APPENDIX E

Ancillary Facility Stormwater Management Feasibility

Parametrix

PROJECT EAST LAKE SAMMAMISH - MASTER PLAN TRAIL SHEET ____ OF ____
BY J. FRIEBEL DATE 3/22/04 CHECKED ____ DATE ____
SUBJECT ANCILLARY PARKING @ WELCOME JOB NO. ____ PHASE ____ TASK ____

Soil = Indianola = OUTWASH
Everett = OUTWASH

PREDEV = 45,740 sq.ft = 1.05 ac OUTWASH GRASS
DEV = 1.05 ac impervious

Rainfall Region = ST 1.0

· KCRTS Level 2 Detention Vault Size

Q_{2PRE} = 0.002 cfs

½ Q_{2PRE} = 0.001 cfs

Q_{10PRE} = 0.033 cfs

Q_{50PRE} = 0.069 cfs

Q_{100PRE} = 0.079 cfs

Target = 0.001 to 0.069 @ 36 intervals of 0.0019

* Min orif size = 0.5 Q = 0.014 cfs. w/ 4-ft head *
infiltration will be Req – need to further evaluate the site for infiltration capacity.

+ Receiving waters not identified.

Retention/Detention Facility

Type of Facility: Detention Vault
Facility Length: 57.00 ft
Facility Width: 35.00 ft
Facility Area: 1995. sq. ft
Effective Storage Depth: 4.00 ft
Stage 0 Elevation: 44.00 ft
Storage Volume: 7980. cu. ft
Riser Head: 4.00 ft
Riser Diameter: 12.00 inches
Number of orifices: 2

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	0.75	0.031	
2	2.25	0.63	0.014	4.0

Top Notch Weir: Rectangular
Length: 1.13 in
Weir Height: 3.70 ft
Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	(ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	44.00	0.	0.000	0.000	0.00
0.01	44.01	20.	0.000	0.001	0.00
0.02	44.02	40.	0.001	0.002	0.00
0.03	44.03	60.	0.001	0.003	0.00
0.04	44.04	80.	0.002	0.003	0.00
0.05	44.05	100.	0.002	0.004	0.00
0.06	44.06	120.	0.003	0.004	0.00
0.16	44.16	319.	0.007	0.006	0.00
0.26	44.26	519.	0.012	0.008	0.00
0.36	44.36	718.	0.016	0.009	0.00
0.46	44.46	918.	0.021	0.010	0.00
0.56	44.56	1117.	0.026	0.011	0.00
0.66	44.66	1317.	0.030	0.012	0.00
0.76	44.76	1516.	0.035	0.013	0.00
0.86	44.86	1716.	0.039	0.014	0.00
0.96	44.96	1915.	0.044	0.015	0.00
1.06	45.06	2115.	0.049	0.016	0.00
1.16	45.16	2314.	0.053	0.016	0.00
1.26	45.26	2514.	0.058	0.017	0.00
1.36	45.36	2713.	0.062	0.018	0.00
1.46	45.46	2913.	0.067	0.018	0.00
1.56	45.56	3112.	0.071	0.019	0.00
1.66	45.66	3312.	0.076	0.020	0.00
1.76	45.76	3511.	0.081	0.020	0.00
1.86	45.86	3711.	0.085	0.021	0.00
1.96	45.96	3910.	0.090	0.021	0.00
2.06	46.06	4110.	0.094	0.022	0.00
2.16	46.16	4309.	0.099	0.022	0.00
2.25	46.25	4489.	0.103	0.023	0.00
2.26	46.26	4509.	0.104	0.023	0.00

Route Time Series through Facility
Inflow Time Series File:se33-dev.tsf
Outflow Time Series File:SE33-VO

Inflow/Outflow Analysis

Peak Inflow Discharge:	0.291 CFS at	7:00 on Jan 9 in Year 8	
Peak Outflow Discharge:	0.255 CFS at	8:00 on Jan 9 in Year 8	
Peak Reservoir Stage:	4.06 Ft		
Peak Reservoir Elev:	48.06 Ft		
Peak Reservoir Storage:	8096. Cu-Ft		
:	0.186 Ac-Ft		

Flow Duration from Time Series File:se33-vo.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.002	38370	62.573	62.573	37.427	0.374E+00
0.004	5415	8.831	71.404	28.596	0.286E+00
0.007	6812	11.109	82.513	17.487	0.175E+00
0.009	4857	7.921	90.434	9.566	0.957E-01
0.012	2858	4.661	95.095	4.905	0.491E-01
0.014	1228	2.003	97.097	2.903	0.290E-01
0.017	845	1.378	98.475	1.525	0.152E-01
0.019	422	0.688	99.163	0.837	0.837E-02
0.022	261	0.426	99.589	0.411	0.411E-02
0.024	94	0.153	99.742	0.258	0.258E-02
0.027	27	0.044	99.786	0.214	0.214E-02
0.030	30	0.049	99.835	0.165	0.165E-02
0.032	22	0.036	99.871	0.129	0.129E-02
0.035	17	0.028	99.899	0.101	0.101E-02
0.037	16	0.026	99.925	0.075	0.750E-03
0.040	14	0.023	99.948	0.052	0.522E-03
0.042	17	0.028	99.976	0.024	0.245E-03
0.045	1	0.002	99.977	0.023	0.228E-03
0.047	2	0.003	99.980	0.020	0.196E-03
0.050	1	0.002	99.982	0.018	0.179E-03
0.052	0	0.000	99.982	0.018	0.179E-03
0.055	1	0.002	99.984	0.016	0.163E-03
0.058	2	0.003	99.987	0.013	0.130E-03
0.060	0	0.000	99.987	0.013	0.130E-03
0.063	3	0.005	99.992	0.008	0.815E-04
0.065	1	0.002	99.993	0.007	0.652E-04
0.068	1	0.002	99.995	0.005	0.489E-04
0.070	0	0.000	99.995	0.005	0.489E-04
0.073	2	0.003	99.998	0.002	0.163E-04
0.075	0	0.000	99.998	0.002	0.163E-04
0.078	0	0.000	99.998	0.002	0.163E-04
0.080	0	0.000	99.998	0.002	0.163E-04
0.083	0	0.000	99.998	0.002	0.163E-04
0.086	0	0.000	99.998	0.002	0.163E-04
0.088	0	0.000	99.998	0.002	0.163E-04
0.091	0	0.000	99.998	0.002	0.163E-04

Duration Comparison Anaylsis
Base File: se33-pre.tsf
New File: se33-vo.tsf
Cutoff Units: Discharge in CFS

	-----Fraction of Time-----			---------Check of Tolerance-------			
Cutoff	Base	New	%Change	Probability	Base	New	%Change
0.023	0.47E-02	0.28E-02	-41.0	0.47E-02	0.023	0.021	-7.8
0.026	0.35E-02	0.24E-02	-31.3	0.35E-02	0.026	0.022	-13.5
0.028	0.25E-02	0.19E-02	-23.2	0.25E-02	0.028	0.025	-11.6
0.031	0.18E-02	0.15E-02	-16.2	0.18E-02	0.031	0.028	-7.4
0.033	0.14E-02	0.11E-02	-20.0	0.14E-02	0.033	0.031	-5.7
0.036	0.12E-02	0.88E-03	-23.9	0.12E-02	0.036	0.033	-8.1
0.039	0.96E-03	0.64E-03	-33.9	0.96E-03	0.039	0.035	-8.3
0.041	0.82E-03	0.34E-03	-58.0	0.82E-03	0.041	0.037	-11.1
0.044	0.60E-03	0.23E-03	-62.2	0.60E-03	0.044	0.039	-11.3
0.046	0.49E-03	0.23E-03	-53.3	0.49E-03	0.046	0.040	-13.9
0.049	0.33E-03	0.18E-03	-45.0	0.33E-03	0.049	0.041	-15.8
0.052	0.26E-03	0.18E-03	-31.2	0.26E-03	0.052	0.042	-18.3
0.054	0.23E-03	0.18E-03	-21.4	0.23E-03	0.054	0.046	-14.4
0.057	0.20E-03	0.15E-03	-25.0	0.20E-03	0.057	0.048	-16.3
0.059	0.16E-03	0.13E-03	-20.0	0.16E-03	0.059	0.055	-6.6
0.062	0.15E-03	0.98E-04	-33.3	0.15E-03	0.062	0.057	-7.3
0.065	0.11E-03	0.65E-04	-42.9	0.11E-03	0.065	0.062	-4.5
0.067	0.82E-04	0.49E-04	-40.0	0.82E-04	0.067	0.063	-6.3
0.070	0.65E-04	0.49E-04	-25.0	0.65E-04	0.070	0.066	-5.6
0.072	0.33E-04	0.33E-04	0.0	0.33E-04	0.072	0.073	0.4
0.075	0.33E-04	0.16E-04	-50.0	0.33E-04	0.075	0.073	-3.0
0.078	0.33E-04	0.16E-04	-50.0	0.33E-04	0.078	0.073	-6.3
0.080	0.33E-04	0.16E-04	-50.0	0.33E-04	0.080	0.073	-9.3
0.083	0.33E-04	0.16E-04	-50.0	0.33E-04	0.083	0.073	-12.2
0.085	0.16E-04	0.16E-04	0.0	0.16E-04	0.085	0.092	7.2
0.088	0.16E-04	0.16E-04	0.0	0.16E-04	0.088	0.092	4.1
0.091	0.16E-04	0.16E-04	0.0	0.16E-04	0.091	0.092	1.1
0.093	0.16E-04	0.00E+00	-100.0	0.16E-04	0.093	0.092	-1.7
0.096	0.16E-04	0.00E+00	-100.0	0.16E-04	0.096	0.092	-4.4
0.098	0.16E-04	0.00E+00	-100.0	0.16E-04	0.098	0.092	-6.9
0.101	0.16E-04	0.00E+00	-100.0	0.16E-04	0.101	0.092	-9.3

Maximum positive excursion = 0.007 cfs (8.3%)
occuring at 0.085 cfs on the Base Data:se33-pre.tsf
and at 0.092 cfs on the New Data:se33-vo.tsf

Maximum negative excursion = 0.010 cfs (-19.5%)
occuring at 0.053 cfs on the Base Data:se33-pre.tsf
and at 0.043 cfs on the New Data:se33-vo.tsf

Parametrix

PROJECT East Lake Sammamish Trail - Surface Water SHEET 1 OF ____
BY Julie Brandt DATE 01/12/04 CHECKED ____ DATE ____
SUBJECT Bark Property Parking JOB NO. 554-1521-039 PHASE 10 TASK 1005

Detention

Predeveloped : 28,300 sq ft = 0.64968 Ac Till * Grass
Developed : 0.64968 Ac Impervious

* Note: Till soil type based on King Co. Soil Survey designation of Alderwood soils in the project vicinity.

Rainfall Region = SeaTac , Scale Factor = 1.0

• KCRTS Level 2 Detention Vault Sizing:

Predev Peaks: $Q_2 = 0.032$, $\frac{1}{2} Q_2 = 0.016$, $Q_{50} = 0.116$, $Q_{100} = 0.137$ cfs

Target = 0.016 cfs to 0.116 cfs @ 36 intv of 0.0028571

2.34	57.34	4961.	0.114	0.019	0.00
2.35	57.35	4982.	0.114	0.020	0.00
2.36	57.36	5003.	0.115	0.020	0.00
2.46	57.46	5215.	0.120	0.023	0.00
2.56	57.56	5427.	0.125	0.025	0.00
2.66	57.66	5639.	0.129	0.026	0.00
2.76	57.76	5851.	0.134	0.028	0.00
2.86	57.86	6063.	0.139	0.029	0.00
2.96	57.96	6275.	0.144	0.031	0.00
3.06	58.06	6487.	0.149	0.032	0.00
3.16	58.16	6699.	0.154	0.033	0.00
3.26	58.26	6911.	0.159	0.034	0.00
3.36	58.36	7123.	0.164	0.035	0.00
3.46	58.46	7335.	0.168	0.036	0.00
3.56	58.56	7547.	0.173	0.037	0.00
3.66	58.66	7759.	0.178	0.038	0.00
3.76	58.76	7971.	0.183	0.039	0.00
3.86	58.86	8183.	0.188	0.040	0.00
3.96	58.96	8395.	0.193	0.041	0.00
4.00	59.00	8480.	0.195	0.041	0.00
4.10	59.10	8692.	0.200	0.350	0.00
4.20	59.20	8904.	0.204	0.914	0.00
4.30	59.30	9116.	0.209	1.640	0.00
4.40	59.40	9328.	0.214	2.440	0.00
4.50	59.50	9540.	0.219	2.720	0.00
4.60	59.60	9752.	0.224	2.980	0.00
4.70	59.70	9964.	0.229	3.210	0.00
4.80	59.80	10176.	0.234	3.430	0.00
4.90	59.90	10388.	0.238	3.640	0.00
5.00	60.00	10600.	0.243	3.830	0.00
5.10	60.10	10812.	0.248	4.020	0.00
5.20	60.20	11024.	0.253	4.190	0.00
5.30	60.30	11236.	0.258	4.360	0.00
5.40	60.40	11448.	0.263	4.530	0.00
5.50	60.50	11660.	0.268	4.680	0.00
5.60	60.60	11872.	0.273	4.840	0.00
5.70	60.70	12084.	0.277	4.980	0.00
5.80	60.80	12296.	0.282	5.130	0.00
5.90	60.90	12508.	0.287	5.270	0.00
6.00	61.00	12720.	0.292	5.400	0.00

Hyd	Inflow	Outflow		Peak		Storage	
		Target	Calc	Stage	Elev	(Cu-Ft)	(Ac-Ft)
1	0.31	0.14	0.20	4.05	59.05	8587.	0.197
2	0.17	*******	0.04	3.67	58.67	7789.	0.179
3	0.16	*******	0.05	4.00	59.00	8488.	0.195
4	0.17	*******	0.03	3.19	58.19	6770.	0.155
5	0.19	*******	0.03	2.96	57.96	6273.	0.144
6	0.10	*******	0.02	2.42	57.42	5130.	0.118
7	0.14	*******	0.01	1.89	56.89	3998.	0.092
8	0.16	*******	0.01	1.89	56.89	4008.	0.092

Route Time Series through Facility
Inflow Time Series File:bark-dev.tsf
Outflow Time Series File:BARK-VO

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

---Annual Peak Flow Rates---

Flow Rate (CFS)	Rank	Time of Peak
0.058	4	2/09/01 2:00
0.029	7	1/05/02 16:00
0.074	2	2/27/03 7:00
0.012	8	3/24/04 19:00
0.032	6	1/05/05 8:00
0.060	3	1/18/06 16:00
0.053	5	11/24/06 3:00
0.137	1	1/09/08 6:00
Computed Peaks		

-----Flow Frequency Analysis-------

- - Peaks - - (CFS)	Rank	Return Period	Prob
0.137	1	100.00	0.990
0.074	2	25.00	0.960
0.060	3	10.00	0.900
0.058	4	5.00	0.800
0.053	5	3.00	0.667
0.032	6	2.00	0.500
0.029	7	1.30	0.231
0.012	8	1.10	0.091
0.116		50.00	0.980

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

---Annual Peak Flow Rates---

Flow Rate (CFS)	Rank	Time of Peak
0.157	7	2/09/01 2:00
0.139	8	1/05/02 16:00
0.192	3	12/08/02 18:00
0.162	6	8/26/04 2:00
0.192	4	10/28/04 16:00
0.168	5	1/18/06 16:00
0.236	2	10/26/06 0:00
0.307	1	1/09/08 6:00
Computed Peaks		

-----Flow Frequency Analysis-------

- - Peaks - - (CFS)	Rank	Return Period	Prob
0.307	1	100.00	0.990
0.236	2	25.00	0.960
0.192	3	10.00	0.900
0.192	4	5.00	0.800
0.168	5	3.00	0.667
0.162	6	2.00	0.500
0.157	7	1.30	0.231
0.139	8	1.10	0.091
0.283		50.00	0.980

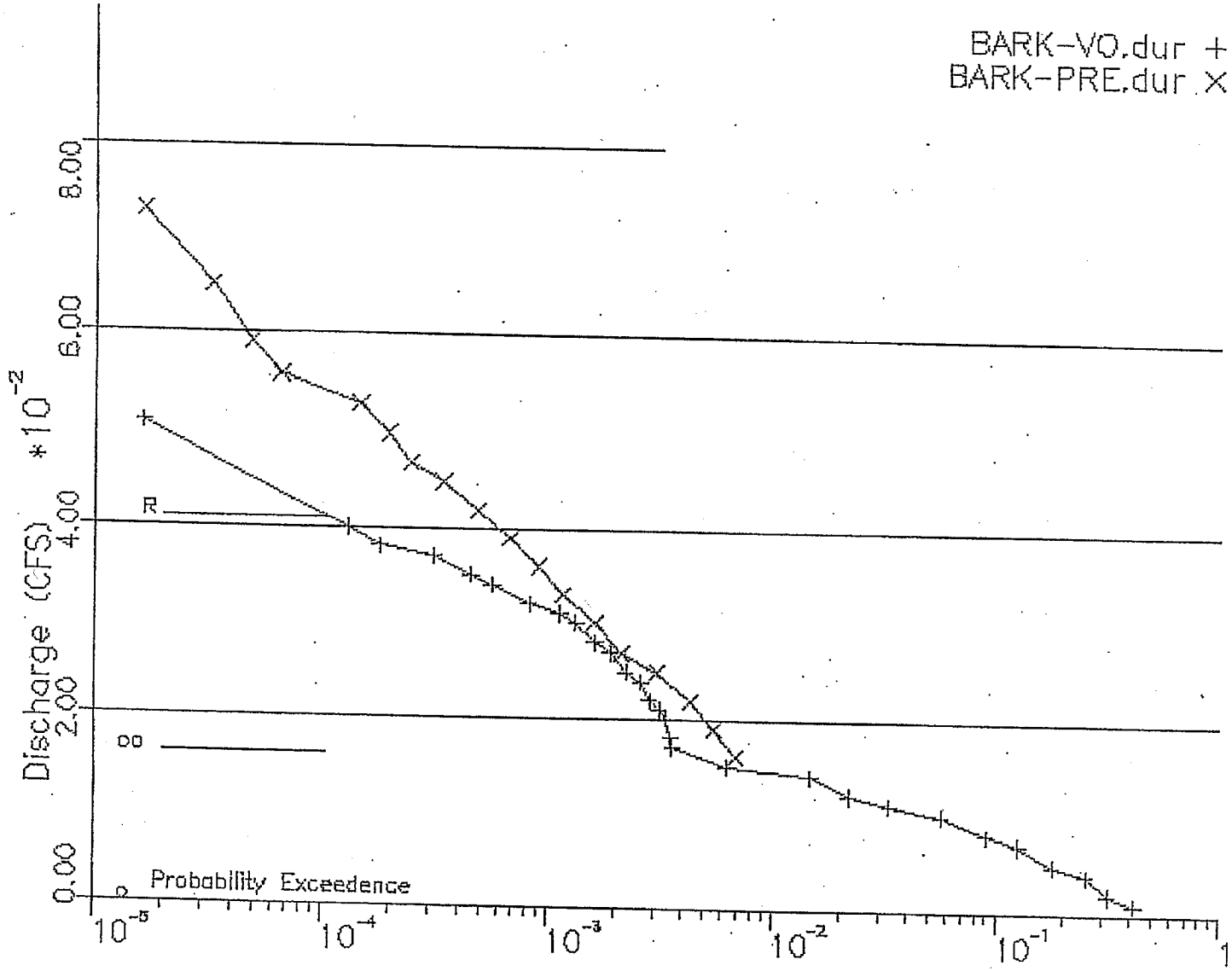
Flow Frequency Analysis
Time Series File:bark-vo.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---

Flow Rate (CFS)	Rank	Time of Peak
0.052	2	2/09/01 20:00
0.014	8	12/28/01 18:00
0.031	5	3/06/03 22:00
0.014	7	8/26/04 6:00
0.022	6	1/05/05 15:00
0.033	4	1/18/06 22:00
0.038	3	11/24/06 7:00
0.197	1	1/09/08 10:00
Computed Peaks		

-----Flow Frequency Analysis-------

- - Peaks - - (CFS)	(ft)	Rank	Return Period	Prob
0.197	4.05	1	100.00	0.990
0.052	4.00	2	25.00	0.960
0.038	3.67	3	10.00	0.900
0.033	3.19	4	5.00	0.800
0.031	2.96	5	3.00	0.667
0.022	2.42	6	2.00	0.500
0.014	1.89	7	1.30	0.231
0.014	1.89	8	1.10	0.091
0.149	4.03		50.00	0.980


BARK-VO.dur +
BARK-PRE.dur X
Discharge (CFS) *10^-2
8.00
6.00
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Probability Exceedence
10^-5
10^-4
10^-3
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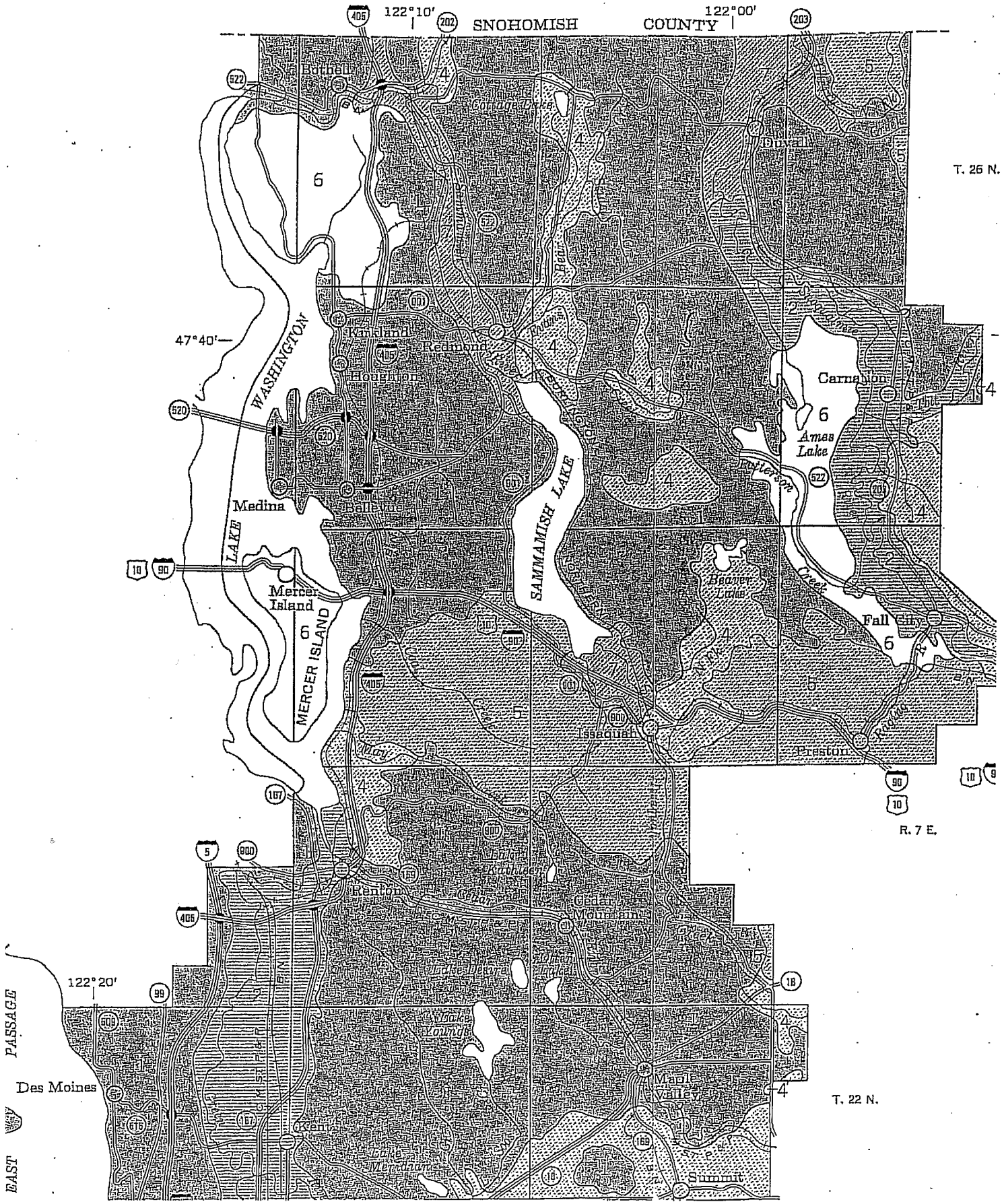
SNOHOMISH COUNTY
122°10'
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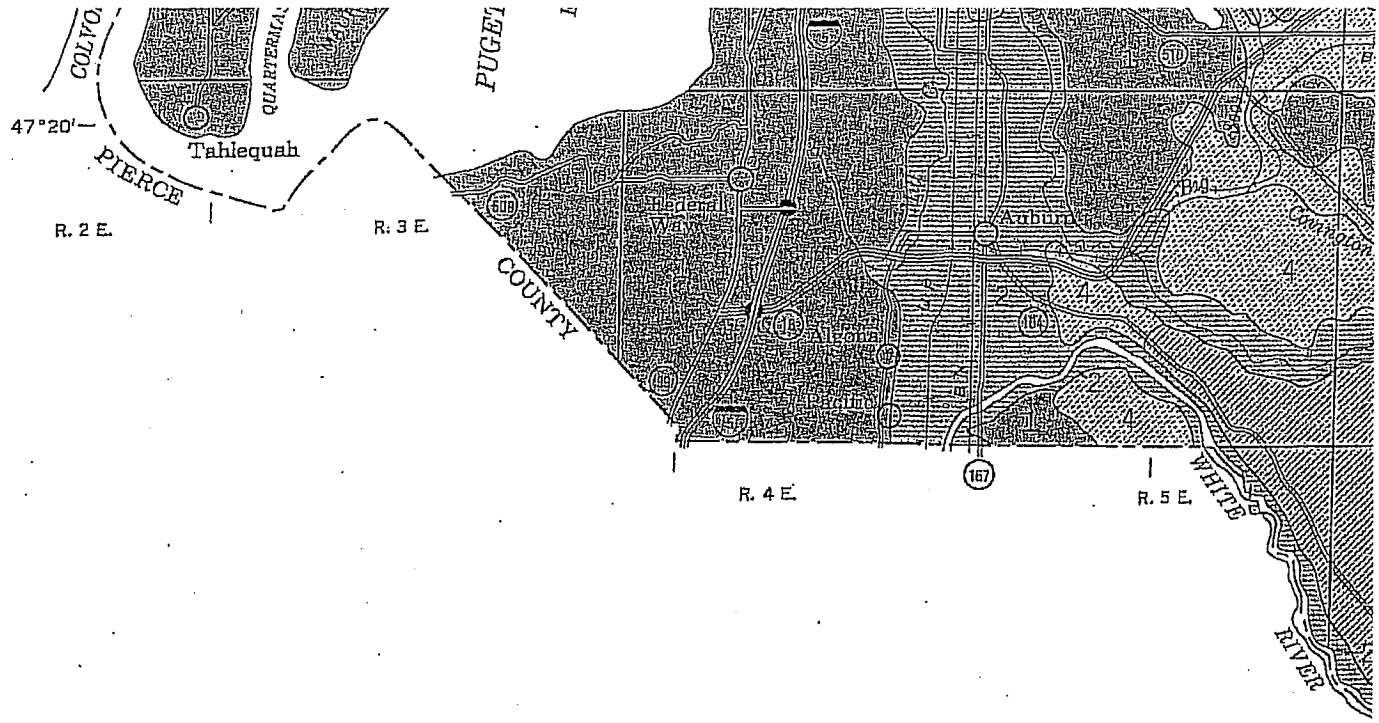
122°20'
47°40'
T. 26 N.
T. 22 N.
R. 7 E.
Bothell
Duvall
Kirkland
Redmond
Houghton
Carnation
Ames Lake
Medina
Bellevue
Mercer Island
MERCER ISLAND
WASHINGTON
LAKE
SAMMAMISH LAKE
Beaver Lake
Fall City
Issaquah
Preston
Renton
Cedar Mountain
Lake Desire
Maple Valley
Des Moines
Kent
Summit
PASSAGE
EAST



SOIL ASSOCIATIONS

1 — Alderwood association: Moderately well drained, undulating to hilly soils that have dense, very slowly permeable glacial till at a depth of 20 to 40 inches; on uplands and terraces

2 — Oridia-Seattle-Woodinville association: Somewhat poorly drained and very poorly drained, nearly level soils; in major stream valleys

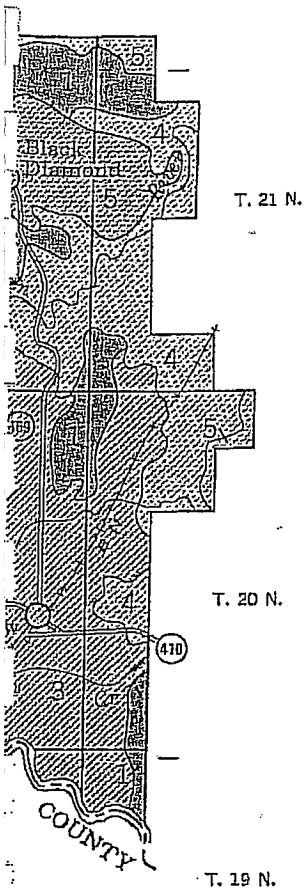
3 — Buckley-Alderwood association: Poorly drained and moderately well drained, nearly level to rolling soils that have dense, slowly permeable and very slowly permeable glacial till at a depth of 20 to 40 inches; on glacial till plains and uplands

4 — Everett association: Somewhat excessively drained, gravelly, gently undulating soils underlain by sand and gravel; on terraces

5 — Beausite-Alderwood association: Well drained and moderately well drained, gently rolling to very steep soils that have sandstone or shale or dense, very slowly permeable glacial till at a depth of 20 to 40 inches; on uplands

6 — Alderwood-Kitsap-Indianola association: Moderately well drained, nearly level to steep soils that have very slowly permeable glacial till or glacial lake deposits at a depth of 16 to 40 inches, and somewhat excessively drained, rolling, deep sandy soils; on uplands and terraces

7 — Puget-Earlmont-Snohomish association: Poorly drained and somewhat poorly drained, nearly level soils that have layers of peat within a few feet of the surface; in major stream valleys



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

WASHINGTON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

KING COUNTY AREA, WASHINGTON

Scale 1:190,080

1 0 1 2 3 4 Miles

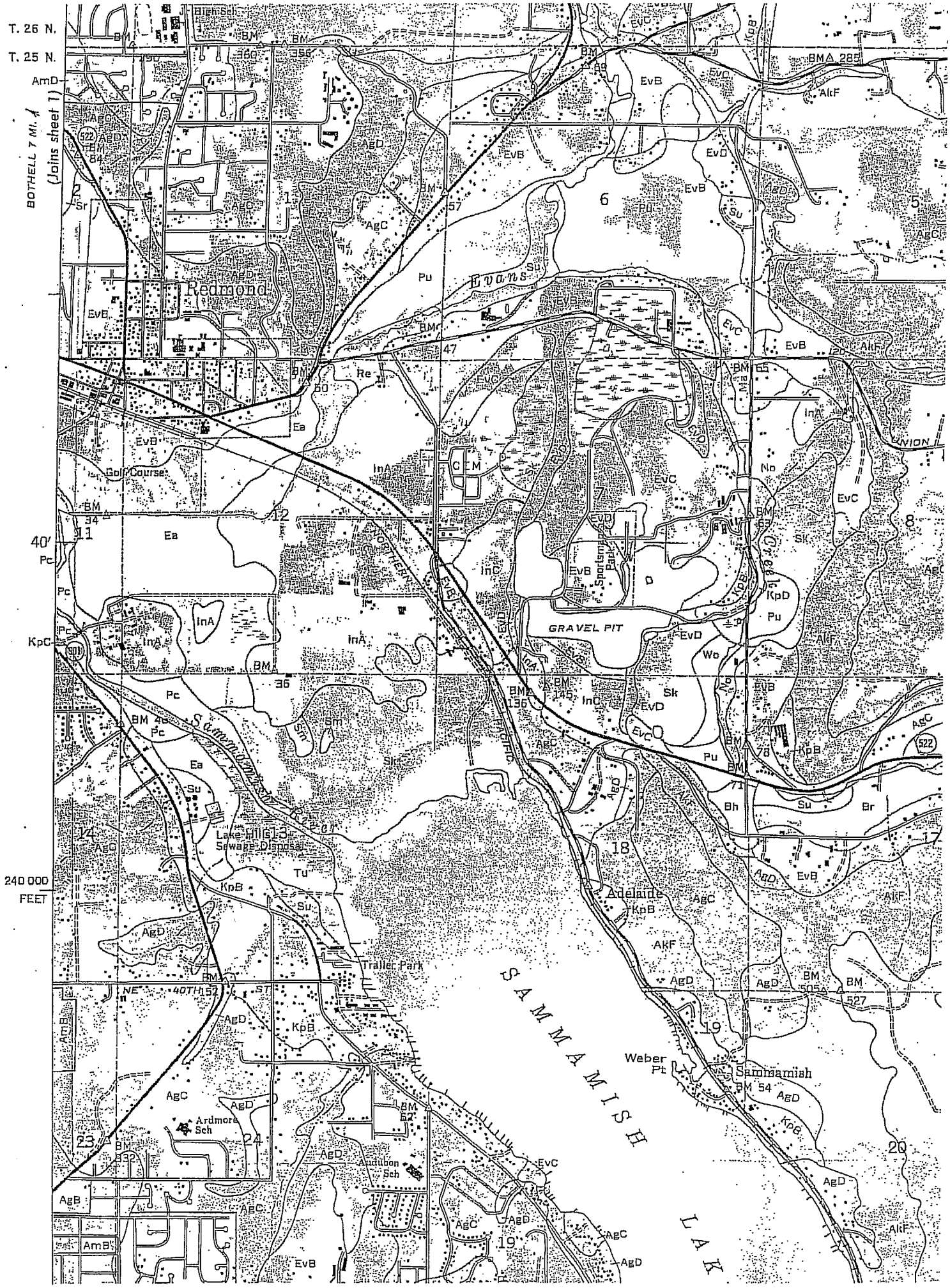
Compiled 1972

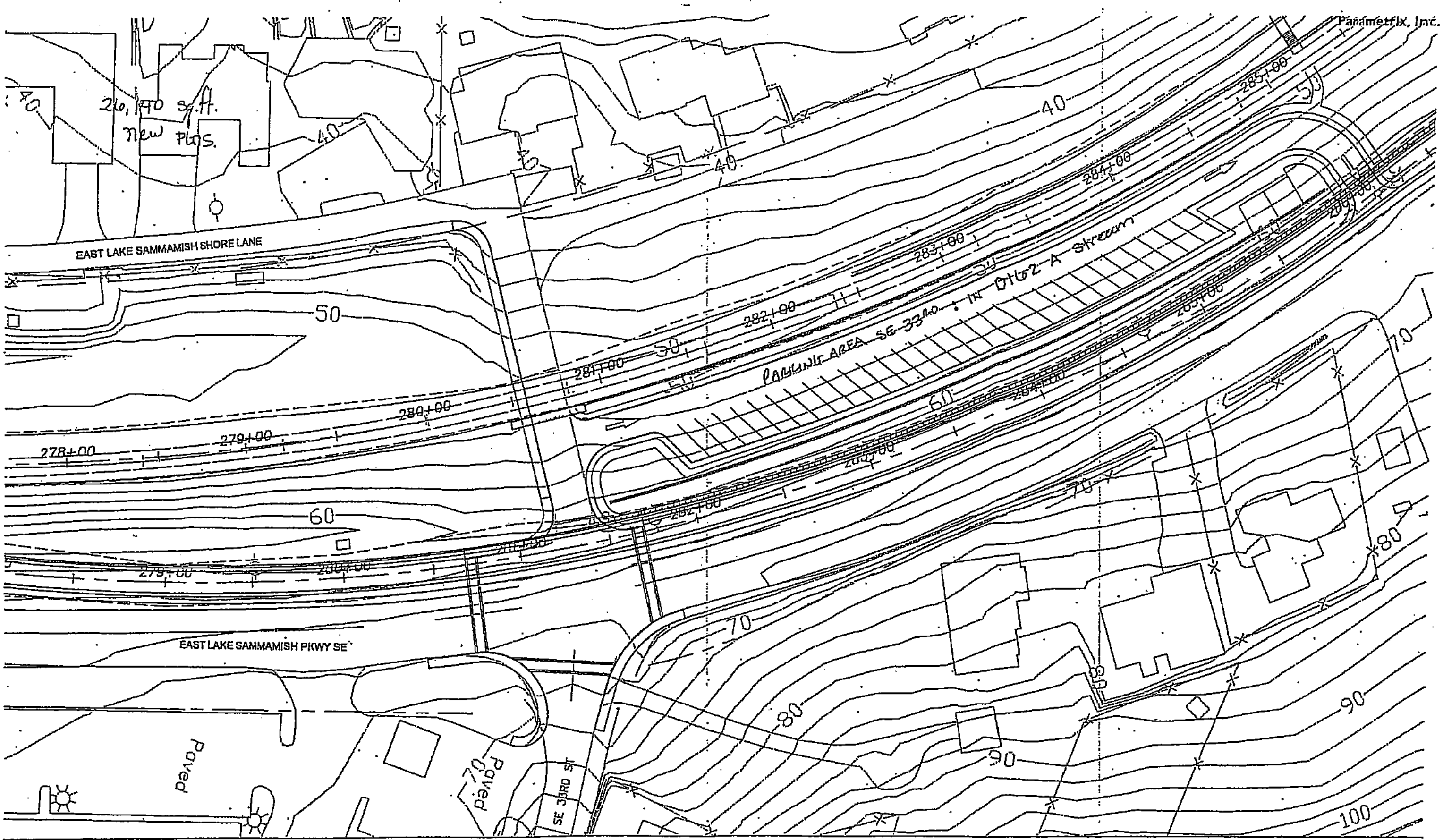
TABLE III-1
EQUIVALENCE BETWEEN SOIL TYPES CLASSIFIED BY U.S. SOIL CONSERVATION SERVICE AND KING COUNTY RUNOFF TIME SERIES

SCS Soil Type	SCS Hydrologic Soil Group	KCRTS Soil Group	Notes
Alderwood (AgB, AgC, AgD)	C	Till	
Arents, Alderwood Material (AmB, AmC)	C	Till	
Arents, Everett Material (An)	B	Outwash	1
Beausite (BeC, BeD, BeF)	C	Till	2
Bellingham (Bh)	D	Till	3
Briscot (Br)	D	Till	3
Buckley (Bu)	D	Till	4
Earlmont (Ea)	D	Till	3
Edgewick (Ed)	C	Till	3
Everett (EvB, EvC, EvD, EwC)	A/B	Outwash	1
Indianola (InC, InA, InD)	A	Outwash	1
Kitsap (KpB, KpC, KpD)	C	Till	
Klaus (KsC)	C	Outwash	1
Neilton (NeC)	A	Outwash	1
Newberg (Ng)	B	Till	3
Nooksack (Nk)	C	Till	3
Norma (No)	D	Till	3
Orcas (Or)	D	Wetland	
Oridia (Os)	D	Till	3
Ovall (OvC, OvD, OvF)	C	Till	2
Pilchuck (Pc)	C	Till	3
Puget (Pu)	D	Till	3
Puyallup (Py)	B	Till	3
Ragnar (RaC, RaD, RnC, RnE)	B	Outwash	1
Renton (Re)	D	Till	3
Salal (Sa)	C	Till	3
Sammamish (Sh)	D	Till	3
Seattle (Sk)	D	Wetland	
Shalcar (Sm)	D	Till	3
Si (Sn)	C	Till	3
Snohomish (So, Sr)	D	Till	3
Sultan (Su)	C	Till	3
Tukwila (Tu)	D	Till	3
Woodinville (Wo)	D	Till	3

Key to Notes:

1. Where outwash soils are saturated or underlain at shallow depth (<5 feet) by glacial till, they should be treated as till soils. (High groundwater table)
2. These are bedrock soils, but calibration of HSPF (Hydrological Simulation Program–Fortran) by King County Surface Water Management shows bedrock soils to have similar hydrologic response to till soils.
3. These are alluvial soils, some of which are underlain by glacial till or have a seasonally high water table. In the absence of detailed study, these soils should be treated as till soils.
4. Buckley soils are formed on the low permeability Osceola mudflow. Hydrologic response is assumed to be similar to that for till soils.


T. 26 N.
T. 25 N.
BOTHELL 7 MI.
(Joins sheet 1)
Redmond
Evans
Golf Course
GRAVEL PIT
Sportsman Park
Sammamish River
Lake Hills Sewage Disposal
Trailer Park
Adelaide
Weber Pt
Sammamish
SAMMAMISH LAKE
Ardmore Sch
Audubon Sch
NE 40TH ST
240 000 FEET
40'



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0 25 50
SCALE IN FEET

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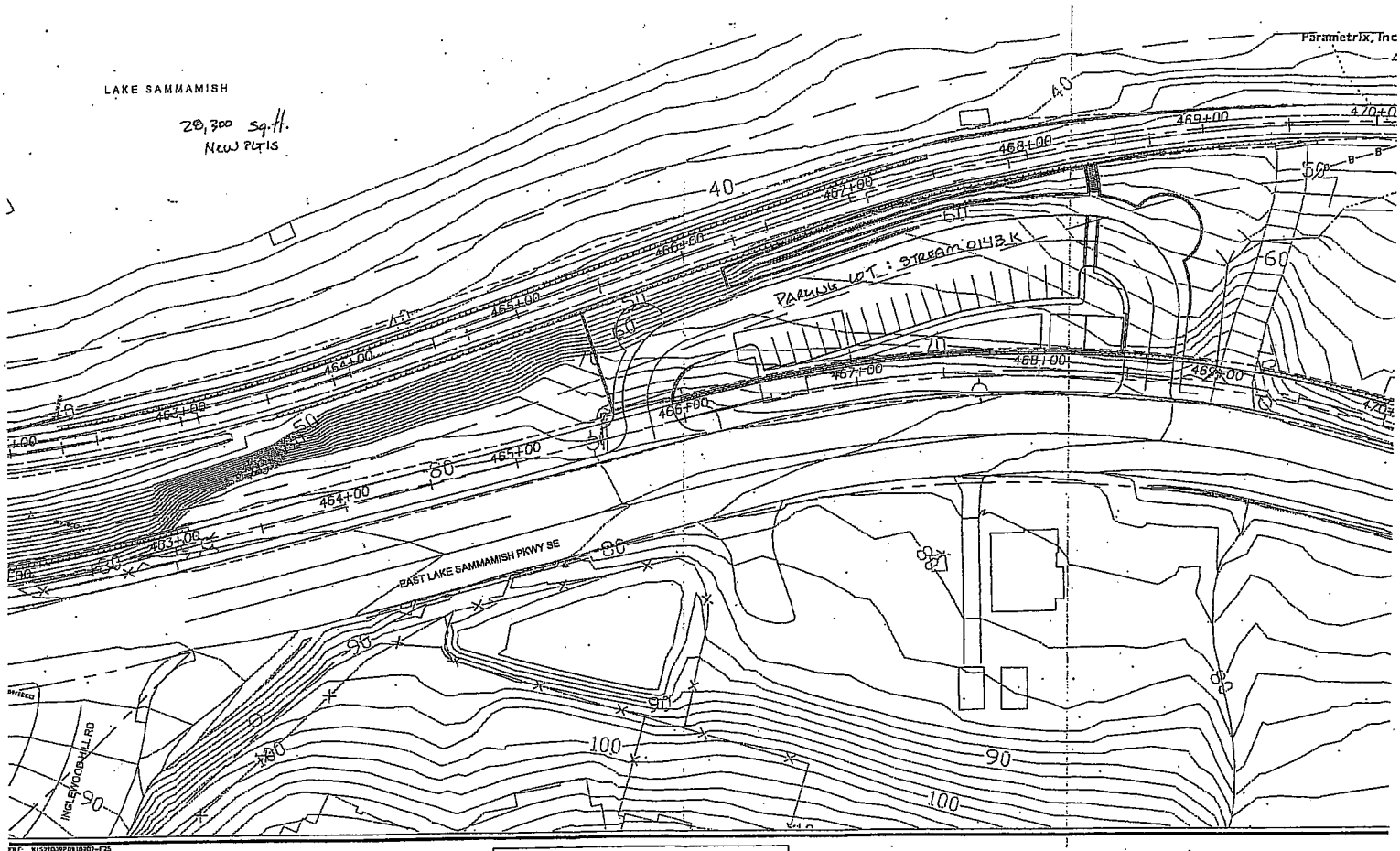
DRAFT Alignment
For Discussion Purposes Only
October 2003

Figure 10
SE 33rd St
Ancillary Facilities
East Lake Sammamish Trail Master Plan



DRAFT Alignment
For Discussion Purposes Only
October 2003

Figure 13
Bark Property
Ancillary Facilities
East Lake Sammamish Trail Master Plan