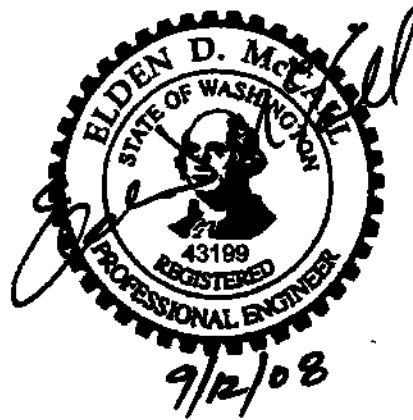


**CONSTRUCTION
DRAINAGE REPORT
FOR THE
RON HASEN SHORT PLAT**

ARLINGTON

Project Number : PWD20080115



MAC ENGINEERING, LLC

P.O. Box 197
Silvana, WA 98287
Phone: 425-501-9990

Prepared by : Elden McCall
Date: September 9th, 2008.
Project Number: 12008

RECEIVED
SEP 12 2008
COA Engineering Dept.

COSTRUCTION DRAINAGE REPORT

INTRODUCTION:

The Ron Hansen short plat will provide 2 new single-family residences (SFR) and retain the existing residence at 6330-208th Street NE within the City of Arlington, Washington. The site is flat at 0% to 3% slopes to the south. The site is vegetated with native landscaping.

The soils on site are Lynnwood loamy sand as indicated in the Snohomish County Area Soils Map and are rated in Hydraulic Soils Group A (See Appendix). The on-site sols are suitable for infiltration of storm water runoff and will allow for Low Impact Development. Soil logs have been provided by Brown's Design dated 8/29/08 and are attached to the Appendix of this drainage report. The Perc rate was indicated at 5 M/I average or approximately 12 inches per hr.

DEVELOPED CONDITIONS:

Storm water runoff from the 2 new SFR's and associated driveways (Approximately 4,000 sf impervious each) will be infiltrated to the natural ground utilizing Low Impact Development techniques. The single lot infiltration systems were designed per the Western Washington Hydrology Model 3(WWHM3) and are attached to Appendix A of this report. To provide water quality runoff for paved surfaces, runoff will sheet flow to the proposed single lot infiltration systems. The infiltration trench were sized to include approximately 4,000 sf of landscaping surfaces. The trenches will be rocked lined with 1 to 1 ½ inch diameter washed rock and wrapped in filter fabric (Void ratio 0.4). The trenches will be approximately 50 ft long and 5 ft wide and 3 ft deep. Roof downspouts will be tied directly into the infiltration trench system. For additional information see the Construction plans. No impacts from this Low Impact Development are anticipated with the development of the Ron Hansen short plat.

**APPENDIX A
RON HANSEN SHORT PLAT**

12008

CONSTRUCTION DRAINAGE ANALYSIS:

**Western Washington Hydrology Model
PROJECT REPORT**

Project Name: RON HANSEN SP
Site Address: 6330-208TH STREET NE
City : Arlington
Report Date : 9/9/2008
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.20

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
A B, Forest, Flat	.15

<u>Impervious Land Use</u>	<u>Acres</u>
----------------------------	--------------

Element Flows To:
Surface Interflow Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
A B, Lawn, Flat	.05

<u>Impervious Land Use</u>	<u>Acres</u>
ROOF TOPS FLAT	0.05
DRIVEWAYS FLAT	0.05

Element Flows To:
Surface Interflow Groundwater
Gravel Trench Bed 1, Gravel Trench Bed 1,

Name : Gravel Trench Bed 1
Bottom Length: 50ft.
Bottom Width : 5ft.

Trench bottom slope 1: 0.001 To 1
 Trench left side slope 0: 0.0001 To 1
 Trench right side slope 2: 0.0001 To 1
 Material thickness of first layer : 3
 Pour Space of material for first layer : 0.4
 Material thickness of second layer : 0
 Pour Space of material for second layer : 0
 Material thickness of third layer : 0
 Pour Space of material for third layer : 0
 Infiltration On
 Infiltration rate : 12
 Infiltration safety factor : 0.25
Discharge Structure
 Riser Height: 2.98 ft.
 Riser Diameter: 10000 in.

Element Flows To:
 Outlet 1 Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dischrg(cfs)	Infilt(cfs)
0.000	0.006	0.000	0.000	0.000
0.033	0.006	0.000	0.000	0.017
0.067	0.006	0.000	0.000	0.017
0.100	0.006	0.000	0.000	0.017
0.133	0.006	0.000	0.000	0.017
0.167	0.006	0.000	0.000	0.017
0.200	0.006	0.000	0.000	0.017
0.233	0.006	0.001	0.000	0.017
0.267	0.006	0.001	0.000	0.017
0.300	0.006	0.001	0.000	0.017
0.333	0.006	0.001	0.000	0.017
0.367	0.006	0.001	0.000	0.017
0.400	0.006	0.001	0.000	0.017
0.433	0.006	0.001	0.000	0.017
0.467	0.006	0.001	0.000	0.017
0.500	0.006	0.001	0.000	0.017
0.533	0.006	0.001	0.000	0.017
0.567	0.006	0.001	0.000	0.017
0.600	0.006	0.001	0.000	0.017
0.633	0.006	0.001	0.000	0.017
0.667	0.006	0.002	0.000	0.017
0.700	0.006	0.002	0.000	0.017
0.733	0.006	0.002	0.000	0.017
0.767	0.006	0.002	0.000	0.017
0.800	0.006	0.002	0.000	0.017
0.833	0.006	0.002	0.000	0.017
0.867	0.006	0.002	0.000	0.017
0.900	0.006	0.002	0.000	0.017
0.933	0.006	0.002	0.000	0.017
0.967	0.006	0.002	0.000	0.017
1.000	0.006	0.002	0.000	0.017
1.033	0.006	0.002	0.000	0.017
1.067	0.006	0.002	0.000	0.017
1.100	0.006	0.003	0.000	0.017
1.133	0.006	0.003	0.000	0.017
1.167	0.006	0.003	0.000	0.017
1.200	0.006	0.003	0.000	0.017
1.233	0.006	0.003	0.000	0.017

1.267	0.006	0.003	0.000	0.017
1.300	0.006	0.003	0.000	0.017
1.333	0.006	0.003	0.000	0.017
1.367	0.006	0.003	0.000	0.017
1.400	0.006	0.003	0.000	0.017
1.433	0.006	0.003	0.000	0.017
1.467	0.006	0.003	0.000	0.017
1.500	0.006	0.003	0.000	0.017
1.533	0.006	0.004	0.000	0.017
1.567	0.006	0.004	0.000	0.017
1.600	0.006	0.004	0.000	0.017
1.633	0.006	0.004	0.000	0.017
1.667	0.006	0.004	0.000	0.017
1.700	0.006	0.004	0.000	0.017
1.733	0.006	0.004	0.000	0.017
1.767	0.006	0.004	0.000	0.017
1.800	0.006	0.004	0.000	0.017
1.833	0.006	0.004	0.000	0.017
1.867	0.006	0.004	0.000	0.017
1.900	0.006	0.004	0.000	0.017
1.933	0.006	0.004	0.000	0.017
1.967	0.006	0.005	0.000	0.017
2.000	0.006	0.005	0.000	0.017
2.033	0.006	0.005	0.000	0.017
2.067	0.006	0.005	0.000	0.017
2.100	0.006	0.005	0.000	0.017
2.133	0.006	0.005	0.000	0.017
2.167	0.006	0.005	0.000	0.017
2.200	0.006	0.005	0.000	0.017
2.233	0.006	0.005	0.000	0.017
2.267	0.006	0.005	0.000	0.017
2.300	0.006	0.005	0.000	0.017
2.333	0.006	0.005	0.000	0.017
2.367	0.006	0.005	0.000	0.017
2.400	0.006	0.006	0.000	0.017
2.433	0.006	0.006	0.000	0.017
2.467	0.006	0.006	0.000	0.017
2.500	0.006	0.006	0.000	0.017
2.533	0.006	0.006	0.000	0.017
2.567	0.006	0.006	0.000	0.017
2.600	0.006	0.006	0.000	0.017
2.633	0.006	0.006	0.000	0.017
2.667	0.006	0.006	0.000	0.017
2.700	0.006	0.006	0.000	0.017
2.733	0.006	0.006	0.000	0.017
2.767	0.006	0.006	0.000	0.017
2.800	0.006	0.006	0.000	0.017
2.833	0.006	0.007	0.000	0.017
2.867	0.006	0.007	0.000	0.017
2.900	0.006	0.007	0.000	0.017
2.933	0.006	0.007	0.000	0.017
2.967	0.006	0.007	0.000	0.017
3.000	0.006	0.007	22.96	0.017

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.000043
5 year	0.000097
10 year	0.000159
25 year	0.000283
50 year	0.000423
100 year	0.000617

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Yearly Peaks for Predeveloped and Mitigated. POC #1

<u>Year</u>	<u>Predeveloped</u>	<u>Mitigated</u>
1950	0.000	0.000
1951	0.000	0.000
1952	0.000	0.000
1953	0.000	0.000
1954	0.000	0.000
1955	0.000	0.000
1956	0.001	0.000
1957	0.000	0.000
1958	0.000	0.000
1959	0.000	0.000
1960	0.000	0.000
1961	0.000	0.000
1962	0.000	0.000
1963	0.000	0.000
1964	0.000	0.000
1965	0.000	0.000
1966	0.000	0.000
1967	0.000	0.000
1968	0.000	0.000
1969	0.000	0.000
1970	0.000	0.000
1971	0.000	0.000
1972	0.000	0.000
1973	0.000	0.000
1974	0.000	0.000
1975	0.000	0.000
1976	0.000	0.000
1977	0.000	0.000
1978	0.000	0.000
1979	0.000	0.000
1980	0.000	0.000
1981	0.000	0.000
1982	0.000	0.000
1983	0.000	0.000
1984	0.000	0.000
1985	0.000	0.000
1986	0.000	0.000
1987	0.000	0.000
1988	0.000	0.000

1989	0.000	0.000
1990	0.000	0.000
1991	0.000	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.000	0.000
1996	0.000	0.000
1997	0.001	0.000
1998	0.001	0.000

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0010	0.0000
2	0.0005	0.0000
3	0.0005	0.0000
4	0.0003	0.0000
5	0.0002	0.0000
6	0.0002	0.0000
7	0.0002	0.0000
8	0.0001	0.0000
9	0.0001	0.0000
10	0.0001	0.0000
11	0.0001	0.0000
12	0.0001	0.0000
13	0.0001	0.0000
14	0.0000	0.0000
15	0.0000	0.0000
16	0.0000	0.0000
17	0.0000	0.0000
18	0.0000	0.0000
19	0.0000	0.0000
20	0.0000	0.0000
21	0.0000	0.0000
22	0.0000	0.0000
23	0.0000	0.0000
24	0.0000	0.0000
25	0.0000	0.0000
26	0.0000	0.0000
27	0.0000	0.0000
28	0.0000	0.0000
29	0.0000	0.0000
30	0.0000	0.0000
31	0.0000	0.0000
32	0.0000	0.0000
33	0.0000	0.0000
34	0.0000	0.0000
35	0.0000	0.0000
36	0.0000	0.0000
37	0.0000	0.0000
38	0.0000	0.0000
39	0.0000	0.0000
40	0.0000	0.0000
41	0.0000	0.0000
42	0.0000	0.0000
43	0.0000	0.0000
44	0.0000	0.0000
45	0.0000	0.0000
46	0.0000	0.0000
47	0.0000	0.0000

48 0.0000 0.0000
49 0.0000 0.0000

POC #1
The Facility PASSED

The Facility PASSED.

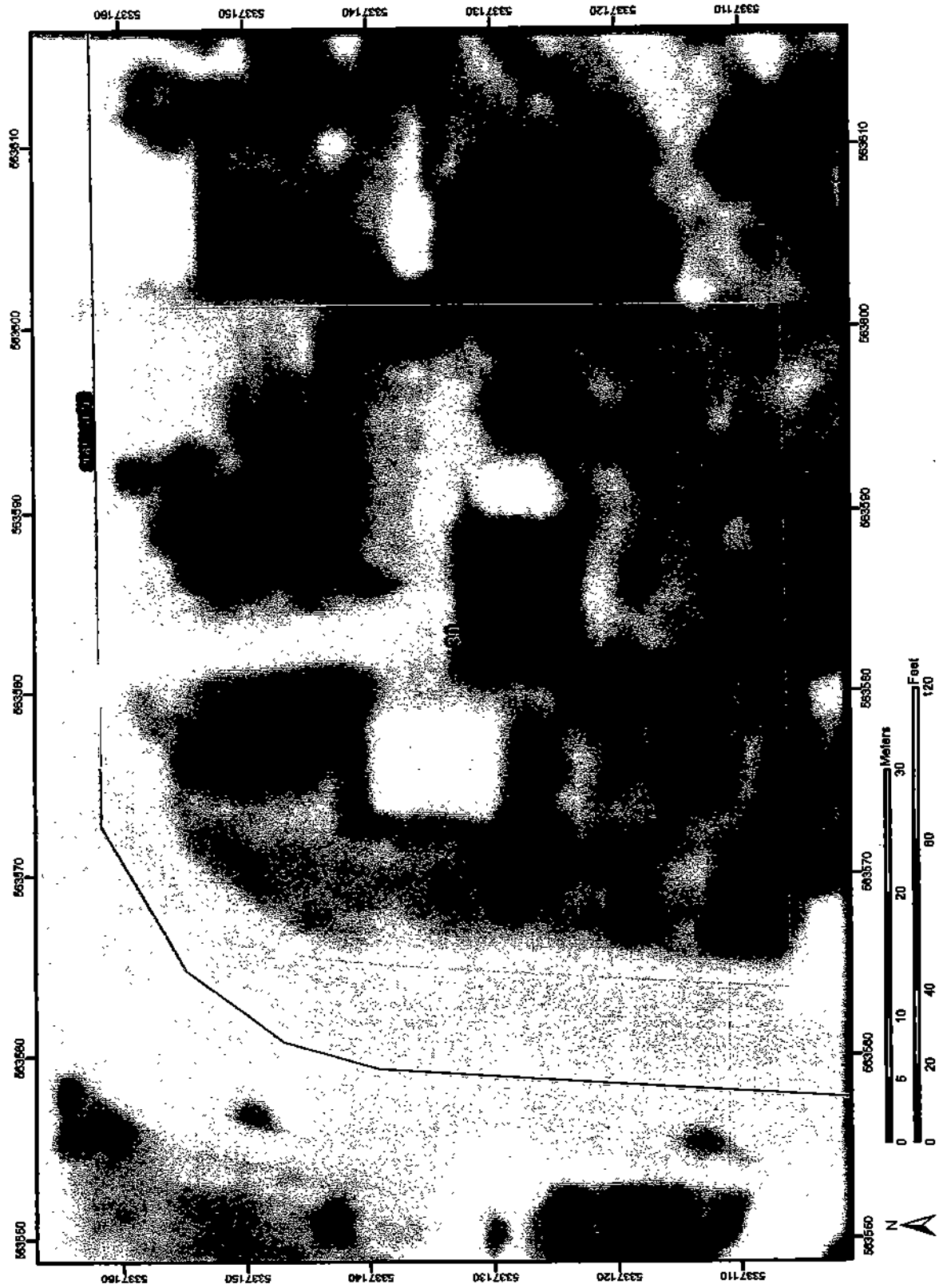
Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
0.0000	1530	0	0	Pass
0.0000	733	0	0	Pass
0.0000	233	0	0	Pass
0.0000	136	0	0	Pass
0.0000	121	0	0	Pass
0.0000	106	0	0	Pass
0.0000	98	0	0	Pass
0.0000	88	0	0	Pass
0.0001	82	0	0	Pass
0.0001	77	0	0	Pass
0.0001	69	0	0	Pass
0.0001	65	0	0	Pass
0.0001	60	0	0	Pass
0.0001	58	0	0	Pass
0.0001	57	0	0	Pass
0.0001	53	0	0	Pass
0.0001	50	0	0	Pass
0.0001	50	0	0	Pass
0.0001	47	0	0	Pass
0.0001	45	0	0	Pass
0.0001	42	0	0	Pass
0.0001	42	0	0	Pass
0.0001	40	0	0	Pass
0.0001	40	0	0	Pass
0.0001	40	0	0	Pass
0.0001	38	0	0	Pass
0.0001	36	0	0	Pass
0.0001	36	0	0	Pass
0.0001	34	0	0	Pass
0.0001	33	0	0	Pass
0.0001	29	0	0	Pass
0.0001	26	0	0	Pass
0.0002	22	0	0	Pass
0.0002	20	0	0	Pass
0.0002	19	0	0	Pass
0.0002	19	0	0	Pass
0.0002	18	0	0	Pass
0.0002	18	0	0	Pass
0.0002	17	0	0	Pass
0.0002	17	0	0	Pass
0.0002	17	0	0	Pass
0.0002	17	0	0	Pass
0.0002	15	0	0	Pass
0.0002	15	0	0	Pass
0.0002	14	0	0	Pass
0.0002	14	0	0	Pass
0.0002	13	0	0	Pass
0.0002	13	0	0	Pass
0.0002	12	0	0	Pass
0.0002	11	0	0	Pass

0.0002	11	0	0	Pass
0.0002	11	0	0	Pass
0.0002	11	0	0	Pass
0.0002	11	0	0	Pass
0.0002	11	0	0	Pass
0.0002	11	0	0	Pass
0.0002	10	0	0	Pass
0.0003	10	0	0	Pass
0.0003	10	0	0	Pass
0.0003	10	0	0	Pass
0.0003	10	0	0	Pass
0.0003	9	0	0	Pass
0.0003	9	0	0	Pass
0.0003	9	0	0	Pass
0.0003	8	0	0	Pass
0.0003	8	0	0	Pass
0.0003	8	0	0	Pass
0.0003	8	0	0	Pass
0.0003	7	0	0	Pass
0.0003	7	0	0	Pass
0.0003	7	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0003	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	6	0	0	Pass
0.0004	5	0	0	Pass
0.0004	5	0	0	Pass
0.0004	5	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	4	0	0	Pass
0.0004	3	0	0	Pass
0.0004	3	0	0	Pass
0.0004	3	0	0	Pass
0.0004	3	0	0	Pass

This program and accompanying documentation is provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by the user. Clear Creek Solutions and the Washington State Department of Ecology disclaims all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions and/or the Washington State Department of Ecology be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions or the Washington State Department of Ecology has been advised of the possibility of such damages.

APPENDIX

Soil Map—Snohomish County Area, Washington



Natural Resources
Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

MAP LEGEND

- Area of Interest (AOI)
 - Area of Interest (AOI)
- Soils
 - Soil Map Units
- Special Point Features
 - Blowout
 - Borrow Pit
 - Clay Spot
 - Closed Depression
 - Gravel Pit
 - Gravelly Spot
 - Landfill
 - Lava Flow
 - Marsh
 - Mine or Quarry
 - Miscellaneous Water
 - Perennial Water
 - Rock Outcrop
 - Saline Spot
 - Sandy Spot
 - Severely Eroded Spot
 - Sinkhole
 - Slide or Slip
 - Sodic Spot
 - Spoil Area
 - Stony Spot
- Special Line Features
 - Gully
 - Short Steep Slope
 - Other
- Political Features
 - Municipalities
 - Cities
 - Urban Areas
- Water Features
 - Oceans
 - Streams and Canals
- Transportation
 - Rails
 - Roads
 - Interstate Highways
 - US Routes
 - State Highways
 - Local Roads
 - Other Roads
- Very Stony Spot
- Wet Spot
- Other

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington
 Survey Area Data: Version 4, Dec 12, 2006

Date(s) aerial images were photographed: 7/10/1990; 7/18/1990

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Snohomish County Area, Washington (WA661)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
30	Lynnwood loamy sand, 0 to 3 percent slopes	0.7	100.0%
Totals for Area of Interest (AOI)		0.7	100.0%

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Snohomish County Area, Washington				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
30	Lynnwood loamy sand, 0 to 3 percent slopes	A	0.7	100.0%
Totals for Area of Interest (AOI)			0.7	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition





BROWN'S DESIGN

PHONE: (360) 652-2882

08-72
29 August 2008

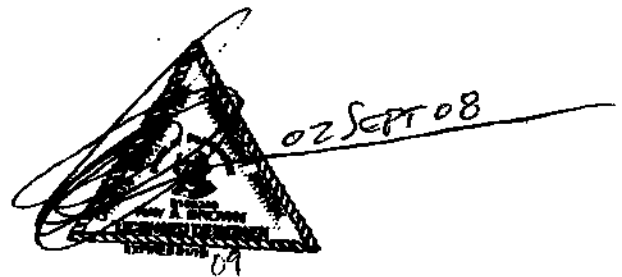
Soil logs roof drainage on 3-lot short plat at 6330-208th Street NE Arlington

Soil logs dug and backfilled 08/29/08

SL#1 0"-12" Sod and dark brown gravelly sandy loam
12"-24" Brown gravelly loamy sand
24"-48" Olive brown gravelly medium sand
48"-60" Gray gravelly fine sand

SL#2 0"-9" Sod and dark brown gravelly sandy loam
9"-30" Brown gravelly loamy sand
30"-60" Olive brown gravelly medium sand

Soil series: Lynnwood loamy sand 0% to 3% slope
Perc rate: 5 M/I average



MIN. 4" PERFORATED PIPE

INFILTRATION TRENCH

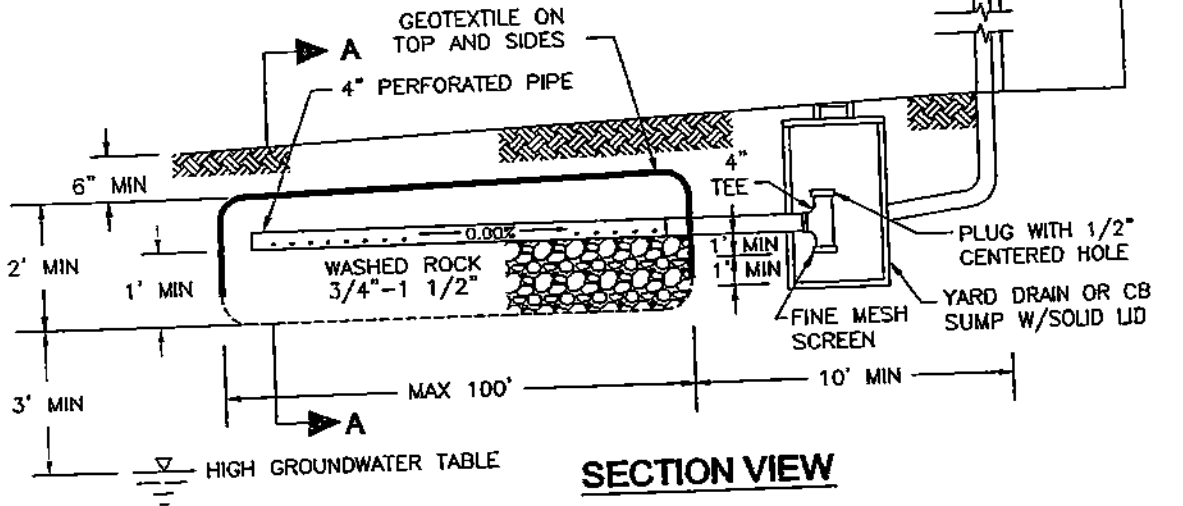
ROOF DRAIN

YARD DRAIN

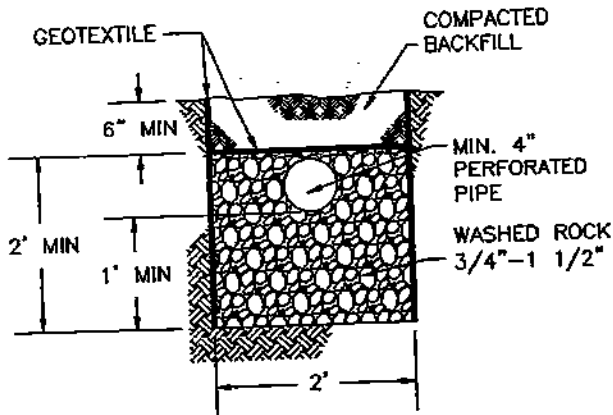
TURNED DOWN ELBOW
OR "T" SECTION

SOLID PIPE

PLAN VIEW



SECTION VIEW



SECTION A-A

NOTES:

1. TRENCHES SHALL BE A MINIMUM OF 10' FROM BUILDING, PROPERTY LINES, AND EASEMENTS.
2. THE FOLLOWING MINIMUM LENGTH (LINEAR FEET) PER 1,000 SQUARE FEET OF ROOF AREA BASED ON SOIL TYPE MAY BE USED FOR SIZING DOWNSPOUT INFILTRATION TRENCHES.

COURSE SAND & COBBLES	20 LF
MEDIUM SAND	30 LF
FINE SAND, LOAMY SAND	75 LF
SANDY LOAM	125 LF
LOAM	190 LF
3. MINIMUM SPACING BETWEEN ADJACENT TRENCH WALLS MUST BE 6 FEET.
4. INFILTRATION TRENCHES SHALL NOT BE BUILT ON SLOPES GREATER THAN 25 PERCENT.
5. SLOPES GREATER THAN 25 PERCENT HAVE A MINIMUM SETBACK OF 50' FOR INFILTRATION TRENCHES.



APPROVED BY	L. OLIVE
DATE	07/31/2008
REF. STAN. SPEC.	

DEPARTMENT OF PUBLIC WORKS
STANDARD DETAIL

RESIDENTIAL ROOF DRAIN INFILTRATION TRENCH

STANDARD DETAIL NUMBER

SD-140