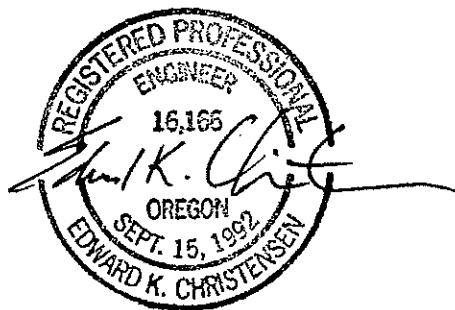


*Storm Drainage Report for the Meadow
Brook Villas Apartments Phase 2*

**1306 N. SPRINGBROOK RD. (OFF
COFFEY LN.) IN NEWBERG,
OREGON**

Welkin JO: 19-122.03



Edward K. Christensen, P.E.

Submittal: 4/17/20

25260 SW PARKWAY DR., SUITE G, WILSONVILLE, OR 97070
(503) 598-1866, fax (503) 598-1868
www.WelkinPC.com ekc@WelkinPC.com

Table of Contents

Project Overview -	3
Stormwater System Design -	4
Stormwater Quality and Infiltration -	5
Downstream Analysis -	6
Operations and Maintenance -	7

Appendix A:

FIGURE 1 A-C	1 inch 24-hour post-developed hydrograph calculation and Coffey Ln. LIDA Form 451
FIGURE 2 A-F	100-yr Stormwater Capacity in a 8 inch main and runoff paths
FIGURE 3 A-L	½ the 2-yr, the 2-yr, 10-yr, and 25-yr, 24-hour post-developed hydrograph calculation
FIGURE 4 A-H	Infiltration tests Saturated Hydraulic Capacity Analysis

PROJECT OVERVIEW:

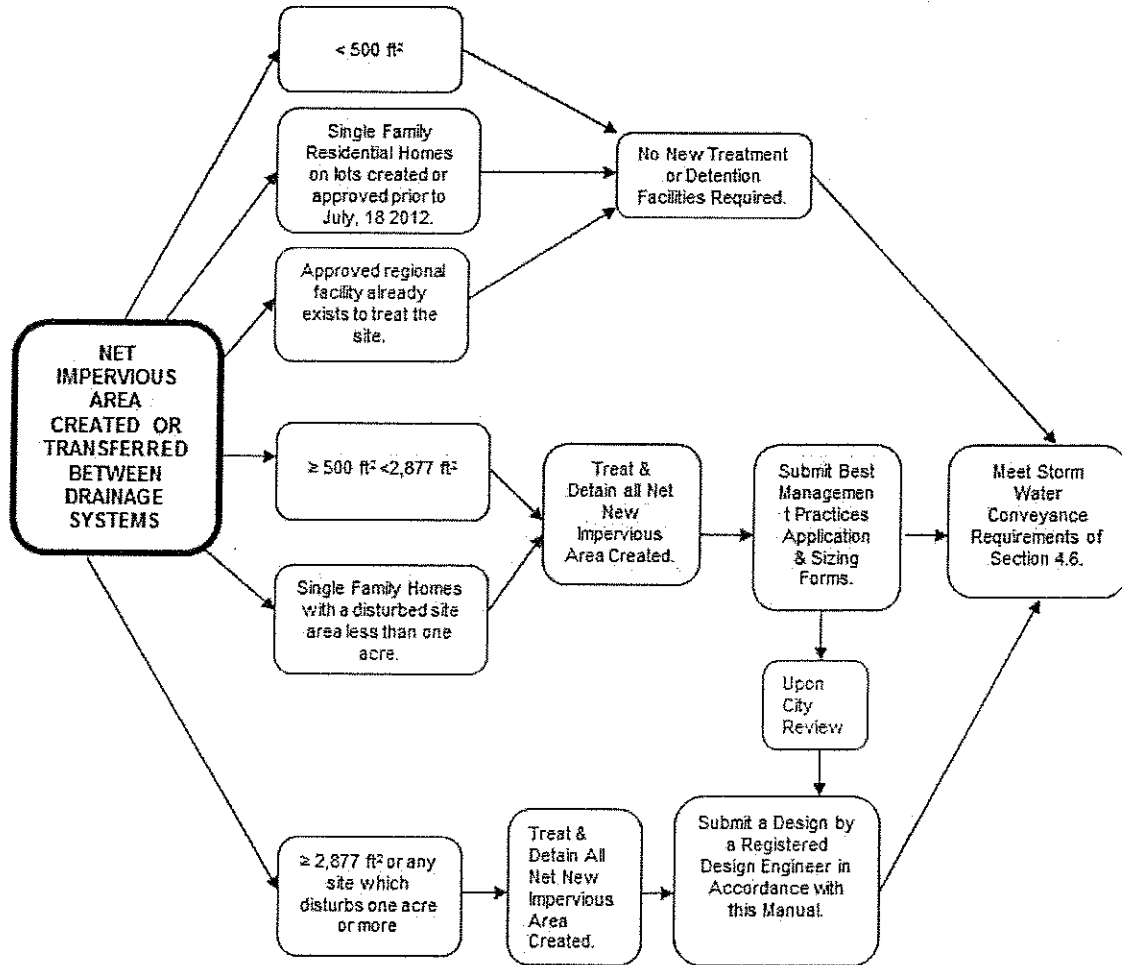
The apartment site is located on Coffey Lane, north of the Safeway store, south of Aquarius Ave. and east of NE Newhall Rd. The site mostly slopes towards an unnamed tributary creek of Springbrook Creek. The unnamed creek bisects the site. The apartments are arranged in a linear fashion paralleling the creek and its adjoining wetlands. The project will have minimal impact on the wetlands. The site has no structures on it currently.

The parcel slopes westerly from a high elevation of 222' to a low in the unnamed Creek of $\pm 180'$. Stormwater on the undeveloped site sheet flows the first 126' at an average slope of 1.82% into the unnamed creek. From there the creek slopes to the southern edge of the parcel at an average slope of 5.93%, where it flows into an existing 48" public storm pipe. There are no hazardous slopes within the site. The drainage way which flows through the site is a perennial drainage channel, with wetlands on both sides of the channel.

DEVELOPMENT OVERVIEW:

The project will contain 75 apartment units with 116 parking spaces. The apartment building roofs, and fronting sidewalks will all drain into a piping system and catch basins which will be run through a 17,494 cf Water Quality and Detention basin to the west of Building D. The Water Quality and Detention basin will use a -0.2' elevation difference between the bottom of the pond and the IE of the outlet to contain the Water Quality event and allow it to infiltrate into the ground. The entire water quality event will be infiltrated into the ground. The Water Quality and Detention basin will be surrounded on all 4 sides by a rockery or concrete retaining wall.

Figure 4.4 Storm water Quality & Quantity Design Flow Chart



STORMWATER SYSTEM DESIGN:

The subdivision is to be designed to convey the ½ the 2, the 2, 10, and 25-year storm events through the Water Quality and Detention basin, and reduce the flows to below predevelopment runoff levels. Using the Santa Barbara Urban Hydrograph (SBUH) method based on a Type IA rainfall distribution, the site has been analyzed to determine the proposed peak runoff rates with 1 inch for the water quality, ½ the 2-year, the 2, 10, and 25-year 24-hour storm events per the requirements of the City of Newberg – see Exhibits 1 A-D. The SBUH method uses runoff curve numbers in conjunction with the site's hydrologic soil group to model the site's runoff characteristics. The SBUH

method does not include infiltration systems and those are calculated separately.

STORMWATER SYSTEM					
Recurrence Interval, Years	½ the 2	2	10	25	100
24-Hour Rainfall (Inches)	1.25	2.5	3.5	4.0	4.50
Undeveloped runoff (cfs)	0.02	0.22	0.55	0.74	0.94
Developed runoff (cfs) After Detention	0.02 *	0.19	0.44	0.67	1.18

- See Stormwater Infiltration rates below.

The largest pipe proposed for the project is a 8 inch PVC for the flow control manhole outlet to handle the higher overflow water if necessary. From the SBUH calculations, our highest flow will be 1.18 cfs from the 100-Year storm. Exhibit 2 A&B provides by Chezy-Manning analysis that to convey the 100-Year flow with an 8" PVC pipe using a slope of 1.0% will convey 1.54 cfs, with an in pipe velocity of 4.53 fps.

WATER QUALITY:

All stormwater will be treated using the Water Quality pond. The bottom of the entire pond will be 0.2' lower than the outlet. The 1" Water Quality event has a developed site runoff volume of 5,904 cf. As noted below in the stormwater infiltration section, the infiltration rate for the pond will be 0.09 cfs. Exhibit 1A indicates a 1 inch peak flow rate of 0.47 cfs. Exhibit 1B is the SBUH for the 1 inch storm. Exhibit 1B also includes a spread sheet result for the quantity of stormwater exceeding the 0.09 cfs infiltration rate. After the storm runoff exceeds 0.09 cfs, the cumulative volume is calculated at the runoff rate minus the infiltration rate. The 1 inch runoff volume exceeding the infiltration rate combined is 954.72 cf. The volume of the 0.2 feet below the invert in the basin is 5,000 sf x 0.2 ft = 1,000 cf. So the 0.2 ft will act as a water quality detention basin, which exceeds the peak runoff volume, so the entire 1 inch runoff, will be infiltrated.

Stormwater for the new Coffey Ln. cul-de-sac and the throat of the apartment driveway will be treated in a bio-swale flow through planter. Exhibit 1C is the LIDA Form 451, which indicates 573.24 sf of planter will be required. The plan is to provide a 600 sf flow through planter.

STORMWATER INFILTRATION:

Infiltration for this site is moderate. On September 16, 2019 Welkin performed 5 infiltration tests on-site. The 5 tests were taken in the locations of the proposed stormwater detention facilities. The underlying soil in stormwater detention facility is Woodburn Silt Loam. Exhibit 4 A-H shows the location of the tests, the test results, and the US Dept of Conservation Saturated Hydraulic Conductivity rate for this soil. The field measurements indicated an average infiltration rate of 1.65 inches per hour. The US Dept of Conservation indicates that the Saturated Hydraulic Conductivity rate for this soil is 11.39 microns per second. 11.39 microns per second equates to 1.61 in per hour. The following calculations use the slower 1.61 inches per hour rate.

During a typical 24 hour storm with 5,000 sf stormwater detention facility, the infiltration would amount to: $(1.61 * 24 / 12) * 5,000 \text{ sf} = 16,100$ cubic feet. Using a 2/1 reduction in the infiltration rate, the infiltration system will infiltrate 8,050 cf/day. Since the 1" water quality storm event for the whole site creates only 5,904 cf of runoff, the entire water quality storm will be infiltrated. The rate of infiltration for the site is: $8,050 \text{ cf/day} \div 86,400 \text{ sec/day} = 0.093$ cfs, which exceeds the 1/2 of the 2-Year flow rate of 0.02 cfs by a 4:1 margin.

100-YEAR RUNOFF:

The 100-year runoff was calculated to be 1.18 cfs after detention. The largest pipe proposed for the project is a 8 inch PVC between the flow control manhole to the outfall near the stream corridor. Exhibit 2 A-D provides by Chezy-Manning analysis that to convey the 100-Year flow with a slope of 1.0%, an 8 inch pipe will have a velocity of 4.53 fps and will convey 1.54 cfs or 0.36 cfs more than our 100-year storm.

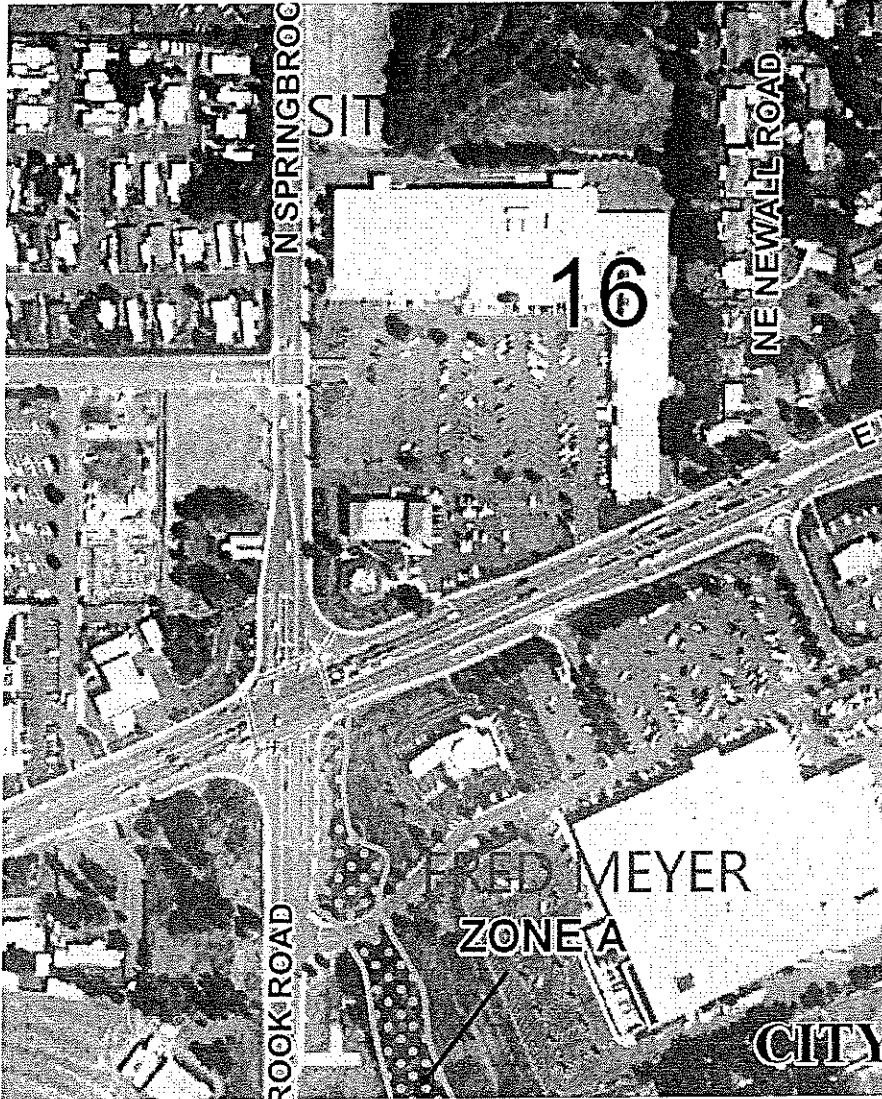
Should the 8 inch pipe become clogged, Exhibit 2E shows the runoff flow paths. The site slopes downward continuously from north to south. With the on-site sidewalks sloping towards the parking area, the Buildings C-F runoff will fall towards the parking area also and eventually runoff around Building E. The lowest Finished Floor for Building E is 220.5 feet. The Top of Curb elevation at southwestern end of Building E is 220.0 feet, providing an adequate relief for the 2.84 cfs storm. In case the 48 inch pipe got clogged and filled up the wetland basin, water would be conveyed to the Rite Aid parking lot and flow west to Springbrook Rd. and then south on Springbrook Rd, away from the site.

Runoff for the new Coffey Ln. cul-de-sac and the throat of the apartment driveway will flow through the planter. The 100-year storm on Coffey Ln. will result in 0.28 cfs of flow. It will enter the stream at the northern end of the site.

DOWNSTREAM ANALYSIS:

The project site is situated approximately 1/4 mile upstream from the Fred Meyer entrance off of N. Springbrook Rd. There is a Zone A within the area cornered by

Highway 99E, Springbrook Rd., and Fred Meyer. The Zone A is limited and ends south of Hayes St. Although this area is indicated a Flood Zone A, the 2014 Stormwater Master Plan does not indicate any significant deficiencies downstream of the project site.



From the review of the 2014 Stormwater Master Plan and site considerations, it can be concluded that because the site is actually reducing runoff to before development levels of runoff, the site will have no impacts on the downstream system.

OPERATIONS AND MAINTENANCE:

The complex owners will be responsible for the maintenance of the private storm system, including the Storm Filter system. The Operation and Maintenance of the flow control storm drainage facility will be provided by the City of Newberg.

Welkin

EKC 15:52 11-Apr-20

Project 19-212.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

1 INCH DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA
 return period = 1 year
 storm duration = 24 hr.
 total rainfall = 1.00 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE
 impervious area = 1.92 A CN = 98
 total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\1 inch.hyd

peak flow = 0.47cfs @ 7.83 hr.
 runoff volume = 5,904 cu.ft.

1 INCH SBUH

147	10.00	0.47	10.50	0.10	21.17	0.05
0.00	0.00		10.67	0.10	21.33	0.05
0.17	0.00		10.83	0.09	21.50	0.05
0.33	0.00		11.00	0.08	21.67	0.05
0.50	0.00		11.17	0.08	21.83	0.05
0.67	0.00		11.33	0.09	22.00	0.05
0.83	0.00		11.50	0.09	22.17	0.05
1.00	0.00		11.67	0.09	22.33	0.05
1.17	0.00		11.83	0.09	22.50	0.05
1.33	0.00		12.00	0.09	22.67	0.05
1.50	0.00		12.17	0.09	22.83	0.05
1.67	0.00		12.33	0.09	23.00	0.05
1.83	0.00		12.50	0.09	23.17	0.05
2.00	0.00		12.67	0.09	23.33	0.05
2.17	0.01		12.83	0.08	23.50	0.05
2.33	0.01		13.00	0.07	23.67	0.05
2.50	0.01		13.17	0.07	23.83	0.05
2.67	0.01		13.33	0.07	24.00	0.05
2.83	0.02		13.50	0.07	24.17	0.02
3.00	0.02		13.67	0.07	24.33	0.00
3.17	0.02		13.83	0.07		
3.33	0.02		14.00	0.07		
3.50	0.03		14.17	0.07		
3.67	0.03		14.33	0.07		
3.83	0.03		14.50	0.07		
4.00	0.04		14.67	0.07		
4.17	0.04		14.83	0.07		
4.33	0.04		15.00	0.06		
4.50	0.04		15.17	0.06		
4.67	0.04		15.33	0.06		
4.83	0.05		15.50	0.06		
5.00	0.06		15.67	0.06		
5.17	0.06		15.83	0.06		
5.33	0.06		16.00	0.06		
5.50	0.06		16.17	0.06		
5.67	0.06		16.33	0.06		
5.83	0.07		16.50	0.06		
6.00	0.08		16.67	0.06		
6.17	0.08		16.83	0.06		
6.33	0.08		17.00	0.05		
6.50	0.08		17.17	0.05		
6.67	0.08		17.33	0.05		
6.83	0.10		17.50	0.05		
7.00	0.12		17.67	0.05		
7.17	0.12		17.83	0.05		
7.33	0.15		18.00	0.05		
7.50	0.17		18.17	0.05		
7.67	0.26		18.33	0.05		
7.83	0.47		18.50	0.05		
8.00	0.42		18.67	0.05		
8.17	0.22		18.83	0.05		
8.33	0.17		19.00	0.05		
8.50	0.15		19.17	0.05		
8.67	0.15		19.33	0.05		
8.83	0.12		19.50	0.05		
9.00	0.10		19.67	0.05		
9.17	0.10		19.83	0.05		
9.33	0.10		20.00	0.05		
9.50	0.10		20.17	0.05		
9.67	0.10		20.33	0.05		
9.83	0.10		20.50	0.05		
10.00	0.10		20.67	0.05		
10.17	0.10		20.83	0.05		
10.33	0.10		21.00	0.05		

MEADOW BROOK VILLAS PHASE 2
1" STORM PEAK FLOW ANALYSIS

TIME INCREMENT	FLOW RATE IN CFS MINUS 0.09 CFS INFILTRATION RATE
0.17 HRS	0.0017
0.17 HRS	0.0051
0.17 HRS	0.0051
0.17 HRS	0.0102
0.17 HRS	0.0136
0.17 HRS	0.0289
0.17 HRS	0.0646
0.17 HRS	0.0561
0.17 HRS	0.0221
0.17 HRS	0.0136
0.17 HRS	0.0102
0.17 HRS	0.0102
0.17 HRS	0.0051
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017
0.17 HRS	0.0017

TOTAL PEAK FLOW VOLUME 954.72 CF
VOLUME OF 0.2' OF STORAGE 1000 CF
IN DETENTION POND

City of Newberg LIDA Sizing Form

(Include this form with plan submittal)

Project Title: MEADOW CREEK VILLAS PHASE 2
 Project Address: 1306 N. SPRINGBROOK RD
 Project Taxlot/ Taxmap#: R 3216CB 00200
 Project Location: NORTH OF NEWBERG RITE AID
 Contact Name/Title/Company: GABE DVOUS, MANAGER, MEADOW BROOK VILLAS, LLC
 Phone/e-mail: gabe@1sbld.com / (360) 694-2552

STEP 1: Determine Impervious Area Requiring Treatment

Total Gross Site Area (acres): Pre. Dev. Impervious Area (ft): (X)
 Proposed Net New Impervious Area (ft): (PA) = (Y) - (X) 9554 (PA) Post Dev. Impervious Area (ft): 9554 (Y)

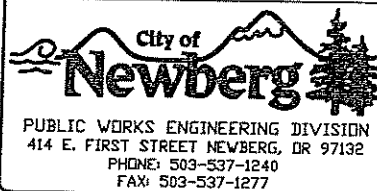
STEP 2: Deduct Impervious Area LIDA Credits

Porous Pavement (sq. ft.): (P)
 Green Roof (sq. ft.): (G)
 Other Credits as approved (sq. ft.): (O)
 Total Credits (sq. ft.): (C) = (P)+(G)+(O)
 Impervious Area Requiring Treatment (sq. ft.): (IA) = (PA) - (C)

STEP 3: Size LIDA Facilities for Remaining Impervious Area

	Impervious Area Treated (sq. ft.)	SF, Sizing Factor	LIDA Facility Size (sq. ft.)
Infiltration Planters/ Rain Garden		0.045	
Flow-through Planter	<u>9554</u>	0.060	<u>573.24 / 600 PROVIDED</u>
Public Flow-through Planter		0.060	

Total Impervious Area Treated (sq. ft.) MUST BE EQUAL TO (IA)



REVISIONS:

LIDA SIZING FORM

SCALE:	N.T.S.
DATE:	MARCH 2014
APPROVED BY:	JAY H.
STANDARD DRAWING	451

Welkin

Project 19-212.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

100-YEAR DEVELOPED-YEAR DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA

return period = 100 years

storm duration = 24 hr.

total rainfall = 4.50 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE

impervious area = 1.92 A CN = 98

total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\100-year developed.hyd

peak flow = 2.84cfs @ 7.83 hr.

runoff volume = 35,459 cu.ft.

Welkin

EKC 09:28 23-Dec-19

Project 19-122.03

MEADOW CREEK APARTMENTS - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH
100-YEAR UNDEVELOPED SITE RUNOFF

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	dense.grasses	n=0.24	126.5	2.3'	1.82%	20.2'
2	shallow concentrated	high.grass	K=9	170.4	10.1'	5.93%	1.3'

total Time of Concentration = 21.5'

storm hyetograph: SCS TypeIA

return period = 100 years

storm duration = 24 hr.

total rainfall = 4.50 in.

pervious area = 2.27 A CN = 77 GpC:Res,2-A.lots

impervious area = 0.00 A CN = 98

total site area = 2.27 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\100-year undeveloped.hyd

peak flow = 0.94cfs @ 8.00 hr.

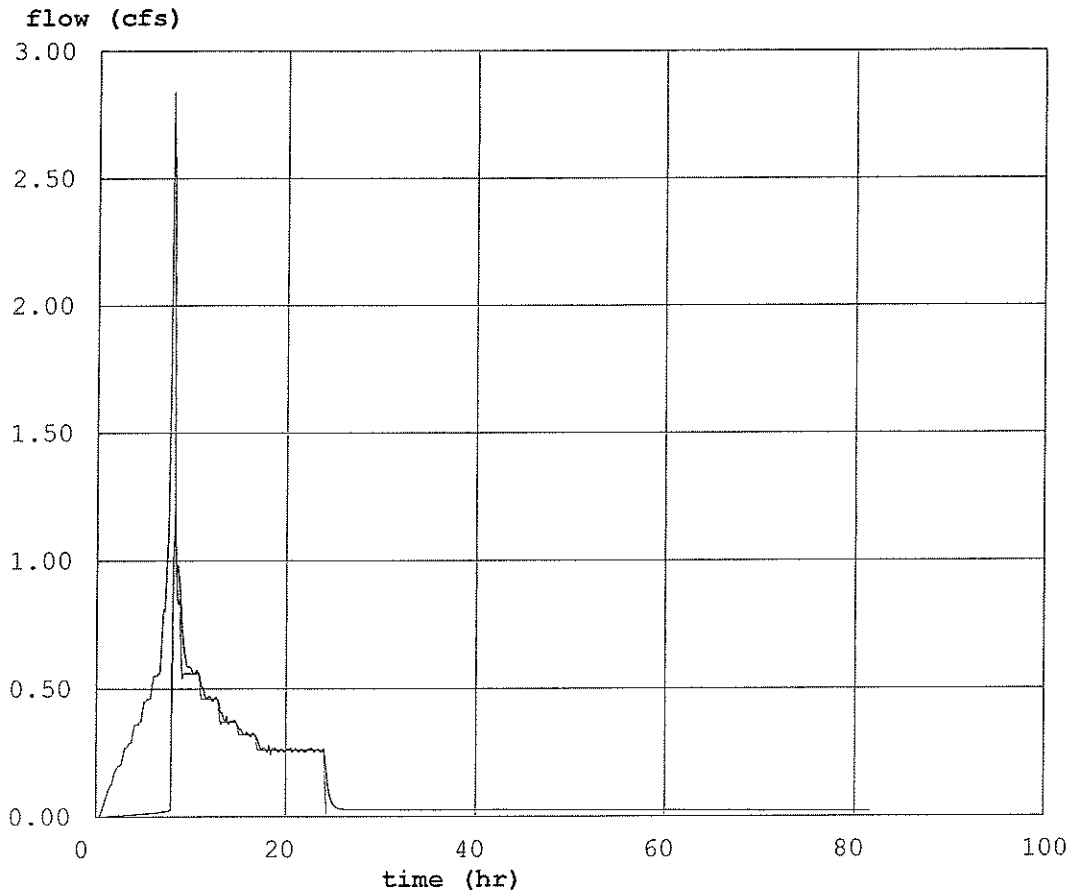
runoff volume = 18,212 cu.ft.

Welkin

EKC 15:44 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

DETENTION ROUTING
100-YEAR STORM DETENTION



DETENTION POND (stage-volume calculated)

elevation	area	volume
212.00	3000	0
214.00	4015	6990
216.00	6595	17494

STAGE	VOLUME
212.0	0
214.0	6990
216.0	17494

OUTLET TYPE	ELEVATION	SIZE
circ. orifice	212.0	dia.(in) = 0.68
circ. orifice	213.8	dia.(in) = 0.50
broad weir	214.9	width(in) = 37.70

inflow hydrograph: c:\program files\quick3\meadow brook - phase 2\100-year developed.hyd
outflow hydrograph: c:\program files\quick3\meadow brook - phase 2\100-year undeveloped.hyd

peaks: inflow = 2.84 cfs @ 7.83 hr.
outflow = 1.18 cfs @ 8.33 hr.
stage: 2.97 ft. detained volume: 12,073 c.f.

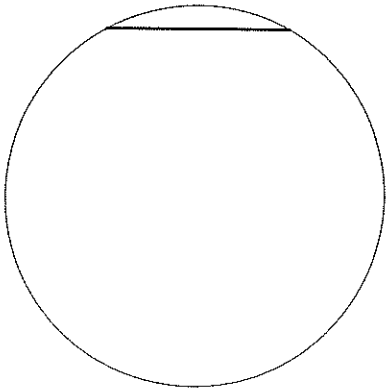
2D

WELKIN ENGINEERING

EKC 17:16 16-Apr-20

Project 19-122.03
MEADOW BROOK VILLAS

GRAVITY PIPE FLOW (Chezy-Manning)
100-YEAR FLOW FROM DETAINED PHASE 2

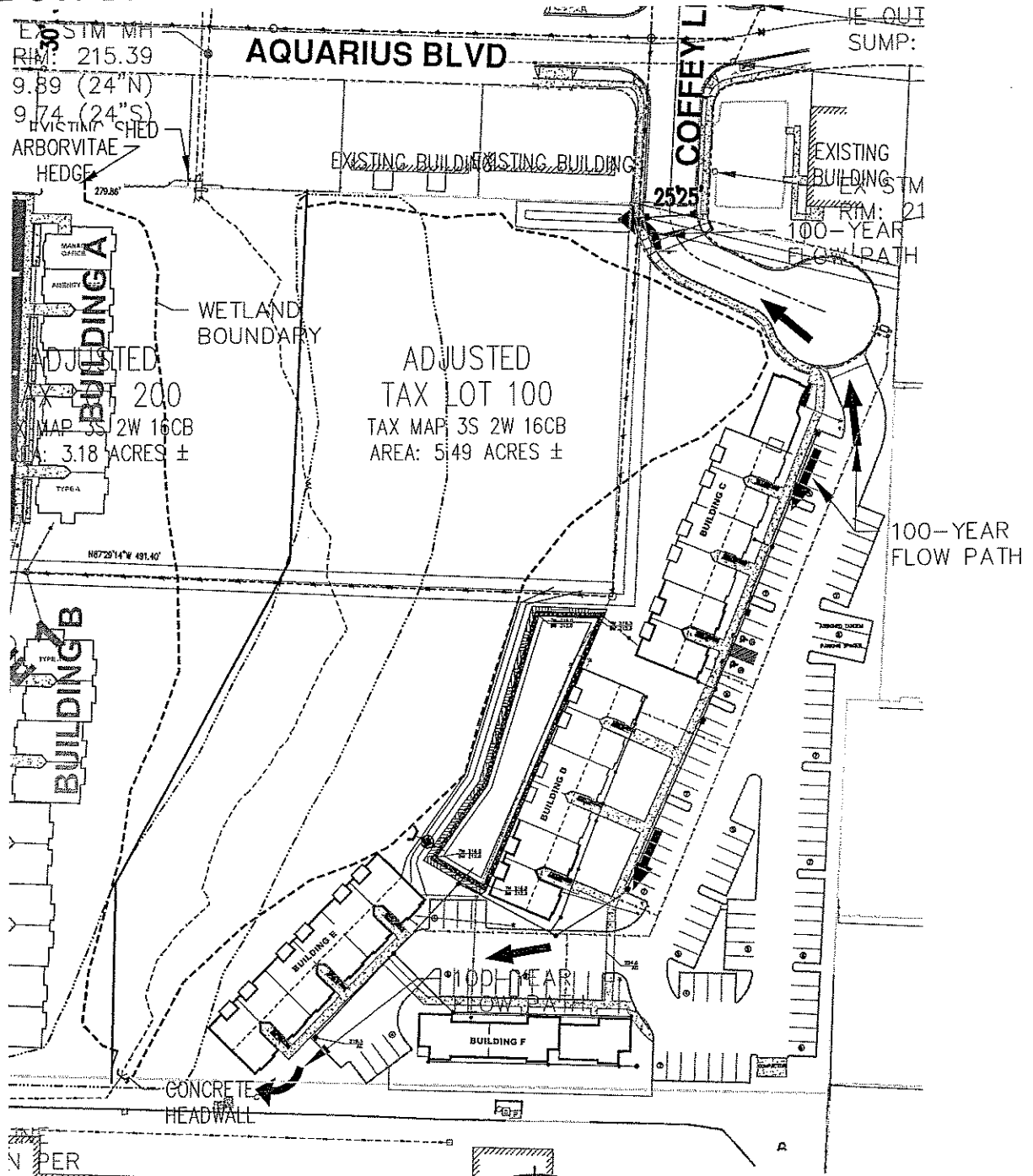


┌┐ 2"

diameter = 8.0"
slope = 1.00%
material: spiral rib metal
Manning's n = 0.011
depth of flow = 93.82% of diameter (max)

wetted perimeter = 1.76'
area = 0.34 s.f.
hydraulic radius = 0.19'
velocity = 4.53 fps
flow = 1.54 cfs

MEADOW BROOK VILLAS 100-YEAR FLOW PATH EXHIBIT 2E



**ENGINEERING
SURVEYING • PLANNING**

25260 SW PARKWAY AVE., SUITE G
WILSONVILLE, OR 97070
TEL: (503) 598-1866
FAX: (503) 598-1868
ekc@WelkinPC.com
www.WelkinPC.com

WEPC DRAWING FILE: P:\Project Data\19-122.03 Phase 2 MCV\dwg\Planning\03 Planning Set\C-XX STORM GRADING V2016.dwg

Welkin

EKC 11:00 17-Apr-20

Project 19-122.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

100-YEAR COFFEY LN. DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	flow type	description	coeff.	distance	fall	slope	T/C
1	overland sheet	smooth.surface	n=0.011	90.0	3.4'	3.78%	1.0'
2	shallow concentrated	paved,gravel	K=27	215.0	4.9'	2.28%	0.9'
3	pipe	plastic.pipe	n=0.011	15.0	0.2'	1.00%	0.0'
4	intermittent channel	grass.channel	K=17	80.0	0.2'	0.25%	1.6'

total Time of Concentration = 3.5'

storm hyetograph: SCS TypeIA
return period = 100 years
storm duration = 24 hr.
total rainfall = 4.50 in.

pervious area = 0.00 A CN = 86.4 CALCULATED FOR THE SITE
impervious area = 0.22 A CN = 98
total site area = 0.22 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\coffey lane.hyd

peak flow = 0.28cfs @ 7.83 hr.
runoff volume = 3,405 cu.ft.

Welkin

EKC 15:09 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH
HALF THE 2-YEAR DEVELOPED-YEAR DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA
return period = 1 year
storm duration = 24 hr.
total rainfall = 1.25 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE
impervious area = 1.92 A CN = 98
total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\half the 2-year developed.h

peak flow = 0.63cfs @ 7.83 hr.
runoff volume = 7,868 cu.ft.

Welkin

EKC 17:07 16-Apr-20

Project 19-122.03

MEADOW CREEK VILLAS - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

1/2 THE 2-YEAR UNDEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	dense.grasses	n=0.24	126.5	2.3'	1.82%	20.2'
2	shallow concentrated	high.grass	K=9	170.4	10.1'	5.93%	1.3'

total Time of Concentration = 21.5'

storm hyetograph: SCS TypeIA

return period = 1 year

storm duration = 24 hr.

total rainfall = 1.25 in.

pervious area = 2.27 A CN = 77 GpC:Res,2-A.lots

impervious area = 0.00 A CN = 98

total site area = 2.27 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\half the 2-year undeveloped

peak flow = 0.02cfs @ 24.00 hr.

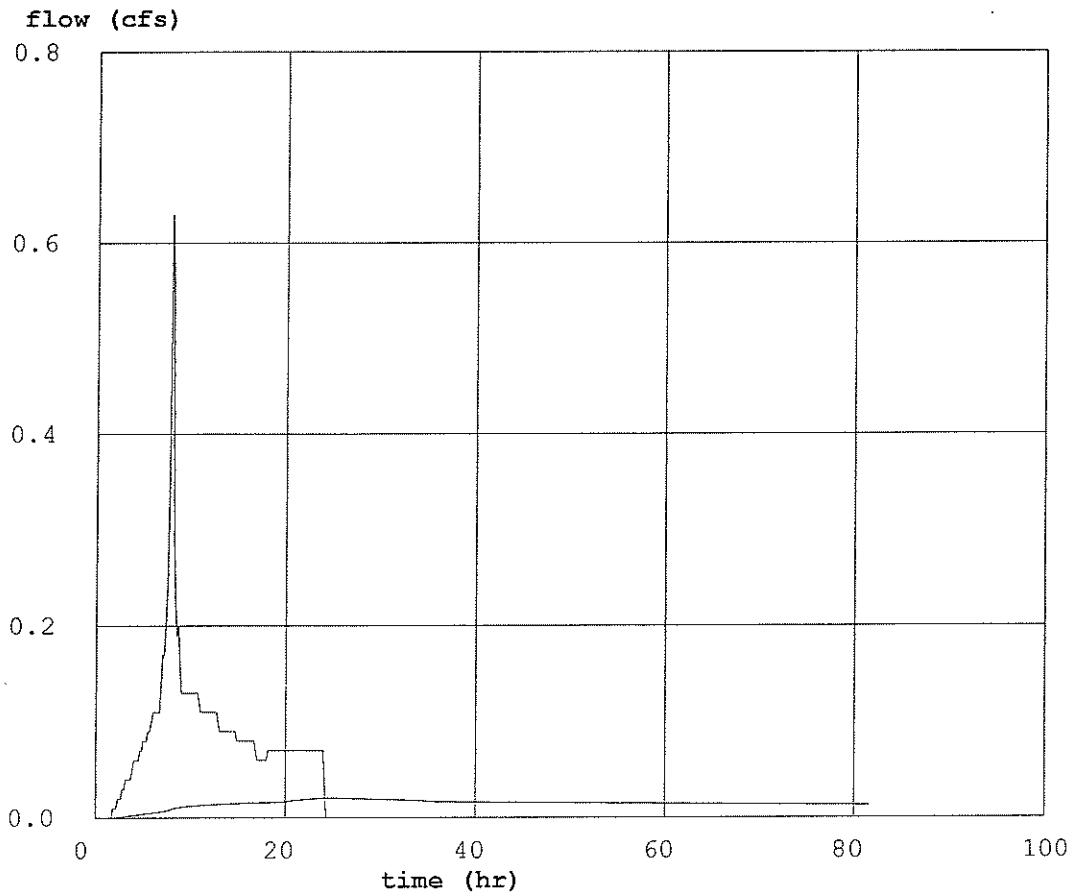
runoff volume = 960 cu.ft.

Welkin

EKC 15:42 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

DETENTION ROUTING
HALF THE 2-YEAR STORM DETENTION



DETENTION POND (stage-volume calculated)

elevation	area	volume
212.00	3000	0
214.00	4015	6990
216.00	6595	17494

STAGE	VOLUME
212.0	0
214.0	6990
216.0	17494

OUTLET TYPE	ELEVATION	SIZE
circ. orifice	212.0	dia.(in) = 0.68
circ. orifice	213.8	dia.(in) = 0.50
broad weir	214.9	width(in) = 37.70

inflow hydrograph: c:\program files\quick3\meadow brook - phase 2\half the 2-year developed.hyd
outflow hydrograph: c:\program files\quick3\meadow brook - phase 2\half the 2-year undeveloped.hyd

peaks: inflow = 0.63 cfs @ 7.83 hr.
outflow = 0.02 cfs @ 24.67 hr.
stage: 1.97 ft. detained volume: 6,902 c.f.

Welkin

EKC 15:11 11-Apr-20

Project 19-212.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

2-YEAR 'DEVELOPED-YEAR DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA
return period = 2 years
storm duration = 24 hr.
total rainfall = 2.50 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE
impervious area = 1.92 A CN = 98
total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\2-year developed.hyd

peak flow = 1.47cfs @ 7.83 hr.
runoff volume = 18,223 cu.ft.

Welkin

EKC 09:30 23-Dec-19

Project 19-122.03

MEADOW CREEK APARTMENTS - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

2-YEAR UNDEVELOPED SITE RUNOFF

2-year, 24-hour rainfall = 2.50"

	flow type	description	coeff.	distance	fall	slope	T/C
1	overland sheet	dense.grasses	n=0.24	126.5	2.3'	1.82%	20.2'
2	shallow concentrated	high.grass	K=9	170.4	10.1'	5.93%	1.3'

total Time of Concentration = 21.5'

storm hyetograph: SCS TypeIA

return period = 2 years

storm duration = 24 hr.

total rainfall = 2.50 in.

pervious area = 2.27 A CN = 77 GpC:Res,2-A.lots

impervious area = 0.00 A CN = 98

total site area = 2.27 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\2-year undeveloped.hyd

peak flow = 0.22cfs @ 8.00 hr.

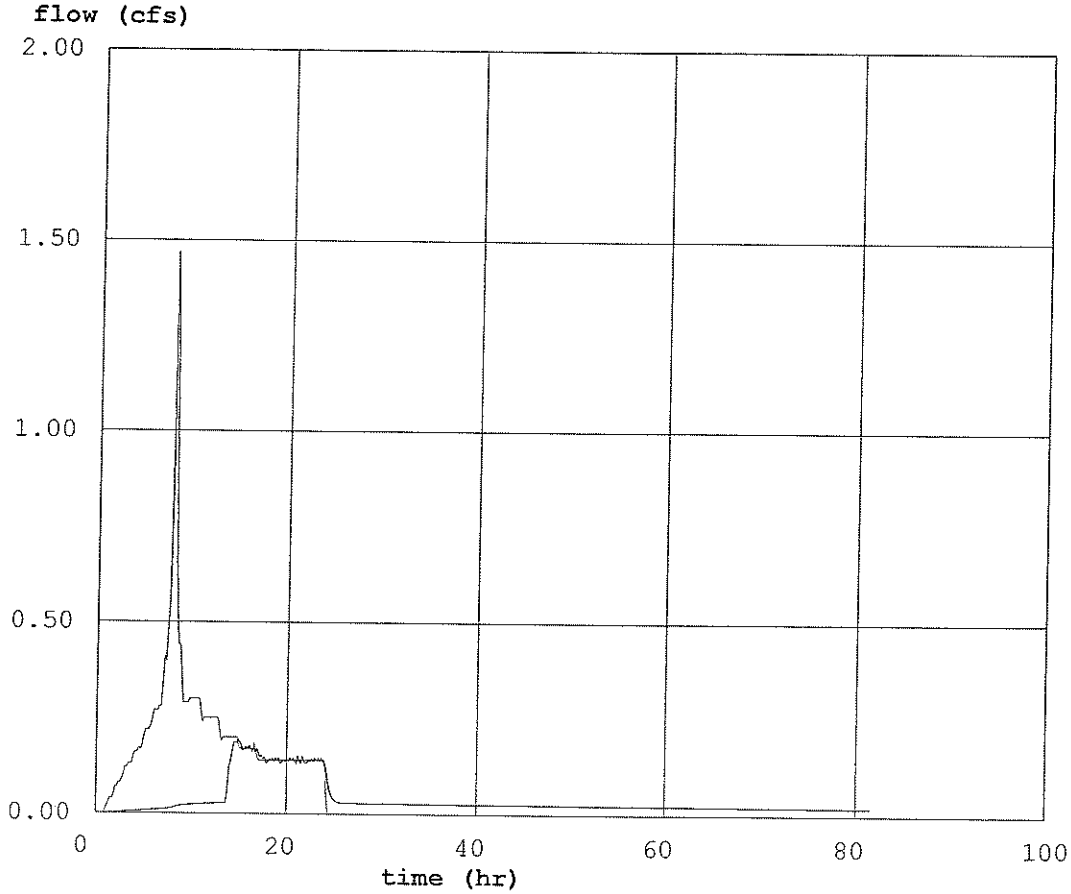
runoff volume = 6,096 cu.ft.

Welkin

EKC 15:41 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

DETENTION ROUTING
2-YEAR STORM DETENTION



DETENTION POND (stage-volume calculated)

elevation	area	volume
212.00	3000	0
214.00	4015	6990
216.00	6595	17494

STAGE	VOLUME
212.0	0
214.0	6990
216.0	17494

OUTLET TYPE	ELEVATION	SIZE
circ. orifice	212.0	dia. (in) = 0.68
circ. orifice	213.8	dia. (in) = 0.50
broad weir	214.9	width(in) = 37.70

inflow hydrograph: c:\program files\quick3\meadow brook - phase 2\2-year developed.hyd
outflow hydrograph: c:\program files\quick3\meadow brook - phase 2\2-year undeveloped.hyd

peaks: inflow = 1.47 cfs @ 7.83 hr.
outflow = 0.19 cfs @ 15.00 hr.
stage: 2.92 ft. detained volume: 11,797 c.f.

Welkin

EKC 15:16 11-Apr-20

Project 19-212.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

10-YEAR DEVELOPED-YEAR DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	flow type	description	coeff.	distance	fall	slope	T/C
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA

return period = 10 years

storm duration = 24 hr.

total rainfall = 3.50 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE

impervious area = 1.92 A CN = 98

total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\10-year developed.hyd

peak flow = 2.15cfs @ 7.83 hr.

runoff volume = 26,789 cu.ft.

Welkin

EKC 09:29 23-Dec-19

Project 19-122.03

MEADOW CREEK APARTMENTS - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH
10-YEAR UNDEVELOPED SITE RUNOFF

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	dense.grasses	n=0.24	126.5	2.3'	1.82%	20.2'
2	shallow concentrated	high.grass	K=9	170.4	10.1'	5.93%	1.3'

total Time of Concentration = 21.5'

storm hyetograph: SCS TypeIA
return period = 10 years
storm duration = 24 hr.
total rainfall = 3.50 in.

pervious area = 2.27 A CN = 77 GpC:Res,2-A.lots
impervious area = 0.00 A CN = 98
total site area = 2.27 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\10-year undeveloped.hyd

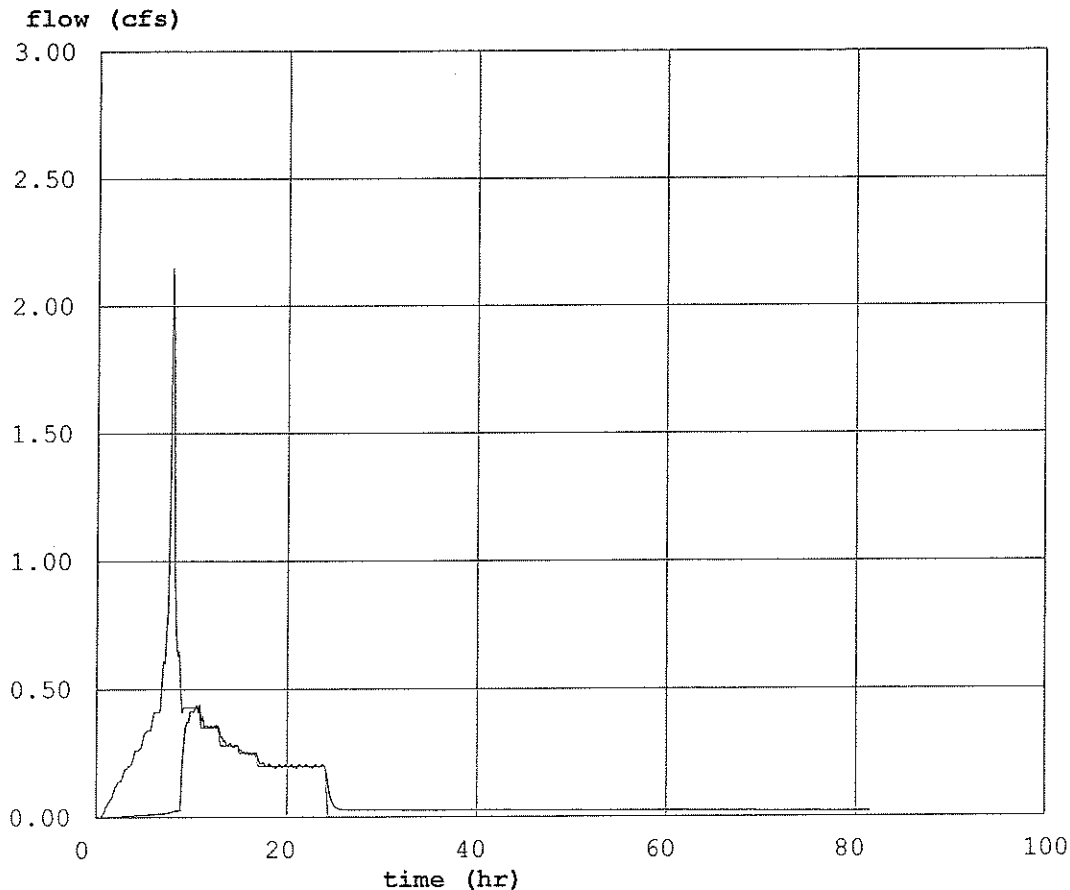
peak flow = 0.55cfs @ 8.00 hr.
runoff volume = 11,783 cu.ft.

Welkin

EKC 15:42 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

DETENTION ROUTING
10-YEAR STORM DETENTION



DETENTION POND (stage-volume calculated)

elevation	area	volume
212.00	3000	0
214.00	4015	6990
216.00	6595	17494

STAGE	VOLUME
212.0	0
214.0	6990
216.0	17494

OUTLET TYPE	ELEVATION	SIZE
circ. orifice	212.0	dia. (in) = 0.68
circ. orifice	213.8	dia. (in) = 0.50
broad weir	214.9	width(in) = 37.70

inflow hydrograph: c:\program files\quick3\meadow brook - phase 2\10-year developed.hyd
outflow hydrograph: c:\program files\quick3\meadow brook - phase 2\10-year undeveloped.hyd

peaks: inflow = 2.15 cfs @ 7.83 hr.
outflow = 0.44 cfs @ 11.00 hr.
stage: 2.92 ft. detained volume: 11,847 c.f.

Welkin

EKC 15:19 11-Apr-20

Project 19-212.03

MEADOW CREEK VISTA - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH

25-YEAR DEVELOPED-YEAR DEVELOPED SITE

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	smooth.surface	n=0.011	90.0	0.9'	1.00%	1.7'
2	shallow concentrated	paved,gravel	K=27	107.0	0.6'	0.56%	0.9'
3	pipe	plastic.pipe	n=0.011	318.0	1.5'	0.47%	1.2'
4	pipe	plastic.pipe	n=0.011	155.0	6.0'	3.87%	0.2'

total Time of Concentration = 4.0'

storm hyetograph: SCS TypeIA
return period = 25 years
storm duration = 24 hr.
total rainfall = 4.00 in.

pervious area = 0.52 A CN = 86.4 CALCULATED FOR THE SITE
impervious area = 1.92 A CN = 98
total site area = 2.44 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\25-year developed.hyd

peak flow = 2.50cfs @ 7.83 hr.
runoff volume = 31,115 cu.ft.

3K

Welkin

EKC 09:30 23-Dec-19

Project 19-122.03

MEADOW CREEK APARTMENTS - PHASE 2

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH
25-YEAR UNDEVELOPED SITE RUNOFF

2-year, 24-hour rainfall = 2.50"

	<i>flow type</i>	<i>description</i>	<i>coeff.</i>	<i>distance</i>	<i>fall</i>	<i>slope</i>	<i>T/C</i>
1	overland sheet	dense.grasses	n=0.24	126.5	2.3'	1.82%	20.2'
2	shallow concentrated	high.grass	K=9	170.4	10.1'	5.93%	1.3'

total Time of Concentration = 21.5'

storm hyetograph: SCS TypeIA
return period = 10 years
storm duration = 24 hr.
total rainfall = 4.00 in.

pervious area = 2.27 A CN = 77 GpC:Res,2-A.lots
impervious area = 0.00 A CN = 98
total site area = 2.27 A

hydrograph file: c:\program files\quick3\meadow brook - phase 2\25-year undeveloped.hyd

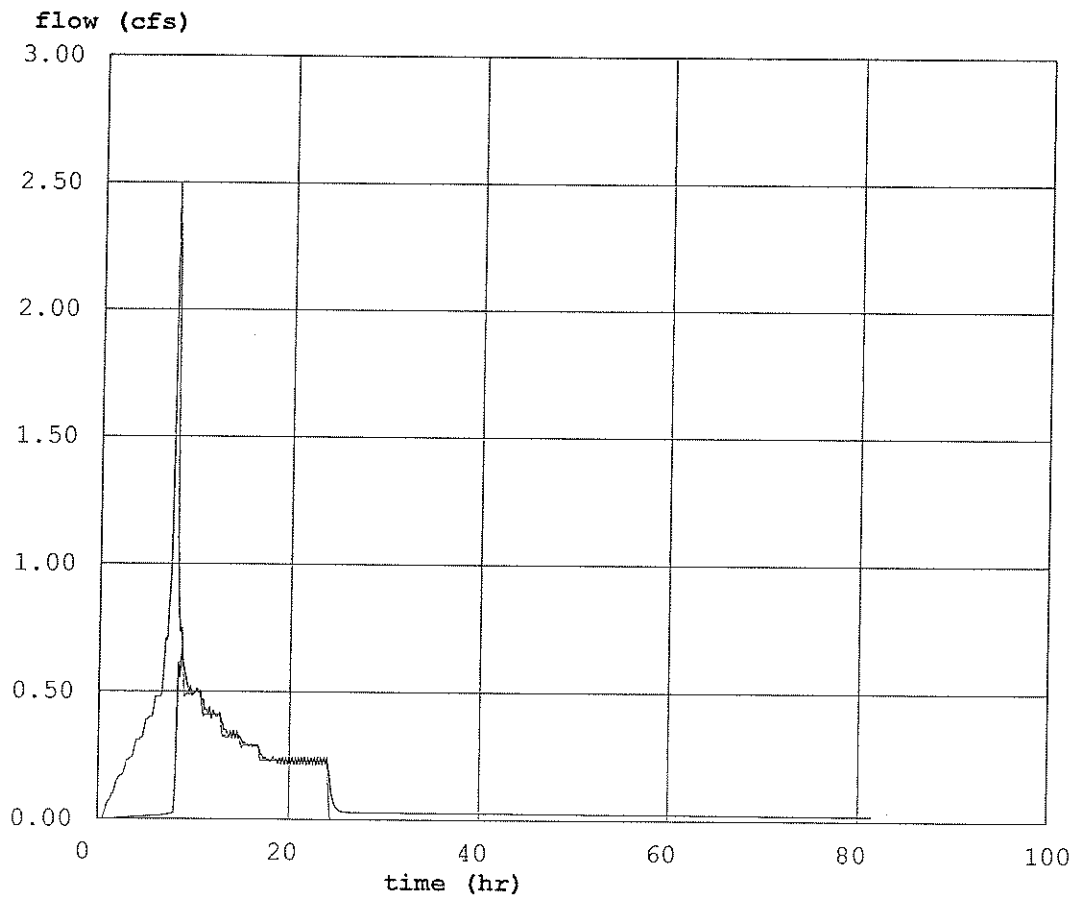
peak flow = 0.74cfs @ 8.00 hr.
runoff volume = 14,928 cu.ft.

Welkin

EKC 15:43 11-Apr-20

Project 19-212.03
MEADOW CREEK VISTA - PHASE 2

DETENTION ROUTING
25-YEAR STORM DETENTION



DETENTION POND (stage-volume calculated)

elevation	area	volume
212.00	3000	0
214.00	4015	6990
216.00	6595	17494

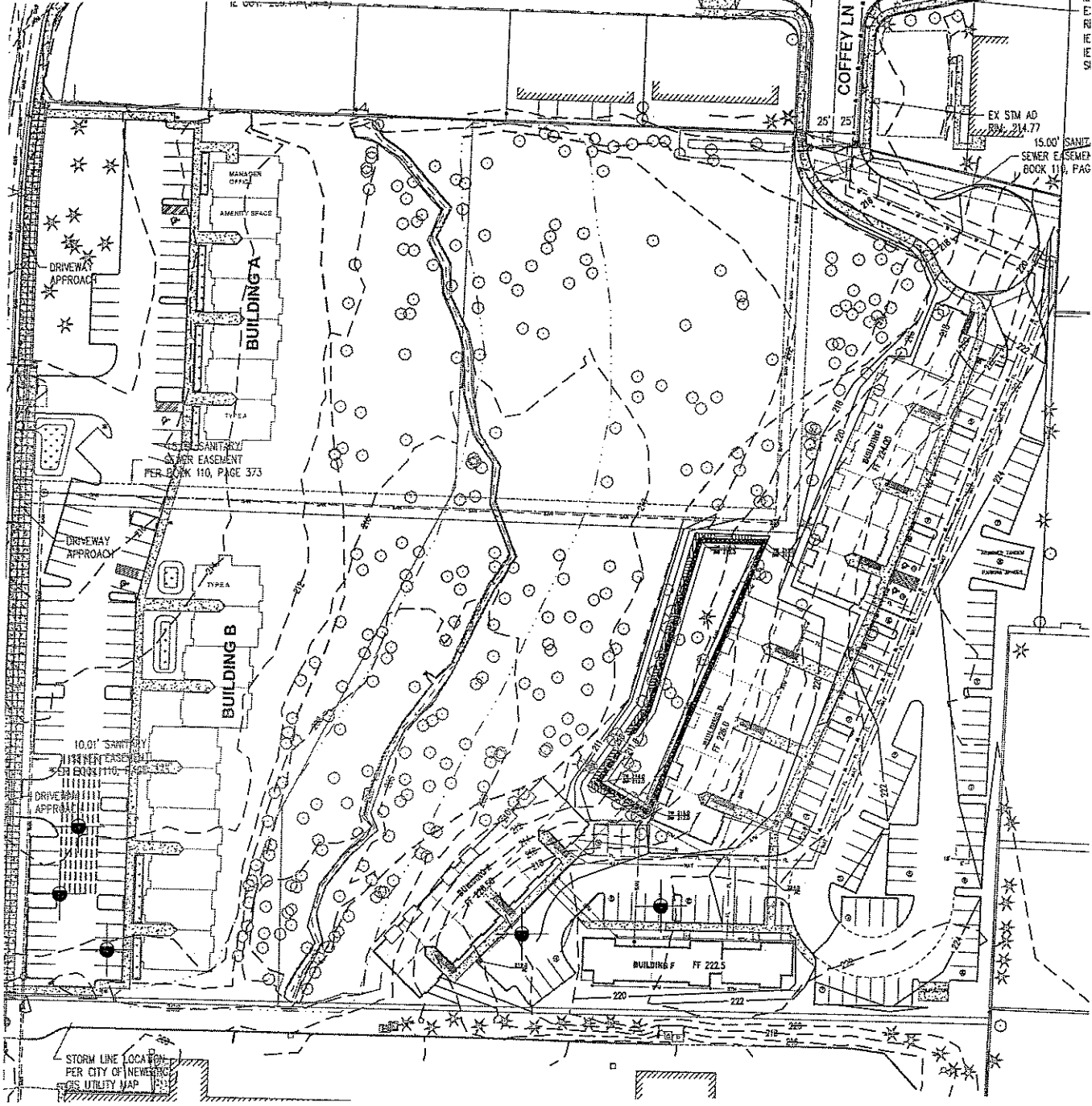
STAGE	VOLUME
212.0	0
214.0	6990
216.0	17494

OUTLET TYPE	ELEVATION	SIZE
circ. orifice	212.0	dia. (in) = 0.68
circ. orifice	213.8	dia. (in) = 0.50
broad weir	214.9	width(in) = 37.70

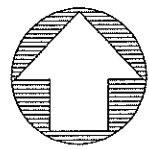
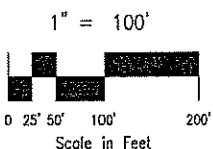
inflow hydrograph: c:\program files\quick3\meadow brook - phase 2\25-year developed.hyd
 outflow hydrograph: c:\program files\quick3\meadow brook - phase 2\25-year undeveloped.hyd

peaks: inflow = 2.50 cfs @ 7.83 hr.
 outflow = 0.67 cfs @ 8.83 hr.
 stage: 2.94 ft. detained volume: 11,909 c.f.

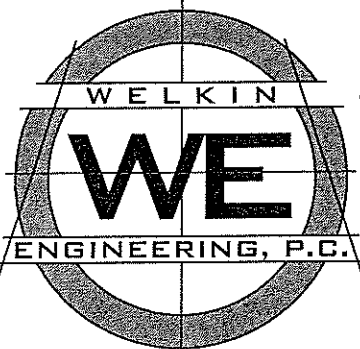
FIELD INFILTRATION PIT LOCATION



DATE: 11/20/2020 11:20:00 AM
WEPC DRAWING FILE: P:\Project Data\19-122.03 Phase 2 MCV\dwg\Planning\03 Planning Set\C-6 GRADING PLAN.dwg



LEGEND



ENGINEERING
SURVEYING • PLANNING

25260 SW PARKWAY AVE., SUITE G
WILSONVILLE, OR 97070

TEL: (503)59 8-1866
FAX: (503) 59 8-1868

ekc@WelkinPC.com
www.WelkinPC.com

9-16-19

Figure E-3: Infiltration Test Data Table

Location: T.L. 3216CB-100 ^{Newburg OR}		Date: 9-16-19	Test Hole Number: 1		
Depth to bottom of hole: 71"		Diameter of hole: 16"	Test Method:		
Tester's Name: Dan Sporer		503-598-1866			
Tester's Company: Welkin Eng.		Tester's Contact Number:			
Depth, feet		Soil Texture			
0"-30"		mixed gravel, asphalt + dirt			
30"-71"		silty clay			
Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
11:05	0	-65"	start	-	start ↓
11:20	15 min	-66"	1"	4"/hr	
11:35	"	-66"	0	0	
11:50	"	-66 1/4"	1/4"	1"/hr	
12:05	"	-66 1/2"	1/4"	1"/hr	Ave: 1.5"/hr
12:15	0	-65"	start	-	start ↓
12:25	15 min	-65 1/4"	1/4"	1"/hr	
12:40	15	-65 1/2"	1/4"	1"/hr	
12:55	15	-65 1/2"	0	-	
1:15	15	-66 1/2"	1"	4"/hr	END ()

Ave: 1.5"/hr

4C

Figure E-3: Infiltration Test Data Table

Location: <i>Newberg OR</i> <i>T.L. 3216CB-100</i>		Date: <i>9-16-19</i>	Test Hole Number: <i>2</i>		
Depth to bottom of hole: <i>63"</i>		Diameter of hole: <i>16"</i>	Test Method:		
Tester's Name: <i>Dan Sporer</i>		Tester's Contact Number: <i>503-598-1866</i>			
Tester's Company:					
Depth, feet		Soil Texture			
<i>0-20"</i>		<i>mixed gravel to silt fill</i>			
Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
<i>12:45</i>	<i>0</i>	<i>-57"</i>	<i>0</i>	<i>-</i>	<i>Start</i>
<i>1:00</i>	<i>15</i>	<i>-57 1/2</i>	<i>1/2"</i>	<i>2"/hr</i>	
<i>1:15</i>	<i>"</i>	<i>-58</i>	<i>1"</i>	<i>4"/hr</i>	
<i>1:30</i>	<i>"</i>	<i>-58</i>	<i>0</i>	<i>0"</i>	
<i>1:45</i>	<i>"</i>	<i>-58 1/2</i>	<i>1/2"</i>	<i>2"/hr</i>	<i>END AVE: 2.0"/HR</i>
<i>1:50</i>	<i>0</i>	<i>-55 1/2"</i>	<i>Start</i>	<i>-</i>	<i>Start</i>
<i>2:05</i>	<i>15</i>	<i>-56</i>	<i>1/2"</i>	<i>2"/hr</i>	
<i>2:15</i>	<i>"</i>	<i>56</i>	<i>0</i>	<i>0</i>	
<i>2:30</i>	<i>"</i>	<i>56</i>	<i>0</i>	<i>0</i>	
<i>2:50</i>	<i>20</i>	<i>56 1/2</i>	<i>1/2</i>	<i>2"/hr</i>	<i>END AVE: 1.0"/HR</i>

Σ AVE: 1.5"/HR

4D

Figure E-3: Infiltration Test Data Table

Location: <i>Newberry</i>		Date: <i>9-16-91</i>		Test Hole Number: <i>3</i>	
Depth to bottom of hole: <i>48"</i>		Diameter of hole: <i>16"</i>		Test Method:	
Tester's Name: <i>Dan Spant</i>			Tester's Contact Number:		
Tester's Company: <i>Walker Eng</i>					
Depth, feet			Soil Texture		
<i>0 - 48"</i>			<i>Silty loam</i>		
Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
<i>1:15</i>	<i>0</i>	<i>-38 1/2"</i>	<i>0</i>	<i>—</i>	<i>Start</i>
<i>1:30</i>	<i>15</i>	<i>-39 1/2"</i>	<i>1"</i>	<i>4"</i>	
<i>1:45</i>	<i>15</i>	<i>-40 1/4"</i>	<i>3/4"</i>	<i>3"</i>	
<i>2:00</i>	<i>15</i>	<i>40 3/4"</i>	<i>1/2"</i>	<i>2"</i>	<i>AVE: 2 1/4" / HR</i>
<i>2:20</i>	<i>20</i>	<i>36 3/4"</i>	<i>0</i>	<i>—</i>	<i>STOP</i>
<i>2:40</i>	<i>20</i>	<i>39 1/4"</i>	<i>2 1/2"</i>	<i>10"</i>	<i>NOT USED</i>

4E

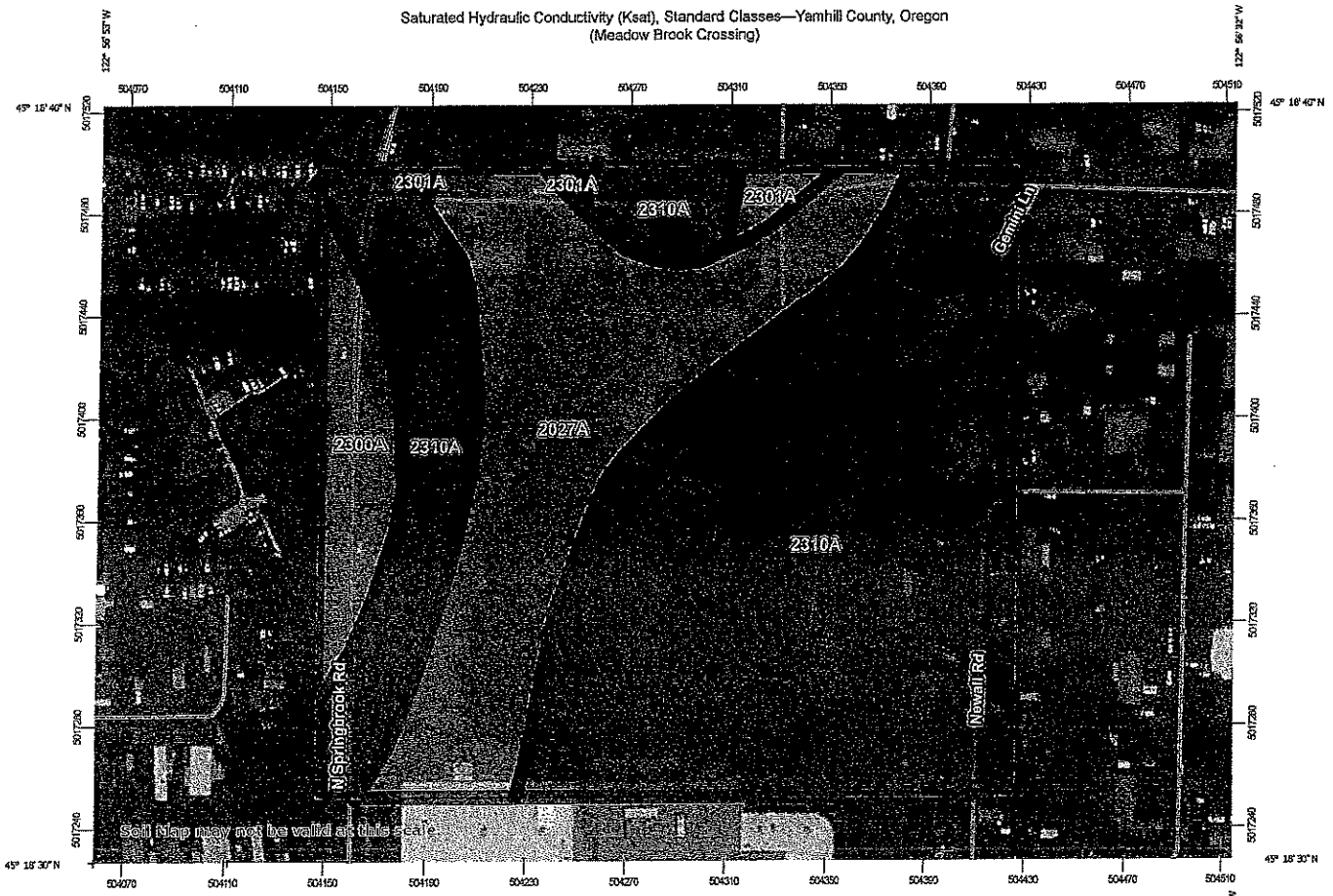
Figure E-3: Infiltration Test Data Table

Location: <i>Newberg</i>		Date: <i>9-16-19</i>	Test Hole Number: <i>4</i>		
Depth to bottom of hole:		Diameter of hole: <i>16"</i>	Test Method:		
Tester's Name: <i>Dan Sporer</i>		Tester's Contact Number:			
Tester's Company: <i>Welkin Eng</i>					
Depth, feet		Soil Texture			
<i>0-48"</i>		<i>Silty Loam</i>			
Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
<i>2:00</i>	<i>0</i>	<i>39 1/8</i>	<i>0</i>	<i>-</i>	<i>Start</i>
<i>2:15</i>	<i>15</i>	<i>39 3/4</i>	<i>5/8"</i>	<i>2 1/2"</i>	
<i>2:30</i>	<i>15</i>	<i>40 1/4</i>	<i>1/2"</i>	<i>2"</i>	
<i>2:45</i>	<i>15</i>	<i>40 1/2</i>	<i>1/4"</i>	<i>1"</i>	
<i>3:00</i>	<i>15</i>	<i>41 3/8</i>	<i>3/8"</i>	<i>3 1/2"</i>	<i>AVE: 2 1/4" / HR.</i>

Figure E-3: Infiltration Test Data Table

Location: T.L. 321CB-100		Date: 9-16-19		Test Hole Number: 5	
Depth to bottom of hole: 4'		Diameter of hole: 16"		Test Method:	
Tester's Name: Dan Sporer			503-598-1866		
Tester's Company: Welkin Eng.			Tester's Contact Number:		
Depth, feet			Soil Texture		
0-12"			mix dirt + gravel fill		
12-48"			silty clay		
Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
2:30	0	-40"	0	0	Start
2:45	15	-40 1/2"	1/2"	2"/hr	
3:00	15	-40 1/2"	0	0	
3:15	15	-40 3/4"	1/4"	1/hr	
3:30	15	-40 3/4"	0	0	AVE: 3/4"/HR

Saturated Hydraulic Conductivity (Ksat), Standard Classes—Yamhill County, Oregon
(Meadow Brook Crossing)



Map Scale: 1:2,080 if printed on A landscape (11" x 8.5") sheet.
0 30 60 120 180 Meters
0 100 200 400 600 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Saturated Hydraulic Conductivity (Ksat), Standard Classes

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
2027A	Verboort silty clay loam, 0 to 3 percent slopes	5.6846	4.7	27.4%
2300A	Aloha silt loam, 0 to 3 percent slopes	4.0748	1.1	6.2%
2301A	Amity silt loam, 0 to 3 percent slopes	7.6412	0.3	1.5%
2310A	Woodburn silt loam, 0 to 3 percent slopes	11.3924	11.0	64.8%
Totals for Area of Interest			17.0	100.0%

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are:

Very low: 0.00 to 0.01

Low: 0.01 to 0.1

Moderately low: 0.1 to 1.0

Moderately high: 1 to 10

High: 10 to 100

Very high: 100 to 705

Rating Options

Units of Measure: micrometers per second