

Pavilion III

25- Lot proposed development

19588 S McCord Road

Oregon City, Oregon



PRELIMINARY DRAINAGE REPORT

April 2015

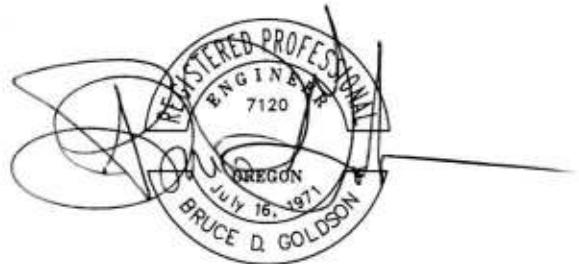
Prepared By:

Bruce D. Goldson, PE

Theta, llc

PO Box 1345, Lake Oswego, Oregon 97035

2014-129H



EXPIRES: 06-30-15

4/4/15

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NARRATIVE ASSUMPTIONS

Existing Conditions:

The subject property has a large house with outbuilding and driveway to McCord. The majority of the site is a Christmas tree farm generally sloping from east to west. There are two sub-basins on the property but both would result in flow to McCord Road and northerly along the Road to a natural drainage way approximately 250-feet northerly of the property. Pavilion Park I abuts the project to the north with road connections and there is a detention/water quality facility approximately 200-feet north on McCord Road.

Developed conditions:

25-new lots are proposed which will extend Anita Place, Pelican Lake Place and Villard Place and complete Joseph Way. McCord Road would be improved with a half street. Storm water would be directed to the original Pavilion system with the majority flowing in a new line north on McCord Road and into the existing detentions facility. This facility would be enlarged to receive and process the new development.

Drain Basin Description:

Existing

There are two minor basins on the property which divide the property more or less in half. The discharge point for both is the roadside ditch on the easterly side of McCord Road. The

northerly basin flows directly to McCord road while the southerly basin flows south westerly across other properties before reaching McCord road. Once the flow reaches the roadside ditch the basins are combined and enter the natural drainage way northwesterly of the site.

Developed

In the developed condition the two basins will be combined with storm lines running westerly in Villard Place, thence in McCord to the existing detention/water quality facility. Overall the drainage pattern will be the same. No discharge of impervious storm water will flow onto adjacent properties. The enlarged facility will meter the storm water out at the pre-design rates.



Summary of storm water flow

	2-YEAR	5-YEAR	10-YEAR	25-YEAR
PRE-DEVELOP	1.62CFS	2.07CFS	2.35CFS	2.89CFS
POST-DEVELOP	2.17CFS	2.74CFS	3.08CFS	3.78 CFS

DESIGN STORM	REQUIRED RELEASE	DESIGN RELEASE
25 YEAR-24 HR	2.35 CFS	2.34CFS
10 YEAR -24 HR	N/A	N/A
5 YEAR - 24 HR	2.07 CFS	0.92CFS
2 YEAR -24 HR	0.81 CFS	0.81 CFS

REGULATORY DESIGN CRITERIA

The storm water quantity management requirements of Oregon City are:

- City Code 13.12 Storm water management and the 1988 Drainage Mater Plan
- City of Oregon City, Public Works, Storm Water & Grading Design Standards.

References

1. King County Department of Public Works, Surface Water Management Division, Hydrographic Programs, Version 4.21B

Water Quality Facility

The required treatment rate is 1/3 of the 2-year design storm. For this project the calculations the 2-year storm is 1.37CF and the water quality quantity is 0.46CFS. The following options will be considered in the final design: a swale inside the detention pond, infiltration at the bottom of the facility or a Stormceptor by CRS with the capacity to treat 100% of the flows.

Design Parameters

The design storm is a 24 hour standard SCS Type 1A

- 2-year.....2.6 inches
- 5-year.....3.1 inches
- 25-year.....4.0 inches
- 100-year.....4.5 inches

SOIL TYPES

8B Bornstedt silt - Type C soil

24B Cottrell Silty/clay - Type C soil

Time of Concentration

$$T = 0.42(n L)^{.8} / (P_2)^{0.5} (S_0)^{0.4} \text{ \& } T = L / 60k(s_0)^{0.5}$$

Pre-Development: $(.42)[(0.17(300))^{0.8} / (2.6)^{0.5} (0.014)^4] = 33.4 \text{ min}$ & $350 / (60)(11)(0.023)^5 = 3.5 \text{ min}$: total 36.9 minutes

Post-Development $(.42)[(0.15(133))^{0.8} / (2.6)^{0.5} (0.020)^4] = 13.7 \text{ min}$ $233 / (60)(27)(0.010)^5 = 1.4 \text{ min}$ + $270 / (60)(42)(0.02)^5 = 0.7 \text{ min}$: Total 15.8 minutes

HYDROGRAPH RESULTS

KING COUNTY DEPARTMENT OF PUBLIC WORKS

Surface Water Management Division

HYDROGRAPH PROGRAMS

Version 4.21B

1 - INFO ON THIS PROGRAM

2 - SBUHYD

3 - MODIFIELD SBUHYD

4 - ROUTE

5 - ROUTE2

6 - ADDHYD

7 - BASEFLOW

8 - PLOTHYD

9 - DTATA

10 - REFAC

11 - RETURN TO DOS

ENTER OPTION:

2

SBUN/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A

2 - 7-DAY DESIGN STORM

3 - STORM DATA FILE

SPECIFY STORM OPTION:

1

S.C.S. TYPE - 1A RAINFALL DISTRIBUTION

ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

2,24,2.6

XXXXXXXXXXXXXXXXXXXX S.C.S.TYPE-1A DISTRIBUTION XXX

XXXXXXXXXXXX 2-YEAR 24-HOUR STORM xxxx 2.60 "TOTAL PRECIP XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX/

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

5.08,92,0.18,98,36.9

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	5.1	92	.2	98	36.9
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
1.62	7.83		34181		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:p1112pre

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

C

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

2.68,86,2.58,98,15.8

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	2.7	86	2.6	98	15.8
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
2.17	7.83		35016		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:p1112post

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

STORM OPTIONS:

1 - S.C.S. TYPE-1A

2 - 7-DAY DESIGN STORM

3 - STORM DATA FILE

SPECIFY STORM OPTION:

1

S.C.S. TYPE - 1A RAINFALL DISTRIBUTION

ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

5,24,3.1

XXXXXXXXXXXXXXXXXXXX S.C.S.TYPE-1A DISTRIBUTION XXX

XXXXXXXXXXXX 5-YEAR 24-HOUR STORM xxxx 3.10" TOTAL PRECIP XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

5.08,92,0.18,98,36.9

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	5.1	92	.2	98	36.9
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
2.07	7.83		43105		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:pili5pre

SPECIFY: C-CONTINUE, N-NEWSTORM,P-PRINT,S-STOP

C

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

2.68,86,2.58,98,15.8

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	2.7	86	2.6	98	15.8

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
2.74	7.83	43775

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:p1115post

SPECIFY: C-CONTINUE, N-NEWSTORM,P-PRINT,S-STOP

N

STORM OPTIONS:

- 1 - S.C.S. TYPE-1A
- 2 - 7-DAY DESIGN STORM
- 3 - STORM DATA FILE

SPECIFY STORM OPTION:

1

S.C.S. TYPE - 1A RAINFALL DISTRIBUTION

ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

10,24,3.4

XXXXXXXXXXXXXXXXXXXX S.C.S.TYPE-1A DISTRIBUTION XX

XXXXXXXXXXXX 10-YEAR 24-HOUR STORM xxxx 3.40" TOTAL PRECIP XX

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

5.08,92,018,98,36.9

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	5.1	92	.2	98	36.9
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
2.35	7.83		48524		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:p11110pre

SPECIFY: C-CONTINUE, N-NEWSTORM,P-PRINT,S-STOP

C

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

2.68,86,2.58,98,15.8

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	2.7	86	2.6	98	15.8
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
3.08	7.83		49109		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\p1110post

SPECIFY: C-CONTINUE, N-NEWSTORM,P-PRINT,S-STOP

N

STORM OPTIONS:

- 1 - S.C.S.. TYPE-1A
- 2 - 7-DAY DESIGN STORM
- 3 - STORM DATA FILE

SPECIFY STORM OPTION:

1

S.C.S. TYPE - 1A RAINFALL DISTRIBUTION

ENTER; FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

25,24,4

XXXXXXXXXXXXXXXXXXXXX S.C.S.TYPE-1A DISTRIBUTION XX
XXXXXXXXXXXXX 25-YEAR 24-HOUR STORM xxxx 4.00" TOTAL PRECIP XX

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

5.08,92,0.18,98,36.9

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	5.1	92	.2	98	36.9
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
2.89	7.83		59468		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:piii25pre

C

ENTER: A(PERV),CN(PERV),A(IMPERV),CN(IMPERV),TC FOR BASIN NO. 1

2.68,86,2.58,98,15.8

DATA PRINT OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.3	2.7	86	2.6	98	15.8
PEAK-Q(CFS)	T-PEAK(HRS)		VOL(CU-FT)		
3.78	7.83		59909		

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:br25post

DETENTION SIZING

ENTER OPTION

10

R/D FACILITY DESIGN ROUTINE

SPEFICY TYPE OF R/D FACILITY

1 - POND 4 - INFILTRATION POND

2 - TANK 5 - INFILTRATION TANK

3 -VAULT

6 - GRAVEL TRENCH/BED

1

ENTER: POND SIDE SLOPE (HORIZ. COMPOENT)

3

ENTER: EFFECTIVE STORAGE DEPTH(ft) BEFORE OVERFLOW

3

ENTER [d:][path]filename[.ext] OF PRIMARY DESIGN INFLOW HYDROGRAPH:

C:br25post

PRELIMINARY DESIGN INFLOW PEAK = 3.78

ENTER PRIMARY DESIGN RELEASE RATE(cfs)

2.35

ENTER NUMBER OF INFLOW HYDROGRAPHS TO BE TESTED FOR PERFORMANCE (5 MAXIMUM)

2

ENTER [d:][path]filename[ext] OF HYDROGRAPH 1:

C:pili5post

ENTER TARGET RELEASE RATE(cfs)

2.07

ENTER [d:][path]filename[ext] OF HYDROGRAPH 2:

C:pili2post

ENTER TARGET RELEASE RATE(cfs)

.0.81

ENTER: NUMBER OF ORIFICES, RISER-HEAD(ft), RISER-DIAMETER(in)

2,4,15

RISER OVERFLOW DEPTH FOR PRIMARY PEAK INFLOW= 0.46FT

SPECIFY ITERATION DISPLAY: Y -YES, N - NO

N

SPECIFY: R - REVIEW/REVISE INPUT, C - CONTINUE

C

INITIAL STORAGE VALUE FOR ITERATION PURPOSES: 20040 CU-FT

BOTTOM ORIFICE: ENTER Q-MAX(cfs)

1.0

DIA.=4.61 INCHES

TOP ORIFICE: ENTER HEIGHT (ft)

2.7

DIA.= 9.53 INCHES

PERFORMANCE: INFLOW TARGET-OUTFLOW ACTUAL-OUTFLOW PK-STAGE STORAGE

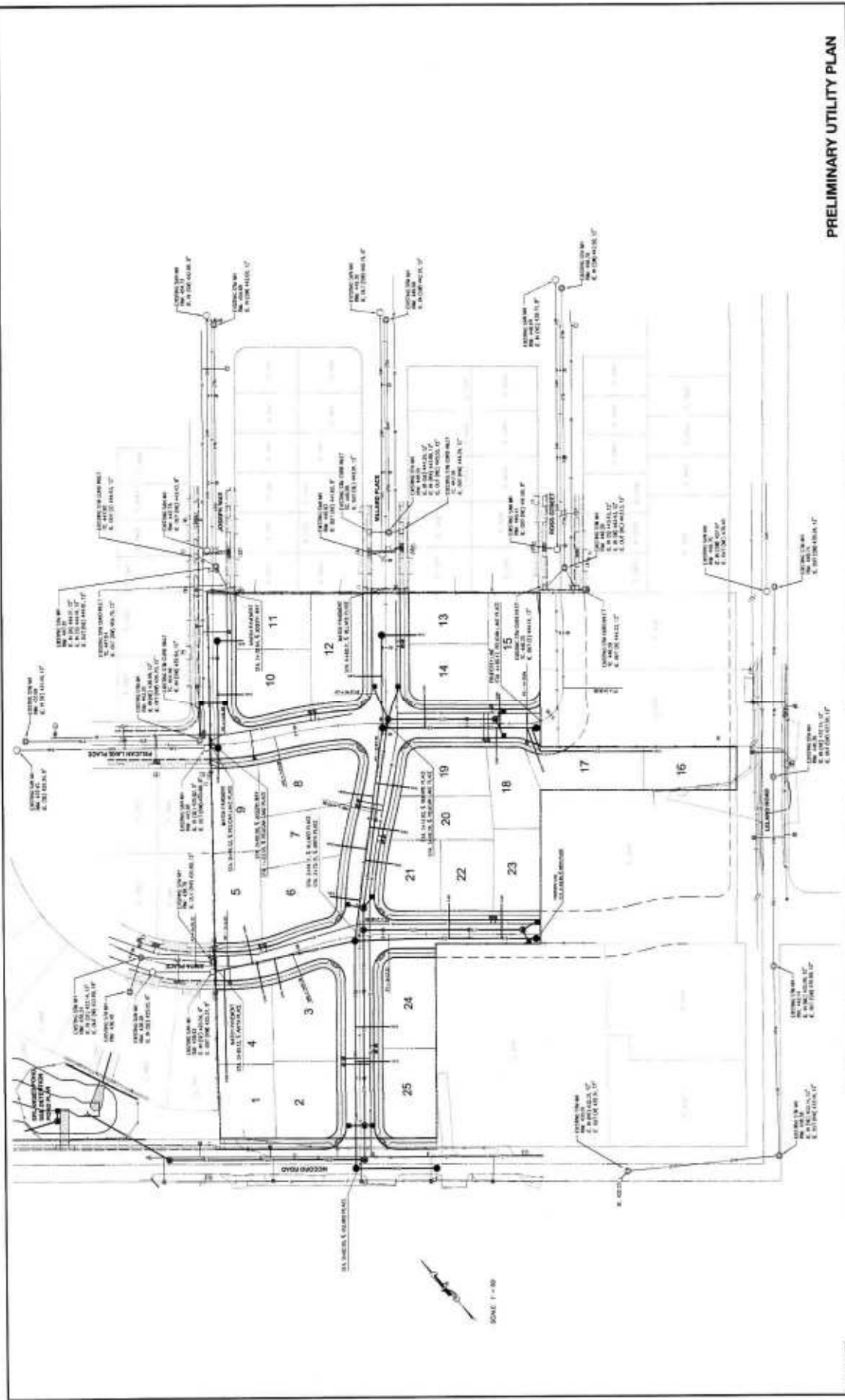
DESIGN HYD:	3.78	2.35	2.34	3.00	9038
TEST HYD 1:	2.74	2.07	.92	2.55	7290
TEST HYD 2:	2.17	.81	.81	1.95	5190

SPECIFY: D - DOCUMENT, R -REVISE, A - ADJUST ORIF, E -ENLARGE, S -STOP

PRELIMINARY DESIGN:

A proposed addition to the detention and water quality pond is proposed at the existing facility northwesterly of the property. The original calculations were not available but a preliminary grading plan illustrated that enlarging the pond by the required 9038 CF is practical. In the final analysis this new development will be intergraded and adjusting the orifices to reflect both developments. Infiltration and water quality requirements will be met by the type A pond configuration.

Appendix



PRELIMINARY UTILITY PLAN

2/2

Pavilion Park III

Iron Construction & Development LLC
 1000 West 10th Street, Suite 200
 Phoenix, AZ 85003
 PH: (602) 452-0400

Therapeutic
 CONSULTING ENGINEERS
 1000 West 10th Street, Suite 200
 Phoenix, AZ 85003
 PH: (602) 452-0400

2016-1-12084



SCALE: 1" = 10'

DRAFT



DETENTION POND

SHEET: 1/1

Pavilion Park III

Thetac LLC
ENGINEERING - SURVEYING - PLANNING
10000 E. 10th Avenue, Suite 100
Denver, CO 80231
(303) 733-1000

2014-1284
PROJECT: 3002
DRAWN: SLS
SCALE: 1" = 10'
DATE: 01/01/2014
BY: SLS
CHECKED: SLS
DATE: 01/01/2014

4.1.2.1 RAINFALL DISTRIBUTION

The rainfall distribution to be used within the City is the design storm of 24-hour duration based on the standard SCS Type 1A rainfall distribution (See Figure 4-2).

Table 4-1 below links the total depth per year of reoccurrence.

Table 4-1: TOTAL DEPTH	
Reoccurrence Year	Total Depth
2	2.6
5	3.1
10	3.4
25	4.0
50	4.4
100	4.5

Table 4-3 MODIFIED CURVE NUMBERS

SCS Western Washington Runoff Curve Numbers		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP			
Runoff curve numbers for selected agricultural, suburban, and urban land use for Type 1A rainfall distribution, 24-hour storm duration. (Published by SCS in 1982)		LAND USE DESCRIPTION			
		A B C D			
Cultivated land	Winter Condition	86	91	94	95
Mountain Open Areas:	Low growing brush and grassland.	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	Undisturbed	42	64	76	81
	Established second growth ²	48	68	78	83
	Young second growth or brush	55	72	81	86
Orchard:	With over crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping					
Good Condition:	Grass cover on > =75% of area	68	80	86	90
Fair Condition:	Grass cover on 50-75% of area	77	85	90	92
Gravel Roads and Parking Lots:		76	85	89	91
Dirt Roads and Parking Lots:		72	82	87	89
Impervious surfaces, pavement, roofs, etc.		98	98	98	98
Open water bodies:	Lakes, wetlands, ponds, etc.	100	100	100	100
Single Family Residential ³ :		Select a separate curve number for pervious and impervious portions of the site or basin.			
Dwelling unit/gross acre	% Impervious ⁴				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
Planned Unit Developments, condominiums, apartments, commercial businesses & industrial areas ³	% impervious ⁴ Must be computed	Select a separate curve number for pervious and impervious portions of the site or basin.			

¹ For a more detailed description of agricultural land use curve numbers, refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.

² Modified by KCFW, 1995.

³ Assumes roof and driveway runoff is directed into street/storm system.

⁴ The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

Table 4-4 MANNING'S COEFFICIENTS/"K" FACTORS

"n" AND "k" Value Used in Time Calculations for Hydrographs "n," Sheet Flow Equation; Manning's Values (for initial 300 ft. of travel)		n
Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil)		0.01
Fallow fields or loose soil surface (no residue)		0.05
Cultivated soil with residue cover (s # 0.20 ft/ft)		0.06
Cultivated soil with residue cover (s > 0.20 ft/ft)		0.17
Short prairie grass and lawns		0.15
Dense grasses		0.24
Bermuda grass		0.41
Range (natural)		0.13
Woods or forest with light underbrush		0.40
Woods or forest with dense underbrush		0.80
* Manning values for sheet flow only, from Overton and Meadows 1976 (See SCS's TR-55, 1986) "k" Values Used in Travel Time/Time of Concentration Calculations Shallow Concentrated Flow (After the initial 300 ft. of sheet flow, R = 0.1)		k
1.	Forest with heavy ground litter and meadows (n = 0.10)	3
2.	Brushy ground with some trees (n = 0.060)	5
3.	Fallow or minimum tillage cultivation (n=0.040)	8
4.	High grass (n=0.035)	9
5.	Short grass, pasture, and lawns (n=0.030)	11
6.	Nearly bare ground (n=0.025)	13
7.	Paved and gravel areas (n=0.012)	27
** Channel flow (intermittent) (At beginning of visible channels R=0.2)		k
1.	Forested swale with heavy ground litter (n=0.10)	5
2.	Forested drainage course/ravine with defined channel bed (n=0.050)	10
3.	Rock-lined waterway (n=0.035)	15
4.	Grassed waterway (n=0.030)	17
5.	Earth-lined waterway (n=0.025)	20
6.	CMP pipe (n=0.024)	21
7.	Concrete pipe (0.012)	42
8.	Other waterways and pipe 0.508/n	
Channel flow (Continuous stream, R=0.4)		k
9.	Meandering stream with some pools (n=0.040)	20
10.	Rock-lined stream (n=0.035)	23
11.	Grass-lined stream (n=0.030)	27
12.	Other streams, man-made channels and pipe 0.807/n **	
** See Table 6-3 for additional Mannings "n" values for open channels		

Tables – Hydrologic Soil Group – Summary By Map Unit

Summary by Map Unit – Clackamas County Area, Oregon (OR610)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8B	Bornstedt silt loam, 0 to 8 percent slopes	C	3.6	56.7%
24B	Cottrell silty clay loam, 2 to 8 percent slopes	C	2.7	43.3%
Totals for Area of Interest			6.3	100.0%

Search

Map Unit Legend

Clackamas County Area, Oregon (OR610)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8B	Bornstedt silt loam, 0 to 8 percent slopes	3.6	56.7%
24B	Cottrell silty clay loam, 2 to 8 percent slopes	2.7	43.3%
Totals for Area of Interest		6.3	100.0%

Soil Map

Legend

Scale 1 inch = 1 mile

