	34939.	0.802	0.347	0.00
8.71	8.71	35676.	0.819	0.355	0.00
8.88	8.88	36372.	0.835	0.363	0.00
8.90	8.90	36454.	0.837	0.364	0.00
9.00	9.00	36864.	0.846	0.830	0.00
9.10	9.10	37274.	0.856	1.680	0.00
9.20	9.20	37683.	0.865	2.780	0.00

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9.30	9.30	38093.	0.874	4.080	0.00
9.40	9.40	38502.	0.884	5.550	0.00
9.50	9.50	38912.	0.893	6.980	0.00
9.60	9.60	39322.	0.903	7.510	0.00
9.70	9.70	39731.	0.912	8.010	0.00
9.80	9.80	40141.	0.922	8.470	0.00
9.90	9.90	40550.	0.931	8.910	0.00
10.00	10.00	40960.	0.940	9.330	0.00
10.10	10.10	41370.	0.950	9.730	0.00
10.20	10.20	41779.	0.959	10.120	0.00
10.30	10.30	42189.	0.969	10.490	0.00
10.40	10.40	42598.	0.978	10.850	0.00
10.50	10.50	43008.	0.987	11.190	0.00
10.60	10.60	43418.	0.997	11.530	0.00
10.70	10.70	43827.	1.006	11.850	0.00

Hyd	Inflow	Outflow	Peak Stage	Peak Elev	Storage (Cu-Ft)	Storage (Ac-Ft)
1	1.34	1.12	9.03	9.03	37003.	0.849
2	0.67	0.36	8.90	8.90	36444.	0.837
3	0.72	0.23	6.59	6.59	26984.	0.619
4	0.67	0.26	7.06	7.06	28902.	0.664
5	0.79	0.27	7.10	7.10	29071.	0.667
6	0.43	0.13	5.30	5.30	21720.	0.499
7	0.49	0.07	4.36	4.36	17876.	0.410
8	0.47	0.05	2.36	2.36	9675.	0.222

Hyd	R/D Facility Outflow	Tributary Inflow	Reservoir Inflow	POC Outflow Target	POC Outflow Calc
1	1.12	0.13	********	0.61	1.21
2	0.36	0.06	********	*******	0.40
3	0.23	0.06	********	*******	0.24
4	0.26	0.06	********	*******	0.29
5	0.27	0.07	********	*******	0.29
6	0.13	0.04	********	*******	0.14
7	0.07	0.04	********	*******	0.09
8	0.05	0.04	********	*******	0.08

```
----------------------------------
Route Time Series through Facility
  Inflow Time Series File:post.tsf
 Outflow Time Series File:rdout
     POC Time Series File:dsout

Inflow/Outflow Analysis
   Peak Inflow Discharge:       1.34 CFS at  6:00 on Jan  9 in Year 8
  Peak Outflow Discharge:       1.12 CFS at  9:00 on Jan  9 in Year 8
    Peak Reservoir Stage:       9.03  Ft
     Peak Reservoir Elev:       9.03  Ft
  Peak Reservoir Storage:   37003.    Cu-Ft
                        :       0.849 Ac-Ft

Add Time Series:bypass.tsf
```

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Peak Summed Discharge: 1.21 CFS at 9:00 on Jan 9 in Year 8
Point of Compliance File:dsout.tsf

Flow Duration from Time Series File:rdout.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.005	37875	61.766	61.766	38.234	0.382E+00
0.015	7456	12.159	73.925	26.075	0.261E+00
0.026	5854	9.547	83.472	16.528	0.165E+00
0.036	3858	6.292	89.764	10.236	0.102E+00
0.046	2593	4.229	93.992	6.008	0.601E-01
0.056	1555	2.536	96.528	3.472	0.347E-01
0.067	1004	1.637	98.165	1.835	0.183E-01
0.077	608	0.992	99.157	0.843	0.843E-02
0.087	58	0.095	99.251	0.749	0.749E-02
0.097	46	0.075	99.326	0.674	0.674E-02
0.107	23	0.038	99.364	0.636	0.636E-02
0.118	49	0.080	99.444	0.556	0.556E-02
0.128	52	0.085	99.529	0.471	0.471E-02
0.138	50	0.082	99.610	0.390	0.390E-02
0.148	17	0.028	99.638	0.362	0.362E-02
0.158	20	0.033	99.671	0.329	0.329E-02
0.169	16	0.026	99.697	0.303	0.303E-02
0.179	17	0.028	99.724	0.276	0.276E-02
0.189	20	0.033	99.757	0.243	0.243E-02
0.199	19	0.031	99.788	0.212	0.212E-02
0.210	28	0.046	99.834	0.166	0.166E-02
0.220	7	0.011	99.845	0.155	0.155E-02
0.230	11	0.018	99.863	0.137	0.137E-02
0.240	14	0.023	99.886	0.114	0.114E-02
0.250	13	0.021	99.907	0.093	0.930E-03
0.261	9	0.015	99.922	0.078	0.783E-03
0.271	11	0.018	99.940	0.060	0.603E-03
0.281	3	0.005	99.945	0.055	0.554E-03
0.291	6	0.010	99.954	0.046	0.457E-03
0.302	6	0.010	99.964	0.036	0.359E-03
0.312	3	0.005	99.969	0.031	0.310E-03
0.322	3	0.005	99.974	0.026	0.261E-03
0.332	3	0.005	99.979	0.021	0.212E-03
0.342	3	0.005	99.984	0.016	0.163E-03
0.353	4	0.007	99.990	0.010	0.978E-04
0.363	4	0.007	99.997	0.003	0.326E-04

Flow Duration from Time Series File:dsout.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.006	38030	62.019	62.019	37.981	0.380E+00
0.017	7463	12.171	74.189	25.811	0.258E+00
0.028	5666	9.240	83.430	16.570	0.166E+00
0.039	3883	6.332	89.762	10.238	0.102E+00
0.050	2607	4.251	94.013	5.987	0.599E-01
0.061	1511	2.464	96.477	3.523	0.352E-01
0.073	1025	1.672	98.149	1.851	0.185E-01

0.084	532	0.868	99.017	0.983	0.983E-02
0.095	116	0.189	99.206	0.794	0.794E-02
0.106	65	0.106	99.312	0.688	0.688E-02
0.117	34	0.055	99.367	0.633	0.633E-02
0.128	52	0.085	99.452	0.548	0.548E-02
0.140	53	0.086	99.538	0.462	0.462E-02
0.151	47	0.077	99.615	0.385	0.385E-02
0.162	17	0.028	99.643	0.357	0.357E-02
0.173	20	0.033	99.675	0.325	0.325E-02
0.184	16	0.026	99.702	0.298	0.298E-02
0.195	17	0.028	99.729	0.271	0.271E-02
0.207	21	0.034	99.764	0.236	0.236E-02
0.218	20	0.033	99.796	0.204	0.204E-02
0.229	15	0.024	99.821	0.179	0.179E-02
0.240	13	0.021	99.842	0.158	0.158E-02
0.251	16	0.026	99.868	0.132	0.132E-02
0.262	16	0.026	99.894	0.106	0.106E-02
0.273	10	0.016	99.910	0.090	0.897E-03
0.285	9	0.015	99.925	0.075	0.750E-03
0.296	10	0.016	99.941	0.059	0.587E-03
0.307	4	0.007	99.948	0.052	0.522E-03
0.318	7	0.011	99.959	0.041	0.408E-03
0.329	4	0.007	99.966	0.034	0.342E-03
0.340	3	0.005	99.971	0.029	0.294E-03
0.352	3	0.005	99.976	0.024	0.245E-03
0.363	2	0.003	99.979	0.021	0.212E-03
0.374	3	0.005	99.984	0.016	0.163E-03
0.385	6	0.010	99.993	0.007	0.652E-04
0.396	3	0.005	99.998	0.002	0.163E-04

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Duration Comparison Anaylsis
Base File: pre.tsf
New File: dsout.tsf
Cutoff Units: Discharge in CFS

	-----Fraction of Time-----			---------Check of Tolerance-------			
Cutoff	Base	New	%Change	Probability	Base	New	%Change
0.000	0.39E+00	0.84E+00	******	0.39E+00	0.000	0.005	******
0.032	0.48E-01	0.14E+00	195.1	0.48E-01	0.032	0.055	72.7
0.063	0.18E-01	0.32E-01	73.1	0.18E-01	0.063	0.073	14.6
0.095	0.86E-02	0.79E-02	-7.8	0.86E-02	0.095	0.090	-5.4
0.127	0.56E-02	0.55E-02	-1.2	0.56E-02	0.127	0.126	-0.5
0.159	0.40E-02	0.37E-02	-7.8	0.40E-02	0.159	0.147	-7.2
0.190	0.28E-02	0.28E-02	0.6	0.28E-02	0.190	0.191	0.1
0.222	0.20E-02	0.19E-02	-5.0	0.20E-02	0.222	0.219	-1.3
0.254	0.12E-02	0.12E-02	4.1	0.12E-02	0.254	0.256	0.9
0.286	0.67E-03	0.75E-03	12.2	0.67E-03	0.286	0.288	0.9
0.317	0.29E-03	0.41E-03	38.9	0.29E-03	0.317	0.342	7.7
0.349	0.18E-03	0.24E-03	36.4	0.18E-03	0.349	0.370	6.0
0.381	0.13E-03	0.98E-04	-25.0	0.13E-03	0.381	0.377	-0.9
0.412	0.16E-04	0.00E+00	-100.0	0.16E-04	0.412	0.397	-3.7

Maximum positive excursion = 0.013 cfs (*****%)
occurring at 0.000 cfs on the Base Data:pre.tsf

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```
and at 0.013 cfs on the  New Data:dsout.tsf

Maximum negative excursion = 0.012 cfs ( -7.6%)
occurring at 0.162 cfs on the Base Data:pre.tsf
and at 0.150 cfs on the  New Data:dsout.tsf
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CONSULTANTS

EXHIBIT 9
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APPENDIX C

GEOTECHNICAL ENGINEERING REPORT
BY ROBINSON NOBLE, INC. (MAY 6, 2013)

SUBMITTED SEPARATELY