# Appendix H:

Preliminary Technical Information Report (Drainage) – Montevallo, September 2005 Revision

# Montevallo

*City of Woodinville, Washington*

**Preliminary Technical Information Report**

**Date:** 11/5/04 **Job #** 03-248

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**Revision Date(s)**
9/27/05

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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*

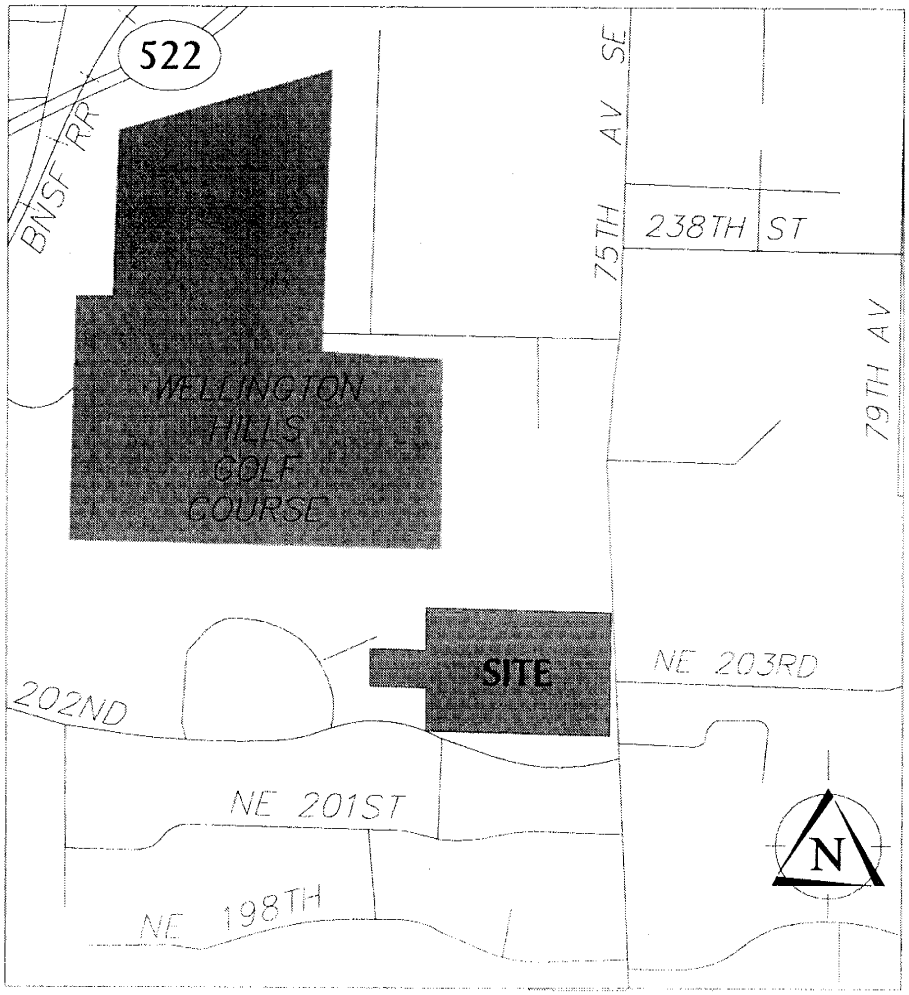
Section VI:
Geotechnical Engineering Study prepared by Earth Consultants Inc., dated September 22, 2004

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*

# 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 the existing onsite wetland.

### 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 156$^{th}$ 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 be dispersed at several locations along the wetland for recharge. Flows discharged from the vault are proposed to drain to the existing onsite wetland via a level spreader.

## *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  Rank  Time of Peak         - - Peaks - -  Rank  Return  Prob
   (CFS)                                 (CFS)             Period
    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
                                     Full Head    Pipe
    Orifice #      Height  Diameter  Discharge  Diameter
                    (ft)     (in)      (CFS)      (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     Elevation      Storage       Discharge  Percolation
     (ft)       (ft)     (cu. ft)   (ac-ft)  (cfs)      (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 spreaders outside of the wetland buffer. The selected lots to provide recharge are lots 10 - 21; 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.

# 5 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

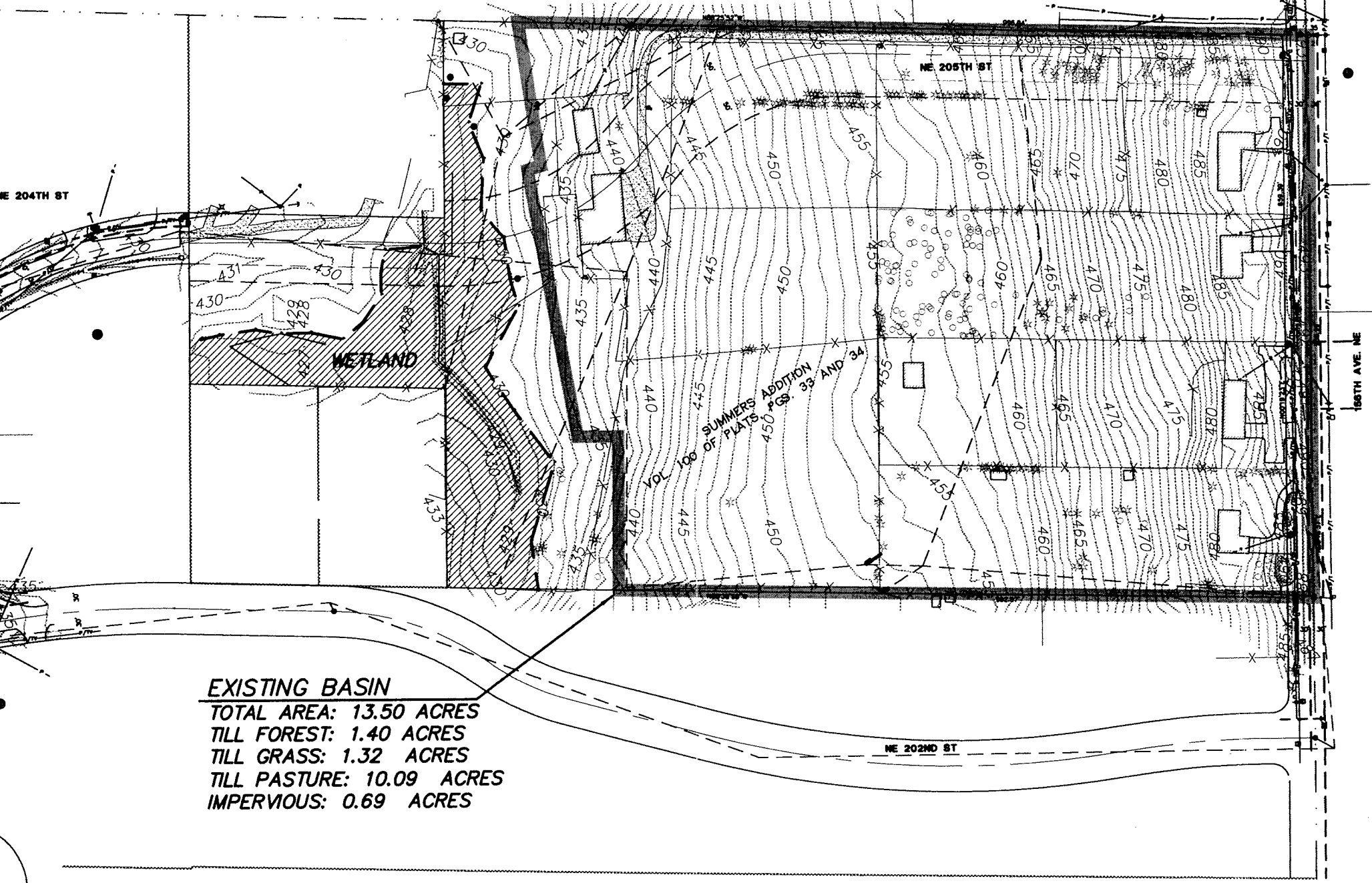
The onsite conveyance system will be designed per the 1998 King County Surface Water Design Manual (KCSWDM). Backwater analysis will be provided in final engineering.

## *5.1 Offsite Capacity*

There do not appear to be any off-site capacity issues.

# 6 SPECIAL REPORTS AND STUDIES

Please refer to the attached Geotechnical Engineering Study prepared by Earth Consultants Inc., dated September 22, 2004.

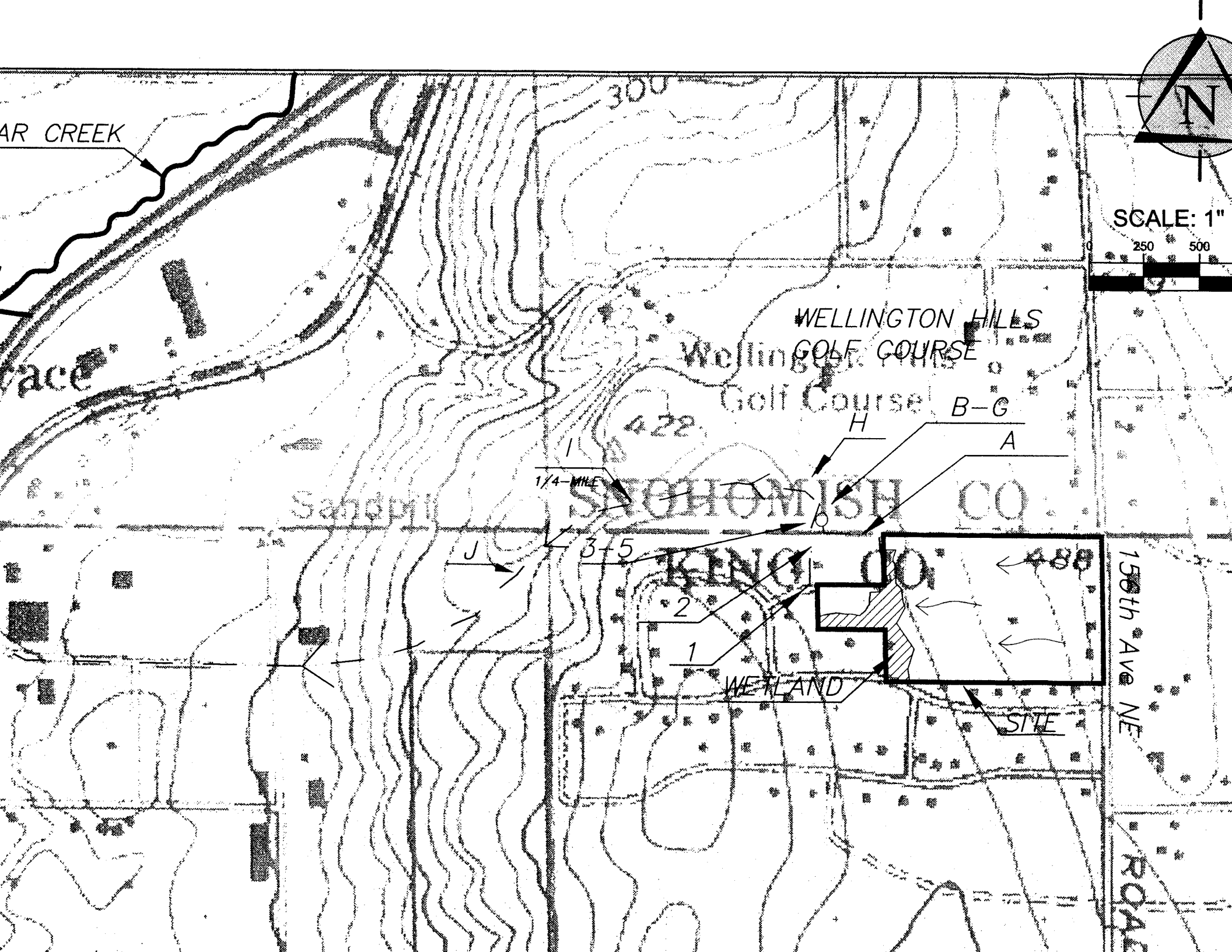


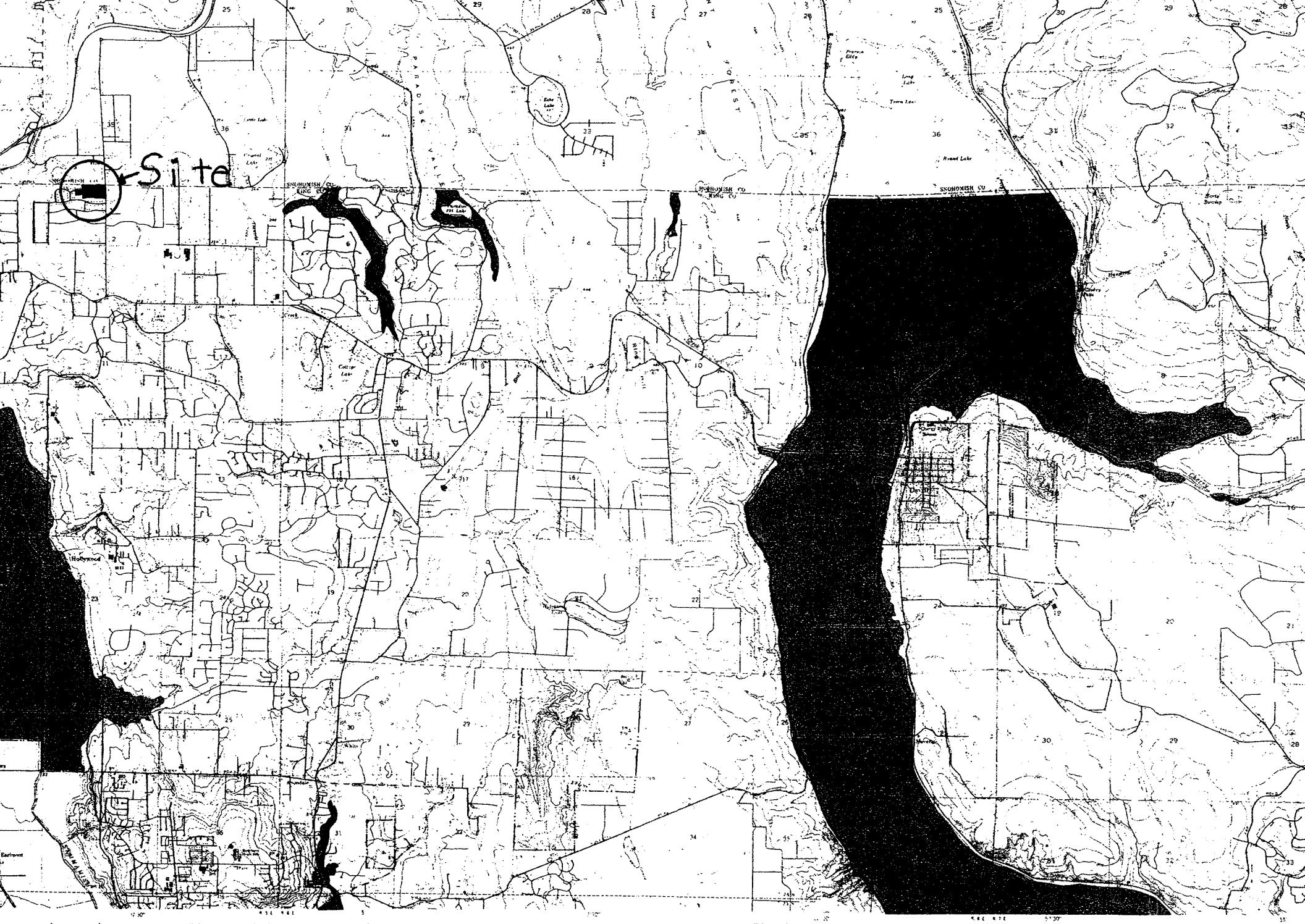

## EXISTING BASIN

TOTAL AREA: 13.50 ACRES
TILL FOREST: 1.40 ACRES
TILL GRASS: 1.32 ACRES
TILL PASTURE: 10.09 ACRES
IMPERVIOUS: 0.69 ACRES

= 150'

300'


AR CREEK
300
N
SCALE: 1"
0
250
500
WELLINGTON HILLS
GOLF COURSE
Wellington Hills
Golf Course
422
H
B–G
A
I
1/4-MILE
SNOHOMISH CO
KING CO
J
3-5
2
1
488
156th Ave NE
WETLAND
SITE



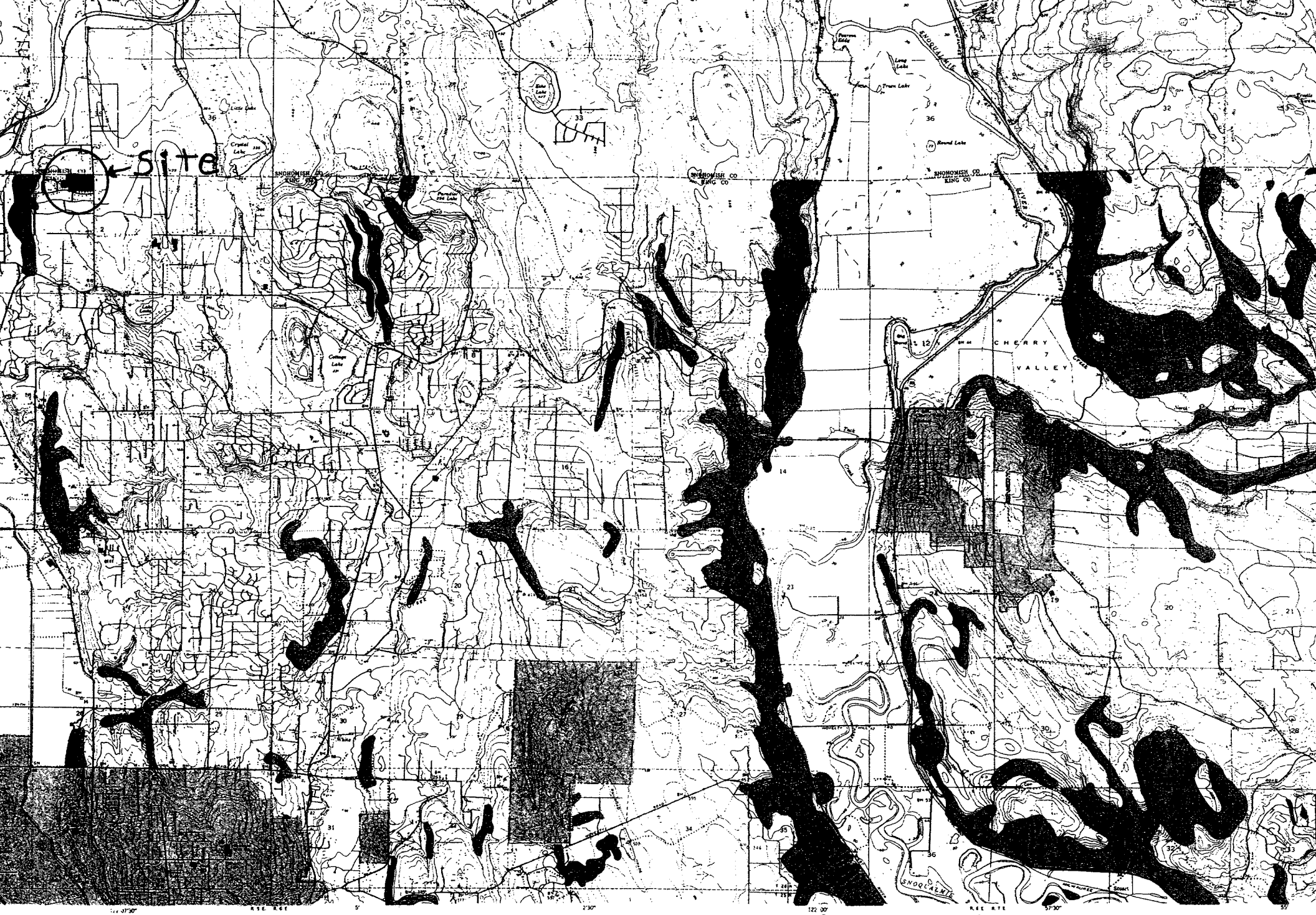

1
MILE

N

The boundaries of the sensitive areas displayed on these maps are approximate. Additional sensitive areas that have not been mapped may be present on a development proposal site. Where differences occur between what is illustrated on these maps and the site conditions, the actual presence or absence on the site of the sensitive area - as defined in the Sensitive Area

See wetlands and landslide hazard maps for additional potential seismic hazard areas. Wetlands and landslide areas are susceptible to failure during earthquakes. Other seismic hazard areas not shown on this map are shorelines underlain by lacustrine sediments; these are susceptible to liquefaction.

# Seismic Hazard Areas




1
MILE

N

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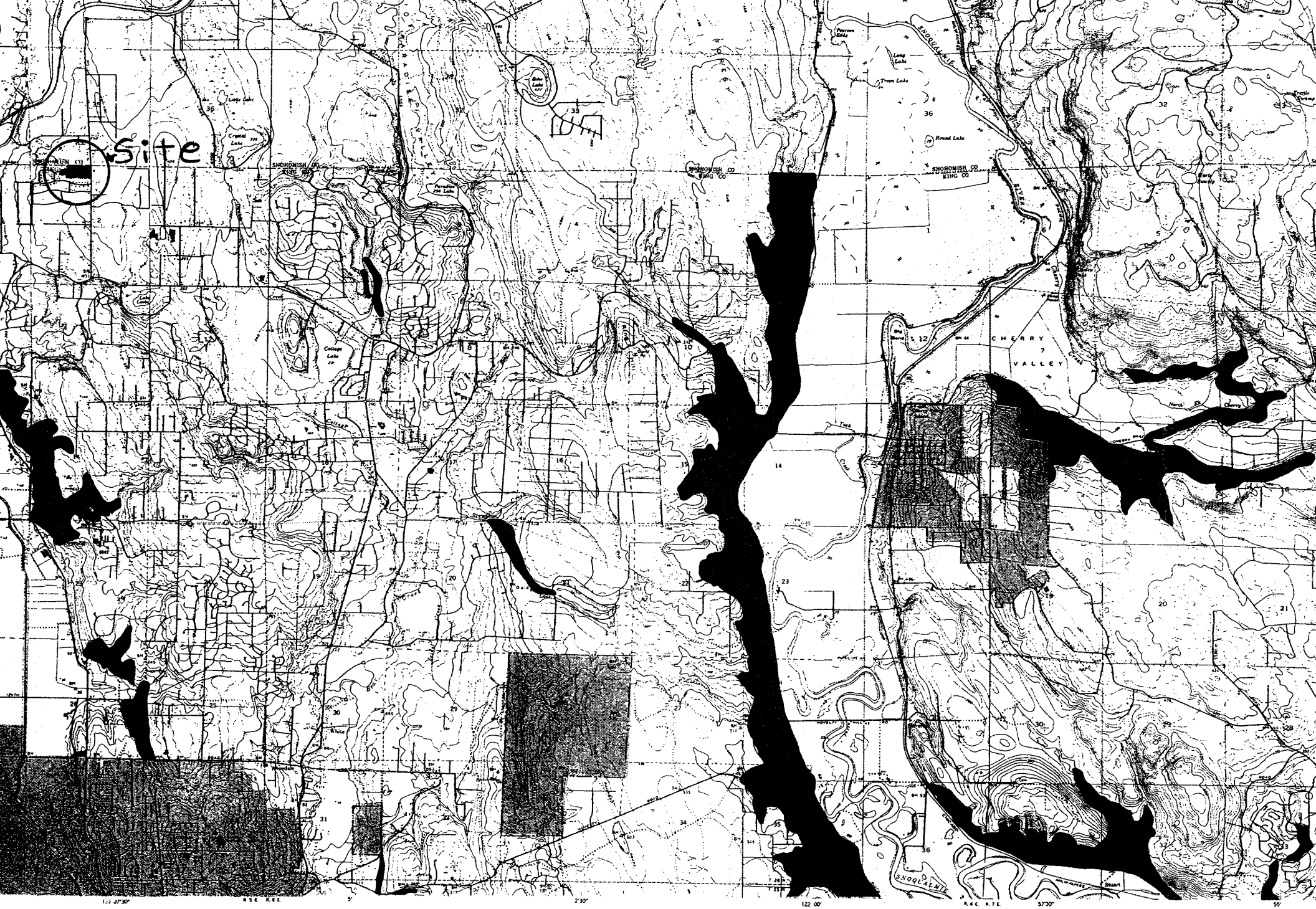
# Erosion Hazard Areas

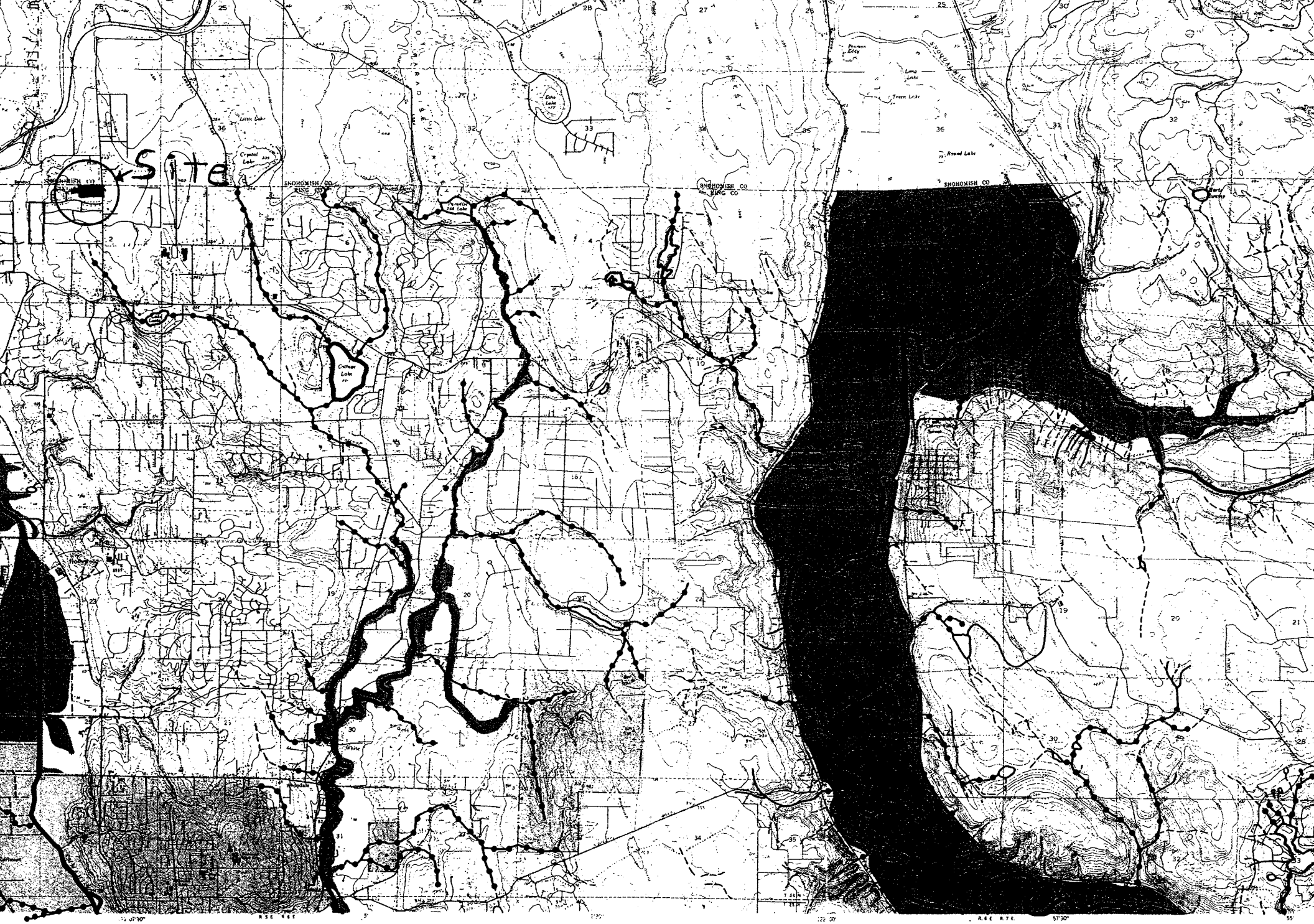



1
MILE

N

The boundaries of the sensitive areas displayed on these maps are approximate. Additional sensitive areas that have not been mapped may be present on a development proposal site. Where differences occur between what is illustrated on these maps and the site conditions, the actual presence or absence on the site of the sensitive area - as defined in the Sensitive Area Ordinance - is the legal control.

# Landslide Hazard Areas




1
MILE

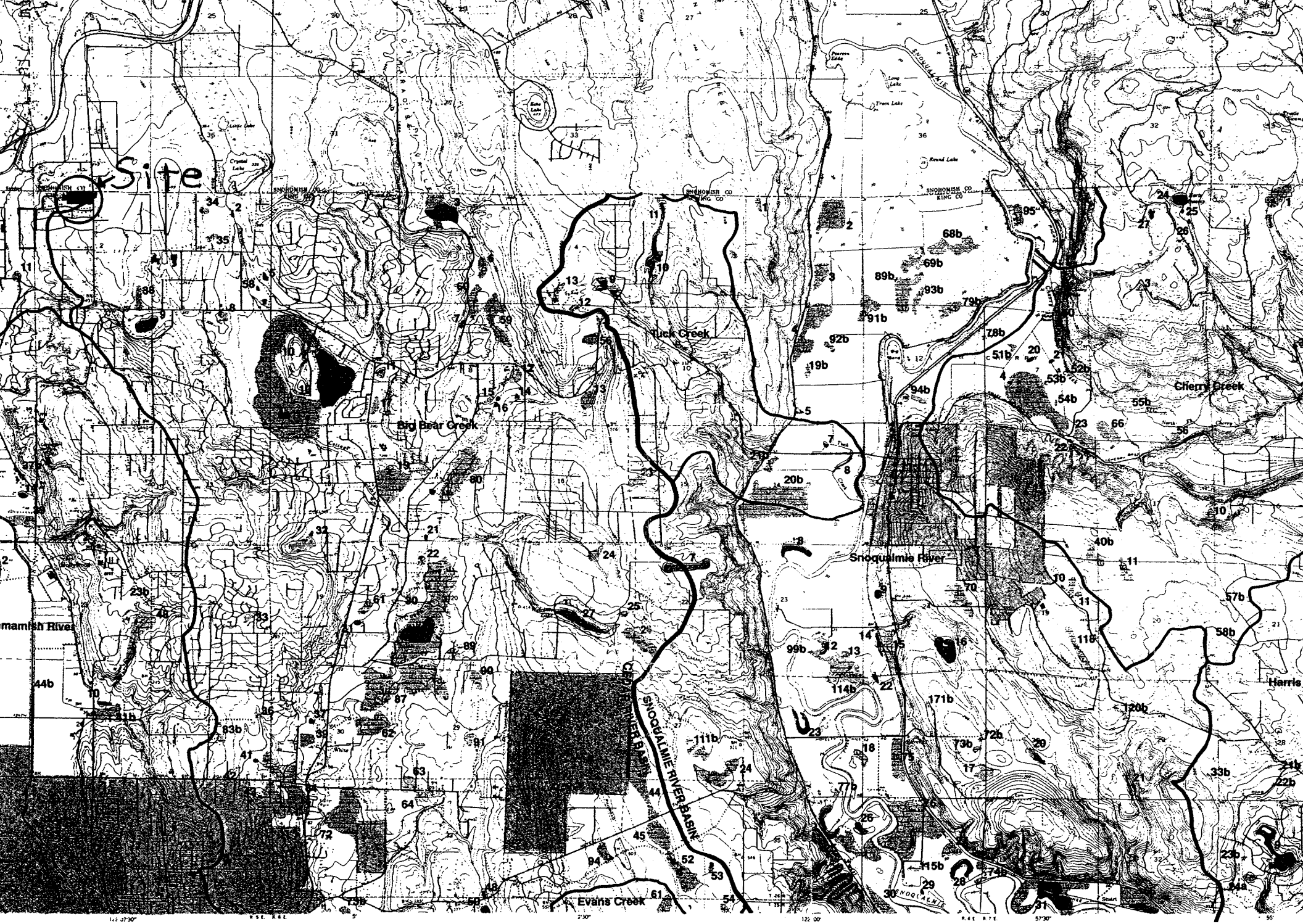
N

The boundaries of the sensitive areas displayed on these maps are approximate. Additional sensitive areas that have not been mapped may be present on a development proposal site. Where differences occur between what is illustrated on these maps and the site conditions, the actual presence or absence on the site of the sensitive area - as defined in the Sensitive Area

One- hundred-year floodplains extend beyond those shown on maps. Flood Insurance Rate Maps do not always show the floodplain to the headwaters of streams.

# Streams and 100-Year Floodplains

- Class 1
- Class 2 (with salmonids)
- Class 2 (perennial; salmonid use undetermined)
- Class 3




# Wetlands

The boundaries of the sensitive areas displayed on these maps are approximate. Additional sensitive areas that have not been mapped may be present on a development proposal site. Where differences occur between what is illustrated on these maps and the site conditions, the actual presence or absence on the site of the sensitive

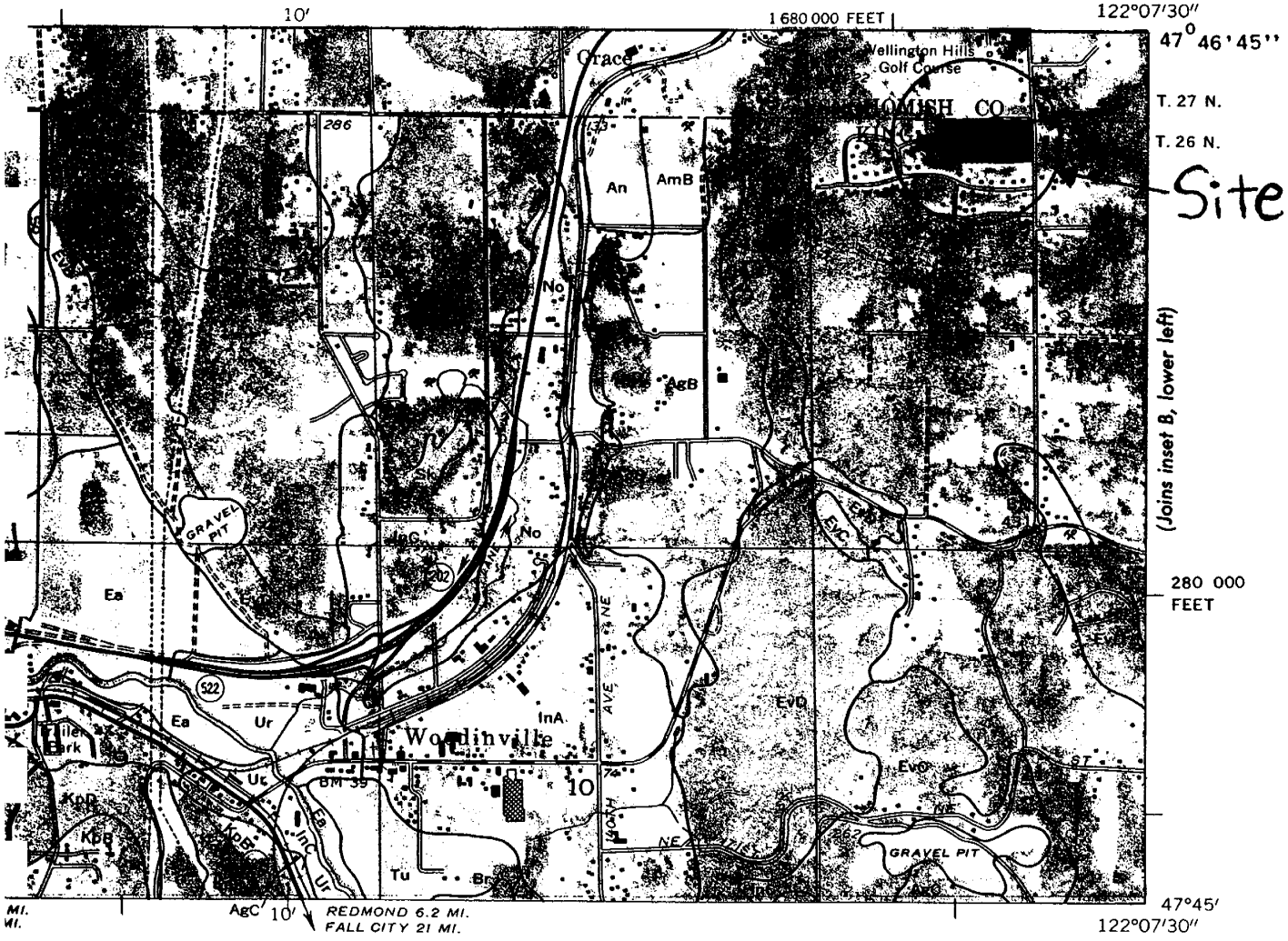
Numbered wetlands, except those with an "a" or "b" designation are included in the *King County Wetlands Inventory*. The locations of wetlands designated "a" have been verified on the site by a variety of sources. Wetlands designated "b" are mapped in the U.S. Fish and Wildlife Service *National Wetlands Inventory*, but their loca-

Wetlands
Open Water
Basin Boundaries

SHEET NO. 4

KING COUNTY AREA, WASHINGTON

(PARTS OF BOTHELL
MALTBY AND MONROE QUADRANGLES)



## GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. See table 6, page 70, for descriptions of woodland groups. Other information is given in tables as follows:

Acreage and extent, table 1, page 9.
Engineering uses of the soils, tables 2 and 3, pages 36 through 55.
Town and country planning, table 4, page 57.
Recreational uses, table 5, page 64.
Estimated yields, table 7, page 79.

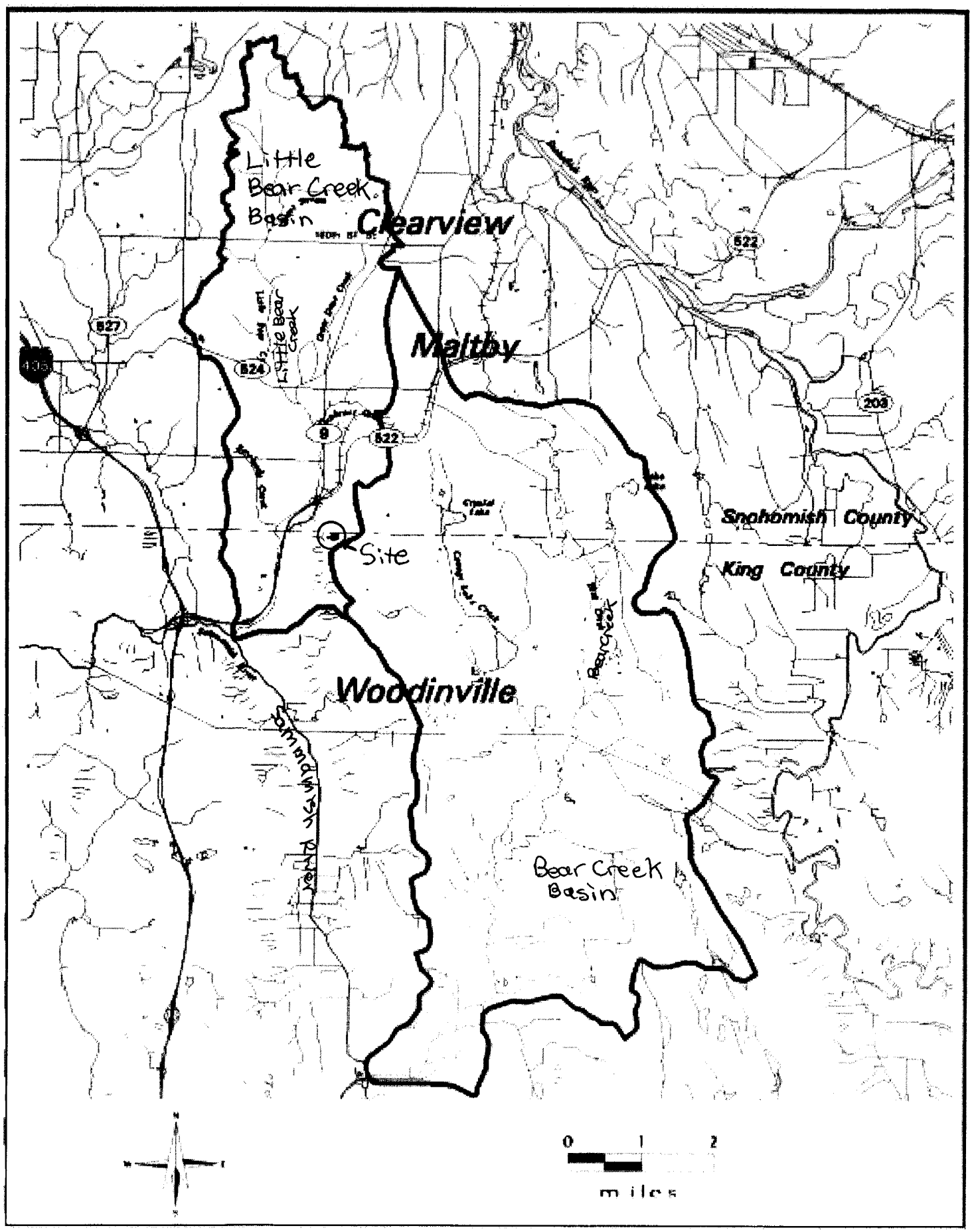
| Map symbol | Mapping unit | Described on page | Capability unit | | Woodland group |
|---|---|---|---|---|---|
| | | | Symbol | Page | Symbol |
| AgB | Alderwood gravelly sandy loam, 0 to 6 percent slopes | 10 | IVe-2 | 76 | 3d2 |
| AgC | Alderwood gravelly sandy loam, 6 to 15 percent slopes | 8 | IVe-2 | 76 | 3d1 |
| AgD | Alderwood gravelly sandy loam, 15 to 30 percent slopes | 10 | VIe-2 | 78 | 3d1 |
| AkF | Alderwood and Kitsap soils, very steep | 10 | VIIe-1 | 78 | 2d1 |
| AmB | Arents, Alderwood material, 0 to 6 percent slopes 1/ | 10 | IVe-2 | 76 | 3d2 |
| AmC | Arents, Alderwood material, 6 to 15 percent slopes 1/ | 10 | IVe-2 | 76 | 3d2 |
| An | Arents, Everett material 1/ | 11 | IVs-1 | 77 | 3f3 |
| BeC | Beausite gravelly sandy loam, 6 to 15 percent slopes | 11 | IVe-2 | 76 | 3d2 |
| BeD | Beausite gravelly sandy loam, 15 to 30 percent slopes | 12 | VIe-2 | 78 | 3d1 |
| BeF | Beausite gravelly sandy loam, 40 to 75 percent slopes | 12 | VIIe-1 | 78 | 3d1 |
| Bh | Bellingham silt loam | 12 | IIIw-2 | 76 | 3w2 |
| Br | Briscot silt loam | 13 | IIw-2 | 75 | 3w1 |
| Bu | Buckley silt loam | 13 | IIIw-2 | 76 | 4w1 |
| Cb | Coastal beaches | 14 | VIIIw-1 | 78 | --- |
| Ea | Earlmont silt loam | 14 | IIw-2 | 75 | 3w2 |
| Ed | Edgewick fine sandy loam | 15 | IIIw-1 | 75 | 2o1 |
| EvB | Everett gravelly sandy loam, 0 to 5 percent slopes | 15 | IVs-1 | 77 | 3f3 |
| EvC | Everett gravelly sandy loam, 5 to 15 percent slopes | 16 | VIs-1 | 78 | 3f3 |
| EvD | Everett gravelly sandy loam, 15 to 30 percent slopes | 16 | VIe-1 | 77 | 3f2 |
| EwC | Everett-Alderwood gravelly sandy loams, 6 to 15 percent slopes | 16 | VIs-1 | 78 | 3f3 |
| InA | Indianola loamy fine sand, 0 to 4 percent slopes | 17 | IVs-2 | 77 | 4s3 |
| InC | Indianola loamy fine sand, 4 to 15 percent slopes | 16 | IVs-2 | 77 | 4s3 |
| InD | Indianola loamy fine sand, 15 to 30 percent slopes | 17 | VIe-1 | 76 | 4s2 |
| KpB | Kitsap silt loam, 2 to 8 percent slopes | 17 | IIIe-1 | 75 | 2d2 |
| KpC | Kitsap silt loam, 8 to 15 percent slopes | 18 | IVe-1 | 76 | 2d2 |
| KpD | Kitsap silt loam, 15 to 30 percent slopes | 18 | VIe-2 | 78 | 2d1 |
| KsC | Klaus gravelly loamy sand, 6 to 15 percent slopes | 18 | VIs-1 | 78 | 3f1 |
| Ma | Mixed alluvial land | 18 | VIw-2 | 78 | 2o1 |
| NeC | Neilton very gravelly loamy sand, 2 to 15 percent slopes | 19 | VIs-1 | 78 | 3f3 |
| Ng | Newberg silt loam | 19 | IIw-1 | 74 | 2o1 |
| Nk | Nooksack silt loam | 20 | IIw-1 | 74 | 2o1 |
| No | Norma sandy loam | 20 | IIIw-3 | 76 | 3w2 |
| Or | Orcas peat | 21 | VIIIw-1 | 78 | --- |
| Os | Oridia silt loam | 21 | IIw-2 | 75 | 3w1 |
| OvC | Ovall gravelly loam, 0 to 15 percent slopes | 22 | IVe-2 | 76 | 3d1 |
| OvD | Ovall gravelly loam, 15 to 25 percent slopes | 23 | VIe-2 | 78 | 3d1 |
| OvF | Ovall gravelly loam, 40 to 75 percent slopes | 23 | VIIe-1 | 78 | 3d1 |
| Pc | Pilchuck loamy fine sand | 23 | VIw-1 | 78 | 2s1 |
| Pk | Pilchuck fine sandy loam | 23 | IVw-1 | 76 | 2s1 |
| Pu | Puget silty clay loam | 24 | IIIw-2 | 76 | 3w2 |
| Py | Puyallup fine sandy loam | 24 | IIw-1 | 74 | 2o1 |
| RaC | Ragnar fine sandy loam, 6 to 15 percent slopes | 25 | IVe-3 | 77 | 4s1 |
| RaD | Ragnar fine sandy loam, 15 to 25 percent slopes | 26 | VIe-2 | 78 | 4s1 |
| RdC | Ragnar-Indianola association, sloping: 1/ | 26 | -------- | -- | --- |
| | Ragnar soil | -- | IVe-3 | 77 | 4s1 |
| | Indianola soil | -- | IVs-2 | 77 | 4s3 |
| RdE | Ragnar-Indianola association, moderately steep: 1/ | 26 | -------- | -- | --- |
| | Ragnar soil | -- | VIe-2 | 78 | 4s1 |
| | Indianola soil | -- | VIe-1 | 77 | 4s2 |

U. S. GOVERNMENT PRINTING OFFICE : 1973 O - 468-266

GUIDE TO MAPPING UNITS--Continued

| Map symbol | Mapping unit | Described on page | Capability unit | | Woodland group |
|---|---|---|---|---|---|
| | | | Symbol | Page | Symbol |
| Re | Renton silt loam | 26 | IIIw-1 | 75 | 3w1 |
| Rh | Riverwash | 27 | VIIIw-1 | 78 | --- |
| Sa | Salal silt loam | 27 | IIw-1 | 74 | 2o1 |
| Sh | Sammamish silt loam | 27 | IIw-2 | 75 | 3w1 |
| Sk | Seattle muck | 28 | IIw-3 | 75 | --- |
| Sm | Shalcar muck | 29 | IIw-3 | 75 | --- |
| Sn | Si silt loam | 29 | IIw-1 | 74 | 2o1 |
| So | Snohomish silt loam | 30 | IIw-2 | 75 | 3w2 |
| Sr | Snohomish silt loam, thick surface variant | 31 | IIw-2 | 75 | 3w2 |
| Su | Sultan silt loam | 31 | IIw-1 | 74 | 3w1 |
| Tu | Tukwila muck | 32 | IIw-3 | 75 | --- |
| Ur | Urban land | 33 | -------- | -- | --- |
| Wo | Woodinville silt loam | 33 | IIw-2 | 75 | 3w2 |

1/ The composition of these units is more variable than that of the others in the Area, but it has been controlled well enough to interpret for the expected use of the soils.


Little Bear Creek Basin
Clearview
Maltby
Woodinville
Site
Snohomish County
King County
Bear Creek Basin
Sammamish River
Little Bear Creek
Bear Creek
522
527
524
9
208
0
1
2
miles

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

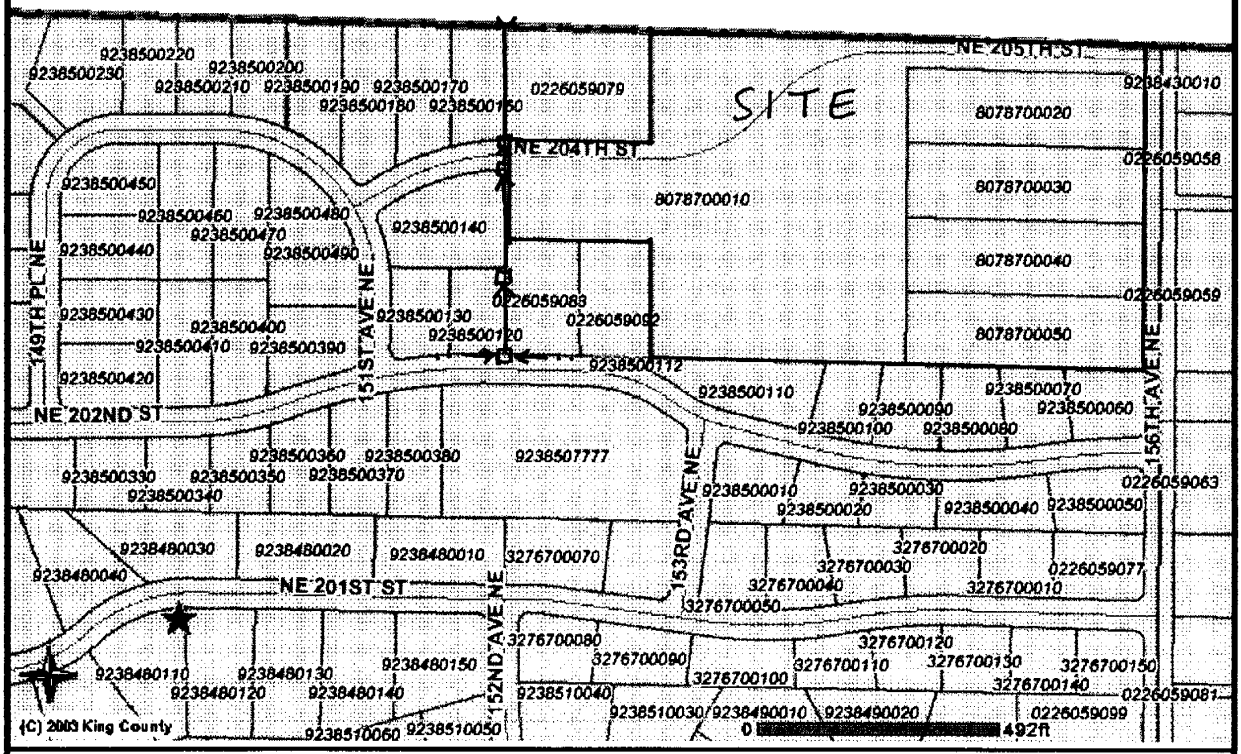
**Basin:** Sammamish River **Subbasin Name:** Little Bear Creek **Subbasin Number:**

| Symbol | Drainage Component Type, Name, and Size | Drainage Component Description | Slope | Distance from site discharge | Existing Problems | Potential Problems | Observations of field inspector, resource reviewer, or resident |
|---|---|---|---|---|---|---|---|
| see map | Type: sheet flow, swale, stream, channel, pipe, pond; Size: diameter, surface area | drainage basin, vegetation, cover, depth, type of sensitive area, volume | % | ¼ mi = 1,320 ft. | constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion | | tributary area, likelihood of problem, overflow pathways, potential impacts |
| **Natural** | **Discharge Path** | | | | | | |
| A | Ditch | Vegetated / Dirt lined | .5 | 0 – 300' | None | Vegetation blocking ditch and pipe entrance | |
| B | 12" Concrete | Into golf course | 1 | 300' – 320' | None | entrance | |
| C | 3' Ditch | Earth lined | 1 | 320' – 330' | None | None | |
| D | 12" Concrete | | .5 | 330' – 345' | None | None | |
| E | 40' x 20' Pond | Cat tails | 0 | 345' – 385' | None | None | |
| F | 12" CMP | | .5 | 385' – 395' | None | Grass blocking entrance | |
| G | 2' Ditch | Tall grass | .5 | 395' – 400' | None | Vegetation blocking ditch and pipe entrance | |
| H | 15" CMP | Angled pipe under fairway | 2 | 400'-930' | None | None | |
| I | 2' Ditch | Grass lined | 2 | 930'-1430' | None | None | |
| J | Ravine | Forested | 15 | 1430' – 1/2 mi | None | Erosion | |
| | | | | | | | |

| **Proposed** | **Discharge Path** | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 24" CB | End of R-O-W | | 0 | None | None | |
| 2 | 12" concrete pipe | Drainage easement along property boundary | 1 | 0-240' | None | Sediment | |
| 3 | 2' Ditch | In golf course | 1 | 240'-250' | None | Vegetation blocking ditch and pipe entrance | |
| 4 | 12" concrete pipe | Brush covered | 1 | 250'-260' | None | Entrance, sediment | |
| 5 | 2' Ditch | Brush covered | 1 | 260'-270' | None | Vegetation blocking ditch | |
| **Joins** | **Natural Discharge** | **Path** | | | | | |

King County | Home | News | Services | Comments | Search

# iMAP - Property Information (Planning)




## Legend

- County Boundary
- Streets
  - Highway
  - Arterials
  - Local
- Forest Production District Boundary
- Agricultural Production District Boundary
- Urban Growth Area Line
- Lakes and Large Rivers
- Streams
- Muckleshoot Tribe
- King County owned properties
- Parcels
- Zoning Labels

Zoning

- A-10 - Agricultural, one DU per 10 acres
- A-35 - Agricultural, one DU per 35 acres
- F - Forest
- M - Mineral
- RA-2.5 - Rural Area, one DU per 5 acres
- RA-5 - Rural Area, one DU per 5 acres
- RA-10 - Rural Area, one DU per 10 acres
- UR - Urban Reserve, one DU per 5 acres
- R-1 - Residential, one DU per acre
- R-4 - Residential, 4 DU per acre
- R-6 - Residential, 6 DU per acre
- R-8 - Residential, 8 DU per acre
- R-12 - Residential, 12 DU per acre
- R-18 - Residential, 18 DU per acre
- R-24 - Residential, 24 DU per acre
- R-48 - Residential, 48 DU per acre
- (cont)
- NB - Neighborhood Business
- CB - Community Business
- RB - Regional Business
- O - Office
- I - Industrial
- Other
- Incorporated Area

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

KING COUNTY SURFACE WATER MANAGEMENT DIVISION

# DRAINAGE INVESTIGATION REPORT

Page 1: INVESTIGATION REQUEST

Type C

Received by: AEO Date: 1/8/96 OK'd by: File No. 96-0018

*Received from:* (Please print plainly for scanning). (Day) (Eve)

NAME: Ken + Lisa Toscano PHONE 481-2753

ADDRESS: 15206 NE 202nd st. City Woodinville State ____ Zip 9807.

Location of problem, if different:

*Reported Problem:*

– See attached –

Plat name: Lot No: Block No:

Other agencies involved: No Field Investigation Needed _____ (initials)

**********TO BE COMPLETED BY COMPLAINT PROGRAM STAFF:**********

NW 1/4 2 S 26 T 5 R Parcel No. 0226059083 Kroll 502W Th.Bros: New 477A4 Old 461, F1

Basin LBR Council Dist 3 Charge No: _____

*RESPONSE:* Citizen notified on _____ by ___ phone ___ letter ___ in person

*DISPOSITION:* Turned to _____ on _____ by _____ OR: No further action recommended becau

___ Lead agency has been notified: _____

___ Problem has been corrected. ___ No problem has been identified. ___ Prior investigation addresses proble See File # _____

___ *Private problem - NDAP will not consider because:*

___ Water originates onsite and/or on neighboring parcel

___ Location is outside SWM Service Area. ___ Other (Specify):

DATE CLOSED: 01/26/96 by: RFDTOWDUL

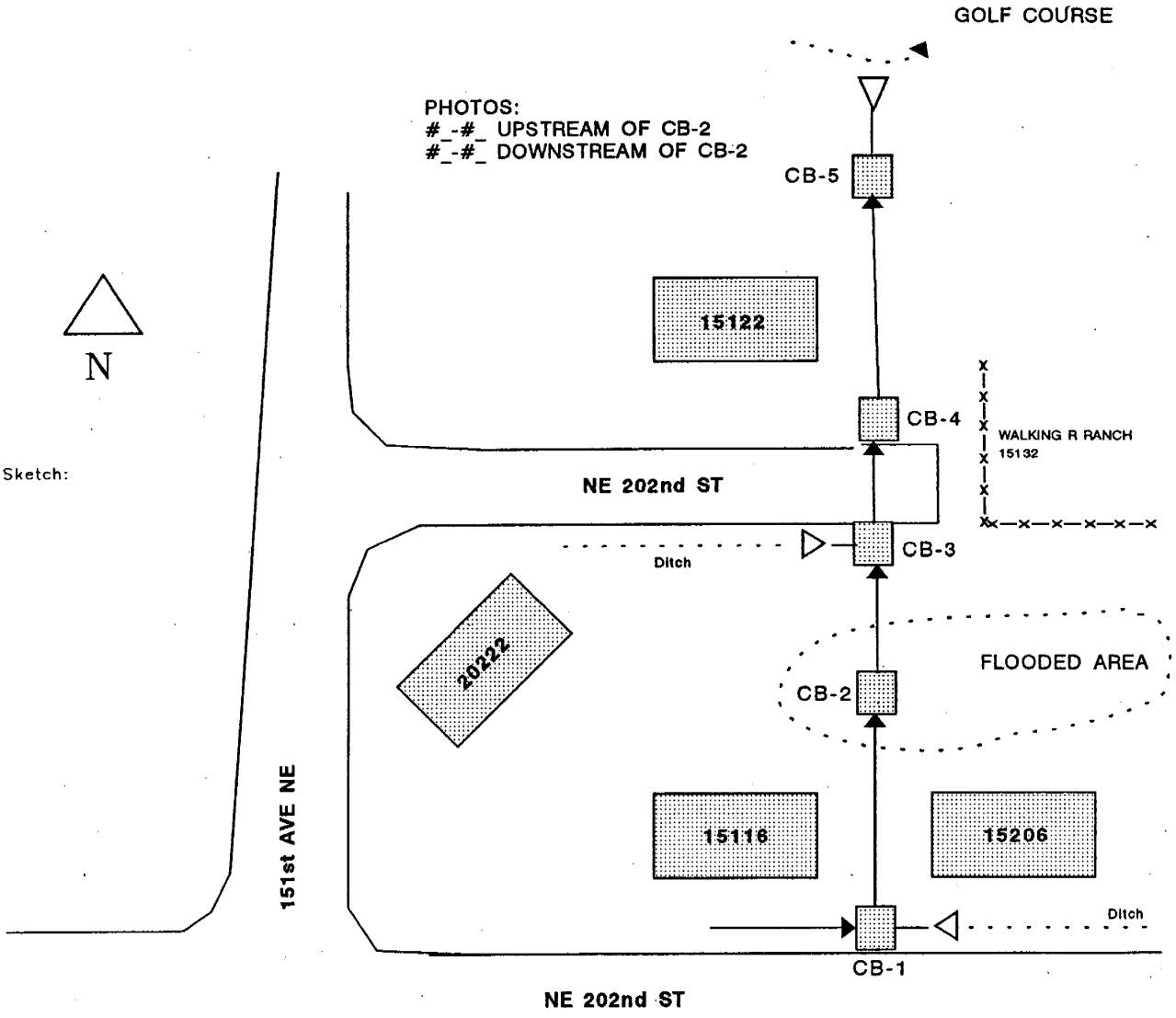
# KING COUNTY SURFACE WATER MANAGEMENT DIVISION
# DRAINAGE INVESTIGATION REPORT



*Details of Investigation:* **KEN TOSCANO**

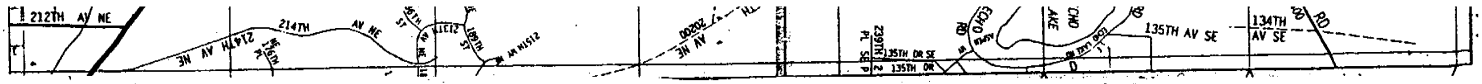
**Site visit on 12/26/95. Met with Mr. and Mrs. Toscano. They indicated the water level during last major storm rose approx. 2'over CB-2. Weather at time of inspection was clear and dry in the upper 30's. All catchbasins except CB-2 had visible drainage flowing. The water level in CB-2 was at 2/3 full level of inlet/outlet pipe. All conveyance pipe is 12"CP. Evidence of some root intrusion was visible at inlet pipe opening in CB-2. Unable to candle pipes due to water level. There was no water moving in CB-2. Appears that there is a partial blockage between CB-1 and CB-3. CB-2 and CB-5 were full of sediment to invert of inlet/outlet pipes.**

Sketch:




*CITY OF WOODINVILLE*

Investigated by ***NIGEL KEIFFER*** Date ***12/26/95***




KING COUNTY SURFACE WATER MANAGEMENT DIVISION

# DRAINAGE INVESTIGATION REPORT

Page 2: FIELD INVESTIGATION

TYPE

File Name: File No.

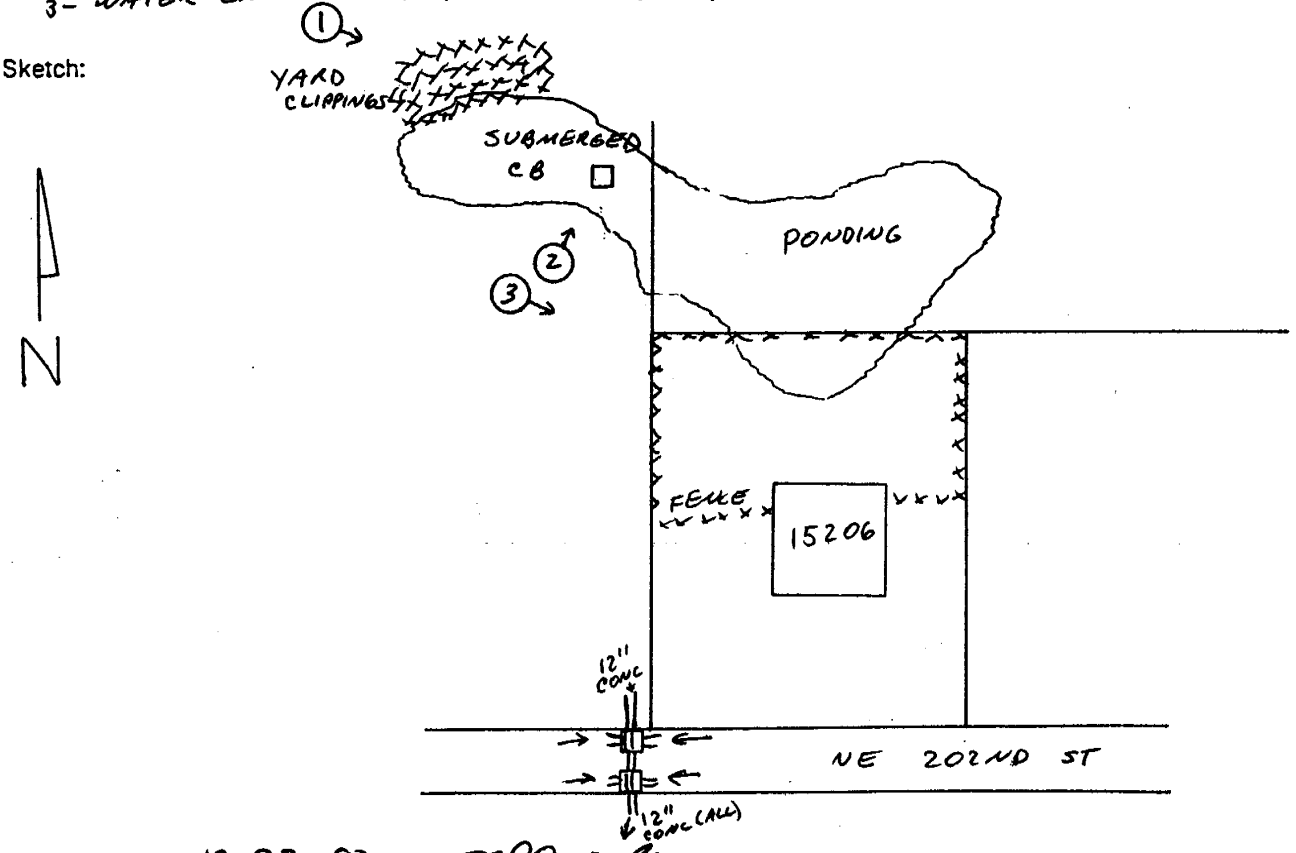
*Details of Investigation:* Date of Field Investigation: 12/22/93 Related Investigations:

WATER FROM A POND BEHIND THE TOSANOS IS RISING AND ENCROACHING INTO THEIR BACK YARD. THE HOUSE IS NOT THREATENED AS IT IS SEVERAL FEET ABOVE THE WATER. FOUND A CB ABOUT 1 FOOT UNDERWATER. COULD NOT TELL WHERE IT WAS SUPPOSED TO DRAIN. ON NE 202ND ST THERE IS A X-CULVERT THAT FLOWS TO THE SOUTH INTO AN OPEN SPACE TRACT. THE CB ON THE NORTH SIDE OF THE ROAD HAS A PIPE LEADING INTO IT THAT COMES FROM THE DIRECTION OF THE SUBMERGED CB BUT A CONNECTION COULD NOT BE CONFIRMED. THE CB'S IN FRONT HAD WATER PONDING IN THEM TO ALMOST ABOVE THE OUTLET PIPES.

1-10-94 CHECKED WITH FM. NOT COUNTY MAINTAINED R/D FACILITY.

PHOTOS:
1- AREA WHERE YARD CLIPPINGS HAVE BEEN DUMPED.
2- SUBMERGED CB.
3- WATER ENCROACHING INTO BACK YARD.

Sketch:




Date of Report: 12/27/93 By: BLaird

Complainant notified by BB by X phone ___ letter ___ personal contact. 1-10-94 - TOLD KEN TOSCANO NO COUNTY OWNED OR MAINTAINED FACILITIES.

KING COUNTY SURFACE WATER MANAGEMENT DIVISION

# DRAINAGE INVESTIGATION REPORT

Page 1: INVESTIGATION REQUEST

OBLEM DRNG TYPE C

eceived by: SANDY Date: 12/9/93 OK'd by: BB File No. 93-1056

eived from: (Please print plainly for scanning). (Day) (Eve)

AME: LISA TOSCANO PHONE 481-2753

DRESS: 15206 NE 202nd ST. City WOODINVILLE State ___ Zip 98072

cation of problem, if different: CHARGE #

tails of Problem:

A POND RUNNING THROUGH HER BACKYARD. THERE IS A STORM DRAIN THAT IS ADJACENT TO IT.

~~[illegible]~~ THEY HAVE ALWAYS CLEANED OUT THE DRAINS, TAKING OUT LEAVES.

WATER IS NOW CREEPING TOWARDS THE HOUSE.

THIS IS THE ~~[illegible]~~ FIRST YEAR IT HAS NOT DRAINED.

CALL FIRST TO LET HER KNOW WHEN SOMEONE WILL INVESTIGATE.

Other agencies involved: (Give details) called 12/9 - 1105 to acknowledge complaint.

| ported Impacts: | # Properties: | Dates/frequency of occurrences: |
|---|---|---|
| ___ Home | ___ | |
| ___ Access road | ___ | |
| ___ Septic system | ___ | |
| ___ Outbuildings, garage | ___ | |
| ___ Yard/landscaping | ___ | |
| ___ Other property | ___ | |
| ___ Stream, lake, wetland | | |

mments:

TO BE COMPLETED BY COMPLAINT PROGRAM STAFF:

cation/Tracking Info: NW 1/4 S 2 T 26 R 5 Parcel No. 022605-9083 Type ___

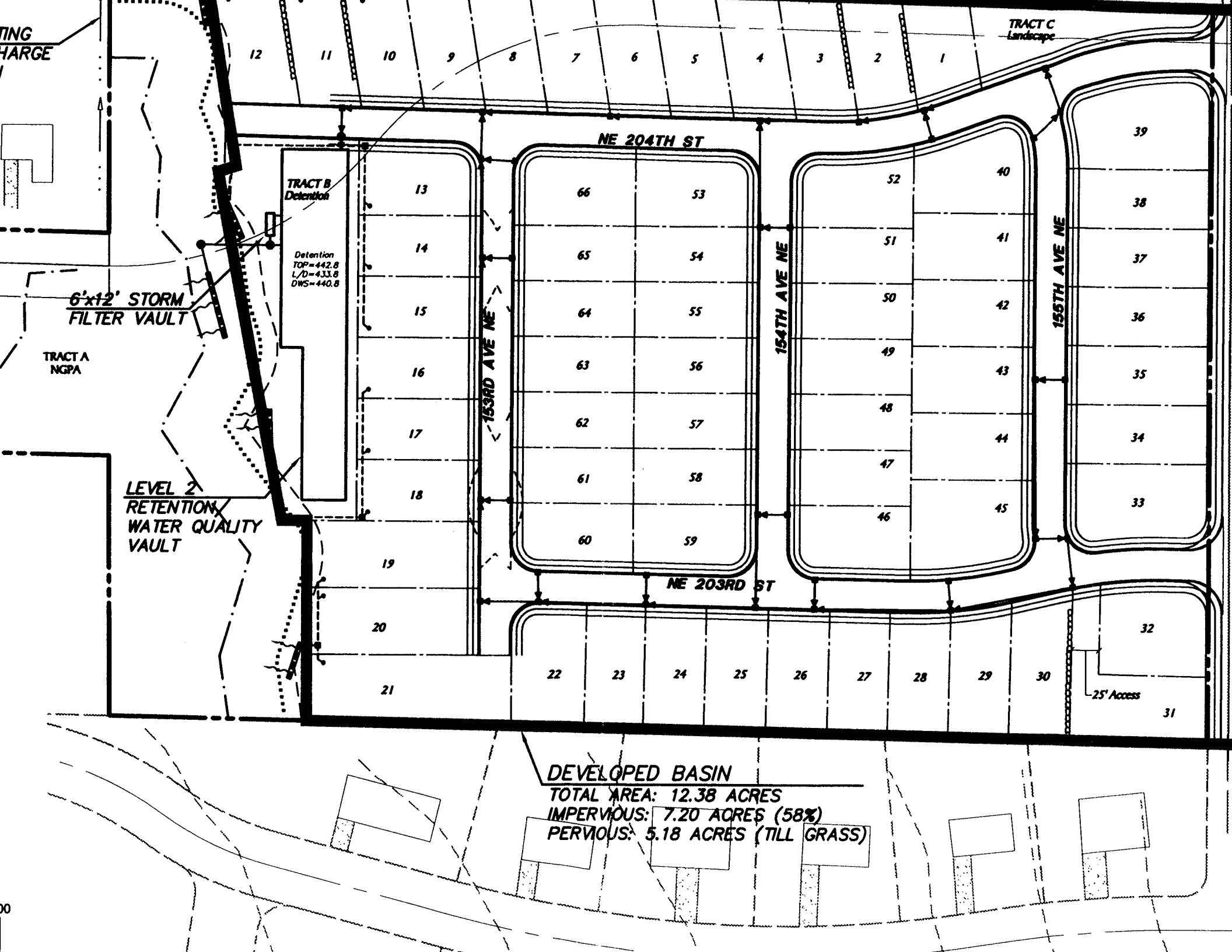
Basin LBR Council Dist 3 DIR Ref/Chg No: ___ City ___ Field investigation needed? ___

Plat name: Block No: Lot No:

ction taken: Assigned to: ___ Turned to ___ on ___/___/___ Initials: ___ KROLL

THOMAS BROS NEW: 477 A4 DATE CLOSED: 1/10/94 OK'd: BB

OLD: 4 E1


TRACT C
Landscape
NE 204TH ST
TRACT B
Detention
Detention
TOP=442.8
L/D=433.8
DWS=440.8
6'x12' STORM
FILTER VAULT
TRACT A
NGPA
LEVEL 2
RETENTION/
WATER QUALITY
VAULT
153RD AVE NE
154TH AVE NE
156TH AVE NE
NE 203RD ST
25' Access
DEVELOPED BASIN
TOTAL AREA: 12.38 ACRES
IMPERVIOUS: 7.20 ACRES (58%)
PERVIOUS: 5.18 ACRES (TILL GRASS)