Appendix G:

Preliminary Technical Information Report (Drainage) – Montevallo, November 2004

Prepared For:
Phoenix Development Inc.
PO Box 7167
7127-196th Street SW
Lynnwood, Washington 98046-3167

Date November 5, 2004

MONTEVALLO
Preliminary Technical Information Report

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LIST OF SUPPLEMENTAL INFORMATION

Note: Where applicable, supplemental information is located at the end of each section.

Section I:
TIR Worksheet

Section III:
Level 1 Downstream Analysis

Section IV:
Existing Basin Exhibit
Developed Basin Exhibit
1998 KCSWDM – Figure 3.2.2.A Rainfall Regions and Regional Scale Factors

Section V:
Offsite Pipe Capacity Calculations*

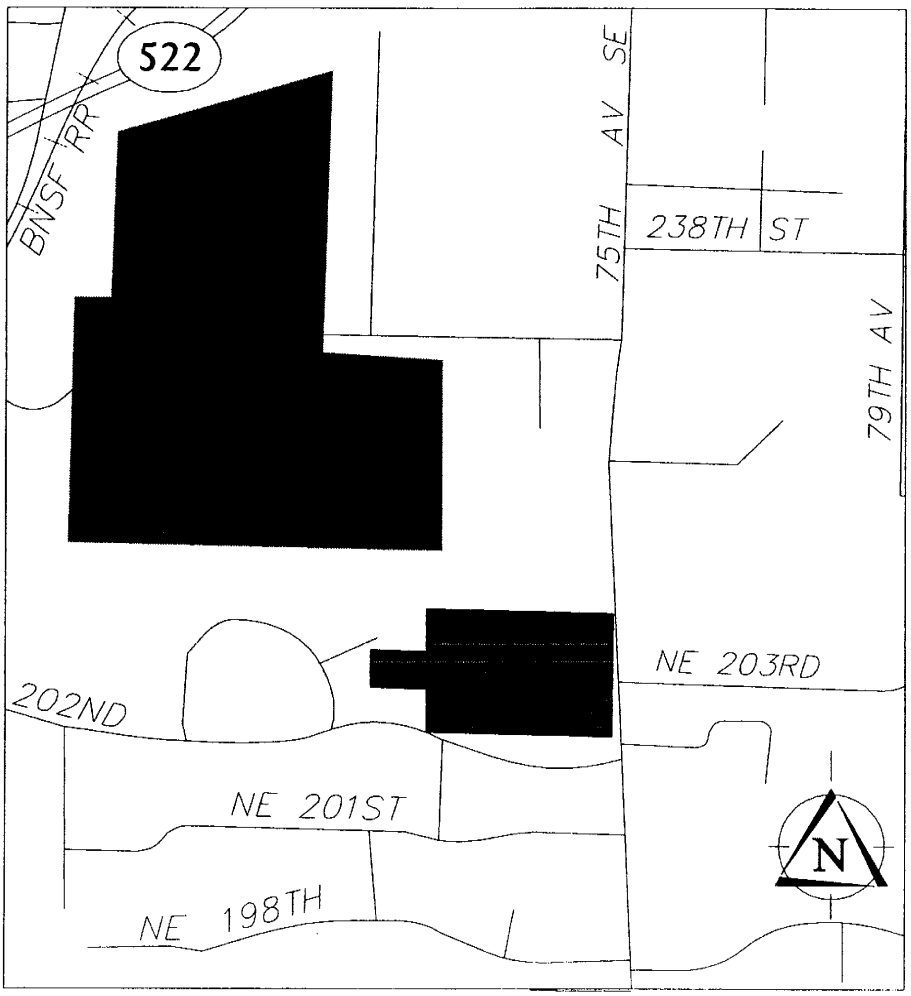
Section VI:
Geotechnical Engineering Study prepared by Earth Consultants Inc., dated September 22, 2004

Section X:
Bond Quantity Worksheet*

*To be provided at Final Engineering Submittal

1 PROJECT OVERVIEW

The Montevallo Project proposes to construct 66 single family homes on approximately 13.5 acres of a 16.5 acre site. The site is located west of 156th Avenue NE and north of NE 202nd Street. In general, the site lies within Section 02, Township 26 North, Range 05 East, W.M., City of Woodinville, Washington. See the vicinity map below and the Developed Conditions Exhibit in the end of Section 4.



VICINITY MAP
Not to Scale

King County Department of Development and Environmental Services

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner Phoenix Development, Inc.

Address Box 3167 7127-196th Street SW Lynnwood, WA 98046-3167

Project Engineer Mark Keller

Company Triad Associates

Address/Phone 11814 115th Ave NE Kirkland, WA 98034 425-821-844

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name Montevallo

Location

Township 26 N

Range 5 E

Section NW 02

Part 3 TYPE OF PERMIT APPLICATION

- [X] Subdivison
- [ ] Short Subdivision
- [ ] Grading
- [ ] Commercial
- [ ] Other _____

Part 4 OTHER REVIEWS AND PERMITS

- [ ] DFW HPA
- [ ] Shoreline Management
- [ ] COE 404
- [ ] Rockery
- [ ] DOE Dam Safety
- [ ] Structural Vaults
- [ ] FEMA Floodplain
- [ ] Other
- [ ] COE Wetlands

Part 5 SITE COMMUNITY AND DRAINAGE BASIN

Community

Northshore

Drainage Basin

Little Bear Creek

Part 6 SITE CHARACTERISTICS

- [ ] River _____
- [ ] Stream _____
- [ ] Critical Stream Reach
- [ ] Depressions/Swales
- [ ] Lake _____
- [ ] Steep Slopes _____
- [ ] Floodplain _____
- [X] Wetlands _____
- [ ] Seeps/Springs
- [ ] High Groundwater Table
- [ ] Groundwater Recharge
- [ ] Other _____

Part 7 SOILS

Soil Type	Slopes	Erosion Potential	Erosive Velcoties
Alderwood gravelly sandy loam	6 to 15 percent	moderate	slow to medium

☐ Additional Sheets Attached

Part 8 DEVELOPMENT LIMITATIONS

	REFERENCE	LIMITATION/SITE CONSTRAINT
☐	Ch. 4 – Downstream Analysis	
☐		
☐		
☐		
☐		
☐		

☐ Additional Sheets Attached

Part 9 ESC REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☒ Sedimentation Facilities	☒ Stabilize Exposed Surface
☒ Stabilized Construction Entrance	☒ Remove and Restore Temporary ESC Facilities
☒ Perimeter Runoff Control	☒ Clean and Remove All Silt and Debris
☒ Clearing and Grading Restrictions	☒ Ensure Operation of Permanent Facilities
☒ Cover Practices	☒ Flag Limits of SAO and open space preservation areas
☒ Construction Sequence	
☐ Other	☐ Other

Part 10 SURFACE WATER SYSTEM

- ☐ Grass Lined Channel
- ☒ Pipe System
- ☐ Open Channel
- ☐ Dry Pond
- ☐ Wet Pond
- ☐ Tank
- ☒ Vault
- ☐ Energy Dissapator
- ☒ Wetland
- ☐ Stream
- ☒ Storm filter
- ☐ Infiltration
- ☐ Depression
- ☒ Flow Dispersal
- ☒ Waiver
- ☐ Regional Detention

Method of Analysis

KCTRS level 2

Compensation/Mitigation of Eliminated Site Storage

_____

Brief Description of System Operation Curb and gutter roadway to catch basins then through a tight line drainage system to a detention vault. The discharge will be controlled under level 2 and with a leaf compost filter system for water quality treatment.

Facility Related Site Limitations

Reference	Facility	Limitation

Part 11 STRUCTURAL ANALYSIS

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

Part 12 EASEMENTS/TRACTS

- ☐ Drainage Easement
- ☐ Access Easement
- ☐ Native Growth Protection Easement
- ☐ Tract
- ☐ Other

Part 13 SIGNATURE OF PROFESSIONAL ENGINEER

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

_____

Signed/Date

2 CONDITIONS AND REQUIREMENTS SUMMARY

2.1 Core Requirements

2.1.1 Core Requirement #1: Discharge at the Natural Location

Runoff from the site drains to the onsite wetland occupying the western portion of the site. The wetland drains offsite to the north via a vegetated ditch along the northwest property boundary of the site. Flow from the ditch enters a culvert / ditch system before discharging into a pond located within the Wellington Hills Golf Course approximately 350 ft downstream of the site. The proposed discharge location of the developed site will be to an existing closed pipe system along the western boundary of the site which meets with the natural downstream drainage path approximately 270' downstream of the site (see Level 1 Report in Section 3). A drainage variance will be requested to the City of Woodinville.

2.1.2 Core Requirement #2: Offsite Analysis

See the Level 1 Downstream Analysis included in Section 3 of this TIR.

2.1.3 Core Requirement #3: Flow Control

Since site drainage is tributary to the Little Bear Creek (classified as salmonid-bearing stream), a detention vault designed to Level 2 flow control standards is proposed. See Section 4 – Flow Control and Water Quality Facility Analysis and Design.

2.1.4 Core Requirement #4: Conveyance System

See Section 6 – Conveyance System Analysis and Design.

2.1.5 Core Requirement #5: Erosion and Sediment Control

See Section 9 – Temporary Erosion and Sedimentation Control Analysis and Design.

2.1.6 Core Requirement #6: Maintenance and Operations

The storm system will be maintained by the City of Woodinville. Operations and Maintenance will be per King County Standards. See Section 10 – Operations and Maintenance Manual.

2.1.7 Core Requirement #7: Financial Guarantees and Liability

This requirement will be addressed during final engineering in Section 9 – Bond Quantity Work Sheet, Retention/Detention Facility Summary, and Declaration of Covenant.

2.1.8 Core Requirement #8: Water Quality

Water Quality BMPs from the Resource Stream Protection Menu will be provided. A treatment train system of wet vault followed by a leaf compost filter (StormFilter) is proposed for the site. The leaf compost filter will be the StormFilter system with leaf compost media by Stormwater Management Inc. See Section 4 – Flow Control and Water Quality Facility Analysis and Design.

2.2 Special Requirement #1: Other Adopted Area-Specific Requirements

2.2.1 Critical Drainage Areas

The site is not located within a Critical Drainage Area.

2.2.2 Master Drainage Plan

Not applicable.

2.2.3 Basin Plans

According to the King County Drainage Basins Map, the site is located within the Little Bear Creek sub-basin of the Sammamish River Drainage Basin.

2.2.4 Lake Management Plans

Not applicable.

2.2.5 Shared Facility Drainage Plans

Not applicable.

2.3 Special Requirement #2: Floodplain/Floodway Delineation

The limits of this project do not lie in a 100-year floodplain.

2.4 Special Requirement #3: Flood Protection Facilities

This special requirement is required for projects with Class 1 or 2 streams with an existing flood protection facility. The site does not contain the above-mentioned items.

2.5 Special Requirement #4: Source Controls

Not applicable. This project is not a commercial, industrial, multifamily or a redevelopment of a commercial, industrial or multifamily project.

3 OFFSITE ANALYSIS

3.1 Level 1 Downstream Analysis

Please refer to the attached Level 1 Downstream Analysis.

4 FLOW CONTROL AND WATER QUALITY DESIGN

4.1 Performance Standards, Flow Control System, W.Q. System

All stormwater facilities will be designed per the 1998 King County Surface Water Design Manual (KCSWDM). Since site drainage is tributary to the Little Bear Creek (classified as salmonid-bearing stream), a detention vault designed to Level 2 flow control standards along with water quality treatment from the Resource Stream Protection Menu is required for the site.

4.2 Drainage Concept

Runoff from the developed site will be collected and detained in a vault located adjacent to the wetland in the western portion of the site. Detained areas will also include the half street of 156th Avenue NE fronting the site to the east. Roof runoff from lots adjacent to the onsite wetland is proposed to bypass the detention vault and discharge into the wetland for recharge. Flows discharged from the site are proposed to drain to the existing system within NE 204th Street. A drainage variance to Core Requirement #1 will be requested (see Level 1 report for downstream details).

4.3 Detention

A detention vault with Level 2 flow control will be provided for the site. A Level 2 flow control facility requires, in addition to the Level 1 flow control requirement (match 2-year and 10-year peak discharge rates of the developed to the predeveloped conditions), that discharge durations from the developed site match those of the predeveloped durations for the range of the predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

The King County Runoff Time Series (KCRTS) program (using hourly time steps) was used to size the Level 2 detention vault. The input parameters for the KCRTS program to estimate runoff for the site are Sea-Tac Rainfall Region with a Scale Factor of 1.0 and Till Soils conditions.

4.3.1 Existing Flows

The existing basin is modeled with developable portions of the site east of the onsite wetland including the half street of 156th Avenue NE fronting the site. The total existing basin area is 13.50 acres with 1.40 acres of till forest, 0.69 acres of impervious, 1.32 acres of till grass, and 10.09 acres of till pasture. Refer to the *Existing Basin Exhibit* at the end of this Section.

KCRTS Existing Peak Flows

Flow Frequency Analysis
Time Series File:exst.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---			-----Flow Frequency Analysis-------			
Flow Rate (CFS)	Rank	Time of Peak	- - Peaks - - (CFS)	Rank	Return Period	Prob
1.02	3	2/09/01 15:00	1.92	1	100.00	0.990
0.496	7	1/05/02 16:00	1.02	2	25.00	0.960
1.02	2	2/28/03 3:00	1.02	3	10.00	0.900
0.241	8	8/26/04 2:00	0.967	4	5.00	0.800
0.574	6	1/05/05 8:00	0.908	5	3.00	0.667
0.967	4	1/18/06 16:00	0.574	6	2.00	0.500
0.908	5	11/24/06 4:00	0.496	7	1.30	0.231
1.92	1	1/09/08 6:00	0.241	8	1.10	0.091
Computed Peaks			1.62		50.00	0.980

The peak downstream flows from the detention vault will not exceed 0.57 cfs and 1.02 cfs for the 2 and 10-year storm events, respectively.

4.3.2 Developed Flows

The developed basin will not include the wetland recharge portion. The developed basin is 12.38 acres with 7.20 acres of impervious surfaces (58%) and 5.18 acres of till grass. Refer to the *Developed Basin Exhibit* at the end of this Section.

KCRTS Developed Peak Flows

Flow Frequency Analysis
Time Series File:site-9-20.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---			-----Flow Frequency Analysis-------			
Flow Rate (CFS)	Rank	Time of Peak	- - Peaks - - (CFS)	Rank	Return Period	Prob
2.21	6	2/09/01 2:00	4.50	1	100.00	0.990
1.77	8	1/05/02 16:00	2.75	2	25.00	0.960
2.66	3	2/27/03 7:00	2.66	3	10.00	0.900
1.89	7	8/26/04 2:00	2.34	4	5.00	0.800
2.28	5	10/28/04 16:00	2.28	5	3.00	0.667
2.34	4	1/18/06 16:00	2.21	6	2.00	0.500
2.75	2	10/26/06 0:00	1.89	7	1.30	0.231
4.50	1	1/09/08 6:00	1.77	8	1.10	0.091
Computed Peaks			3.91		50.00	0.980

The 100-year peak developed flow rate generated from the detained area is 4.50 cfs.

4.3.3 Detention Vault Modeling

The following is the output from the KCRTS program for the modeled Level 2 detention vault.

KCRTS Level 2 Vault

Retention/Detention Facility

Type of Facility: Detention Vault
Facility Length: 285.00 ft
Facility Width: 50.00 ft
Facility Area: 14250. sq. ft
Effective Storage Depth: 6.50 ft
Stage 0 Elevation: 0.00 ft
Storage Volume: 92625. cu. ft
Riser Head: 6.50 ft
Riser Diameter: 12.00 inches
Number of orifices: 3

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	2.44	0.412	
2	3.10	2.63	0.346	6.0
3	4.40	2.31	0.210	6.0

Top Notch Weir: None
Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	(ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	0.00	0.	0.000	0.000	0.00

0.03	0.03	428.	0.010	0.026	0.00
0.05	0.05	713.	0.016	0.036	0.00
0.08	0.08	1140.	0.026	0.045	0.00
0.10	0.10	1425.	0.033	0.051	0.00
0.13	0.13	1853.	0.043	0.058	0.00
0.15	0.15	2138.	0.049	0.063	0.00
0.18	0.18	2565.	0.059	0.068	0.00
0.20	0.20	2850.	0.065	0.073	0.00
0.33	0.33	4703.	0.108	0.093	0.00
0.46	0.46	6555.	0.150	0.109	0.00
0.59	0.59	8408.	0.193	0.124	0.00
0.71	0.71	10118.	0.232	0.136	0.00
0.84	0.84	11970.	0.275	0.148	0.00
0.97	0.97	13823.	0.317	0.159	0.00
1.10	1.10	15675.	0.360	0.169	0.00
1.22	1.22	17385.	0.399	0.179	0.00
1.35	1.35	19238.	0.442	0.188	0.00
1.48	1.48	21090.	0.484	0.196	0.00
1.61	1.61	22943.	0.527	0.205	0.00
1.73	1.73	24653.	0.566	0.213	0.00
1.86	1.86	26505.	0.608	0.220	0.00
1.99	1.99	28358.	0.651	0.228	0.00
2.12	2.12	30210.	0.694	0.235	0.00
2.24	2.24	31920.	0.733	0.242	0.00
2.37	2.37	33773.	0.775	0.249	0.00
2.50	2.50	35625.	0.818	0.255	0.00
2.62	2.62	37335.	0.857	0.262	0.00
2.75	2.75	39188.	0.900	0.268	0.00
2.88	2.88	41040.	0.942	0.274	0.00
3.01	3.01	42893.	0.985	0.280	0.00
3.10	3.10	44175.	1.014	0.284	0.00
3.13	3.13	44603.	1.024	0.287	0.00
3.15	3.15	44888.	1.030	0.294	0.00
3.18	3.18	45315.	1.040	0.304	0.00
3.21	3.21	45743.	1.050	0.317	0.00
3.24	3.24	46170.	1.060	0.333	0.00
3.26	3.26	46455.	1.066	0.353	0.00
3.29	3.29	46883.	1.076	0.375	0.00
3.32	3.32	47310.	1.086	0.382	0.00
3.35	3.35	47738.	1.096	0.389	0.00
3.47	3.47	49448.	1.135	0.416	0.00
3.60	3.60	51300.	1.178	0.439	0.00
3.73	3.73	53153.	1.220	0.461	0.00
3.86	3.86	55005.	1.263	0.480	0.00
3.98	3.98	56715.	1.302	0.499	0.00
4.11	4.11	58568.	1.345	0.516	0.00
4.24	4.24	60420.	1.387	0.533	0.00
4.37	4.37	62273.	1.430	0.549	0.00
4.40	4.40	62700.	1.439	0.553	0.00
4.42	4.42	62985.	1.446	0.557	0.00
4.45	4.45	63412.	1.456	0.564	0.00
4.47	4.47	63697.	1.462	0.574	0.00
4.50	4.50	64125.	1.472	0.586	0.00
4.52	4.52	64410.	1.479	0.601	0.00
4.54	4.54	64695.	1.485	0.617	0.00
4.57	4.57	65123.	1.495	0.632	0.00
4.59	4.59	65408.	1.502	0.639	0.00

4.72	4.72	67260.	1.544	0.672	0.00
4.85	4.85	69113.	1.587	0.700	0.00
4.97	4.97	70823.	1.626	0.727	0.00
5.10	5.10	72675.	1.668	0.752	0.00
5.23	5.23	74528.	1.711	0.775	0.00
5.36	5.36	76380.	1.753	0.797	0.00
5.48	5.48	78090.	1.793	0.819	0.00
5.61	5.61	79943.	1.835	0.839	0.00
5.74	5.74	81795.	1.878	0.859	0.00
5.87	5.87	83648.	1.920	0.879	0.00
5.99	5.99	85358.	1.960	0.897	0.00
6.12	6.12	87210.	2.002	0.916	0.00
6.25	6.25	89063.	2.045	0.933	0.00
6.38	6.38	90915.	2.087	0.951	0.00
6.50	6.50	92625.	2.126	0.967	0.00
6.60	6.60	94050.	2.159	1.290	0.00
6.70	6.70	95475.	2.192	1.860	0.00
6.80	6.80	96900.	2.225	2.610	0.00
6.90	6.90	98325.	2.257	3.410	0.00
7.00	7.00	99750.	2.290	3.710	0.00
7.10	7.10	101175.	2.323	3.970	0.00
7.20	7.20	102600.	2.355	4.220	0.00
7.30	7.30	104025.	2.388	4.450	0.00
7.40	7.40	105450.	2.421	4.670	0.00
7.50	7.50	106875.	2.454	4.870	0.00
7.60	7.60	108300.	2.486	5.070	0.00
7.70	7.70	109725.	2.519	5.260	0.00
7.80	7.80	111150.	2.552	5.440	0.00
7.90	7.90	112575.	2.584	5.610	0.00
8.00	8.00	114000.	2.617	5.780	0.00
8.10	8.10	115425.	2.650	5.940	0.00
8.20	8.20	116850.	2.683	6.100	0.00
8.30	8.30	118275.	2.715	6.250	0.00
8.40	8.40	119700.	2.748	6.400	0.00
8.50	8.50	121125.	2.781	6.550	0.00

Hyd	Inflow	Outflow		Peak		Storage	
		Target	Calc	Stage	Elev	(Cu-Ft)	(Ac-Ft)
1	4.50	*******	3.14	6.87	6.87	97842.	2.246
2	2.21	*******	0.96	6.48	6.48	92311.	2.119
3	2.21	1.02	0.87	5.82	5.82	82903.	1.903
4	2.34	*******	0.79	5.34	5.34	76095.	1.747
5	2.66	*******	0.70	4.86	4.86	69219.	1.589
6	1.38	0.57	0.48	3.87	3.87	55158.	1.266
7	1.77	*******	0.28	2.95	2.95	42046.	0.965
8	1.89	*******	0.24	2.19	2.19	31166.	0.715

Duration Comparison Anaylsis
Base File: exst.tsf
New File: rdout.tsf
Cutoff Units: Discharge in CFS

	-----Fraction of Time-----			---------Check of Tolerance-------			
Cutoff	Base	New	%Change	Probability	Base	New	%Change
0.230	0.90E-02	0.54E-02	-40.1	0.90E-02	0.230	0.224	-2.7
0.283	0.63E-02	0.35E-02	-44.6	0.63E-02	0.283	0.229	-19.1
0.335	0.49E-02	0.32E-02	-34.3	0.49E-02	0.335	0.231	-31.1

0.388	0.37E-02	0.30E-02	-17.7	0.37E-02	0.388	0.267	-31.2
0.440	0.28E-02	0.27E-02	-6.3	0.28E-02	0.440	0.416	-5.6
0.493	0.21E-02	0.22E-02	0.8	0.21E-02	0.493	0.494	0.2
0.546	0.15E-02	0.17E-02	15.4	0.15E-02	0.546	0.564	3.3
0.598	0.10E-02	0.12E-02	14.1	0.10E-02	0.598	0.616	3.0
0.651	0.77E-03	0.80E-03	4.3	0.77E-03	0.651	0.654	0.5
0.703	0.44E-03	0.49E-03	11.1	0.44E-03	0.703	0.713	1.4
0.756	0.24E-03	0.24E-03	0.0	0.24E-03	0.756	0.762	0.9
0.808	0.16E-03	0.15E-03	-10.0	0.16E-03	0.808	0.804	-0.6
0.861	0.65E-04	0.00E+00	-100.0	0.65E-04	0.861	0.846	-1.7

```
Maximum positive excursion = 0.021 cfs (  3.9%)
occurring at 0.526 cfs on the Base Data:exst.tsf
and at 0.546 cfs on the  New Data:rdout.tsf

Maximum negative excursion = 0.129 cfs (-35.2%)
occurring at 0.365 cfs on the Base Data:exst.tsf
and at 0.236 cfs on the  New Data:rdout.tsf
```

The outflow durations do not exceed the maximum 10% threshold. In addition, more than half of the flow duration curve is below the existing target duration curve. Therefore, the designed vault meets the Level 2 flow control requirement. The required detention volume is approximately 92,625 cf. The final vault will be designed to accommodate the required detention volume plus a 10% safety factor.

4.4 Wetland Recharge

The Montevallo site contains one wetland and buffer which is 2.82 acres. The wetland recharge will be provided by the back 20' of yards, roof, and footing drains dispersing runoff toward the wetland. The driveway and front yard will drain to the street. The roof and footing drains will be dispersed in a level spreader outside of the wetland buffer. The selected lots to provide recharge are lots 10 - 20; see the *Wetland Recharge Exhibit* at the end of this section. The area break down is 0.70 acres of impervious and 0.42 acres of grass. This area was subtracted from the developed area going to the detention vault.

KCTRS Wetland Flows

Flow Frequency Analysis
Time Series File:wet9-20.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---				-----Flow Frequency Analysis-------			
Flow Rate (CFS)	Rank	Time of Peak		- - Peaks - - (CFS)	Rank	Return Period	Prob
0.208	6	2/09/01	2:00	0.421	1	100.00	0.990
0.170	8	1/05/02	16:00	0.266	2	25.00	0.960
0.250	3	2/27/03	7:00	0.250	3	10.00	0.900
0.183	7	8/26/04	2:00	0.221	4	5.00	0.800
0.220	5	10/28/04	16:00	0.220	5	3.00	0.667
0.221	4	1/18/06	16:00	0.208	6	2.00	0.500
0.266	2	10/26/06	0:00	0.183	7	1.30	0.231
0.421	1	1/09/08	6:00	0.170	8	1.10	0.091
Computed Peaks				0.369		50.00	0.980

4.5 Water Quality

Selecting from the BMPs listed in the Resource Stream Protection Menu, water quality for the site will be provided by a two-facility treatment train system (Option 3). The proposed treatment train will be a basic wet vault followed by a leaf compost filter (StormFilter).

4.5.1 Wet Vault

The basic wet vault was sized per Chapter 6.4 of the 1998 KCSWDM.

Total Area = 12.38 acres

Impervious = 7.20 acres

Pervious = 5.18 acres (till grass)

$V_r = (0.9A_i + 0.25A_{tg} + 0.10A_{tf} + 0.01A_o) \times 43{,}560 \times (R/12)$

Where V_r = volume of runoff from mean annual storm (cf)

A_i = area of impervious surface = 7.20 acres

A_{tg} = area of till soil covered with grass = 5.18 acres

A_{tf} = area of till soil covered with forest = 0 acres

A_o = area of outwash soil covered with grass or forest = 0 acres

R = rainfall from mean annual storm = 0.47" (Figure 6.4.1.A)

$V_r = [(0.9)(7.20\ ac) + (0.25)(5.18\ ac) + (0.10)(0\ ac) + (0.01)(0\ ac)] \times 43560 \times (0.47/12)$

$V_r = 13{,}264\ cf$

$V_b = fV_r$ (Equation 6-14)

Where V_b = wetpool volume (cf)

f = volume factor = 3 (basic wet vault)

V_r = runoff volume = 13,264 cf

$V_b = (3)(13{,}264)$

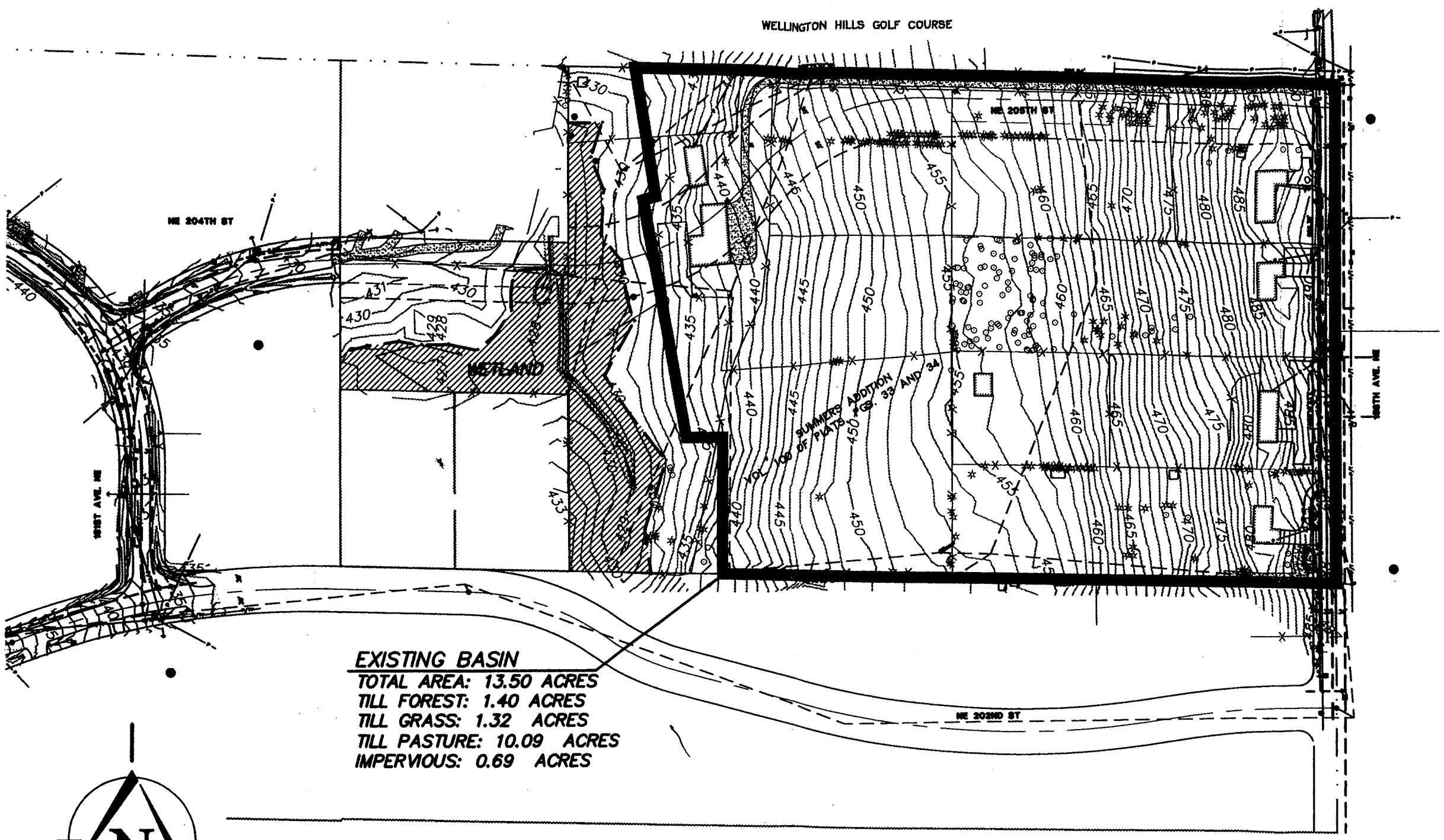
$V_b =$ **39,794 cubic-feet**

The required wet vault volume is approximately 39,794 cf. The wet vault will be designed to provide the required water quality volume.

4.5.2 StormFilter

A StormFilter vault is proposed to provide additional water quality treatment required for Resource Stream Protection. This vault will treat flows downstream of the water quality / detention vault. The StormFilter vault will be sized to accommodate the number of StormFilter cartridges required to treat the 2-year outflow from the detention vault. As determined in Section 4.3.3 Detention Vault Modeling, the 2-year outflow is 0.48 cfs. A StormFilter cartridge can treat 0.0334 cfs (15 gal/min), therefore the required number of cartridges is 15. A 12' x 6' StormFilter vault is proposed to accommodate the required cartridges for treatment. Final StormFilter vault sizing will be done by Stormwater Management Inc.

Flows in excess of the 2-year peak flows released from the detention vault will bypass the StormFilter via a flow splitter.



TRIAD ASSOCIATES
11814 119th Ave. NE
Kirkland, WA 98034-6923
425.821.8448
425.821.3481 fax
800.488.0788 toll free
www.triadassoc.com

Existing On-Site Drainage Conditions

MONTEVALLO

WASHINGTON

CITY OF WOODINVILLE

NO.	DATE	REVISION

PROJECT MANAGER
PROJECT SURVEYOR
PROJECT ENGINEER
PROJECT LANDSCAPE ARCHITECT
FIRST SUBMITTAL DATE:
SCALE: HORZ.: 1"=150' VERT.:

STAMP NOT VALID UNLESS SIGNED AND DATED

JOB NO. 03-248

SHEET NO. 1 OF 1

WELLINGTON HILLS GOLF COURSE

PROPOSED DISCHARGE PATH

EXISTING DISCHARGE PATH

TRACT D
Access and Utility

TRACT A
NGPA

6'x12' STORM FILTER VAULT

LEVEL 2 RETENTION WATER QUALITY VAULT

TRACT B
Detention

Detention
TOP=442.8
L/D=433.8
DWS=440.8

TRACT C
Landscape

NE 204TH ST

NE 203RD ST

153RD AVE NE

154TH AVE NE

155TH AVE NE

156TH AVENUE NE

NE 203RD PLACE

25' Access

DEVELOPED BASIN
TOTAL AREA: 12.38 ACRES
IMPERVIOUS: 7.20 ACRES (58%)
PERVIOUS: 5.18 ACRES (TILL GRASS)

N

SCALE: 1" = 100'

0 50 100 200

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DEVELOPED CONDITIONS EXHIBIT

MONTEVALLO

WASHINGTON

CITY OF WOODINVILLE,

BY CK

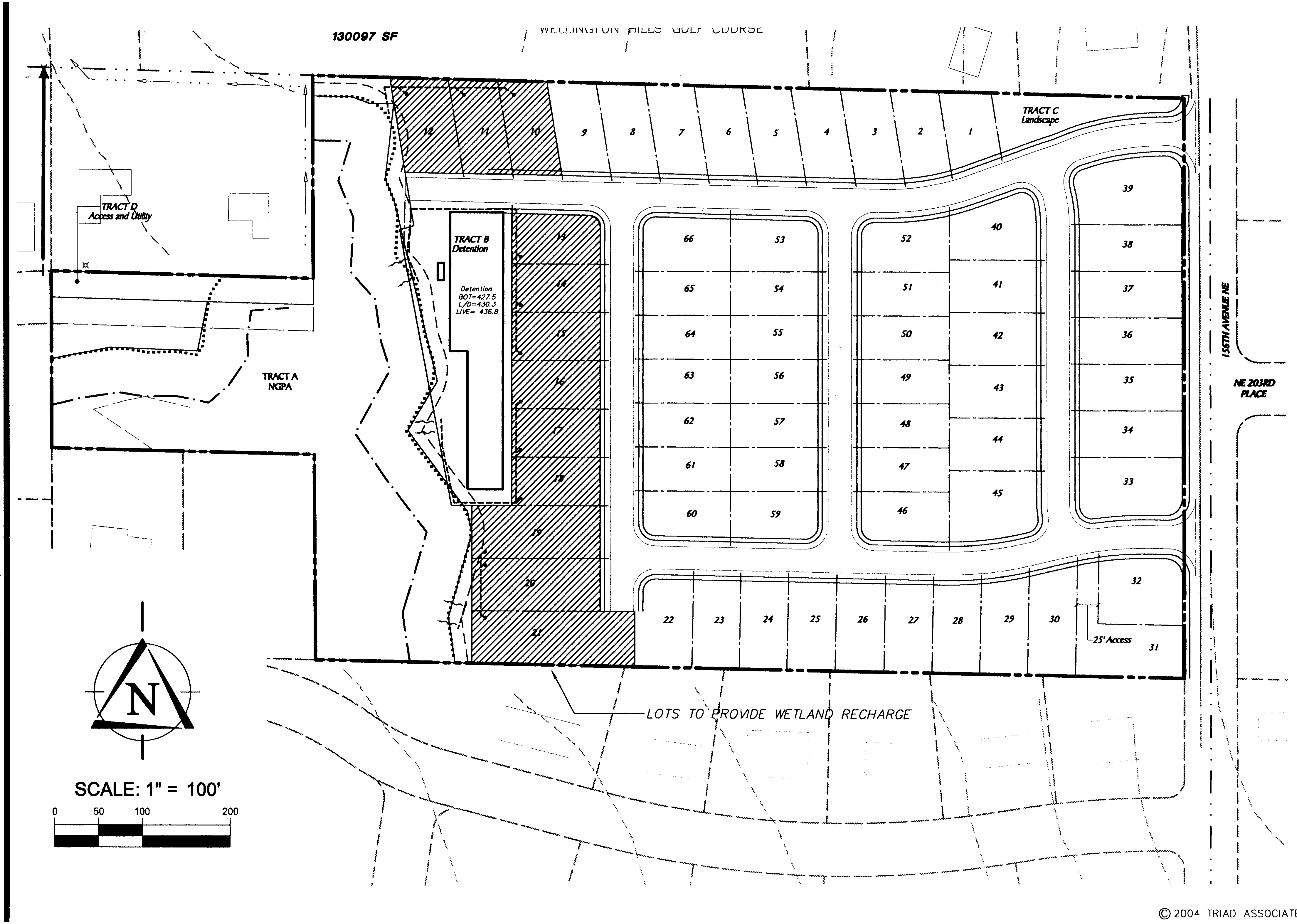
NO.	DATE	REVISION
1	6/23/05	Storm Outfall

GEORGE PETERSEN, AICP
PROJECT MANAGER
ROBERT C. WILLIS, PLS
PROJECT SURVEYOR
MARK D. HEALEY, PE
PROJECT ENGINEER
PROJECT LANDSCAPE ARCHITECT
FIRST SUBMITTAL DATE:
SCALE: HORZ.: 1"=100' VERT.: N/A

STAMP NOT VALID UNLESS SIGNED AND DATED

JOB NO. 03-248

SHEET NO. 1 OF 1



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WETLAND RECHARGE EXHIBIT

MONTEVALLO

CITY OF WOODINVILLE, WASHINGTON

NO.	DATE	REVISION	BY	CK

GEORGE NEWMAN, AICP
PROJECT MANAGER
ROBERT E. WALLIS, PLS
PROJECT SURVEYOR
MARK O. KELLER, PE
PROJECT ENGINEER
PROJECT LANDSCAPE ARCHITECT
FIRST SUBMITTAL DATE:
SCALE: HORIZ.: 1"=100' VERT.:N/A

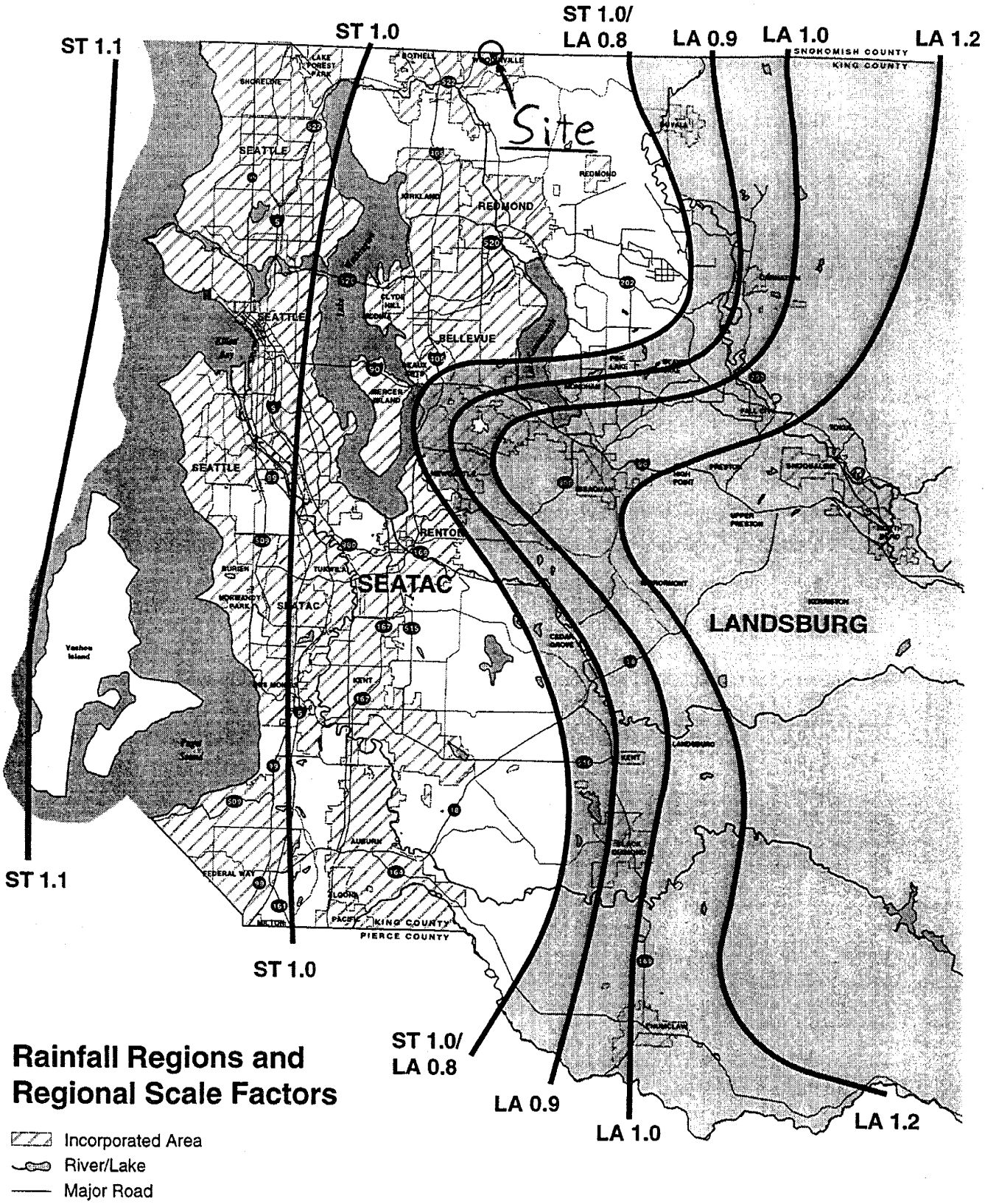
STAMP NOT VALID UNLESS SIGNED AND DATED

JOB NO. 03-248

SHEET NO. 1 OF 1

E:\PROJECTS\03248\dwgfiles\TIR\03248wetlandrechrge.dwg, Layout1

FIGURE 3.2.2.A RAINFALL REGIONS AND REGIONAL SCALE FACTORS



7 OTHER PERMITS

None at this time. Drainage variance from requirements of natural discharge location will be requested from the City of Woodinville.

8 ESC ANALYSIS AND DESIGN

Temporary Erosion and Sediment Control measures will be included in final engineering.

9 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLORATION OF COVENANT

9.1 Bond Quantities

A Site Improvement Bond Quantity Worksheet will be provided at the end of the engineering review process.

9.2 Facility Summaries

Vault details and detention facility summary worksheet will be provided with the next submittal.

9.3 Declaration of Covenant

Not applicable.

10 OPERATIONS AND MAINTENANCE

The storm system will be maintained by the City of Woodinville. Operations and Maintenance will be per King County Standards.