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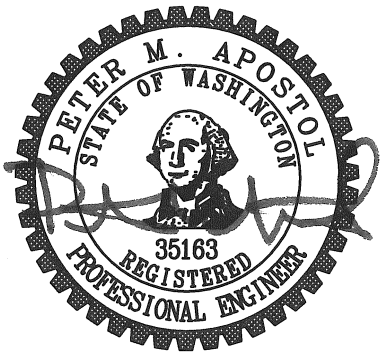
PRELIMINARY
STORMWATER SITE PLAN REPORT

Project: Redmond Integrated Service Center
15511 NE 90th Street
Redmond, WA 98052

Prepared For: Third Place Design CO-OP
117 Wester Ave W, Suite 266
Seattle, WA 98119

Prepared By: Max Berde, PE
Reviewed By: Peter Apostol, PE

Date: September 1, 2016



"I hereby certify that this Stormwater Site Plan for the Redmond Integrated Service Center Redevelopment Project has been prepared by me or under my supervision and meets minimum standards of City of Redmond and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."

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SECTION I – PROJECT OVERVIEW

General Description:
The Redmond Integrated Service Center project site is located at the existing Sammamish River Business Park Buildings in Redmond, WA. The site address is 15511 NE 90th Street, Redmond, WA 98052 (see Figure 1 for vicinity map). The project site includes existing developed approximately 1.72 acres.
The proposed improvements will consist of the following major items of work:

- Demolition of both existing office buildings (combined footprint of 34170 SF)
- Construction of 2-story Service Center building (approx.14,000 SF footprint)
- Construction of parking lot and utility improvements

Existing Conditions:
The existing site for the Redmond Integrated Service Center project consists of an existing 17,114 SF office and warehouse structure on the west portion of the site and associated impervious parking and loading areas to the south, west, and east of the building. Refer to Figure 2 and Appendix D for the existing soils. On the east portion of site consists of an existing 17,056 SF office and warehouse with associated impervious parking and loading areas to the east and south of the building (see Figure 3 for a graphical depiction of the Project Site's existing surfaces).

The site is generally flat and has been graded to drain to catch basins throughout the site. Slopes are generally less than 5%.

The site has an existing storm drainage collection and conveyance system via 6-12" PVC and CMP pipe between catch basins. Runoff is conveyed from the southern portion of the site to the northern end, where it heads east and is discharged into Sammamish River. Refer to Figure 4 for the existing hydrology. Using WWHM, the release rates for the existing site are 0.605, 0.879, and 1.247 cfs for the 2, 10, and 50 year return periods, respectively. Refer to Appendix B for the pre and post developed drainage calculations.

Developed Conditions:
The proposed site for the Redmond Integrated Service Center projects consists of an approximately 14,000 SF two story building, a 315 SF green house, 25,000 SF of parking lot, 3 bioretention areas with a total of 715 SF of bottom area, as well as a new storm drainage system and utility connections. Refer to Figure 5 for the proposed developed conditions.

The proposed redeveloped site is graded such that stormwater runoff from pollution-generating impervious surfaces (PGIS) sheets flows to curb scuppers for collection and then into bioretention areas to provide enhanced water quality treatment. Treated stormwater is then conveyed the existing stormwater line, which discharges into the Sammamish River.

All non PGIS will be conveyed to the existing stormwater system and discharged into the Sammamish River via catch basins, area drains, and stormwater lines. Refer to Figure 6

for the developed hydrology (drainage basin map). Using WWHM, the release rates for the proposed developed site are 0.489, 0.724, and 0.947 cfs for the 2, 10, and 50 year return periods, respectively. Refer to Appendix B for the pre and post developed drainage calculations.

Although the site has high seasonal groundwater, onsite infiltration is proposed for clean stormwater runoff from the building's roof into 2' deep infiltration galleries to the west and east of the building. Due to the high groundwater readings onsite, only 3.0' of separation is possible from the bottom of infiltration gallery to the high groundwater reading determined by the City of Redmond. Per the 2005 Department of Ecology Stormwater Management Manual, a groundwater mounding analysis is in process to determine if 3.0' is adequate separate from the groundwater for infiltration to occur.

The proposed site also lies within the City of Redmond Wellhead Protection Zone 2, which prohibits infilitration of PGIS runoff.

The water quality requirements of the 2005 Department of Ecology Stormwater Management Manual for Western Washington and the City of Redmond Stormwater Modifications will be met through the use of onsite bioretention cells. Refer to Appendix C for preliminary bioretention calculations.

Pre- and Post- Developed Release Rates

Return Period	Pre-developed	Post-developed
2 year	0.605 cfs	0.489 cfs
10 year	0.879 cfs	0.724 cfs
50 year	1.247 cfs	0.947 cfs

Minimum Requirements:
The project will meet requirements of the City of Redmond and the 2005 Department of Ecology (DOE) manual. Since the project site has more than 35% of existing impervious coverage it is classified as a redevelopment. Since the site has more than 5,000 square feet of proposed new plus replaced impervious surfaces, the project must be in compliance with Minimum Requirements #1 through #9 (per Figure 2.3 of the 2012 DOE Manual). The following is a summary of how these requirements are being met:

Minimum Requirement #1 - Preparation of Stormwater Site Plans
Stormwater site plans have been developed and include this report and plans which are included in Appendix A.

Minimum Requirement #2 - Construction Stormwater Pollution Prevention (SWPP)

A Construction Stormwater Pollution Prevention Plan will be completed for the project including a temporary erosion and sedimentation control plan which the Contractor will implement.

Minimum Requirement #3 - Source Control of Pollution
As required by the City of Redmond, operational and structural source control BMPs for the proposed use of the site will be implemented with the project.

Minimum Requirement #4 - Preservation of Natural Drainage Systems and Outfalls
Existing flow patterns will not be altered by the proposed improvements and existing discharge points will be maintained (Sammamish River).

Minimum Requirement #5 - Onsite Stormwater Management
All new landscape areas within the project will have compost-amended soils per City of Redmond requirements. Existing impervious site coverage makes dispersion BMPs infeasible. Onsite treated stormwater is proposed to be discharged into the Sammamish River. Roof runoff is proposed to be infiltrated onsite.

Minimum Requirement #6 – Runoff Treatment
Runoff Treatment is required as the amount of on-site pollution generating impervious surfaces is greater than the 5,000 SF threshold requirement. Bioretention cells are proposed to provide enhanced water quality treatment. Cells will be lined to protect the well head and prevent PGIS runoff from infiltrating.

Minimum Requirement #7 – Flow Control
A basin analysis has been performed to determine the impacts of direct discharge of site stormwater to an existing conveyance outfall in the Sammamish River. The project site is drained by a conveyance system that is comprised entirely of manmade conveyance elements that extends to the ordinary high water line of the exempt receiving water, though it does experience tailwater effects depending on the level of the Sammamish River.

Minimum Requirement #8 – Wetlands Protection
Minimum Requirement #8 is not applicable to this project.

Minimum Requirement #9 – Operation and Maintenance
An Operations and Maintenance Manual for the onsite stormwater facilities will be prepared at a later date.

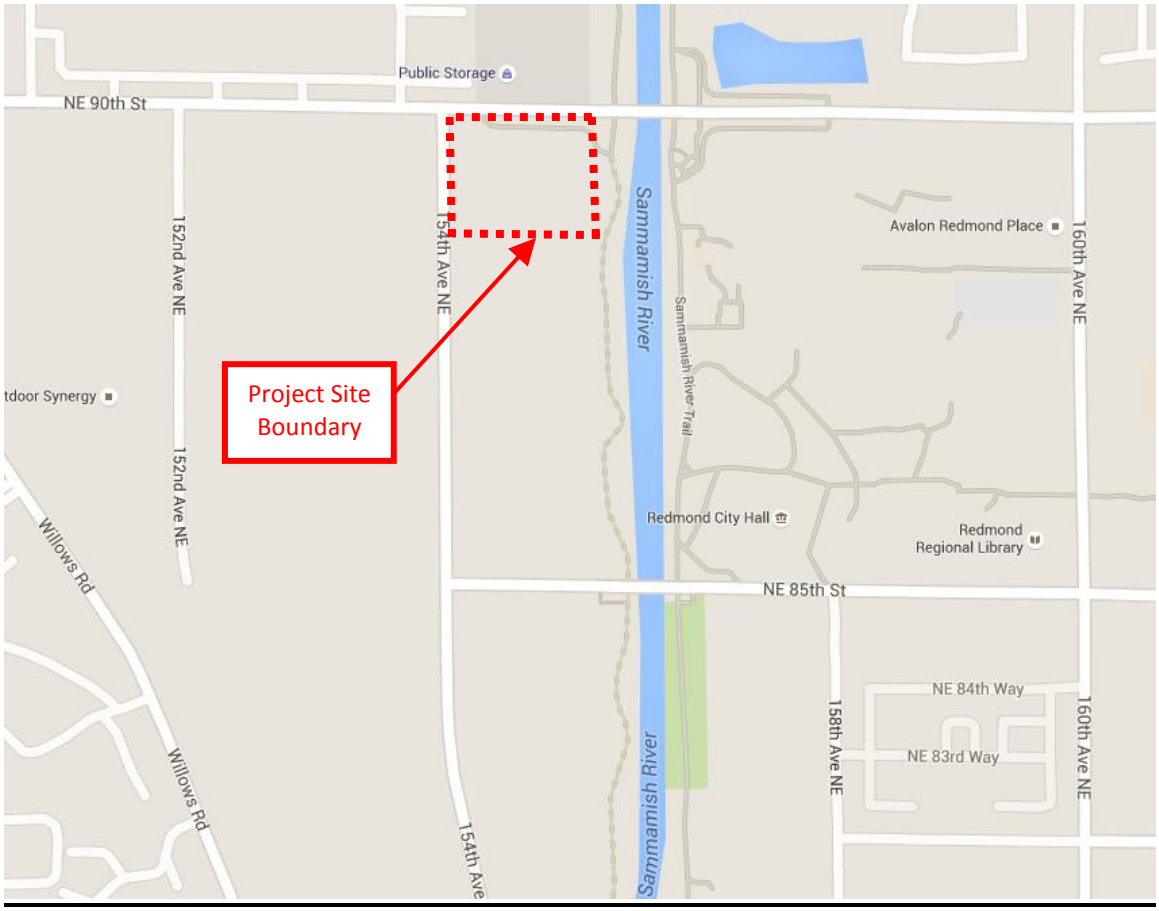

FIGURE 1 – VICINITY MAP

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SECTION II –EXISTING CONDITIONS SUMMARY

The existing topographical and physical conditions of the project area including existing buildings, existing utilities, and other natural features is indicated on Figure 3, the topographic survey, which follows this Section.

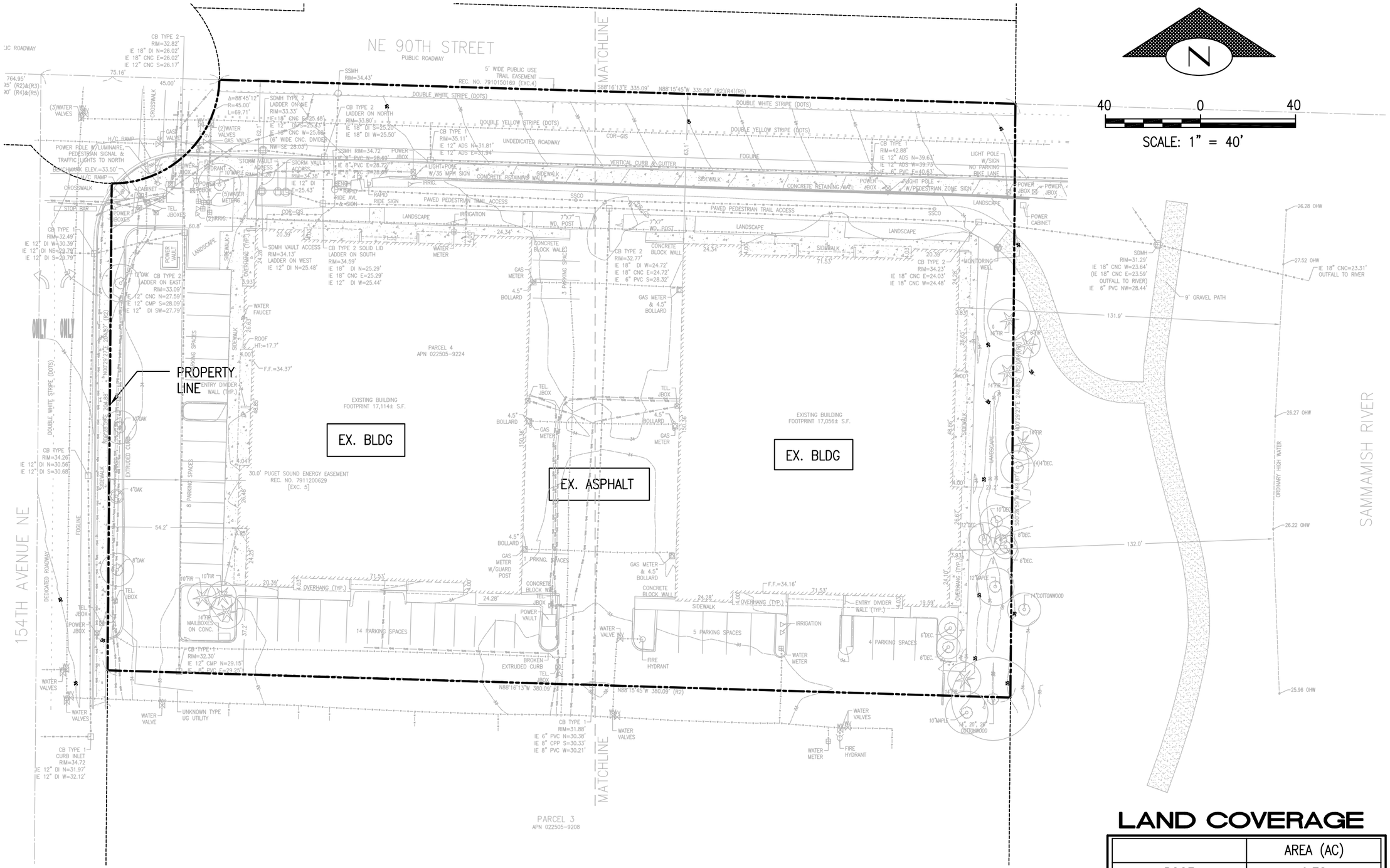
Site Soils
Per the NRCS soils survey (see Figure 2 below), the onsite soils consist of Indianola Loamy Fine Sand, which are part of the SCS Hydrologic Group A.

Topography
The site is generally flat and has been graded to drain to catch basins throughout the site. Slopes are generally less than 5%. The right-of-way on NE 68th St drains the west.

Critical Areas
The site lies within the FEMA 100-year floodplain for the Sammamish River. The Base Flood Elevation at this particular location is 33.6', NAVD 88 datum. To ensure the proposed site has a positive net floodplain storage in comparison to the existing sites floodplain storage, a Civil3D model was run comparing the volume lying under the BFE for both the existing and proposed site. The existing site has a floodplain storage of 340 cubic yards, while the proposed site has a floodplain storage of 550 cubic yards, meeting the compensatory storage requirement. Refer to Appendix E for visualization of existing and proposed floodplain storage.

Existing site soils are Snohomish silt loam, SCS Hydrologic Group C.

FIGURE 2 – SOILS



LAND COVERAGE

	AREA (AC)
ROOF	0.78
PARKING/SIDEWALK	0.78
LAWN	0.16

FIGURE 3 - EXISTING CONDITIONS

SCALE 1" - 40'

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SECTION III –OFFSITE ANALYSIS

Offsite analysis for this site consisted of research of the existing conveyance systems both upstream and downstream of the proposed site. A drainage report was obtained from the City of Redmond, completed in 1999 along NE 90th Street. Upstream, water is conveyed from both 154th Avenue NE and NE 90th Street through catch basins and 12" and 18" storm lines. An estimated 0.515 acres is collected and conveyed to the north east corner of the property site from 154th ave, and an estimated 0.273 acres is collected and conveyed tro the same spot from NE 90th street. This stormwater runoff combines into an 18" line at the NE corner of the proposed site, at a slope of 0.7%. The proposed on-site stormwater will replace the existing onsite storm lines, connecting at the same catch offsite catch basins as before. As shown in Figures 4 and 6, the release rate for the proposed site will decrease from the existing site's release rate.

Downstream analysis of the proposed site revealed that the conveyance system for this site consists entirely of manmade-structures (18" concrete pipe), discharging below the ordinary high water line of the Sammamish River.

See the supplemental Basin Analysis of the NE 90th St conveyance system for more information.

SECTION IV - PERMANENT STORMWATER CONTROL PLAN

The proposed site improvements have been designed to drain stormwater runoff to bioretention cells located in the site parking lot islands. The bioretention cells will provide enhanced water quality treatment. The cells will be lined and include an underdrain to protect the well head

Water Quality System

Proposed improvements will result in more than 5,000 SF of pollution generating surfaces. Construction of a stormwater treatment facility is therefore required. The project site required enhanced water quality treatment per DOE and City of Redmond requirements. Bioretention cells are proposed to provide enhanced treatment before infiltrating stormwater onsite.

Preliminary bioretention sizing was completed using MGSFloodV4 (15 min time step), an approved program by the Department of Ecology, to ensure at least 91% of runoff is treated through the facility.

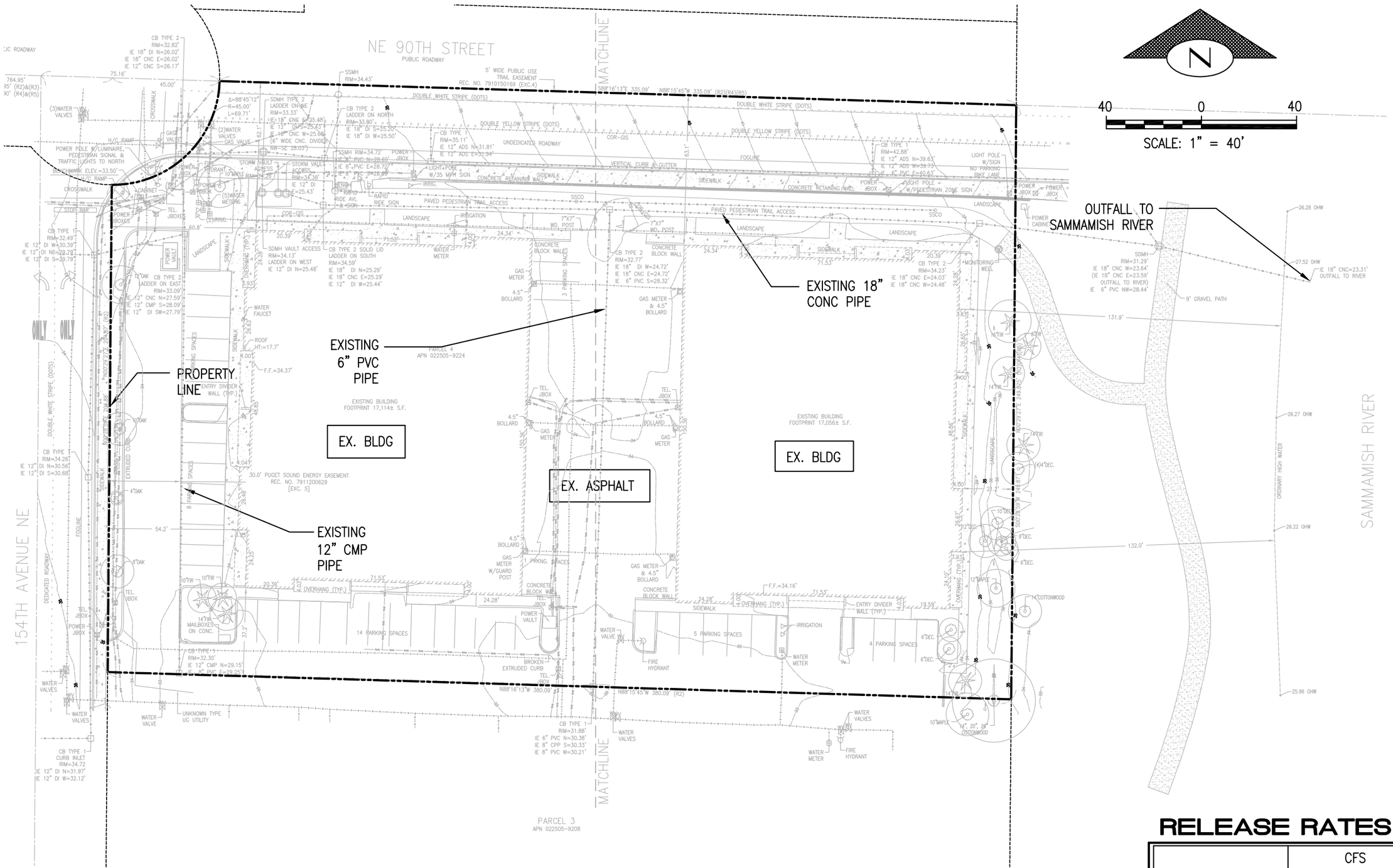
The bioretention sizing calculations are summarized below. The full model calculations are provided in Appendix B. The proposed bioretention areas are shown on the civil plans in Appendix A.

Bioretention Sizing

Proposed PGIS Area	Required Bioretention Area	Proposed Bioretention Area
0.58 AC	657 SF	715 SF

Flow Control

A supplemental basin analysis of the NE 90th St conveyance system is provided. Clean roof runoff is proposed to be infiltrated onsite to the extent feasible based on site limitations and the groundwater levels.



RELEASE RATES

	CFS
2 YEAR	0.605
10 YEAR	0.879
50 YEAR	1.247

FIGURE 4 – EXISTING HYDROLOGY

SCALE 1" = 40'

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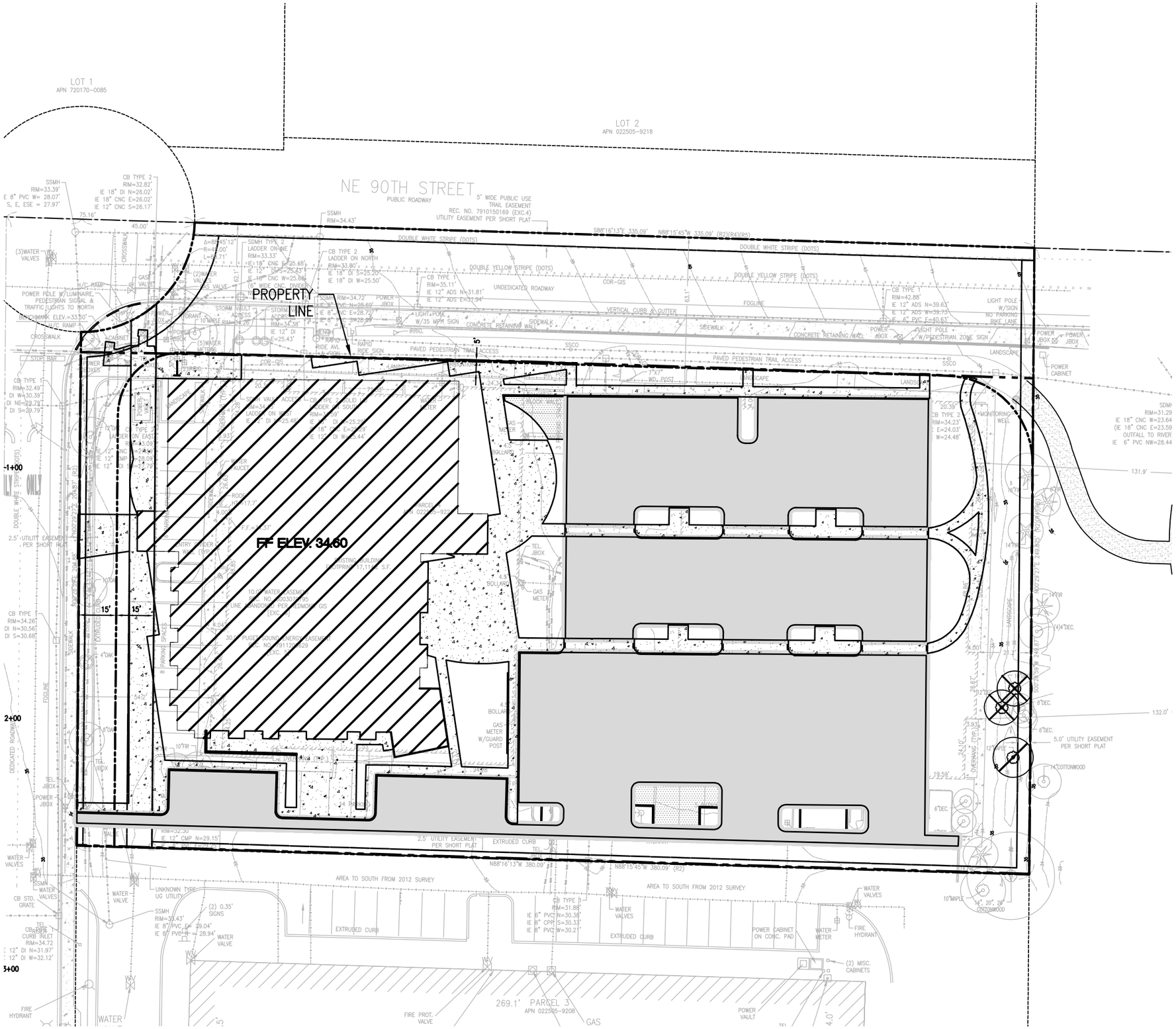

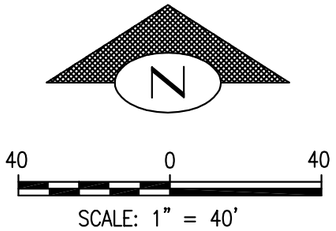

LEGEND

- POLLUTION–GENERATING IMPERVIOUS SURFACE 0.58 AC
- NON POLLUTION–GENERATING IMPERVIOUS 0.26 AC
- ROOF 0.37 AC
- BIORETENTION CELL 0.02 AC
- PERVIOUS 0.42 AC

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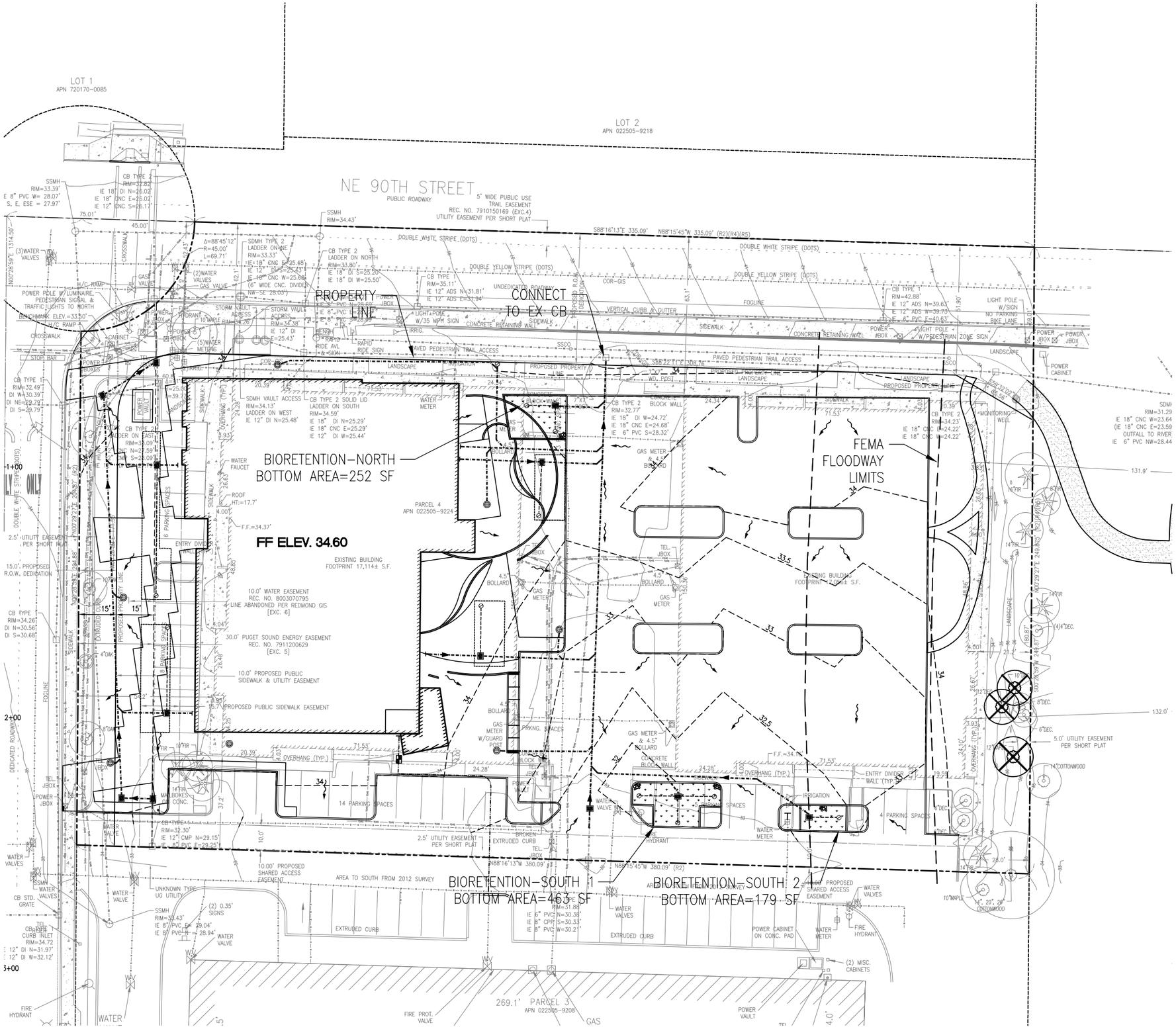
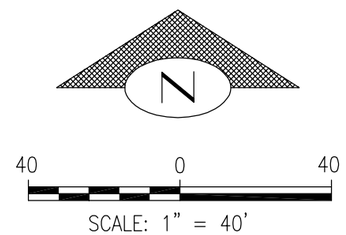
FIGURE 5 – DEVELOPED CONDITIONS

SCALE 1" = 80'





LEGEND

- CLEANOUT
- PATIO DRAIN
- AREA DRAIN
- CB TYPE-1
- 4" STORM DRAIN
- STORM DRAIN MAIN

RELEASE RATES

	CFS
2 YEAR	0.489
10 YEAR	0.724
50 YEAR	0.947

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FIGURE 6 - DEVELOPED HYDROLOGY

SCALE 1" = 80'

SECTION V- CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The Erosion and Sediment Control (ESC) Best Management Practices (BMP's) to be implemented during the site construction will limit the disturbance of soils and sediment transport of the project property.

ESC BMP's

- Construction/ Clearing Limits: Prior to construction, the limits of disturbance will be clearly identified and delineated by survey tape and stakes. The proposed limits are intended to reduce the amount of disturbed area and unnecessary impact that would increase the potential for erosion during construction.

- Cover Measures: Temporary cover shall be provided if any area is to remain unworked for more than seven days during the dry season. Temporary cover shall consist of mulch, erosion control nets, or plastic sheeting.

- Perimeter Protection: Perimeter protection shall be installed to reduce the amount of sediment transported beyond the disturbed areas to the adjacent properties. Filter fabric fencing will also be installed around excavation stockpiles.

Additional BMPs will be shown in the TESC plan. The ESC measures shall be applied and maintained so as to prevent, to the maximum extent practicable, the transport of sediment laden runoff from the disturbed areas from leaving the project site. All ESC BMP's shall be inspected daily and maintained to ensure they are operating properly and as intended by the TESC Plans.

SECTION VI – SPECIAL REPORTS AND STUDIES

A geotechnical engineering report was completed by Geotech Consultants, Inc. on 11/5/2015, and is included in Appendix D.

SECTION VII – OTHER PERMITS

Additional permits include the civil construction permit through the Coordinated Civil Review Process (CCR) in the City of Redmond, Building Permit from the City of Redmond, as well as the Washington State Department of Ecology NPDES Notice of Intent for Construction Stormwater.

SECTION VIII –OPERATION AND MAINTENANCE MANUAL

The Operations and Maintenance Manual will be submitted at the later date.

APPENDIX A – CIVIL PLANS

REDMOND INTEGRATED SERVICE CENTER

15511 NE 90th ST

REDMOND, WASHINGTON

GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION; CITY OF REDMOND STDS AND CODES; PERMIT CONDITIONS; AND ALL OTHER APPLICABLE CODES, ORDINANCES AND STANDARDS.
2. ALL WORK PERTAINING TO THIS PROJECT SHALL BE SUBJECT TO INSPECTION BY THE CITY OF REDMOND INSPECTOR OR HIS/HER DESIGNATED REPRESENTATIVE. PRIOR TO ANY SITE WORK, THE CONTRACTOR SHALL CONTACT THE INSPECTOR TO SCHEDULE A PRE-CONSTRUCTION CONFERENCE.
3. A COPY OF THE APPROVED PLANS MUST BE ON-SITE WHENEVER CONSTRUCTION IS IN PROGRESS. THE APPLICANT IS RESPONSIBLE FOR OBTAINING ANY OTHER REQUIRED OR RELATED PERMITS PRIOR TO BEGINNING CONSTRUCTION.
4. ALL SITE WORK SHALL COMPLY WITH THESE PLANS AND THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEERING REPORT.
5. ALL LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREIN WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THESE PLANS.
6. MAINTAIN 1' MINIMUM VERTICAL SEPARATION BETWEEN ADJACENT OR CROSSING UTILITIES.

GENERAL ESC NOTES

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

GRADING NOTES

1. ALL EARTHWORK AND SUBGRADE PREPARATION SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OF THE GEOTECHNICAL REPORT PREPARED FOR THIS PROJECT AND PROJECT SPECIFICATIONS.
2. FINISH GRADE INDICATED IS FINAL SURFACE ELEVATION FOLLOWING PLACEMENT OF ALL SURFACING MATERIALS.
3. GRADE ALL AREAS TO PROVIDE DRAINAGE AWAY FROM BUILDINGS. FINE GRADE AREAS TO DIRECT DRAINAGE TO DRAINAGE STRUCTURES.
4. WALKWAYS SHALL HAVE MAXIMUM LONGITUDINAL SLOPE OF 4.9% AND MAXIMUM CROSS SLOPE OF 2%.

EARTHWORK

ESTIMATE EARTHWORK ON-SITE
CUT: 780 CY
FILL: 600 CY

CITY OF REDMOND CLEARING, GRADING, AND TEMPORARY EROSION CONTROL NOTES

1. ALL WORK AND MATERIALS TO BE PER CITY OF REDMOND STANDARDS.
2. KEEP OFF-SITE STREETS CLEAN AT ALL TIMES. FLUSHING STREETS SHALL NOT BE ALLOWED. ALL STREETS SHOULD BE SWEPT.
3. ADDITIONAL EROSION/SEDIMENT CONTROL MEASURES MAY BE REQUIRED BY CITY INSPECTOR.
4. WHEN WORK IS STOPPED/COMPLETED IN AN AREA, THE CITY INSPECTOR MAY REQUIRE POSTCONSTRUCTION EROSION CONTROL INCLUDING SEEDING OR OTHER MEASURES.
5. LOCATIONS SHOWN OF EXISTING UTILITIES ARE APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE CORRECT LOCATIONS TO AVOID DAMAGE OR DISTURBANCE.
6. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN STREET USE AND OTHER RELATED PERMITS PRIOR TO ANY CONSTRUCTION.
7. ALL GROUND COVER IS TO REMAIN UNDISTURBED OUTSIDE OF CLEARING AREAS.
8. THE TEMPORARY EROSION/SEDIMENT CONTROLS SHALL BE INSTALLED, INSPECTED, AND OPERATING BEFORE ANY GRADING OR EXTENSIVE LAND CLEARING. THESE CONTROLS MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND LANDSCAPING ARE COMPLETE.
9. TIE IMPERVIOUS SURFACES (ROOF, STREETS, DRIVEWAYS, ETC.) TO COMPLETED DRAINAGE SYSTEM AS SOON AS POSSIBLE.
10. A PRE-CONSTRUCTION MEETING WITH THE CONSTRUCTION DIVISION AND ALL PERMITS MUST BE COMPLETED BEFORE START OF CONSTRUCTION.
11. CLEARING LIMITS SHALL BE LOCATED BY A LICENSED CIVIL ENGINEER OR LAND SURVEYOR.
12. APPROVAL OF THIS TEMPORARY EROSION/SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN.
13. THIS APPROVAL FOR TESC IS VALID FOR CONSTRUCTION BETWEEN MAY 1 AND SEPTEMBER 30. THIS APPROVAL FOR TESC IS NOT VALID FOR THE RAINY SEASON (OCTOBER 1 THROUGH APRIL 30).
14. REMOVE ALL TESC MEASURES ONCE ALL WORK IS COMPLETED AND SITE IS PERMANENTLY STABILIZED.

CITY OF REDMOND STANDARD WATER/WASTEWATER NOTES

A. GENERAL.

1. ANY DEVIATIONS REGARDING THE WATER AND SEWER IMPROVEMENTS SHALL BE SUBMITTED TO THE CITY OF REDMOND, WATER/WASTEWATER DIVISION ENGINEER FOR APPROVAL PRIOR TO IMPLEMENTATION IN THE FIELD.
2. ALL WORK AND MATERIALS SHALL CONFORM TO THE STANDARD SPECIFICATIONS AND DETAILS OF THE CITY OF REDMOND. WATER AND SEWER SPECIFICATIONS AND DETAILS SHALL BE THE SPECIFICATIONS AND DETAILS IN EFFECT ON THE DATE OF APPROVAL OF THESE CONSTRUCTION DRAWINGS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UNDERGROUND UTILITIES. CALL UNDERGROUND LOCATE SERVICE, 1-800-424-5555, FOR UTILITY MARKING.
4. NO WORK SHALL COMMENCE PRIOR TO A PRE-CONSTRUCTION CONFERENCE AT THE CITY OF REDMOND.
5. COORDINATE WITH LANDSCAPING IMPROVEMENTS. NO TREES SHALL BE PLANTED WITHIN EIGHT FEET OF WATER OR SEWER IMPROVEMENTS.

B. WATER.

1. ALL FIRE HYDRANTS SHALL BE COVERED WITH A BURLAP SACK UNTIL THE WATER SYSTEM HAS BEEN PLACED INTO SERVICE.
2. FIRE HYDRANTS SHALL BE EQUIPPED WITH STORZ CONNECTORS.

C. SEWER.

1. SIDE SEWERS SHALL HAVE A MINIMUM SLOPE OF TWO PERCENT.
2. NEW SANITARY SEWER MAINS SHALL BE PLUGGED AND NOT PUT INTO SERVICE UNTIL LINES HAVE BEEN CLEANED, FLUSHED AND TESTED.

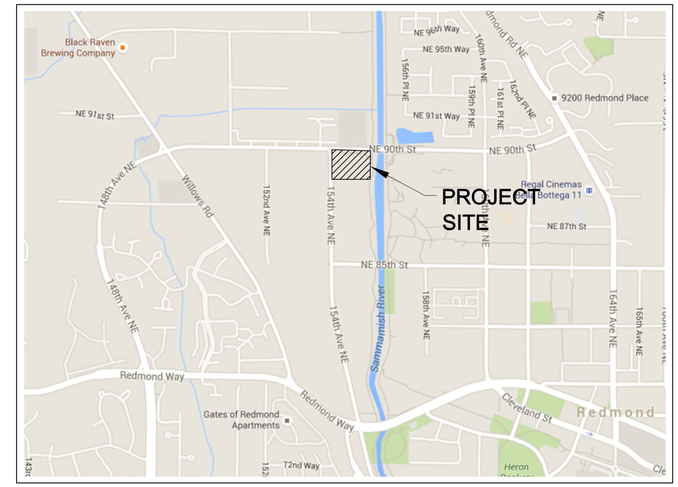
FLOOD INFORMATION

THE SITE IS LOCATED IN A FEMA FLOOD PLAIN. THE DEVELOPED SITE DOES NOT DECREASE THE BASE FLOOD STORAGE OR VOLUME BELOW BASE FLOOD ELEVATION.

BASE FLOOD ELEVATION = 33.60 FT

SITE BASE FLOOD STORAGE 340 CY EXISTING CONDITION (STORAGE BELOW BFE)

SITE BASE FLOOD STORAGE 550 CY DEVELOPED CONDITION (STORAGE BELOW BFE)



VICINITY MAP

NTS

SITE LOCATION

LATITUTDE: 47°40'26" N
LONGITUDE: 122°7'17.4" W

ABBREVIATIONS

ACP	ASPHALT CONCRETE PAVEMENT	LA	LANDSCAPE ARCHITECT
APPROX	APPROXIMATE	LF	LINEAL FEET
ARCH	ARCHITECTURAL	MAX	MAXIMUM
ATB	ASPHALT TREATED BASE	MECH	MECHANICAL
BMP	BEST MANAGEMENT PRACTICES	MIN	MINIMUM
CB	CATCH BASIN	MJ	MECHINICAL JOINT
CEM	PORTLAND CEMENT	N	NORTH
CL	CLASS	OC	ON CENTER
COB	CITY OF BELLINGHAM	OD	OUTSIDE DIAMETER
CONC	CONCRETE	POC	POINT OF CONNECTION
COORD	COORDINATE	PROP	PROPOSED
CSTC	CRUSHED SURFACING TOP COURSE	R	RADIUS
DEMO	DEMOLITION/DEMOLISH	REF	REFERENCE
DIA	DIAMETER	REM	REMOVE
DP	DEPTH	REQ	REQUIRED
E	EAST	RJ	RESTRAINED JOINT
ELEC	ELECTRICAL	S	SOUTH
ELEV, EL	ELEVATION	SCH	SCHEDULE
EX, EXIST	EXISTING	SD	STORM DRAIN
FDC	FIRE DEPARTMENT CONNECTION	SPKLR	FIRE SPRINKLER
FF	FINISH FLOOR	SQ	SQUARE
FG	FINISHED GRADE	SS	SANITARY SEWER
FL	FLANGE	STRUCT	STRUCTURAL
GA	GAUGE	TYP	TYPICAL
GV	GATE VALVE	UNO	UNLESS NOTED OTHERWISE
HMA	HOT MIX ASPHALT	W	WEST
ID	INSIDE DIAMETER	WD	WIDTH
IE	INVERT ELEVATION	W/	WITH
		WA	WATER

SHEET INDEX

SHEET C1.0	COVER AND NOTES
SHEET C2.0	TESC PLAN (NOT INCLUDED)
SHEET C3.0-C3.1	PAVING AND GRADING PLAN
SHEET C4.0	UTILITY AND DRAINAGE PLAN
SHEET C5.0-C5.1	CIVIL DETAILS (NOT INCLUDED)
SHEET C6.0	FIRE PLAN
SHEET C6.1	FIRE FLOW CALCULATION

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90% PREP INTAKE

ISSUE DATE: 05.5.16
DRAWN BY: HS
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NO.	DATE	REMARK
1	2.16.2016	30% INTAKE
2	5.5.2016	60% INTAKE
3	9.1.2016	90% INTAKE

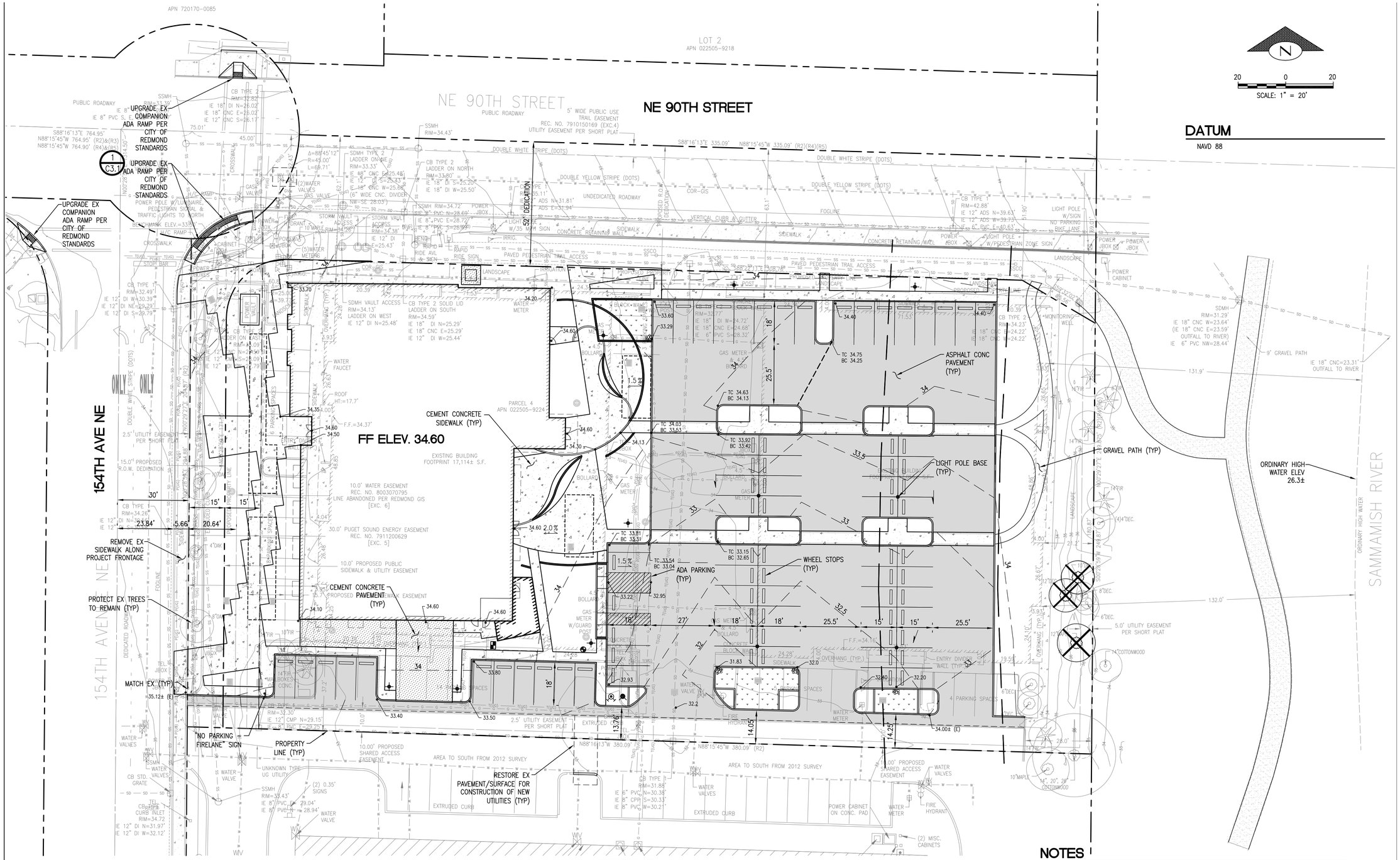
DRAWING NAME:

COVER AND NOTES

SHEET NO:

C1.0

File: Z:\2015 Project Documents\15011 Hopelink RISC\Plans\RISC-C1-COVER.dwg ID: Max Date: 01-Sep-16 1:52:26pm



DATUM

NAVD 88

LEGEND

- CURB & GUTTER
- CURB RAMP
- ASPHALT CONC. PAVEMENT
- CEM CONC WALK
- CEM CONC PAVEMENT
- GRAVEL SURFACING

NOTES

1. SEE SHEET C1.0 FOR GENERAL NOTES, ESC NOTES, TESC NOTES, CLEARING AND GRADING NOTES, AND GRADING NOTES.
2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH CITY OF REDMOND REQUIREMENTS AND STANDARDS.
3. REFER TO ARCHITECT AND LANDSCAPE ARCHITECT DRAWING FOR ADDITIONAL SITE AND LANDSCAPING INFORMATION.
4. FIELD VERIFY ELEVATIONS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
5. REMOVE EXISTING FEATURES AS REQUIRED FOR CONSTRUCTION OF NEW IMPROVEMENTS.

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3	9.1.2016	90% INTAKE

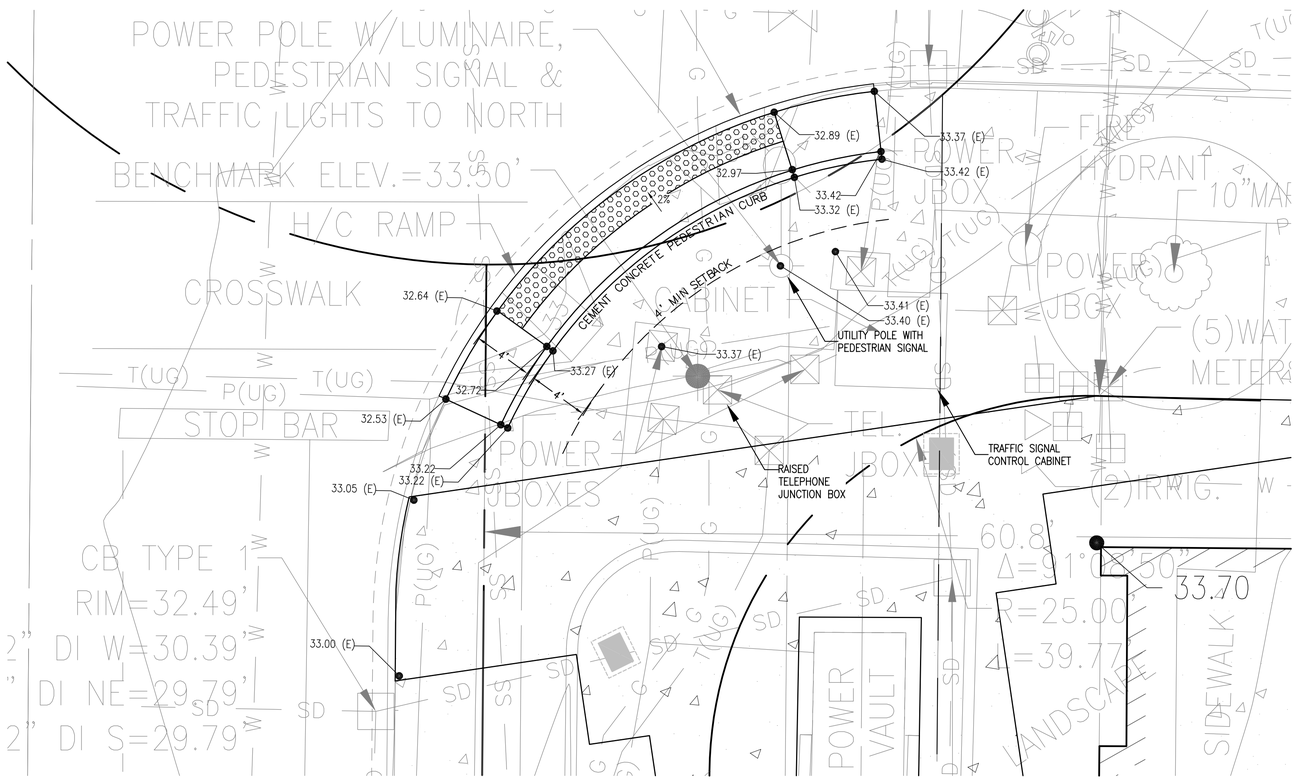
DRAWING NAME:

GRADING AND PAVING PLAN

SHEET NO:

C3.0

File: Z:\2015 Project Documents\15011 Hopelink RISC\Plans\RISC-C3-GRAD.dwg ID: Max Date: 01-Sep-16 1:22:28pm



1 / C3.1 **SE CORNER GRADING DETAIL**

1"=5'

N

5 0 5

SCALE: 1" = 5'

DATUM

NAVD 88

NOTES

1. SEE SHEET C1.0 FOR GENERAL NOTES, ESC NOTES, TESC NOTES, CLEARING AND GRADING NOTES, AND GRADING NOTES.
2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH CITY OF REDMOND REQUIREMENTS AND STANDARDS.
3. REFER TO ARCHITECT AND LANDSCAPE ARCHITECT DRAWING FOR ADDITIONAL SITE AND LANDSCAPING INFORMATION.
4. FIELD VERIFY ELEVATIONS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
5. REMOVE EXISTING FEATURES AS REQUIRED FOR CONSTRUCTION OF NEW IMPROVEMENTS.

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DRAWING NAME:

GRADING AND PAVING PLAN

SHEET NO:

C3.1

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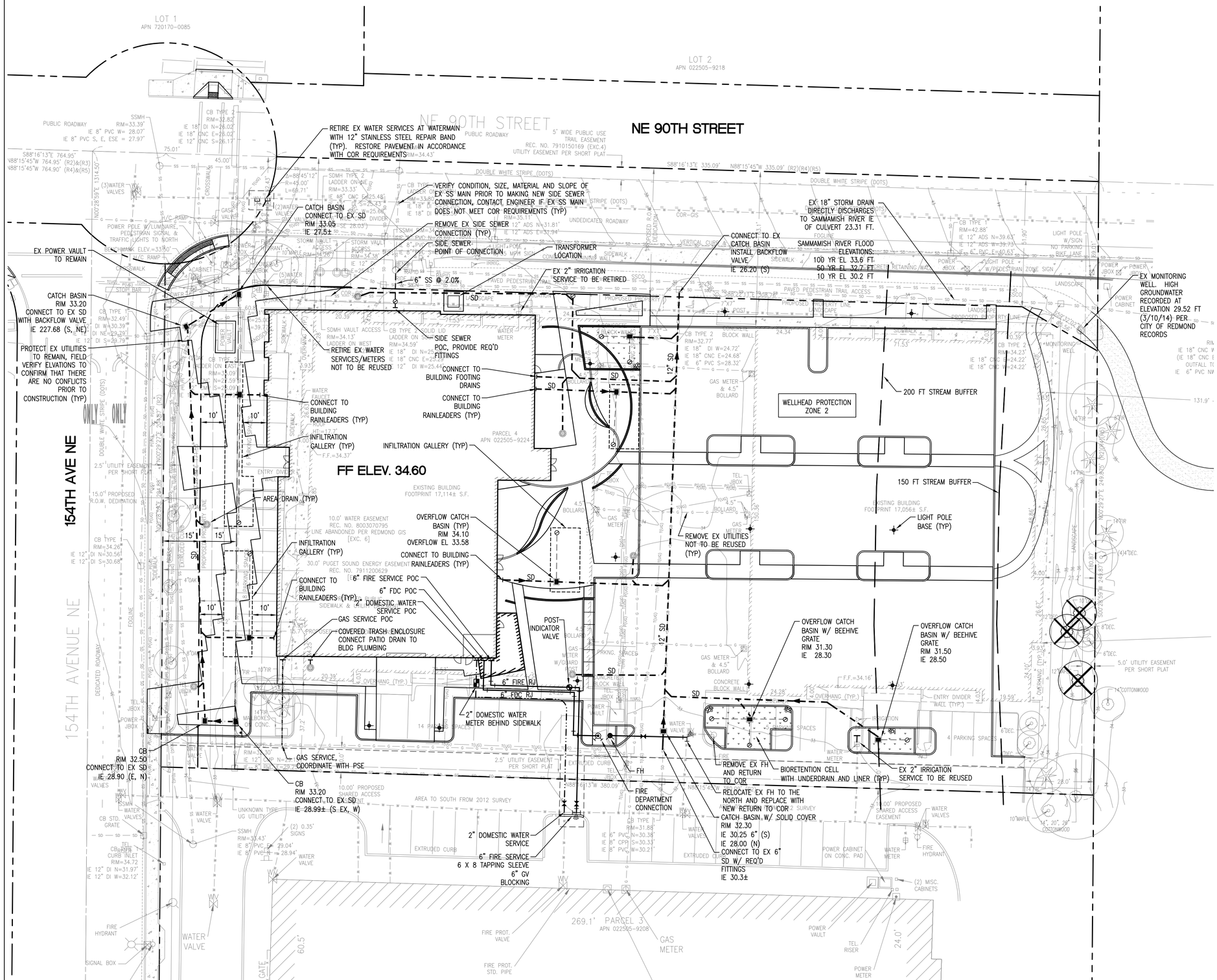

DATUM

NAVD 88

LEGEND

- CLEANOUT
- PATIO DRAIN
- AREA DRAIN
- CB TYPE-1
- 4" STORM DRAIN
- STORM DRAIN MAIN
- SANITARY SEWER LINE
- WATER SERVICE LINE
- WATER/FIRE MAIN
- PIPE OUTLET

NOTES

1. SEE SHEET C1 FOR GENERAL NOTES.
2. ALL WORK SHALL CONFORM TO THE CITY OF REDMOND STANDARDS AND REQUIREMENTS.
3. FIELD VERIFY ELEVATIONS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
4. REMOVE EXISTING FEATURES AS REQUIRED FOR CONSTRUCTION OF NEW IMPROVEMENTS.
5. FIRE SERVICE SHALL INCLUDE AN INSIDE BUILDING BACKFLOW PREVENTER PER CITY OF REDMOND OF REQUIREMENTS.

STORMWATER NOTES

1. STORMWATER TREATMENT FOR RUNOFF FROM POLLUTION GENERATING IMPERVIOUS SURFACES SHALL BE BY LINED BIORETENTION CELLS WITH UNDERDRAINS. SITE IS LOCATED IN WELLHEAD PROTECTION ZONE 2 AND INFILTRATION OF PGIS WITHIN THIS ZONE IS PROHIBITED.
2. SITE HAS SEASONAL HIGH GROUNDWATER.
3. PROJECT IS PROPOSING INFILTRATION OF STORMWATER RUNOFF FROM BUILDING ROOF AREAS.

INFILTRATION NOTES

HIGH GROUNDWATER ELEVATION (PER CITY DATA)	28.58'
BOTTOM OF PROPOSED INFILTRATION GALLERIES (3' SEPARATION TO BE CONFIRMED WITH MOUNDING ANALYSIS)	31.58'
DEPTH OF PROPOSED INFILTRATION GALLERIES	2.00'
OVERFLOW ELEVATION OF PROP. INF. GALLERIES	33.58'
FINISHED FLOOR ELEVATION	34.60'
PRELIMINARY INFILTRATION GALLERY AREA REQUIRED FOR FULL INFILTRATION OF STORMWATER RUNOFF FROM PROPOSED ROOF AREA =	1300 SF
PROPOSED INFILTRATION GALLERY AREA =	1690 SF

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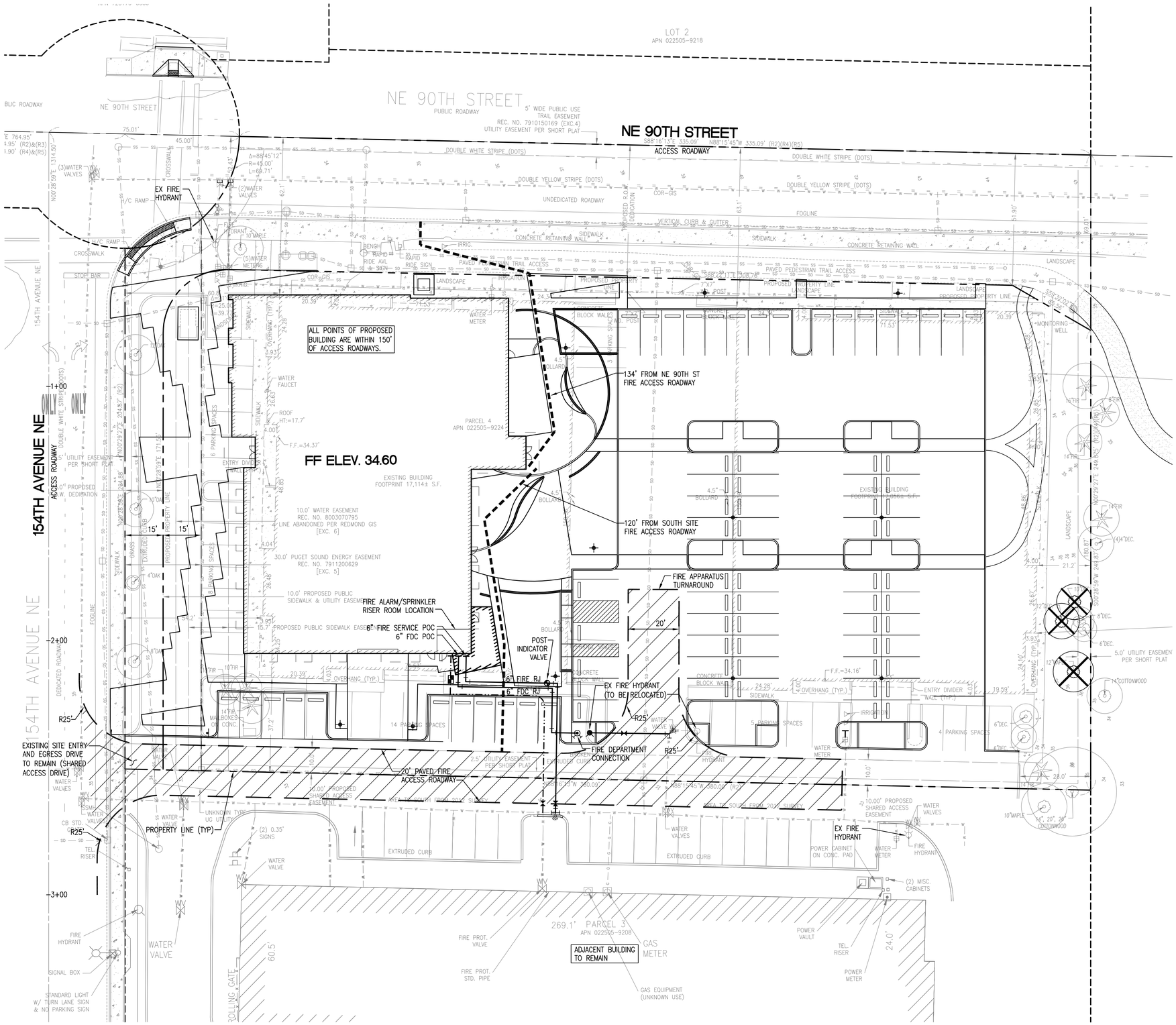
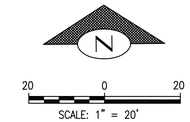
DRAWING NAME:

UTILITY AND DRAINAGE PLAN

SHEET NO:

C4.0





DATUM

NAVD 88

LEGEND

- WATER SERVICE LINE
- WATER/FIRE MAIN
- FIRE DEPT CONNECTION
- POST INDICATOR VALVE
- FIRE HYDRANT
- 150' MAX FIRE ACCESS TO ALL PORTIONS OF BUILDING
- 20' WIDE FIRE ACCESS ROADWAY

NOTES

1. SEE UTILITY PLAN, SHEET C4.0 FOR FIRE AND WATER CONNECTIONS.
2. SEE SHEET C6.1 FOR FIRE FLOW CALCULATION.

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3	9.1.2016	90% INTAKE

DRAWING NAME:

FIRE PLAN

SHEET NO:

C6.0

File: Z:\2015 Project Documents\15011 Hopelink RISC\Plans\RISC-C6-FIRE.dwg ID: Max Date: 01-Sep-16 7:57:12pm

CITY OF REDMOND FIRE FLOW CALCULATION

Redmond Fire Department Standards

Required Fire Flow Calculation Form

PROJECT: HOPELINK REDMOND INTEGRATED SERVICE CENTER Date: 11/12/2015

LOCATION: 15511 NORTHEAST 90TH STREET, REDMOND, WA 98052

DEVELOPER: HOPELINK PHONE: 425-869-6000

ARCHITECT: THIRD PLACE DESIGN CO-OPERATIVE PHONE: 206-582-7106

BUILDING CONSTRUCTION TYPE: IA, IB, IIA, IIB, IIIA, IIIB, IV, VA, (VB) (circle one)

Number of stories: 2 /____Footprint area: 15,670 SF Mezzanines/partial floors NONE

TOTAL GROSS AREA: 31,850 SF

All Commercial & Single Family 3,600 square feet or greater

1. Obtain the basic flow from the RFDS Basic Flow Chart for the identified Construction type and gross area: Basic Flow: 4,750 GPM
2. Add 10% if residential use is > 50% (except SFR) x 1.1 N/A
3. For fire sprinklers subtract 50% x 0.5 2,375 GPM
4. Exposure Surcharge in Buildings without Fire Sprinklers, multiply by 1.00 to 1.75*
   (*To determine the exposure factor add a percentage for each of four directions. Use the conversion table to convert distance to percent, and then add the percent to the previous total.*)

Conversion Table 11/12/2015

Feet = %	Feet = %
0'-10' = 25%	N =_____=_____
11'-25'=20%	E =_____=_____
26'-40'=15%	W=_____=_____
41'-80'=10%	S =_____=_____
81'-120'= 5%	Subtotal: _____(.75 maximum)

X 1.___= N/A

Other surcharge or credit (Explain):_____

TOTAL REQUIRED FIRE FLOW: 2,375 GPM

FIRE FLOW AVAILABLE PER PUBLIC WORKS: _____

Single Family Residential Developments (<3,600 square foot homes):

1. No Fire Sprinklers =1500 gpm/All Fire Sprinklers = 1000 gpm _____
2. Wood shingles allowed in the development **add** 250 gpm _____
3. Less than 10 feet allowed between structures **add** 250 gpm _____

TOTAL REQUIRED FIRE FLOW: ___

FIRE FLOW AVAILABLE PER PUBLIC WORKS: _____

December 2014 Edition **Page 3 of 4**

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DRAWING NAME:

FIRE FLOW CALCULATION

SHEET NO:

C6.1

File: Z:\2015 Project Documents\15011 Hopelink RISC\Plans\RISC-C6-FIRE.dwg ID: Max Date: 01-Sep-16 7:57:39pm

APPENDIX B – DRAINAGE CALCULATIONS AND PRELIMINARY INFILATRATION SIZING

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.34
Program License Number: 201510001
Run Date: 05/25/2016 4:14 PM

Input File Name: Hopelink - Roof Inf.fld
Project Name: Hopelink RISC
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

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

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

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

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

---------- Subbasin : Subbasin 1 ----------
-------Area(Acres) --------

Till Forest	0.320
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.000
Subbasin Total	0.320

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

---------- Subbasin : Subbasin 1 ----------
-------Area(Acres) --------

Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.320

Subbasin Total 0.320

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

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

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

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

Link Name: New Infilt Trench Lnk1
Link Type: Infiltration Trench
Downstream Link: None

Trench Type	:	Trench on Embankment Sideslope
Trench Length (ft)	:	130.00
Trench Width (ft)	:	10.00
Trench Depth (ft)	:	2.00
Trench Bottom Elev (ft)	:	100.00
Trench Rockfill Porosity (%)	:	30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 2.00

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

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

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

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	55.484
Total:	55.484

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Link: New Infilt Trench Ln	141.324
Total:	141.324

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.351 ac-ft/year, Post Developed: 0.894 ac-ft/year

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

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

Number of Links: 0

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

Number of Links: 1

********** Link: New Infilt Trench Lnk1 **********

Infiltration/Filtration Statistics----------
Total Runoff Volume (ac-ft): 141.32
Total Runoff Infiltrated (ac-ft): 141.32, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Percent Treated (Infiltrated+Filtered)/Total Volume: 100.00%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Infilt Trench Lnk1

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	6.794E-03	2-Year	1.606E-06
5-Year	1.160E-02	5-Year	3.366E-06
10-Year	1.443E-02	10-Year	4.821E-06
25-Year	1.862E-02	25-Year	7.254E-06
50-Year	2.241E-02	50-Year	8.534E-06
100-Year	2.691E-02	100-Year	9.655E-06
200-Year	3.638E-02	200-Year	7.881E-02

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	-100.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	-100.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-80.0%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	-100.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	-100.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	RISC-Peaks
Site Name:	RISC
Site Address:	15511 NE 90TH ST
City:	REDMOND
Report Date:	2/12/2016
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.00
Version:	2015/07/20

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

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Landuse Basin Data
Predeveloped Land Use

EXISTING

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
C, Lawn, Flat	0.16
Pervious Total	0.16
Impervious Land Use	Acres
ROOF TOPS FLAT	0.78
PARKING FLAT	0.78
Impervious Total	1.56
Basin Total	1.72

Element Flows To:

Surface	Interflow	Groundwater

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Mitigated Land Use

PROPOSED

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
C, Lawn, Flat	0.44
Pervious Total	0.44
Impervious Land Use	Acres
ROOF TOPS FLAT	0.37
PARKING FLAT	0.84
Impervious Total	1.21
Basin Total	1.65

Element Flows To:

Surface	Interflow	Groundwater

DRAFT

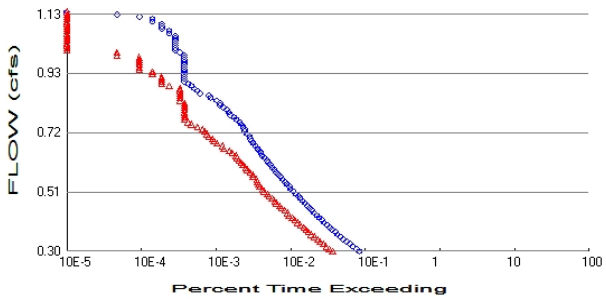
Routing Elements
Predeveloped Routing

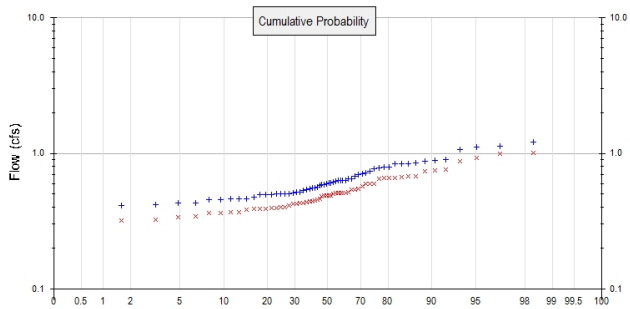
DRAFT

Mitigated Routing

DRAFT

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.16
Total Impervious Area: 1.56

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.44
Total Impervious Area: 1.21

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.605057
5 year	0.767724
10 year	0.87863
25 year	1.022886
50 year	1.133561
100 year	1.247137

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.489442
5 year	0.628652
10 year	0.72446
25 year	0.850001
50 year	0.946943
100 year	1.046932

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.794	0.661
1950	0.836	0.656
1951	0.495	0.412
1952	0.430	0.337
1953	0.464	0.364
1954	0.492	0.399
1955	0.556	0.445
1956	0.547	0.440
1957	0.627	0.517
1958	0.500	0.399

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1959	0.504	0.391
1960	0.510	0.426
1961	0.534	0.436
1962	0.459	0.363
1963	0.517	0.422
1964	0.498	0.396
1965	0.648	0.537
1966	0.427	0.343
1967	0.738	0.596
1968	0.840	0.679
1969	0.590	0.488
1970	0.564	0.457
1971	0.673	0.546
1972	0.708	0.600
1973	0.413	0.321
1974	0.617	0.507
1975	0.695	0.539
1976	0.478	0.392
1977	0.506	0.393
1978	0.620	0.487
1979	0.850	0.665
1980	0.792	0.677
1981	0.631	0.507
1982	0.896	0.735
1983	0.719	0.569
1984	0.457	0.370
1985	0.630	0.508
1986	0.542	0.429
1987	0.834	0.657
1988	0.503	0.390
1989	0.629	0.488
1990	1.120	0.988
1991	0.884	0.760
1992	0.453	0.366
1993	0.389	0.309
1994	0.420	0.326
1995	0.558	0.447
1996	0.606	0.508
1997	0.585	0.484
1998	0.583	0.462
1999	1.213	1.004
2000	0.600	0.488
2001	0.649	0.509
2002	0.778	0.651
2003	0.604	0.506
2004	1.132	0.932
2005	0.518	0.428
2006	0.460	0.384
2007	1.061	0.880
2008	0.869	0.746
2009	0.769	0.597

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Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.2129	1.0036
2	1.1324	0.9875
3	1.1201	0.9324

4	1.0609	0.8800
5	0.8964	0.7601
6	0.8843	0.7463
7	0.8686	0.7347
8	0.8499	0.6789
9	0.8400	0.6774
10	0.8361	0.6650
11	0.8344	0.6613
12	0.7935	0.6573
13	0.7918	0.6558
14	0.7776	0.6507
15	0.7692	0.5996
16	0.7384	0.5975
17	0.7191	0.5960
18	0.7078	0.5691
19	0.6947	0.5457
20	0.6729	0.5391
21	0.6490	0.5369
22	0.6480	0.5168
23	0.6308	0.5095
24	0.6301	0.5084
25	0.6292	0.5079
26	0.6274	0.5074
27	0.6201	0.5068
28	0.6171	0.5057
29	0.6058	0.4881
30	0.6042	0.4881
31	0.5996	0.4880
32	0.5898	0.4867
33	0.5851	0.4845
34	0.5825	0.4621
35	0.5640	0.4572
36	0.5583	0.4473
37	0.5557	0.4455
38	0.5475	0.4402
39	0.5417	0.4364
40	0.5341	0.4286
41	0.5181	0.4278
42	0.5171	0.4262
43	0.5099	0.4225
44	0.5061	0.4118
45	0.5039	0.3989
46	0.5031	0.3987
47	0.4996	0.3962
48	0.4980	0.3931
49	0.4952	0.3920
50	0.4923	0.3911
51	0.4779	0.3903
52	0.4642	0.3839
53	0.4599	0.3697
54	0.4591	0.3663
55	0.4575	0.3641
56	0.4531	0.3628
57	0.4298	0.3426
58	0.4273	0.3369
59	0.4199	0.3257
60	0.4132	0.3206
61	0.3894	0.3089

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Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3025	1772	776	43	Pass
0.3109	1615	703	43	Pass
0.3193	1453	641	44	Pass
0.3277	1320	584	44	Pass
0.3361	1192	527	44	Pass
0.3445	1079	490	45	Pass
0.3529	988	440	44	Pass
0.3613	906	401	44	Pass
0.3697	841	368	43	Pass
0.3781	765	343	44	Pass
0.3865	706	321	45	Pass
0.3949	654	288	44	Pass
0.4033	602	262	43	Pass
0.4117	560	242	43	Pass
0.4200	516	223	43	Pass
0.4284	480	202	42	Pass
0.4368	438	194	44	Pass
0.4452	407	178	43	Pass
0.4536	385	161	41	Pass
0.4620	354	151	42	Pass
0.4704	331	138	41	Pass
0.4788	314	131	41	Pass
0.4872	284	120	42	Pass
0.4956	271	110	40	Pass
0.5040	249	105	42	Pass
0.5124	232	94	40	Pass
0.5208	215	89	41	Pass
0.5292	205	82	40	Pass
0.5376	189	79	41	Pass
0.5460	181	77	42	Pass
0.5544	166	75	45	Pass
0.5628	157	67	42	Pass
0.5711	145	66	45	Pass
0.5795	136	61	44	Pass
0.5879	129	56	43	Pass
0.5963	120	53	44	Pass
0.6047	113	49	43	Pass
0.6131	106	46	43	Pass
0.6215	102	43	42	Pass
0.6299	96	41	42	Pass
0.6383	88	40	45	Pass
0.6467	85	35	41	Pass
0.6551	80	32	40	Pass
0.6635	77	27	35	Pass
0.6719	72	26	36	Pass
0.6803	67	22	32	Pass
0.6887	64	20	31	Pass
0.6971	61	19	31	Pass
0.7055	60	17	28	Pass
0.7138	55	16	29	Pass
0.7222	52	15	28	Pass
0.7306	52	14	26	Pass
0.7390	49	12	24	Pass

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0.7474	47	10	21	Pass
0.7558	44	9	20	Pass
0.7642	40	8	20	Pass
0.7726	37	8	21	Pass
0.7810	33	8	24	Pass
0.7894	32	8	25	Pass
0.7978	30	8	26	Pass
0.8062	27	8	29	Pass
0.8146	24	8	33	Pass
0.8230	24	8	33	Pass
0.8314	22	7	31	Pass
0.8398	18	7	38	Pass
0.8482	17	7	41	Pass
0.8566	13	7	53	Pass
0.8649	12	7	58	Pass
0.8733	11	7	63	Pass
0.8817	10	5	50	Pass
0.8901	9	4	44	Pass
0.8985	8	4	50	Pass
0.9069	8	4	50	Pass
0.9153	8	4	50	Pass
0.9237	8	3	37	Pass
0.9321	8	3	37	Pass
0.9405	8	2	25	Pass
0.9489	8	2	25	Pass
0.9573	8	2	25	Pass
0.9657	8	2	25	Pass
0.9741	8	2	25	Pass
0.9825	8	2	25	Pass
0.9909	8	1	12	Pass
0.9993	7	1	14	Pass
1.0076	6	0	0	Pass
1.0160	6	0	0	Pass
1.0244	6	0	0	Pass
1.0328	6	0	0	Pass
1.0412	6	0	0	Pass
1.0496	6	0	0	Pass
1.0580	6	0	0	Pass
1.0664	5	0	0	Pass
1.0748	5	0	0	Pass
1.0832	4	0	0	Pass
1.0916	4	0	0	Pass
1.1000	4	0	0	Pass
1.1084	3	0	0	Pass
1.1168	3	0	0	Pass
1.1252	2	0	0	Pass
1.1336	1	0	0	Pass

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Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

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LID Report

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

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

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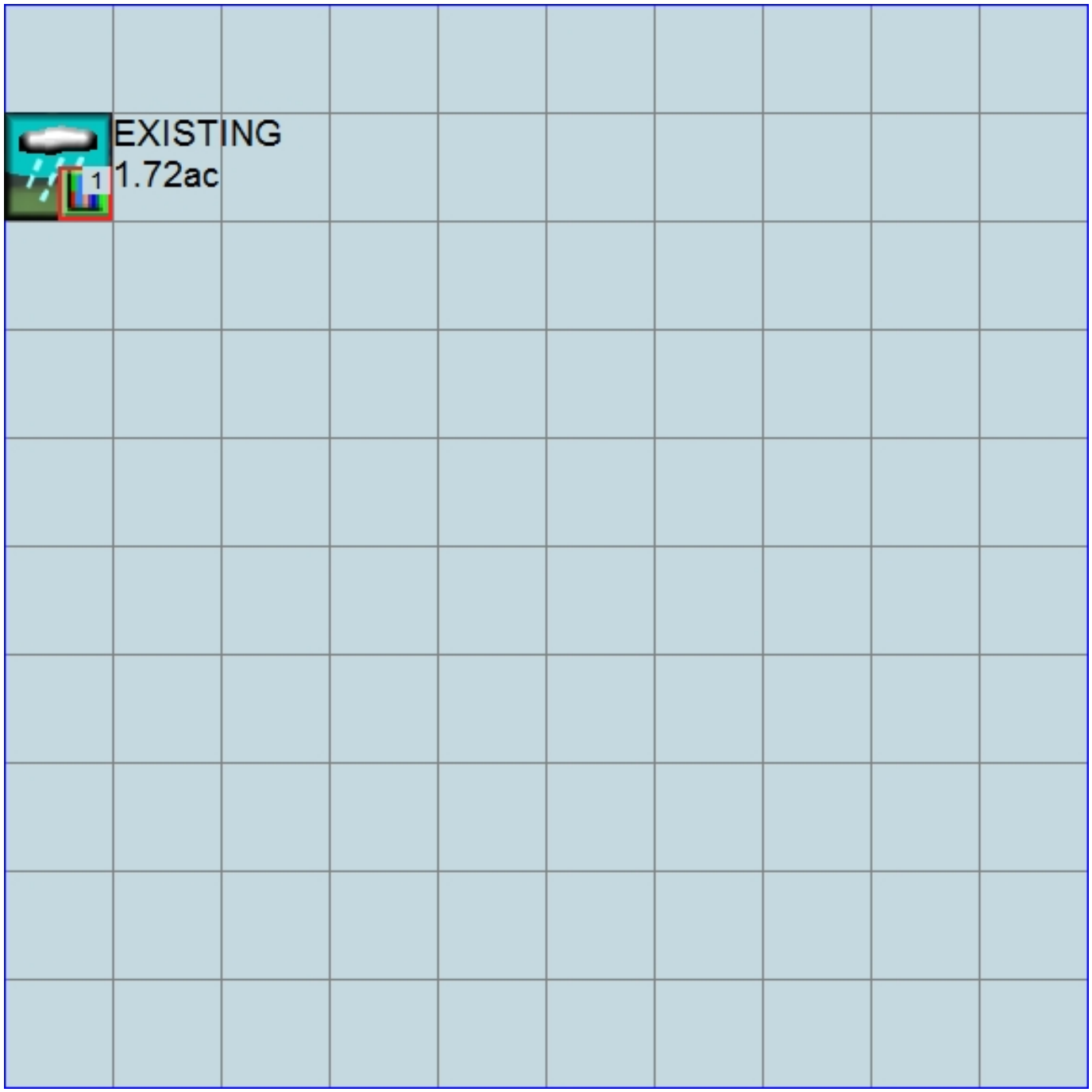
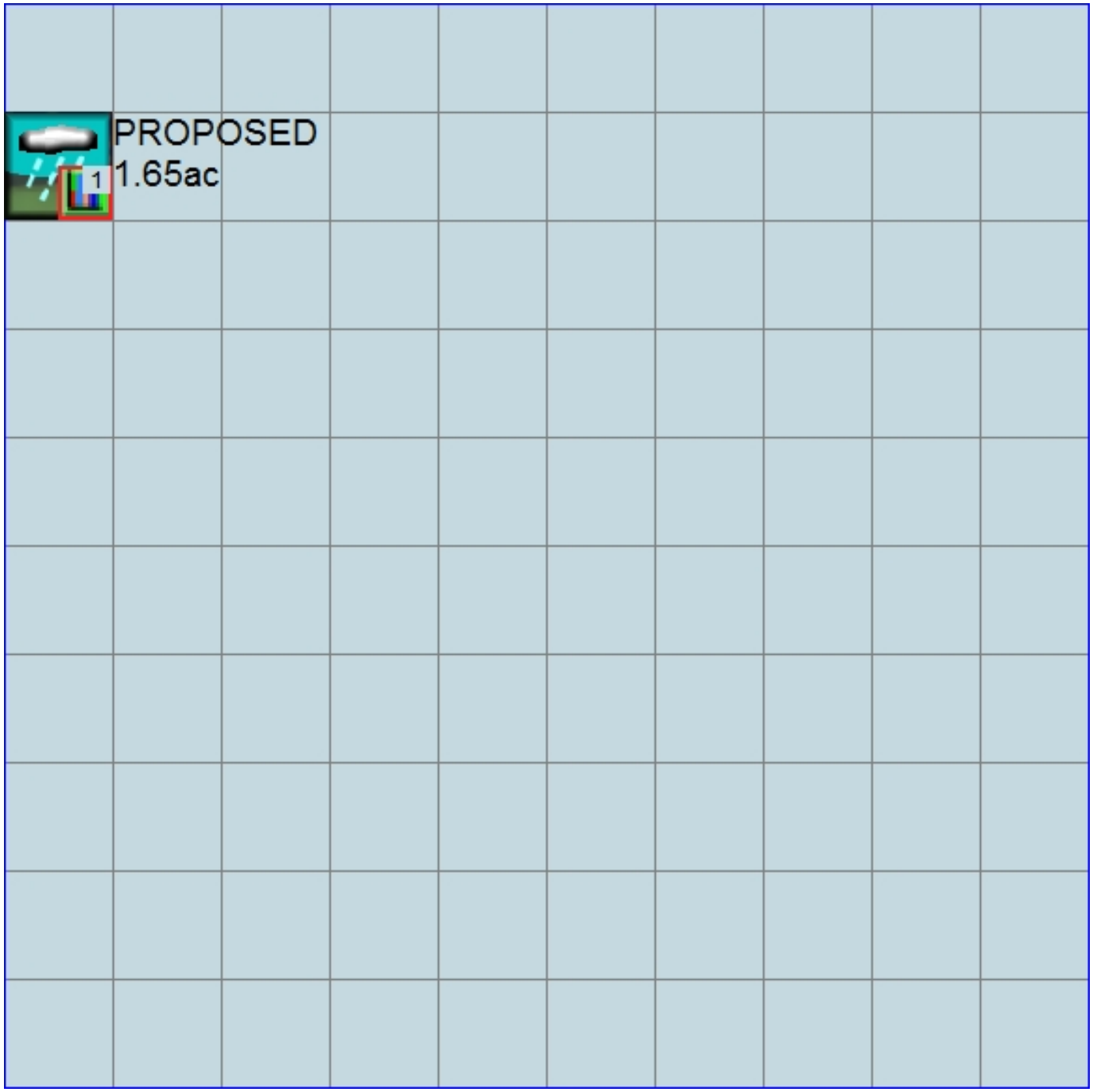
Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   RISC-Peaks.wdm
MESSU      25   PreRISC-Peaks.MES
           27   PreRISC-Peaks.L61
           28   PreRISC-Peaks.L62
           30   POCRISC-Peaks1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       4
      IMPLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -   #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        EXISTING                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -   #  NPT   NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -   #                          User  t-series Engl Metr ***
                                            in  out           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

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```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -   # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   16              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -   #                     User  t-series Engl Metr ***
                                       in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
   11      PARKING/FLAT           1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
   11         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    0    1    9
   11         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
   11         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -   # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
   11            400      0.01       0.1       0.1
```

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```
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
   11              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
   11              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
EXISTING***
PERLND  16                        0.16     COPY   501     12
PERLND  16                        0.16     COPY   501     13
IMPLND   4                        0.78     COPY   501     15
IMPLND  11                        0.78     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -   #<-----------------><---> User T-series  Engl Metr LKFG           ***
                                          in  out                            ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

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```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

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Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   RISC-Peaks.wdm
MESSU      25   MitRISC-Peaks.MES
           27   MitRISC-Peaks.L61
           28   MitRISC-Peaks.L62
           30   POCRISC-Peaks1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       4
      IMPLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -   #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        PROPOSED                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -   #  NPT   NMN ***
    1         1     1
  501         1     1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -   #                          User  t-series Engl Metr ***
                                            in  out           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

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```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16             0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   16             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
   11      PARKING/FLAT           1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
   11         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    0    1    9
   11         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
   11         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
   11            400      0.01       0.1       0.1
```

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```
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
   11              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
   11              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PROPOSED***
PERLND  16                        0.44     COPY   501     12
PERLND  16                        0.44     COPY   501     13
IMPLND   4                        0.37     COPY   501     15
IMPLND  11                        0.84     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                        in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

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```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO      0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO      0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO      0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

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Mitigated HSPF Message File

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Disclaimer

Legal Notice

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APPENDIX C – PRELIMINARY BIORETENTION CALCULATIONS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 201510001
Project Simulation Performed on: 02/12/2016 2:27 PM
Report Generation Date: 02/12/2016 2:27 PM

Input File Name: WQ Bioretention NORTH Sizing.fld
Project Name:
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 60

Extended Precipitation Time Series Selected
Climatic Region Number: 14

Full Period of Record Available used for Routing
Precipitation Station : 96004405 Puget East 44 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961044 Puget East 44 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	0.216	0.183	
Area of Links that Include Precip/Evap (acres)	0.000	0.006	
Total (acres)	0.216	0.189	

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000

Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.216
---	---
Subbasin Total	0.216

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.183
---	---
Subbasin Total	0.183

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

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

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

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

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

Link Name: New Bio Lnk2
Link Type: Bioretention Facility
Downstream Link Name: New Copy Lnk1

Base Elevation (ft) : 103.00
Riser Crest Elevation (ft) : 103.50
Storage Depth (ft) : 0.50

Bottom Length (ft) : 5.0
Bottom Width (ft) : 50.4
Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 252.
Area at Riser Crest El (sq-ft) : 252.
(acres) : 0.006
Volume at Riser Crest (cu-ft) : 202.
(ac-ft) : 0.005

Infiltration on Bottom only Selected

Soil Properties
Biosoil Thickness (ft) : 1.50
Biosoil Saturated Hydraulic Conductivity (in/hr) : 2.00
Biosoil Porosity (Percent) : 20.00
Maximum Elevation of Bioretention Soil : 104.00
Native Soil Hydraulic Conductivity (in/hr) : 0.00

Underdrain Present
Orifice Present in Under Drain
Orifice Control Elevation (ft) : 101.00
Orifice Diameter (in) : 6.000

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 6.00
Common Length (ft) : 0.000
Riser Crest Elevation : 103.50 ft

Hydraulic Structure Geometry

Number of Devices: 0

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

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

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

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: Subbasin 1		0.000
Link:	New Copy Lnk1	0.000
Link:	New Bio Lnk2	Not Computed
Total:		0.000

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

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

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

Number of Links: 0

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

Number of Links: 2

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

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 93.13
Inflow Volume Including PPT-Evap (ac-ft): 93.13
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 93.13
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk1

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

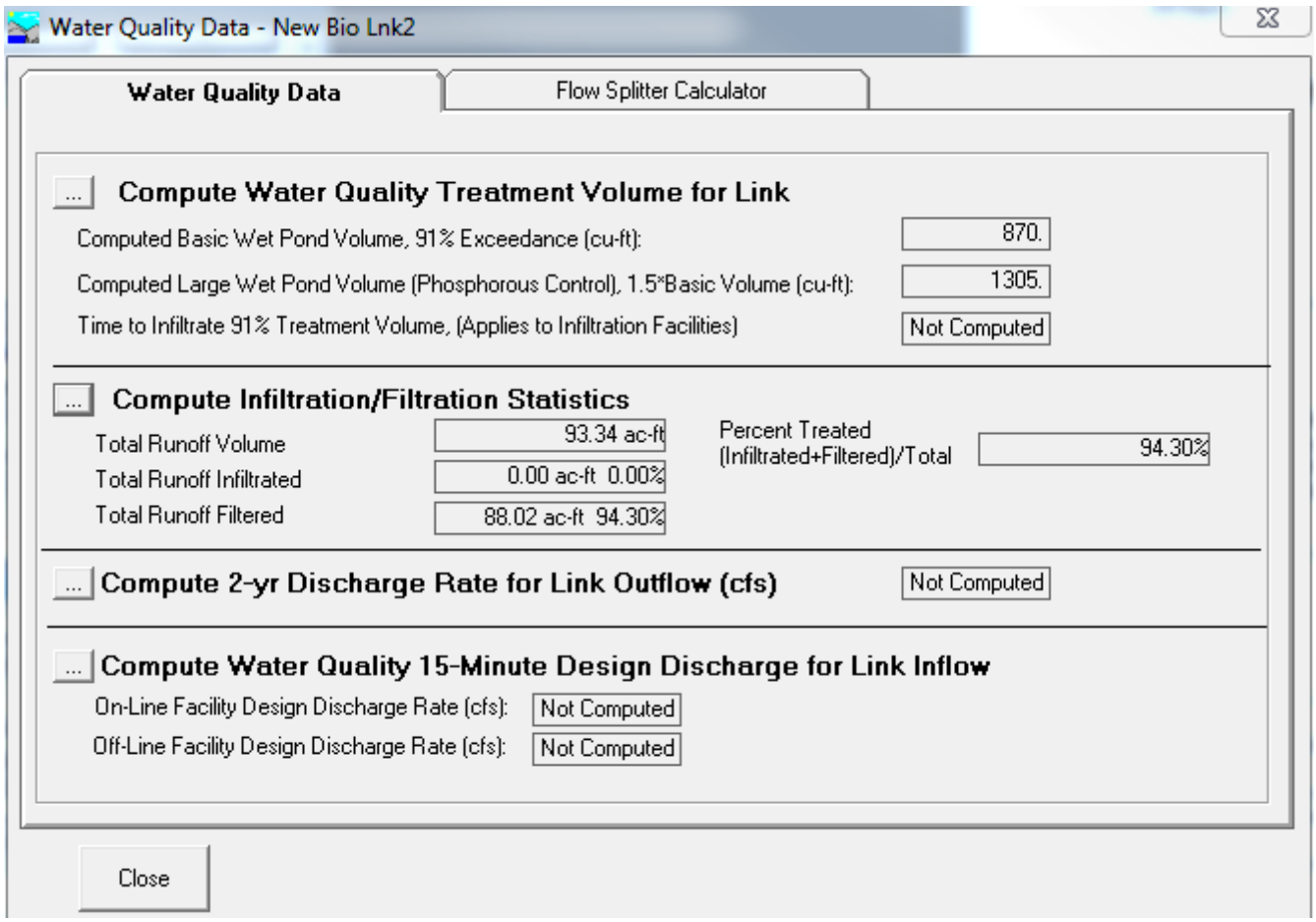
Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	6.224E-02	2-Year	4.829E-02
5-Year	7.831E-02	5-Year	6.400E-02
10-Year	9.256E-02	10-Year	7.252E-02
25-Year	0.104	25-Year	8.774E-02
50-Year	0.113	50-Year	9.361E-02
100-Year	0.124	100-Year	9.859E-02
200-Year	0.139	200-Year	0.118

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	-68.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	-57.4%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-57.6%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 201510001
Project Simulation Performed on: 02/12/2016 2:45 PM
Report Generation Date: 02/12/2016 2:48 PM

Input File Name: WQ Bioretention SOUTH 1 Sizing.fld
Project Name:
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 60

Extended Precipitation Time Series Selected
Climatic Region Number: 14

Full Period of Record Available used for Routing
Precipitation Station : 96004405 Puget East 44 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961044 Puget East 44 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	0.216	0.322	
Area of Links that Include Precip/Evap (acres)	0.000	0.011	
Total (acres)	0.216	0.333	

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000

Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.216
---	---
Subbasin Total	0.216

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.322
---	---
Subbasin Total	0.322

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

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

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

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

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

Link Name: New Bio Lnk2
Link Type: Bioretention Facility
Downstream Link Name: New Copy Lnk1

Base Elevation (ft) : 103.00
Riser Crest Elevation (ft) : 103.50
Storage Depth (ft) : 0.50

Bottom Length (ft) : 10.0
Bottom Width (ft) : 46.2
Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 462.
Area at Riser Crest El (sq-ft) : 462.
(acres) : 0.011
Volume at Riser Crest (cu-ft) : 370.
(ac-ft) : 0.008

Infiltration on Bottom only Selected

Soil Properties
Biosoil Thickness (ft) : 1.50
Biosoil Saturated Hydraulic Conductivity (in/hr) : 2.00
Biosoil Porosity (Percent) : 20.00
Maximum Elevation of Bioretention Soil : 104.00
Native Soil Hydraulic Conductivity (in/hr) : 0.00

Underdrain Present
Orifice Present in Under Drain
Orifice Control Elevation (ft) : 101.00
Orifice Diameter (in) : 6.000

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 6.00
Common Length (ft) : 0.000
Riser Crest Elevation : 103.50 ft

Hydraulic Structure Geometry

Number of Devices: 0

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

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

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

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Link: New Copy Lnk1	0.000
Link: New Bio Lnk2	0.000
Total:	0.000

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

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

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

Number of Links: 0

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

Number of Links: 2

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

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 164.00
Inflow Volume Including PPT-Evap (ac-ft): 164.00
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 164.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Bio Lnk2 **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 159.26
Inflow Volume Including PPT-Evap (ac-ft): 164.45
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 156.08, 94.91%
Primary Outflow To Downstream System (ac-ft): 164.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 94.91%

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

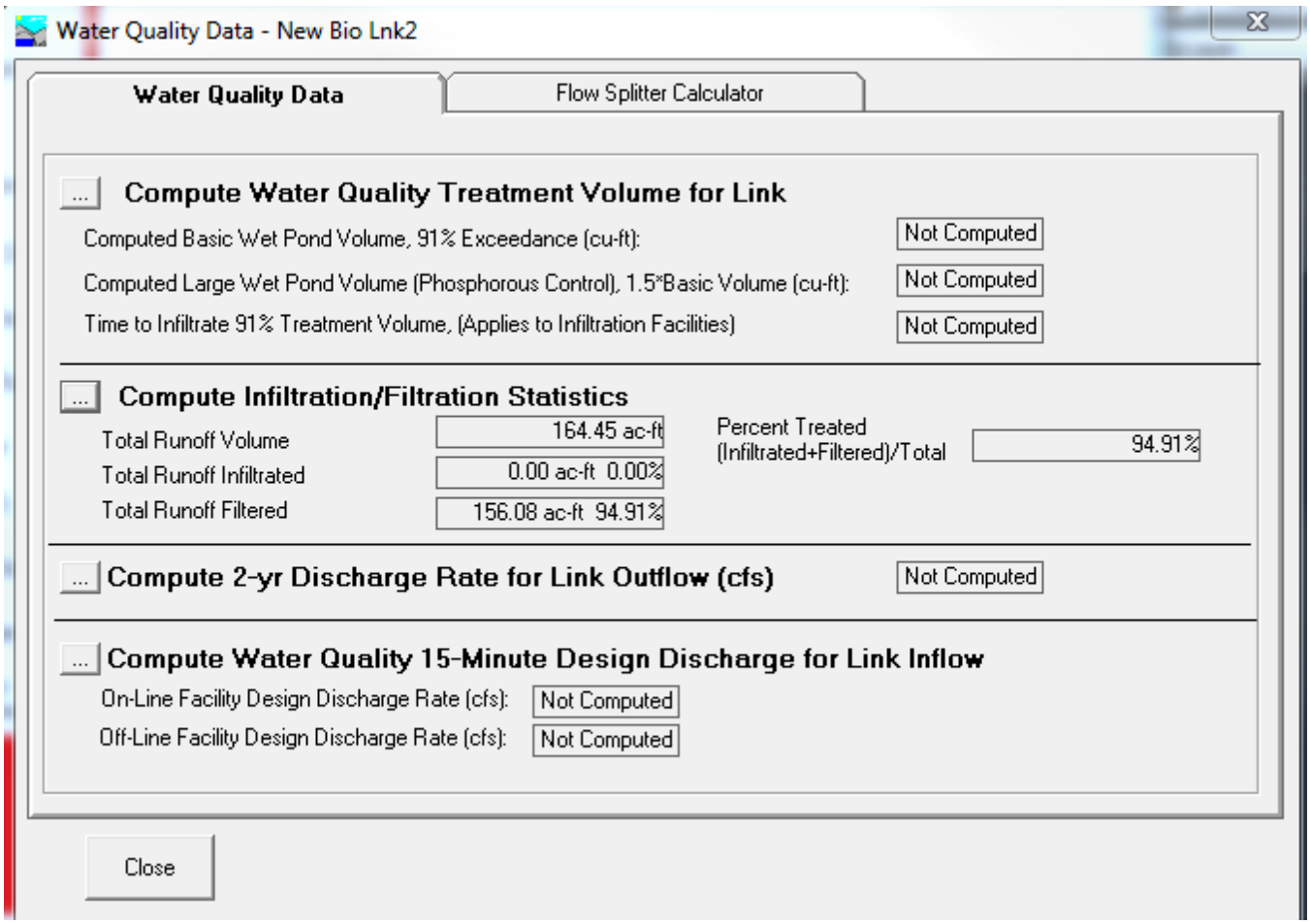
Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk1

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

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	6.224E-02	2-Year	8.227E-02
5-Year	7.831E-02	5-Year	0.111
10-Year	9.256E-02	10-Year	0.124
25-Year	0.104	25-Year	0.146
50-Year	0.113	50-Year	0.159
100-Year	0.124	100-Year	0.162
200-Year	0.139	200-Year	0.203

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



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 201510001
Project Simulation Performed on: 11/11/2015 4:59 PM
Report Generation Date: 02/12/2016 2:57 PM

Input File Name: WQ Bioretention SOUTH 2 Sizing.fld
Project Name:
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 60

Extended Precipitation Time Series Selected
Climatic Region Number: 14

Full Period of Record Available used for Routing
Precipitation Station : 96004405 Puget East 44 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961044 Puget East 44 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	0.160	0.156	
Area of Links that Include Precip/Evap (acres)	0.000	0.004	
Total (acres)	0.160	0.160	

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000

Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.160
---	---
Subbasin Total	0.160

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

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

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.156
---	---
Subbasin Total	0.156

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

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

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

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

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

Link Name: New Bio Lnk2
Link Type: Bioretention Facility
Downstream Link Name: New Copy Lnk1

Base Elevation (ft) : 103.00
Riser Crest Elevation (ft) : 103.50
Storage Depth (ft) : 0.50

Bottom Length (ft) : 10.0
Bottom Width (ft) : 17.9
Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 179.
Area at Riser Crest El (sq-ft) : 179.
(acres) : 0.004
Volume at Riser Crest (cu-ft) : 143.
(ac-ft) : 0.003

Infiltration on Bottom only Selected

Soil Properties
Biosoil Thickness (ft) : 1.50
Biosoil Saturated Hydraulic Conductivity (in/hr) : 2.00
Biosoil Porosity (Percent) : 20.00
Maximum Elevation of Bioretention Soil : 104.00
Native Soil Hydraulic Conductivity (in/hr) : 0.00

Underdrain Present
Orifice Present in Under Drain
Orifice Control Elevation (ft) : 101.00
Orifice Diameter (in) : 6.000

Riser Geometry
Riser Structure Type : Circular
Riser Diameter (in) : 6.00
Common Length (ft) : 0.000
Riser Crest Elevation : 103.50 ft

Hydraulic Structure Geometry

Number of Devices: 0

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

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

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

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

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Link: New Copy Lnk1	0.000
Link: New Bio Lnk2	0.000
Total:	0.000

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

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

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

Number of Links: 0

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

Number of Links: 2

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

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 78.98
Inflow Volume Including PPT-Evap (ac-ft): 78.98
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 78.98
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Bio Lnk2 **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 77.16
Inflow Volume Including PPT-Evap (ac-ft): 79.15
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 72.05, 91.02%
Primary Outflow To Downstream System (ac-ft): 78.98
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 91.02%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Copy Lnk1

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

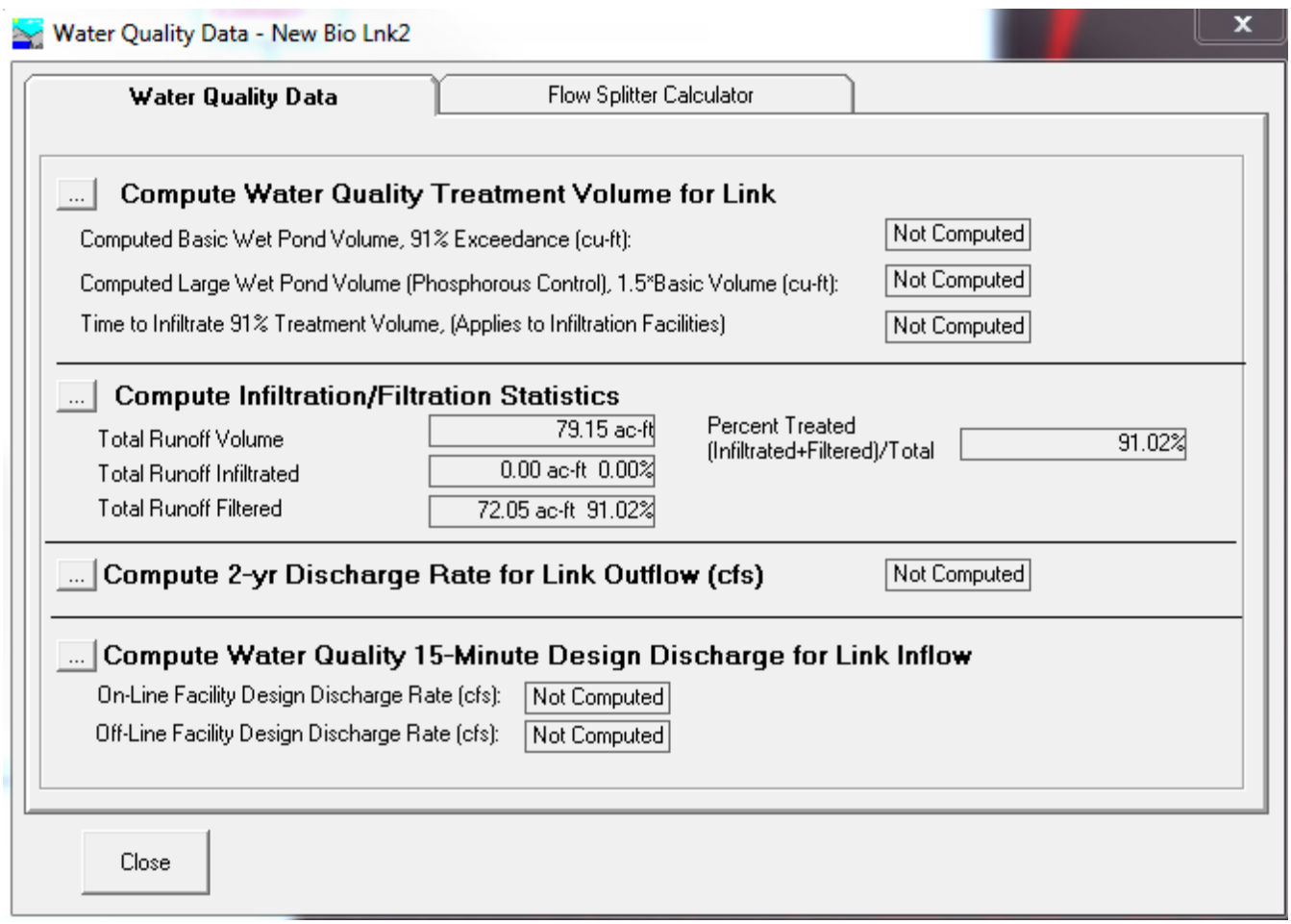
Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	4.610E-02	2-Year	4.406E-02
5-Year	5.801E-02	5-Year	5.539E-02
10-Year	6.856E-02	10-Year	6.600E-02
25-Year	7.709E-02	25-Year	7.575E-02
50-Year	8.349E-02	50-Year	8.258E-02
100-Year	9.179E-02	100-Year	9.080E-02
200-Year	0.103	200-Year	0.103

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	-38.2%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	-13.5%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	2.8%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	1.4%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS



APPENDIX D – GEOTECHNICAL ENGINEERING STUDY

GEOTECH
CONSULTANTS, INC.

13256 Northeast 20th Street, Suite 16
Bellevue, Washington 98005
(425) 747-5618 | GEOTECHNW.COM

November 5, 2015

JN 15449

Hopelink
10675 Willows Road Northeast #275
Redmond, Washington 98052

Attention: Susanna Cioch *via email: scioch@hope-link.org*

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Hopelink Facility
15511 Northeast 90th Street
Redmond, Washington

Dear Ms. Cioch:

We are pleased to present this geotechnical engineering report for the proposed Hopelink facility to be constructed in Redmond, Washington. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design criteria for foundations and pavements. This work was authorized by your acceptance of our proposal, P-9288, dated September 29, 2015.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

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TRC/MRM: at

GEOTECHNICAL ENGINEERING STUDY
Proposed Hopelink Facility
15511 Northeast 90th Street
Redmond, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed Hopelink facility to be located in Redmond.

The two existing buildings on the property are to be removed. We were provided with a site plan and floor plans prepared by Third Place Design Co-Operative dated May 13, 2015 and November 17, 2015. Based on these plans, we understand that the development will consist of a two-story building to be located on the west portion of the site, and a parking area that will cover most of the rest of the property. No below-grade spaces, such as basements, are expected. A plaza and urban garden will be located in the southeast corner of the site.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the site in Redmond. The rectangular-shaped property is bordered to the north by Northeast 90th Street, to the west by 154th Avenue Northeast, to the east by a public trail and then by the Sammamish River, and to the south by a commercial building.

The flat site is currently developed with two, one-story commercial buildings. Much of the exterior of the buildings is faced with masonry. We observed a few cracks in the masonry, with widths of up to 1/16th inch. We did not observe indications of substantial settlement. Most of the remainder of the site is paved with asphalt, with some landscape areas along the property edges and close to the buildings.

We expect that these existing buildings are supported on conventional foundations. What extent of excavation and earthwork conducted to prepare the foundation and slab areas for these buildings is not known.

SUBSURFACE

The subsurface conditions around the two buildings were explored by drilling three test borings at the approximate locations shown on the Site Exploration Plan, Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The borings were drilled on October 19, 2015 using a trailer-mounted, hollow-stem auger drill. Samples were taken at approximate 2.5 and 5-foot intervals with a standard penetration sampler. This split-spoon sampler, which has a 2-inch outside diameter, is driven into the soil with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler a given

distance is an indication of the soil density or consistency. A geotechnical engineer from our staff observed the drilling process, logged the test borings, and obtained representative samples of the soil encountered. The Test Boring Logs are attached as Plates 3 through 5.

Soil Conditions

The borings were all drilled in pavement areas. These explorations encountered a few inches of asphalt over 2 to 3 feet of fill consisting of gravelly sand. This fill seemed to be at least moderately compact.

Beneath the fill were native materials consisting of organic silt, ash, and peat that extended to depths of 4.5 to 7 feet. Those soils likely represent the upper few feet of the natural subsurface profile.

Underlying the organic soils was medium-dense sand with gravel. This soil is the typical recessional outwash found throughout much of the downtown Redmond area. The outwash extended to the base of the explorations at 31.5 feet.

Groundwater Conditions

Groundwater seepage was observed at a depth of 12 to 15 feet in the test borings, which were left open for only a short time period. The borings were also conducted following a long, dry summer, before the onset of heavy rains. Therefore, the seepage levels on the logs represent the location of transient water seepage and may not indicate the static groundwater level. As has been found with seasonal monitoring of wells throughout Redmond, the regional groundwater table will rise and fill seasonally, depending on rainfall, snowmelt, and other factors. We expect that the seasonal high groundwater level is much closer to the ground surface than the level of seepage observed in the borings.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. If a transition in soil type occurred between samples in the borings, the depth of the transition was interpreted. The relative densities and moisture descriptions indicated on the test boring logs are interpretive descriptions based on the conditions observed during drilling.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

The test borings conducted for this study encountered fill and compressible peat soils that were underlain at depths of 4.5 to 7 feet by medium-dense sand with gravel. The fill and peat soils are not suitable to support foundation loads without excessive long-term settlement, and so the structure foundations should extend down to the native sand soils. This will likely require over-

excavation of the upper materials. The over-excavations could be made vertically and filled with low-strength concrete, or they could be made wider and be filled with compacted structural fill. Foundation over-excavations are discussed in more detail in the ***Conventional Foundations*** section of this report.

The new building will overlie the footprint of the existing western building. The earthwork process that was accomplished for the construction of the existing buildings is not documented. As a result, it is possible that the unsuitable soils have already been removed in those areas, but it will not be possible to determine this until demolition of the buildings occurs. Test pits should be completed as soon as the demolition completed to determine whether or not the peat and other unsuitable soils were removed beneath the existing buildings. Due to this unknown, it would be most prudent that the construction planning and budget to assume that full overexcavation to bearing soils will be needed throughout the entire building.

As noted in the ***Seismic Considerations*** section of this report, there is some risk for seismic liquefaction of the outwash material beneath the water table under a large earthquake. We calculate that believe that settlement on the order of 3 inches could occur after a large seismic event. We do not believe that this amount of settlement would be structurally destabilizing if liquefaction was to occur. However, to mitigate the potential for catastrophic bearing loss beneath a concentrated load, we recommend that all foundations for the building be continuous. They should also be theoretically able to span a minimum distance of 10 feet without support, similar to a grade beam. These recommendations are intended to provide a more rigid foundation system. This foundation system will be suitable for the safety and health of occupants during a seismic event, but damage to the building would occur if seismic liquefaction were to occur. If the amount of settlement described above and the resulting damage to the structure is not tolerable, then a deep foundation system or ground improvements should be used.

Organic soils, such as were found in the upper portions of the borings, will consolidate over a long period of time. This can cause a multitude of issues for on-grade elements built over the peat soils. Even lightly-loaded elements such as floor slabs and pavements will settle substantially if they are placed over these soils. It would be most appropriate to remove the organic soils and peat throughout the entire building for best long-term performance of both the foundations and the floor slabs. If the peat is left in place under slabs, there will be substantial settlement relative to the foundations, and this would likely damage any underslab utilities.

An alternative to all of the above-recommended excavation to remove unsuitable soils beneath would be to utilize a system such as Rammed Aggregate Piers to construct compacted rock columns extending through the compressible soils to the outwash gravel. These piers typically are spaced every 6 to 8 feet through the entire footprint of the building, supporting the foundations and slabs. The use of a system such as this reduces the extent and volume of overexcavation and replacement of unsuitable soils. Rammed Aggregate Piers are typically designed by the specialty contractor that would install them. If this system is used, underslab utilities would likely have to be structurally connected to the slabs and foundations to prevent them from settling.

While not a structural concern, utilities and other on-grade elements placed above the peat soils outside of the building footprint will settle noticeably over time. Any settlement-sensitive structures and utilities should be excavated through the highly compressible soils. For utilities, this applies at least to manholes, catch basins and vaults. Pavements should be sloped as steeply as possible to surface catchbasins to reduce the potential for ponding of surface water when the pavements settle around them. Also, gravity utilities, such as sewers and storm drains should be sloped as steeply as possible to reduce the potential for flow problems when the pipes settle.

The outwash soils are highly permeable. Infiltration of runoff from on-site impervious areas could be utilized, if allowed by the City of Redmond. The infiltration system should be set as close to the existing grade as possible, in order to maintain function during periods of high water table. The City of Redmond may have access to well monitoring results that would allow a more definitive estimation of the potential high groundwater level in this area.

The erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered. We anticipate that a silt fence will be needed around the downslope sides of any cleared areas. Existing pavements, ground cover, and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Rocked staging areas and construction access roads should be provided on unpaved areas to reduce the amount of soil or mud carried off the property by trucks and equipment. Trucks should not be allowed to drive off of the paved or rock-covered areas. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Following clearing or rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site soil profile within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Site Class). As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.25g and 0.48g, respectively.

The site is underlain by medium-dense to dense, saturated, outwash soil consisting of sand and gravel. These soils have been demonstrated to have a moderate potential for liquefaction during a

large earthquake. Utilizing the Seismic Design Maps tool on the USGS website, the PGA for a Maximum Considered Earthquake (MCE) at the site would be 0.51g for a Site Class of D. Using procedures developed by Seed, Idriss, et al. we estimated the total ground settlement that could result if liquefaction were to occur in the loose to medium-dense soils beneath the water table under the MCE. Considering the PGA of 0.51g, we have calculated that a total ground settlement of approximately 3 inches could result. Given the variability in soil conditions and the inherent inaccuracies in the calculation methods, it is highly likely that this represents the high side of expected ground settlements. It is not possible to accurately determine the amount of differential settlement, and it is often assumed that a maximum differential settlement equal to one-half of the total will occur over a reasonable spacing along a wall or between columns. We estimate differential ground settlement on the order of 1.5 inches could occur across the building.

Lateral spreading is a phenomenon where there is essentially a slope stability failure within the liquefied soils. This has been observed to occur primarily in coastal and river conditions, where there is a free face that the soil can move toward. At this time, the methods for estimating the potential ground movement that could result from lateral spreading are even more limited in accuracy than those used for liquefaction analysis. Using methods developed by Bartlett and Youd, we have estimated that the potential for lateral ground movement to impact the proposed building is negligible.

CONVENTIONAL FOUNDATIONS

The proposed structure can be supported on conventional continuous footings bearing on undisturbed, medium-dense, native soil, or on structural fill placed above this competent native soil. See the section entitled ***General Earthwork and Structural Fill*** for recommendations regarding the placement and compaction of structural fill beneath structures. Adequate compaction of structural fill should be verified with frequent density testing during fill placement. Prior to placing structural fill beneath foundations, the excavation should be observed by the geotechnical engineer to document that adequate bearing soils have been exposed.

We recommend that continuous spread footings have minimum widths of 16 inches. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required. Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand.

Overexcavation will likely be required below the footings to expose competent native soil. Unless lean concrete is used to fill an overexcavated hole, the overexcavation must be at least as wide at the bottom as the sum of the depth of the overexcavation and the footing width. For example, an overexcavation extending 2 feet below the bottom of a 2-foot-wide footing must be at least 4 feet wide at the base of the excavation. If lean concrete is used, the overexcavation need only extend 6 inches beyond the edges of the footing.

An allowable bearing pressure of 3,000 pounds per square foot (psf) is appropriate for footings supported on competent native soil. A one-third increase in this design bearing pressure may be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil, or on structural fill up to 5 feet in thickness, will be about one-inch, with differential settlements on the order of one-half-inch in a distance of 30 feet along a continuous footing with a uniform load.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill.

We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.45
Passive Earth Pressure	300 pcf

Where: pcf is Pounds per Cubic Foot, and Passive Earth Pressure is computed using the equivalent fluid density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend maintaining a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate values.

FOUNDATION AND RETAINING WALLS

No tall retaining walls are expected for this project. Even so, walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Active Earth Pressure *	35 pcf
Passive Earth Pressure	300 pcf
Coefficient of Friction	0.45
Soil Unit Weight	130 pcf

Where: pcf is Pounds per Cubic Foot, and Active and Passive Earth Pressures are computed using the equivalent fluid pressures.

*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above active equivalent fluid pressure.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added to the above lateral soil pressures. Where sloping backfill is desired behind the walls, we will need to be given the wall dimensions and the slope of the backfill in order to provide the appropriate design earth pressures. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density. Heavy construction equipment should not be operated behind retaining and foundation

walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired. The passive pressure given is appropriate only for a shear key poured directly against undisturbed native soil, or for the depth of level, well-compacted fill placed in front of a retaining or foundation wall. The values for friction and passive resistance are ultimate values and do not include a safety factor. Restrained wall soil parameters should be utilized for a distance of 1.5 times the wall height from corners or bends in the walls. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

The surcharge wall loads that could be imposed by the design earthquake can be modeled by adding a uniform lateral pressure to the above-recommended active pressure. The recommended surcharge pressure is 8**H** pounds per square foot (psf), where **H** is the design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. If the native sand is used as backfill, a drainage composite similar to Miradrain 6000 should be placed against the backfilled retaining walls. The drainage composites should be hydraulically connected to the foundation drain system.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. Water percolating through pervious surfaces (pavers, gravel, permeable pavement, etc.) must also be prevented from flowing toward walls or into the backfill zone. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains

additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is important to prevent a build up of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

SLABS-ON-GRADE

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or products. ACI also notes that vapor *retarders* such as 6-mil plastic sheeting have been used in the past, but are now recommending a minimum 10-mil thickness for better durability and long term performance. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection. If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in

accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the near-surface soil at the subject site would generally be classified as Type C. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1.5:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut. Excavation shoring will be needed if steeper cuts are attempted, or if groundwater or caving soils are encountered in an excavation. This may affect any deep excavations necessary for utilities.

Any excavations extending below the water table will require substantial dewatering. This is an expensive process that typically involves high capacity dewatering wells.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand or loose soil can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

DRAINAGE CONSIDERATIONS

Footing drains should be used where: (1) crawl spaces or basements will be below a structure; (2) a slab is below the outside grade; or (3) the outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock that is encircled with non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor or the level of a crawl space. The discharge pipe for subsurface drains should be sloped for flow to the outlet point.

Roof and surface water drains must not discharge into the foundation drain system. A typical drain detail is attached to this report as Plate 6. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains.

If the structure includes an elevator, it may be necessary to provide special drainage or waterproofing measures for the elevator pit. If no seepage into the elevator pit is acceptable, it will be necessary to provide a footing drain and free-draining wall backfill, and the walls should be waterproofed. If the footing drain will be too low to connect to the storm drainage system, then it will likely be necessary to install a pumped sump to discharge the collected water. Alternatively, the elevator pit could be designed to be entirely waterproof; this would include designing the pit structure to resist hydrostatic uplift pressures.

Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to a building should slope away at least 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section. Water from roof, storm water, and foundation drains should not be discharged onto slopes; it should be tightlined to a suitable outfall located away from any slopes.

PAVEMENT AREAS

The pavement section may be supported on competent, native soil, on structural fill, or on existing fill compacted to a 95 percent density. The pavement subgrade must be in a stable, non-yielding condition at the time of paving. Granular structural fill or geotextile fabric may be needed to stabilize soft, wet, or unstable areas. To evaluate pavement subgrade strength, we recommend that a proof roll be completed with a loaded dump truck immediately before paving. In most instances where unstable subgrade conditions are encountered, an additional 12 inches of granular structural fill will stabilize the subgrade, except for very soft areas where additional fill could be required. The subgrade should be evaluated by Geotech Consultants, Inc., after the site is stripped and cut to grade. Recommendations for the compaction of structural fill beneath pavements are given in the section entitled ***General Earthwork and Structural Fill***. The performance of site pavements is directly related to the strength and stability of the underlying subgrade.

If the existing fill is left in place, it should be compacted before the pavement section is placed. In this case, the pavement for lightly loaded traffic and parking areas should consist of 2 inches of asphalt concrete (AC) over 6 inches of crushed rock base (CRB) or 3 inches of asphalt-treated base (ATB). We recommend providing heavily loaded areas with 3 inches of AC over 8 inches of CRB or 6 inches of ATB. Heavily loaded areas are typically main driveways, dumpster sites, or areas with truck traffic. Increased maintenance and more frequent repairs should be expected if thinner pavement sections are used.

If the existing fill is removed, the above-recommended pavement sections will have to be underlain by a minimum 24-inch thickness of compacted crushed rock placed over a non-woven filter fabric.

Due to the presence of the peat soils, periodic maintenance and patching of the pavements should be expected. This is common for the surrounding area. Sometimes, overlays can be required to ensure proper flow of surface water to storm catchbasins.

The pavement section recommendations and guidelines presented in this report are based on our experience in the area and on what has been successful in similar situations. As with any pavements, some maintenance and repair of limited areas can be expected as the pavement ages. Cracks in the pavement should be sealed as soon as possible after they become evident, in order to reduce the potential for degradation of the subgrade from infiltration of surface water. For the same reason, it is also prudent to seal the surface of the pavement after it has been in use for several years. To provide for a design without the need for any maintenance or repair would be uneconomical.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. It is important that existing foundations be removed before site development. The stripped or removed materials should not be mixed with any materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not sufficiently compacted, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath footings, slabs or walkways	95%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

Structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the test borings are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test borings. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

This report has been prepared for the exclusive use of Hopelink and its representatives for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

The scope of our work did not include an environmental assessment, but we can provide this service, if requested.

The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 5	Test Boring Logs
Plate 6	Typical Footing Drain Detail

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

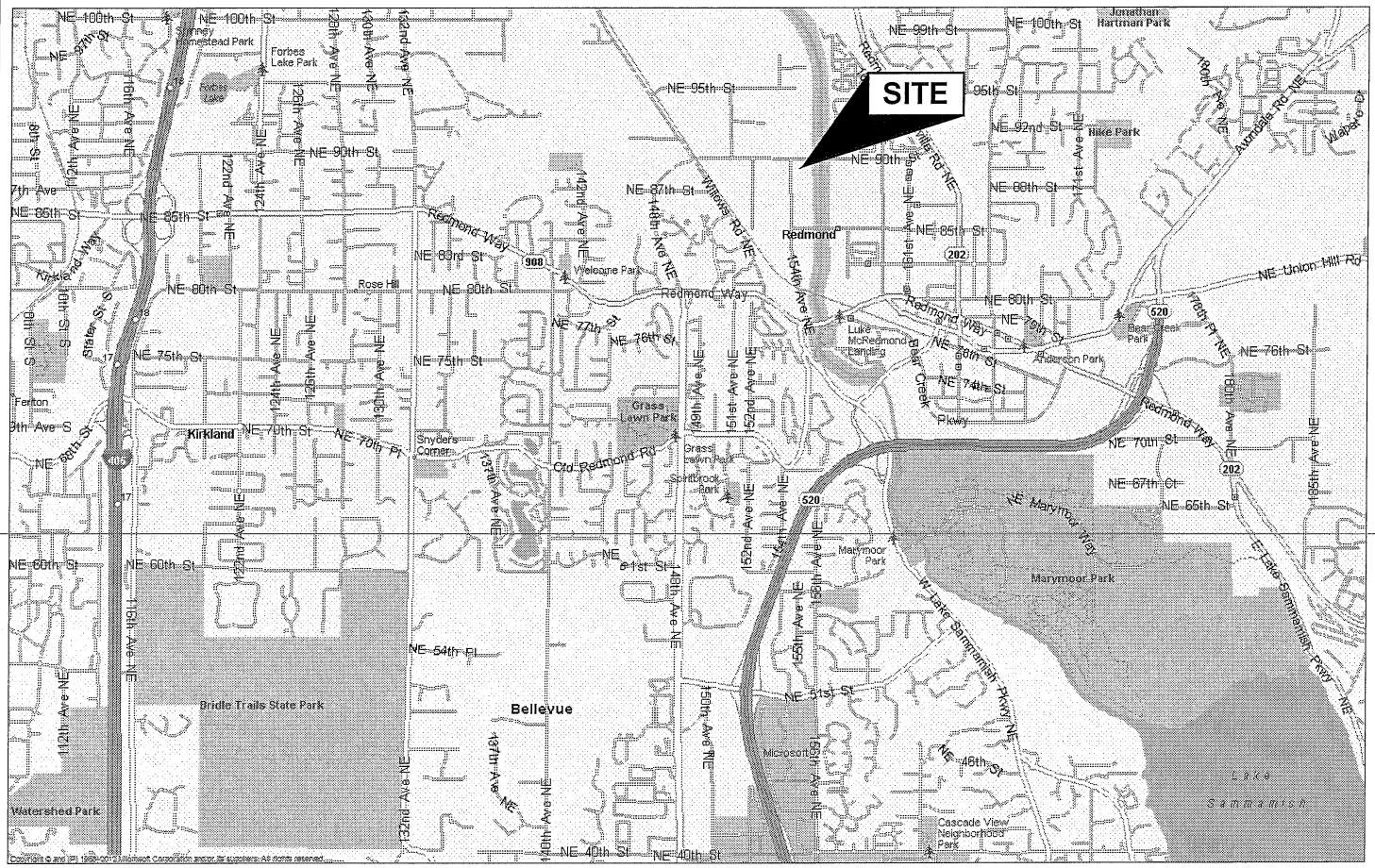
Thor Christensen, P.E.
Senior Engineer

MARC R. McGINNIS
STATE OF WASHINGTON
27845
REGISTERED
PROFESSIONAL ENGINEER

11/5/15

Marc R. McGinnis, P.E.
Principal

NORTH



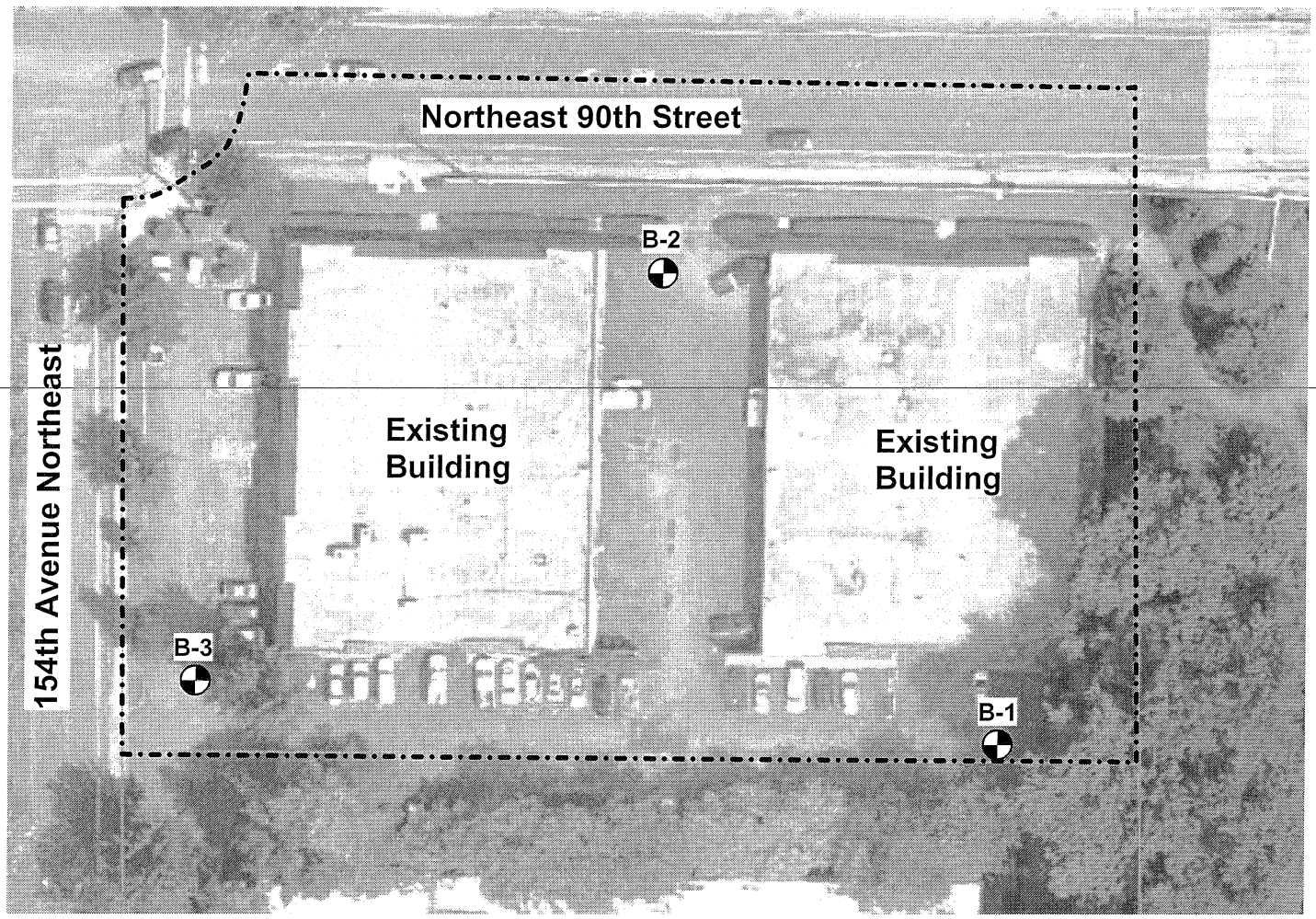
(Source: Microsoft MapPoint, 2013)

GEOTECH
CONSULTANTS, INC.

VICINITY MAP

15511 Northeast 90th Street
Redmond, Washington

Job No:	Date:		Plate:
15449	Oct. 2015		1



Legend:

Test Boring Location

(Source: King County iMap website)

GEOTECH
CONSULTANTS, INC.

SITE EXPLORATION PLAN

15511 Northeast 90th Street
Redmond, Washington

Job No:	Date:		Plate:
15449	Oct. 2015	No Scale	2

BORING 1

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
					FILL	2.5 inches of asphalt over: Brown SAND with gravel, fine to coarse-grained, moist, medium-dense **(FILL)**
5			11	1	PT	Dark brown PEAT with a 2-inch layer of ash, moist, stiff
					SW	Gray-brown SAND with gravel, moist, medium-dense
10		▼	47	2		-increased gravel content
15			22	3		-decreased gravel content, becomes gray
20			21	4		
25			22	5		
30			20	6		

* **Test boring was terminated at 31.5 feet on October 19, 2015.**
* **Groundwater was encountered at 13 feet during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

15511 Northest 90th Street
Redmond, Washington

Job	Date:	Logged by:	Plate:
15449	Oct. 2015	TRC	3

BORING 2

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
						2.5 inches of asphalt over: Brown SAND with gravel, fine to coarse-grained, moist, medium-dense **(FILL)**
			6	1	OL	Brown organic SILT and gray ASH, non-plastic, moist, loose
					PT	Dark brown PEAT, moist to wet, medium-stiff
5			22	2	SW	Gray-brown SAND with gravel, moist, medium-dense
10		▼	17	3		-becomes wet
15			23	4		-becomes gray
20			32	5		-becomes dense
25			25	6		-becomes medium-dense
30			47	7		-becomes dense

* **Test boring was terminated at 31.5 feet on October 19, 2015.**
* **Groundwater was encountered at 12 feet during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

15511 Northest 90th Street
Redmond, Washington

Job	Date:	Logged by:	Plate:
15449	Oct. 2015	TRC	4

BORING 3

Depth (ft.)	Moisture	Water Table	Blows per Foot	Sample	USCS	Description
					FILL	3 inches of asphalt over: Brown SAND with gravel, fine to coarse-grained, moist, medium-dense **(FILL)**
			4	1	PT	Dark brown PEAT with a 6-inch layer of ash, moist, medium-stiff
5			4	2		
			28	3	SW	Gray-brown SAND with gravel, moist, medium-dense
10			20	4		
15		▼	21	5		-becomes wet
20			43	6		-becomes dense
25			30	7		
30			20	8		-becomes medium-dense

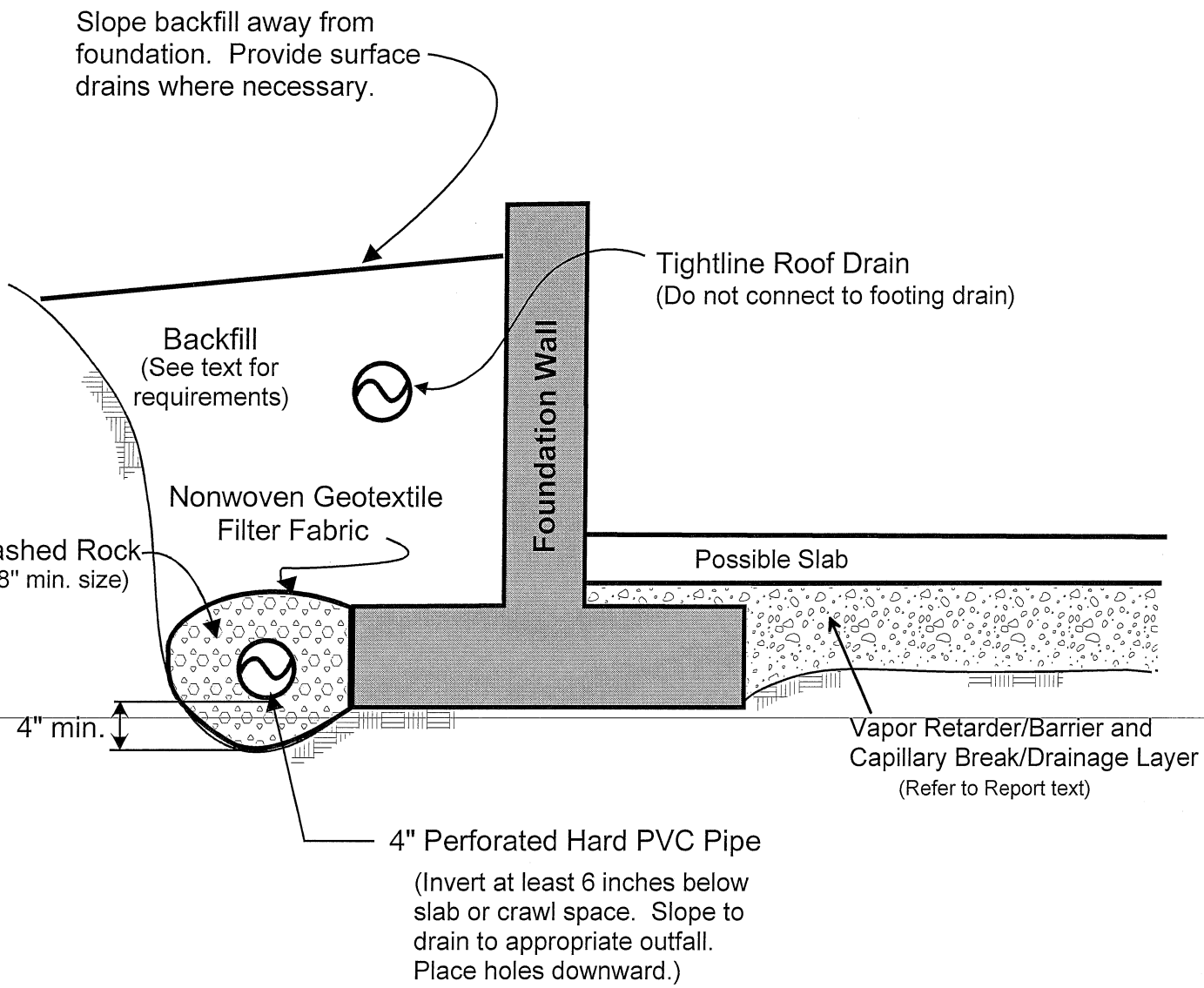
*** Test boring was terminated at 31.5 feet on October 19, 2015.**
*** Groundwater was encountered at 15 feet during drilling.**

GEOTECH
CONSULTANTS, INC.

TEST BORING LOG

15511 Northest 90th Street
Redmond, Washington

Job	Date:	Logged by:	Plate:
15449	Oct. 2015	TRC	5



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

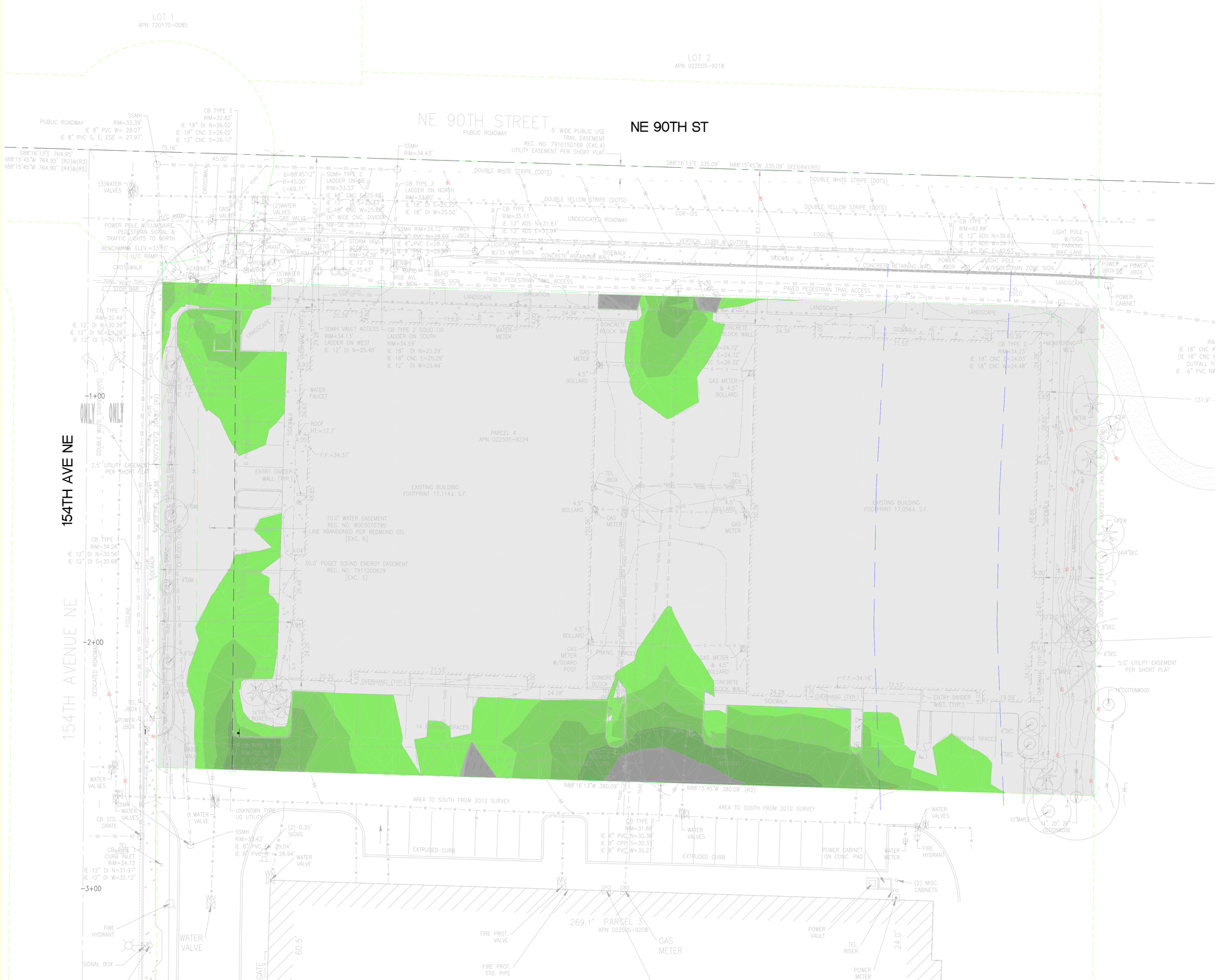
GEOTECH
CONSULTANTS, INC.

FOOTING DRAIN DETAIL

15511 Northeast 90th Street
Redmond, Washington

Job No:	Date:		Plate:
15449	Oct. 2015		6

APPENDIX E – FLOODPLAIN STORAGE



N

SCALE: 1" = 20'

DATUM

NAVD 88

LEGEND

AMOUNT OF STORAGE

- NO STORAGE (ABOVE 33.6')
- 0.0'–.32'
- 0.32'–0.64'
- 0.64'–0.96'
- 0.96'–1.28'
- 1.28'–1.60'

TOTAL STORAGE = 340 CU YDS

hopelink

Redmond Integrated Service Center

Redmond, WA

coterra ENGINEERING PLLC
321 3rd Ave South, Suite 307
Seattle, Washington 98104
ph 206.596.7115
coterraengineering.com

90% PREP INTAKE

ISSUE DATE: 05.5.16
DRAWN BY: HS
CHECKED BY: PA

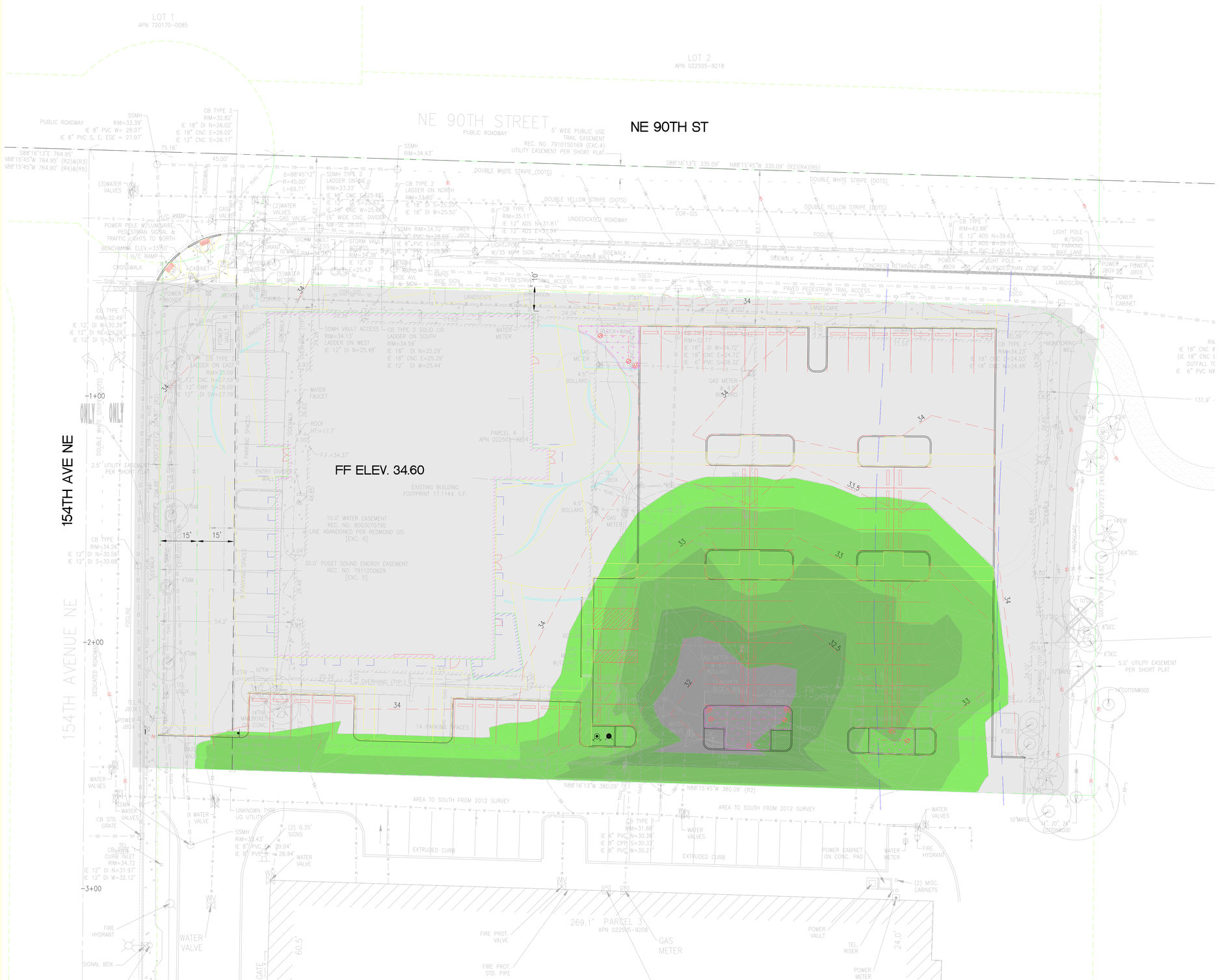
NO.	DATE	REMARK
1	02.16.2016	30% & 60% INTAKE
2	05.5.2016	90% INTAKE

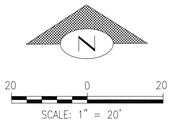
DRAWING NAME:

EXISTING FLOOD STORAGE

SHEET NO:

EXHIBIT B





DATUM

NAVD 88

LEGEND

AMOUNT OF STORAGE

- NO STORAGE (ABOVE 33.6')
- 0.0'–.32' OF STORAGE
- 0.32'–0.64'
- 0.64'–0.96'
- 0.96'–1.28'
- 1.28'–1.60'

TOTAL STORAGE = 550 CU YDS

hopelink

Redmond Integrated Service Center

Redmond, WA

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ph 206.596.7115
coterraengineering.com

90% PREP INTAKE

ISSUE DATE: 05.5.16
DRAWN BY: HS
CHECKED BY: PA

NO.	DATE	REMARK
1	02.16.2016	30% & 60% INTAKE
2	05.5.2016	90% INTAKE

DRAWING NAME:

PROPOSED FLOOD STORAGE

SHEET NO:

EXHIBIT A