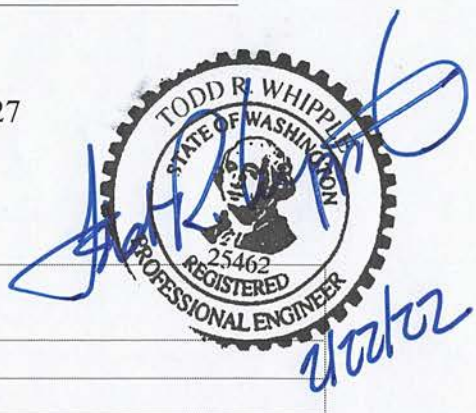
WCE

Whipple Consulting Engineers, Inc.

21 S. Pines Road
Spokane Valley, WA 99206
Ph 509-893-2617 Fax 509-926-0227



MEMORANDUM

TO:	City of Spokane M. Nilsson, J. Taylor and J. Saywers		
FROM:	Todd R. Whipple, P. E.		
DATE:	February 22, 2022		
PROJECT NO:	21-3130	**NAME:**	Westridge PUD, Phase 1 Construction 21st Avenue, Grandview to Westwood Hills, 1st Addition
REGARDING:	Review of the Previously Approved Storm Drainage Report, Prepared by Mike Yake, PE with Inland Pacific Engineering, Inc., dated 9-03-1997		

This report has been prepared by Todd R. Whipple, PE and reviewed by the WCE Staff under the direction of the professional engineer whose seal and signature appears hereon:

INTRODUCTION:

The purpose of the drainage review of the previously approved Drainage Report is to compare results presented in 1997, as prepared under the 1995 Guidelines for Stormwater Management (GSM) as they relate to the current areawide storm water standards as found in the 2008 Spokane Regional Stormwater Manual (SRSM).

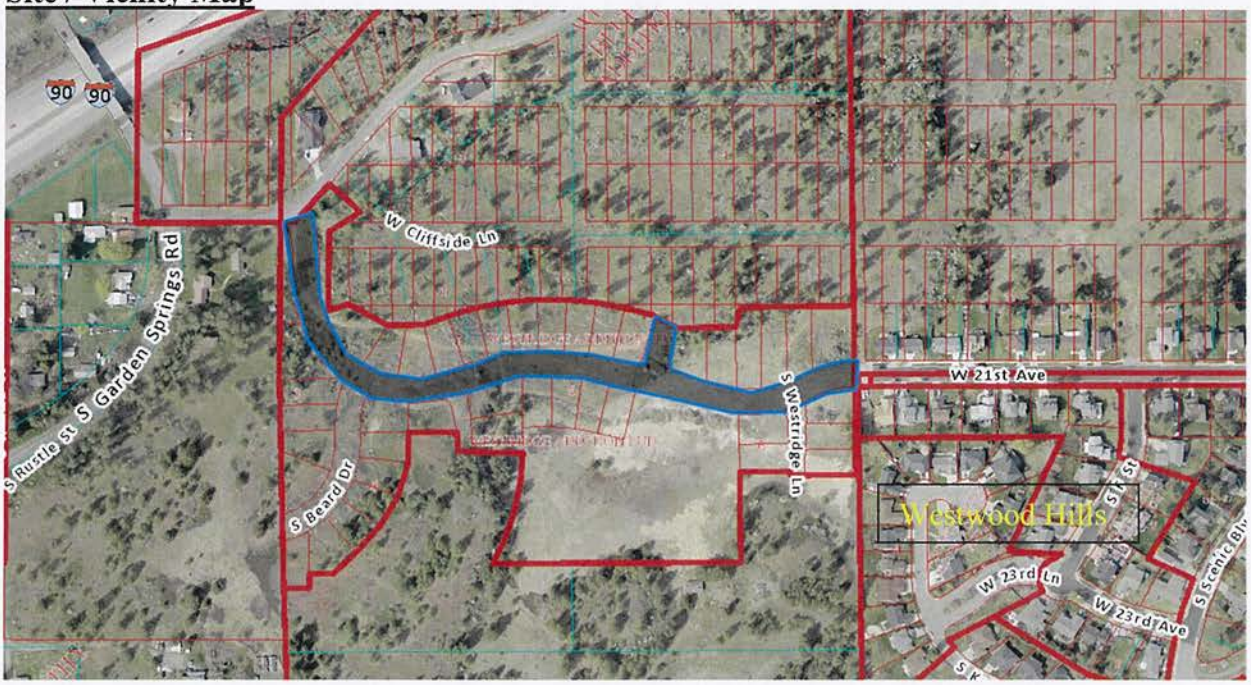
This submittal will review two elements and recommend changes if required.

1. Review the Phase 1 requirements which include the construction of 21st Avenue from Grandview to the westerly boundary of the Westwood Hills 1st Addition. This review focused on the approved plans that were approved for construction on 5/19/1998 by the City of Spokane as a part of the final plat of Westridge Addition PUD (Phase 1). A vicinity map is attached for ease of reference on the next page, see Figure 1.

2. Review the overall drainage for the area that will drain to the large low area / borrow area located south of and adjacent to 21st Avenue. This is to review the issues that were evaluated at the time of final plat as it related to the overall Approved Westridge PUD Preliminary Plat. The notable exception to the plans and original assumptions, is that as proposed in 1998 there was intended to be an overflow to the east through the Westwood Hills First Addition. The omitted easement in the Westwood Hills plat generally prohibits the large catchment area from having an emergency overflow route. As this

route is omitted, the large catchment area and resulting 47 Acres of contributing area, will be evaluated as an evaporation and limited infiltration basin, calculations have been included for development of the entirety of what was the Westridge PUD, now Known as the Beard Addition to West Bluff.

Site / Vicnity Map



This review will confirm or modify the storm elements approved in 1997 that are necessary to control and treat the stormwater runoff from the project site. The results reported will confirm that there are no negative impacts to the adjacent properties with the construction of the approved phase 1 development plans.

The project lies within the Spokane County, in the City of Spokane in Section 26, Township 25 N., Range 42 E., W.M. and is comprised of approximately 27 recorded lots and tracts. While this project lies in soils that are generally defined as Type B with some Type C soils, the SRSM would allow the evaluation by the V= 1133A method provided there are less than 12% fines. However, without the benefit of a geotechnical evaluation the V=1815 method which is consistent with the bowstring method from the GSM was used.

While the SRSM allows for treatment using the Low Impact Development (LID) method as outlined in the Washington State Department of Ecology Stormwater Manual for Eastern Washington (SMMEW), this method for phase one is not being utilized, future phases may incorporate this type of analysis.

NARRATIVE:

Site Information:
Property address: 21st Avenue between Grandview and the Westwood Hills 1st Addition Plat

Parcel #'s: Per the Basin Map, See Scout for more information
Lot size: The platted area encompasses approximately 15.9 acres
SW 1/4 of Section 26, T 25 N., R 42 E., W.M.

Geotechnical Information:

A geotechnical evaluation including infiltration testing and calculations have been requested by Budinger and should be provided and prepared within weeks following the submittal of this evaluation. It should be noted that at the time of original design, no geotechnical evaluations were found, yet indicated on the original Basin maps, and only a listing of soil types from what was then the USDA, Spokane County Soil Survey (SCS) provided the following:

> **SOILS DESCRIPTION**
>
> Sheet 73 of the Spokane County Soil Survey indicates that the proposed site primarily consists of Hesseltine soils with some small outcrops of Cheny & Uhlig, and Cocolalla soils. The Hesseltine (HvC, HsB, Hob) and Cheney & Uhlig (CnB) soils belong to soil group B. The small outcrop of Cocolalla (Cy) soil belongs to soil group C. The soil survey map can be seen in the appendix.

The presence of Type B soils would indicate that infiltration, even to a limited degree would be acceptable, the current USDA Soil Survey indicates the following soil types.

> Approximately 10% Cocolalla-Hardesty (1021) complex 0 to 3 percent slopes, a Type B/D soil group; 80% NorthStar-Rock outcrop (3115) complex, 0 to 15 percent slopes, a Type C soil; and 10% Rock Outcrop-NorthStar (3126) complex 15 to 30 percent slopes, a Type C soil.

Proposed Pond C is in Soil Type 3126, a Type C soils.Based on recent infiltration testing provided by Budinger on sites to the north in similar soils, acceptable infiltration rates of 0.3 cfs for a Type 1 drywell were encountered, so the results of the infiltration testing may modify the results of this evaluation. Pond B, a temporary pond is in Soil Type 1021, a the type B/D soil, for the temporary pond an outflow of 0.3 cfs was use, however, additional testing as well will validate the ability to infiltrate water. Within the evaporation analysis of the entire 47 Acre site, an infiltration rate of 1.5x10-7 cfs/sf was used for the evaporation pond, which is the same rate that we use for infiltration into competent basalt rock nearby.

Storage calculations from the original study were for the 100-year event and those were used here. Additionally, the original study used an older version of Pond Pack, that was used here to some extent, however, updated bowstring analysis using the rational method for Basin C and, original Basin B was also used for treatment and total volume based on outflow, a HydroCAD analysis for the entire basin undeveloped (pre) and develop (post) was also evaluated and is attached for reference only as we believe that for Phase 1, the 100-year bowstring evaluation is more conservative. See the Appendix for more information.

Basin C

Basin C as shown in the Basin map, located at the west end of 21st Avenue and includes Beard Avenue, Slopes toward Grandview Avenue. As can be seen from Table 1, the 100-year Pond Pack volume of 5,094 cf from 1998 was conservative because of the way it was run, the SRSM 100-year bowstring maximum storage volume of 5,214 cf while not as conservative is still contained within the total pond volume proposed of 13,157 cf. Pond C was approved to have a Discharge pipe to the ditch on the northside of Grandview Avenue. We propose to eliminate the need for the approved offsite discharge once a full-scale drywell test is performed in Pond C during construction. Thus also eliminating potential impact to downstream properties. See the Appendix for more information.

Table 1 –Basin C Summary (Original Basin C, pg. 4 Summary Table)

Item No.	Description	Volume
1998 Analysis Basin C	Required 100-year volume, offsite discharge was 0.9 cfs	5,544 cf (Pond Pack)
1998 Analysis Basin C	Required Treatment volume, offsite discharge was 0.9 cfs	Not Provided
2022 Analysis Basin C	Required 100-year maximum volume, offsite discharge eliminated and 0.3 cfs gallery installed	5,094 cf (Bowstring) 13,157 cf Provided/Proposed
2022 Analysis Basin C	Required Treatment volume, offsite discharge eliminated and 0.3 cfs gallery installed	2,172 cf (Bowstring) 2,172 cf Provided/Proposed

Basin B

Basin b Located at the East end of 21st Avenue and includes the bluff to the north, slopes to the large catchment/barrow area south of 21st Avenue. As can be seen in Table 2 as well in the Stormwater Summary Table from the 1998 Storm Report, the previous project did not require any storage volume for Basin B, the reasoning we believe, is that it ultimately was covered or would be covered in the storage of the large Catchment/ barrow area known as Pond A, where the full storm was to be stored.

Regardless, we have evaluated Basin B using the 100-year Bowstring method for stormwater per the SRSM the runoff from Basin B and the easterly 2/3rds of 21st Avenue would result, for the 100-year storm, a maximum volume of 8,388 cf and a treatment volume of 2,097 cf. For this basin we are proposing a temporary Pond B, that will meet these treatment requirements as noted within Table 2.

For Ponds C and B we are proposing to upgrade these two ponds to Bio-Retention ponds, with underdrains and drywells or rock galleries, the final disposition of the outlet will occur at the completion of the geotechnical infiltration testing. See the revisions to the plans for updated pond plans.

Table 2 –Phase 1 - Basin B Summary, 21st Avenue Development and upslope undeveloped properties only.

Item No.	Description	Volume
1998 Analysis Basin B	Required 100-year volume, offsite discharge was 2.3 cfs(pg. 4 Summary Table)	0,000 cf (Pond Pack)
1998 Analysis Basin B	Required Treatment volume, offsite discharge was 2.3 cfs(pg. 4 Summary Table)	Not Provided
2022 Analysis Basin B	Required 100-year maximum volume, offsite discharge eliminated and 0.3 cfs gallery installed	8,388 cf (Bowstring) 12,892 cf Provided/Proposed
2022 Analysis Basin B	Required Treatment volume, offsite discharge eliminated and 0.3 cfs gallery installed	2,097 cf (Bowstring) 2,097 cf Provided/Proposed

OVERALL DEVELOPED PROPERTY – Basins A and B

In the original Drainage Report from 1998, the Author included an analysis for the proposed entirety of the Westridge PUD site being developed, this sized the pond in the large catchment/ borrow area as well as an overflow through Westwood Hills. As the Westwood plats did not include the overflow depicted on the Approved Plans, an analysis to evaluate as an evaporation scenario for these two basins was performed. The area is approximately 47 acres, this analysis used HydroCAD while the original analysis, used, Pond Pack, circa 1998. The results are included in Table 3 and the Appendix.

Basin A+B in this Analysis for the big pond is a 47-acre area that includes Basin A and B, this is the same for the 1998 Drainage Report with a slight adjustment in area. The results are as follows.

Table 3 –Buildout Preliminary Basin A+B Summary

Item No.	Description	Volume
1998 Analysis Basin A+B	Required 100-year volume, Total Basin size 37.61 + 10.36 = 47.97 Ac (Pond Pack)	100 Year Runoff Basin A = 97,146 cf Basin B = 12,348 cf Total = 109,494 cf / 2.52 ac/ft
1998 Analysis Basin A+B	Storage Volume Provided (est)	Evaporation Pond Storage Volume Provided = 616,884 cf / 14.16 ac/ft
2022 Analysis Basin A+B	Required 100-year volume, 47 acres (HydroCAD)	Runoff Volume = 143,704 cf / 3.299 ac/ft
2022 Analysis Basin A+B	Storage Volume Provided	Bottom Area = 187,308 sf Storage = 559,386 cf / 13.76 ac/ft

As shown within Table 3 the runoff volume of the 2022 analysis is larger than the 1998 analysis , and the estimated storage volume of the large catchment/barrow area is smaller in the 2022 analysis , than in the 1998 analysis. However, within both analysis years, the large catchment area is sufficient to store the runoff of both basins A & B.

Soil infiltration Comparison (SRSM Evaporation Worksheets attached)

Overall Basin Evaporation Results with and without any infiltration show that the proposed large catchment/ barrow (Pond A) area is adequate whether there is infiltration or not. The large pond without infiltration is empty or should be expected to have no standing water between August and September, prior to the beginning of the wet season. Should some infiltration occur, the dry period in the pond would extend to include the month of July.

Critical Areas:

Based on the Critical Area Maps provided by the City of Spokane GIS as well as a review of , DNR Streams mapping website, US Fish and Wildlife, National wetlands mapper and other maps as available, there does not appear to be any critical areas on site. At this time, no inventoried wetlands or federal flood zones are present within the project site.

CONCLUSION:

As required for the construction of 21st Avenue between Grandview Road and the Westwood Hills subdivision, the previously approved storm drainage report prepared in 1998 by Inland Pacific Engineering and stamped by Mike Yake, PE appears to meet the current standards of the Spokane Regional Stormwater Manual. To be conservative, a couple of changes are being proposed, they are shown on the Amended Construction plans and described as follows:

1. A geotechnical evaluation along with infiltration test at Pond C and the large Pond A evaporation impoundment is to be conducted, as no geotechnical evaluation or testing was found in the original application file.
2. All storm calculations were based on the 100-year storm whether the calculations were via bowstring or the CN method using HydroCAD.
3. Pond C is proposed to be modified by increasing the pond bottom area from 1,988 sf to 2,172 sf, an increase of 184 sf, also the pond depth will be increased to 1.0 feet, Per LID Standards, and at this time some infiltration is assumed to occur. While the overflow pipe will be maintained as an emergency overflow route, it is not anticipated that it will be the primary source of out flow, as a drywell is anticipated to be installed.
4. Basin B, 21st Avenue development, we are recommending that a temporary pond be constructed at the pipe outfall, within the large catchment/ Pond A. This temporary pond B, will be removed at the time of further design and construction of the remainder of the plat, or it will remain in place as a filtration basin so that clean up and maintenance in the future may be made easier. This temporary Pond A is proposed to be 2,097 sf and again have a depth of 1.0 feet with a berm at 1.5 feet above pond bottom.

Based on this review of the previously approved storm drainage report, we believe that the final construction of 21st Avenue as noted will adequately collect, treat and discharge stormwater runoff generated by the site during the 100-year storm event. Also, the storm drainage facilities will contain and discharge the 100-year storm under non frozen conditions. Therefore, this project will have no adverse impact to adjacent and/or downstream properties.

APPENDIX

1. Basin Maps
2. Basin Calculation Worksheet
3. Pond Volume Work Sheet
4. SRSM Bowstrings
    a. 25 year
    b. 50 year
    c. 100 year
5. Evaporation Calculations
    a. Without Infiltration
    b. With Infiltration
6. HydroCAD Calculations
7. Supplemental Information
    a. Previously approved plans w/ markup
    b. Previously approved Drainage Report
8. NRCS Soil Report (pending Budinger Report)

1. BASIN MAPS

Measurement

Acres

Measurement Result

47 Acres

Clear

Press CTRL to enable snapping

City of Spokane GIS | Esri Community Maps Contributors, City of Spokane, Spokane County, WA

P:\WCE_WORK\2021 WCE PROJECTS\2021-3109 Lennar- Beard Addition to West Bluff\DWG\3109-STORM TRW.dwg, Model, 1/25/2022 4:37:39 PM, Adobe PDF, 1:200

PRE & POST BASIN MAP

POND C

#C
210,850 SF
4.61 AC

#B
457,145 SF
10.49 AC
(21% AVG)

#A
36.51 AC
Pond - 4.3 AC
32.21

OVERALL POND A

TEMP POND A

650 LF ±

1560'

7.5% 40 State

2. BASIN CALC SHT

Whipple Consulting Engineers
Basin Calculation Worksheet

WCE No. 21-3130
2/16/2022 Lennar - 21st Avenue
TRW

Imp 0.9
Per 0.15

Intensities from SRSM eqn. 5-13, per Table 5-7, Assumes Tc = 5 min
I (2 yr) = 1.418 inches I (10 yr)= 2.619 inches NOTE:
I (25 yr) = 3.319 inches I (50 yr)= 3.843 inches
I (100 yr) = 4.381 inches

SPOKANE COUNTY - SRSM - GRASSED PERCOLATION METHOD

1815 A

Basin	Total	Access/Parking	Sidewalk (NPGIS)	Sidewalk	Dvwy	Building to Drywell	Buildings to Pond	Total	Total	Weighted	PGIS	POND	Pond	Q=CIA (cfs) 2 yr	10 yr	25 yr	50 yr	100 yr
	sf	/Street (sf)	sf	sf	SF		sf	Impervious	Pervious	"C"	sf	Area (sf)	Vol (cf)					
Post Onsite Flow																		
POST A (SITE) LESS BASIN C	2,047,320	253,280	79,150	0	79,200	0	168,750	580,380.00	1,466,940.00	0.36	501,230.00	41,769.17	20,884.58	24.17	44.64	56.56	65.50	74.66
POST C - POND C	200,850	37,440	10,400	0	4,928	0	9,750	62,518.00	138,332.00	0.38	52,118.00	4,343.17	2,171.58	2.51	4.63	5.87	6.79	7.75
POST B - TEMP POND B	457,165	36,000	10,000	0	4,576	0	9,750	60,326.00	396,839.00	0.25	50,326.00	4,193.83	2,096.92	3.71	6.84	8.67	10.04	11.45
Total	**658,015**	**73,440**	**20,400**	**0**	**9,504**	**0**	**19,500**	**102,444.00**	**555,571.00**	**0.27**	**102,444.00**	**8,537.00**	**4,268.50**	**5.71**	**10.55**	**13.37**	**15.49**	**17.65**

3. POND VOLUME

WHIPPLE CONSULTING ENGINEERS
POND VOLUME CALC SHEET

Date: 2/22/2022

Project: 21-3130 LENNAR - WESTRIDGE - 21ST AVENUE
Designer: TRW

								Treatment					*Storage*
Basins	Ponds/ Swales	Bottom Area sf	Treatment Area (w/ Side Slopes)	Squared Side lf	Pond Bottom Elevation at Drywell	Pond Drywell Elevation	Top of Berm Elevation (avg)	Conic Volume to Rim cf	Side * Slope Volume cf	Total Volume to to Rim cf	Conic Volume to Inlet cf	Side Slope Volume cf	Total Volume to Inlet cf
POST	**C**	2,171	4,901	46.59	2231.00	2232.00	2235.00	2,171	280	**2,451**	8,684	4,473	13,157
POST	**B**	2,097	4,744	45.79	2245.00	2246.00	2249.00	2,097	275	**2,372**	8,388	4,396	12,784
Totals		**4,268**	**9,645**	**x**	**x**	**x**	**x**	**4,268**	**554**	**4,822**	**17,072**	**8,869**	**25,941**

* LID ponds do not calculate side slopes.

4.2. 3BSM 25-45
Boustring

PEAK FLOW CALCULATION PROJECT: 3130

25-Year Design Storm **Lennar - 21st Avenue**

BASIN: C

Tot. Area	200,850 SF	4.61 Acres	
Imp. Area	62,518 SF	C=	0.9
Perv. Area	138,332 SF	C=	0.15
Wt. C =	0.38	PGIS Area =	52,118

WCE Applicable Travel Time Ground Cover Coefficients		
Per Table 5-6 SRSM		
Type of Cover	K (ft/min)	
Short Pasture	420	
Nearly Bare Ground	600	
Small Roadside Ditch/ Grass	900	
Paved Area (use for parking lots)	1200	
Gutter - 4 inches deep	1500	
Gutter - 6 inches deep	2400	
Pipe - 12-inch PVC/DI	3000	
Pipe - 15/18-inch PVC/DI	3900	
Pipe - 24-inch PVC/DI	4700	

Reaches		
Reach 1	Offsite	also applicable for Pre-Developed Tc
Length	170.00	
K	1200.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	1.00	Minutes
Reach 2	Finished Lot from House to Street	
Length	85.00	
K	2400.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	0.25	Minutes
Reach 3	Gutter Flow to Inlet/Catch Basin	
Length	150.00	
K	3000.00	
Slope (ft/ft)	0.0600	be sure this is decimal equivalent slope 0.0000
Travel Time	0.20	Minutes
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)
Length	600.00	
K	3900.00	12-inch Pipe minimum
Slope (ft/ft)	0.0600	Average Slope for total pipe run
Travel Time	0.63	Minutes
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia
Length	0.00	
K	4700.00	15/18-inch Pipe
Slope (ft/ft)	0.0050	Average Slope for total pipe run
Travel Time	0.00	Minutes
Sum of Tc	2.08	Minutes
Tc for Analysis	5.00	Minutes

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: C

DESIGNER: TRW

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	5.00
Outflow (cfs)	0.3000
Design Year Flow	25
Area (acres)	4.61
Impervious Area (sq ft)	62,518
'C' Factor	0.38
Area * C	1.768
PGIS Area	52,118

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel. (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
5.00	300	3.32	5.87	2359	90	2269	
15	900	1.67	2.95	2956	270	2686	
25	1500	1.21	2.14	3432	450	2982	
35	2100	0.98	1.74	3822	630	3192	
45	2700	0.84	1.48	4155	810	3345	
55	3300	0.74	1.31	4450	990	3460	
65	3900	0.67	1.18	4715	1170	3545	
75	4500	0.61	1.08	4957	1350	3607	
85	5100	0.56	1.00	5181	1530	3651	
95	5700	0.53	0.93	5390	1710	3680	
105	6300	0.49	0.87	5586	1890	3696	
115	6900	0.47	0.82	5771	2070	3701	<==
125	7500	0.44	0.78	5947	2250	3697	
135	8100	0.42	0.75	6115	2430	3685	
145	8700	0.40	0.71	6275	2610	3665	
155	9300	0.39	0.68	6429	2790	3639	
165	9900	0.37	0.66	6577	2970	3607	
175	10500	0.36	0.63	6719	3150	3569	
185	11100	0.35	0.61	6857	3330	3527	
195	11700	0.33	0.59	6990	3510	3480	
205	12300	0.32	0.57	7119	3690	3429	
215	12900	0.32	0.56	7244	3870	3374	
225	13500	0.31	0.54	7365	4050	3315	
235	14100	0.30	0.53	7484	4230	3254	
245	14700	0.29	0.51	7599	4410	3189	
255	15300	0.28	0.50	7712	4590	3122	
265	15900	0.28	0.49	7821	4770	3051	
275	16500	0.27	0.48	7929	4950	2979	
285	17100	0.26	0.47	8033	5130	2903	
295	17700	0.26	0.46	8136	5310	2826	
305	18300	0.25	0.45	8237	5490	2747	
315	18900	0.25	0.44	8335	5670	2665	
325	19500	0.24	0.43	8432	5850	2582	
335	20100	0.24	0.42	8527	6030	2497	
345	20700	0.23	0.41	8620	6210	2410	
355	21300	0.23	0.40	8655	6390	2265	
365	21900	0.22	0.40	8728	6570	2158	
375	22500	0.22	0.39	8740	6750	1990	
385	23100	0.22	0.39	8972	6930	2042	

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{25} = 9.09

N_{25} = 0.626

Flow (weighted c)

Qwc= 5.87 cfs

Flow (time of concentration)

Qtc= 5.87 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
385							
395	23700	0.21	0.37	8783	7110	1673	
405	24300	0.21	0.37	9005	7290	1715	
415	24900	0.20	0.35	8784	7470	1314	
425	25500	0.20	0.35	8995	7650	1345	
435	26100	0.19	0.33	8743	7830	913	
445	26700	0.19	0.33	8943	8010	933	
455	27300	0.18	0.32	8659	8190	469	
465	27900	0.18	0.32	8848	8370	478	
475	28500	0.17	0.30	8532	8550	-18	
485	29100	0.17	0.30	8711	8730	-19	
495	29700	0.16	0.28	8363	8910	-547	
505	30300	0.16	0.28	8531	9090	-559	
515	30900	0.15	0.26	8152	9270	-1118	
525	31500	0.15	0.26	8309	9450	-1141	
535	32100	0.14	0.25	7898	9630	-1732	
545	32700	0.14	0.25	8045	9810	-1765	
555	33300	0.13	0.23	7602	9990	-2388	
565	33900	0.13	0.23	7738	10170	-2432	
575	34500	0.12	0.21	7263	10350	-3087	
585	35100	0.12	0.21	7389	10530	-3141	
595	35700	0.11	0.19	6882	10710	-3828	
605	36300	0.11	0.19	6997	10890	-3893	
615	36900	0.10	0.17	6458	11070	-4612	
625	37500	0.10	0.17	6563	11250	-4687	
635	38100	0.09	0.16	5992	11430	-5438	
645	38700	0.09	0.16	6086	11610	-5524	
655	39300	0.08	0.14	5484	11790	-6306	
665	39900	0.08	0.14	5567	11970	-6403	
675	40500	0.07	0.12	4933	12150	-7217	
685	41100	0.07	0.12	5006	12330	-7324	
695	41700	0.06	0.10	4340	12510	-8170	
705	42300	0.06	0.10	4402	12690	-8288	
715	42900	0.05	0.09	3704	12870	-9166	
725	43500	0.05	0.09	3756	13050	-9294	
735	44100	0.04	0.07	3026	13230	-10204	
745	44700	0.04	0.07	3067	13410	-10343	

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,172	cu ft
Provided Treatment Volume - Min.	2,172	cu ft
STORAGE REQ. - 25 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	3,701	cu ft
Provided Pond Storage Volume to Inlet - Min.	13,157	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**14,357**	**cu ft**

PEAK FLOW CALCULATION PROJECT: 3130

25-Year Design Storm **Lennar - 21st Avenue**

BASIN: A & B

Tot. Area	457,165	SF	10.50	Acres
Imp. Area	60,326	SF	C=	0.9
Perv. Area	396,839	SF	C=	0.15
Wt. C =	0.25	PGIS Area =		50,236

WCE Applicable Travel Time Ground Cover Coefficients			
Per Table 5-6 SRSM			
Type of Cover		K (ft/min)	
Short Pasture		420	
Nearly Bare Ground		600	
Small Roadside Ditch/ Grass		900	
Paved Area (use for parking lots)		1200	
Gutter - 4 inches deep		1500	
Gutter - 6 inches deep		2400	
Pipe - 12-inch PVC/DI		3000	
Pipe - 15/18-inch PVC/DI		3900	
Pipe - 24-inch PVC/DI		4700	

Reaches		
Reach 1	Offsite	also applicable for Pre-Developed Tc
Length	250.00	
K	420.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	4.21	Minutes
Reach 2	Finished Lot from House to Street	
Length	85.00	
K	420.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	1.43	Minutes
Reach 3	Gutter Flow to Inlet/Catch Basin	
Length	300.00	
K	2400.00	
Slope (ft/ft)	0.0300	be sure this is decimal equivalent slope 0.0000
Travel Time	0.72	Minutes
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)
Length	650.00	
K	3000.00	12-inch Pipe minimum
Slope (ft/ft)	0.0500	Average Slope for total pipe run
Travel Time	0.97	Minutes
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia
Length	0.00	
K	3900.00	15/18-inch Pipe
Slope (ft/ft)	0.0050	Average Slope for total pipe run
Travel Time	0.00	Minutes
Sum of Tc	7.33	Minutes
Tc for Analysis	7.33	Minutes

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: A & B

DESIGNER: TRW

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	7.33
Outflow (cfs)	0.3000
Design Year Flow	25
Area (acres)	10.50
Impervious Area (sq ft)	60326
'C' Factor	0.25
Area * C	2.613
PGIS Area	50,236

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel. (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
7.33	440	2.61	6.83	4023	132	3891	
15	900	1.67	4.36	4576	270	4306	
25	1500	1.21	3.17	5223	450	4773	
35	2100	0.98	2.57	5770	630	5140	
45	2700	0.84	2.19	6245	810	5435	
55	3300	0.74	1.93	6668	990	5678	
65	3900	0.67	1.74	7050	1170	5880	
75	4500	0.61	1.59	7401	1350	6051	
85	5100	0.56	1.47	7727	1530	6197	
95	5700	0.53	1.37	8031	1710	6321	
105	6300	0.49	1.29	8317	1890	6427	
115	6900	0.47	1.22	8587	2070	6517	
125	7500	0.44	1.16	8844	2250	6594	
135	8100	0.42	1.10	9089	2430	6659	
145	8700	0.40	1.05	9324	2610	6714	
155	9300	0.39	1.01	9549	2790	6759	
165	9900	0.37	0.97	9765	2970	6795	
175	10500	0.36	0.94	9974	3150	6824	
185	11100	0.35	0.90	10176	3330	6846	
195	11700	0.33	0.88	10371	3510	6861	
205	12300	0.32	0.85	10561	3690	6871	
215	12900	0.32	0.82	10744	3870	6874	<==
225	13500	0.31	0.80	10923	4050	6873	
235	14100	0.30	0.78	11097	4230	6867	
245	14700	0.29	0.76	11266	4410	6856	
255	15300	0.28	0.74	11432	4590	6842	
265	15900	0.28	0.72	11593	4770	6823	
275	16500	0.27	0.71	11751	4950	6801	
285	17100	0.26	0.69	11905	5130	6775	
295	17700	0.26	0.68	12056	5310	6746	
305	18300	0.25	0.66	12204	5490	6714	
315	18900	0.25	0.65	12349	5670	6679	
325	19500	0.24	0.64	12491	5850	6641	
335	20100	0.24	0.62	12631	6030	6601	
345	20700	0.23	0.61	12768	6210	6558	
355	21300	0.23	0.60	12819	6390	6429	
365	21900	0.22	0.59	12926	6570	6356	
375	22500	0.22	0.57	12944	6750	6194	
385	23100	0.22	0.57	13287	6930	6357	

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{25} = 9.09

N_{25} = 0.626

Flow (weighted c)

Qwc= 8.67 cfs

Flow (time of concentration)

Qtc= 6.83 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)
385						
395	23700	0.21	0.55	13007	7110	5897
405	24300	0.21	0.55	13334	7290	6044
415	24900	0.20	0.52	13007	7470	5537
425	25500	0.20	0.52	13318	7650	5668
435	26100	0.19	0.49	12944	7830	5114
445	26700	0.19	0.49	13240	8010	5230
455	27300	0.18	0.47	12818	8190	4628
465	27900	0.18	0.47	13099	8370	4729
475	28500	0.17	0.44	12630	8550	4080
485	29100	0.17	0.44	12895	8730	4165
495	29700	0.16	0.41	12379	8910	3469
505	30300	0.16	0.41	12628	9090	3538
515	30900	0.15	0.39	12066	9270	2796
525	31500	0.15	0.39	12299	9450	2849
535	32100	0.14	0.36	11689	9630	2059
545	32700	0.14	0.36	11907	9810	2097
555	33300	0.13	0.34	11250	9990	1260
565	33900	0.13	0.34	11452	10170	1282
575	34500	0.12	0.31	10748	10350	398
585	35100	0.12	0.31	10935	10530	405
595	35700	0.11	0.28	10184	10710	-526
605	36300	0.11	0.28	10354	10890	-536
615	36900	0.10	0.26	9557	11070	-1513
625	37500	0.10	0.26	9711	11250	-1539
635	38100	0.09	0.23	8867	11430	-2563
645	38700	0.09	0.23	9006	11610	-2604
655	39300	0.08	0.21	8114	11790	-3676
665	39900	0.08	0.21	8238	11970	-3732
675	40500	0.07	0.18	7299	12150	-4851
685	41100	0.07	0.18	7407	12330	-4923
695	41700	0.06	0.15	6421	12510	-6089
705	42300	0.06	0.15	6513	12690	-6177
715	42900	0.05	0.13	5480	12870	-7390
725	43500	0.05	0.13	5556	13050	-7494
735	44100	0.04	0.10	4477	13230	-8753
745	44700	0.04	0.10	4537	13410	-8873

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,093	cu ft
Provided Treatment Volume - Min.	2,372	cu ft
STORAGE REQ. - 25 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	6,874	cu ft
Provided Pond Storage Volume to Inlet - Min.	12,784	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**13,984**	**cu ft**

4.b. TRSM 50-YR
BOWSTRINGS

PEAK FLOW CALCULATION PROJECT: 3130

50-Year Design Storm **Lennar - 21st Avenue**

BASIN: C

Tot. Area	200,850 SF	4.61 Acres	
Imp. Area	62,518 SF	C=	0.9
Perv. Area	138,332 SF	C=	0.15
Wt. C =	0.38	PGIS Area =	52,118

WCE Applicable Travel Time Ground Cover Coefficients			
Per Table 5-6 SRSM			
Type of Cover		K (ft/min)	
Short Pasture		420	
Nearly Bare Ground		600	
Small Roadside Ditch/ Grass		900	
Paved Area (use for parking lots)		1200	
Gutter - 4 inches deep		1500	
Gutter - 6 inches deep		2400	
Pipe - 12-inch PVC/DI		3000	
Pipe - 15/18-inch PVC/DI		3900	
Pipe - 24-inch PVC/DI		4700	

Reaches		
Reach 1	Offsite	also applicable for Pre-Developed Tc
Length	170.00	
K	1200.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	1.00	Minutes
Reach 2	Finished Lot from House to Street	
Length	85.00	
K	2400.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	0.25	Minutes
Reach 3	Gutter Flow to Inlet/Catch Basin	
Length	150.00	
K	3000.00	
Slope (ft/ft)	0.0600	be sure this is decimal equivalent slope 0.0000
Travel Time	0.20	Minutes
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)
Length	600.00	
K	3900.00	12-inch Pipe minimum
Slope (ft/ft)	0.0600	Average Slope for total pipe run
Travel Time	0.63	Minutes
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia
Length	0.00	
K	4700.00	15/18-inch Pipe
Slope (ft/ft)	0.0050	Average Slope for total pipe run
Travel Time	0.00	Minutes
Sum of Tc	2.08	Minutes
Tc for Analysis	5.00	Minutes

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: C

DESIGNER: BNG

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	5.00
Outflow (cfs)	0.3000
Design Year Flow	50
Area (acres)	4.61
Impervious Area (sq ft)	62518
'C' Factor	0.38
Area * C	1.768
PGIS Area	52,118

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
5.00	300	3.84	6.80	2732	90	2642	
15	900	1.91	3.38	3389	270	3119	
25	1500	1.38	2.45	3918	450	3468	
35	2100	1.12	1.98	4349	630	3719	
45	2700	0.95	1.68	4718	810	3908	
55	3300	0.84	1.48	5043	990	4053	
65	3900	0.75	1.33	5335	1170	4165	
75	4500	0.69	1.22	5602	1350	4252	
85	5100	0.64	1.12	5849	1530	4319	
95	5700	0.59	1.05	6078	1710	4368	
105	6300	0.56	0.98	6294	1890	4404	
115	6900	0.52	0.93	6497	2070	4427	
125	7500	0.50	0.88	6690	2250	4440	
135	8100	0.47	0.84	6874	2430	4444	<==
145	8700	0.45	0.80	7050	2610	4440	
155	9300	0.43	0.77	7218	2790	4428	
165	9900	0.42	0.74	7380	2970	4410	
175	10500	0.40	0.71	7536	3150	4386	
185	11100	0.39	0.69	7686	3330	4356	
195	11700	0.38	0.66	7832	3510	4322	
205	12300	0.36	0.64	7972	3690	4282	
215	12900	0.35	0.62	8109	3870	4239	
225	13500	0.34	0.61	8242	4050	4192	
235	14100	0.33	0.59	8371	4230	4141	
245	14700	0.32	0.57	8497	4410	4087	
255	15300	0.32	0.56	8620	4590	4030	
265	15900	0.31	0.55	8739	4770	3969	
275	16500	0.30	0.53	8856	4950	3906	
285	17100	0.29	0.52	8971	5130	3841	
295	17700	0.29	0.51	9082	5310	3772	
305	18300	0.28	0.50	9192	5490	3702	
315	18900	0.28	0.49	9299	5670	3629	
325	19500	0.27	0.48	9404	5850	3554	
335	20100	0.27	0.47	9507	6030	3477	
345	20700	0.26	0.46	9608	6210	3398	
355	21300	0.26	0.45	9694	6390	3304	
365	21900	0.25	0.44	9774	6570	3204	
375	22500	0.25	0.44	9837	6750	3087	
385	23100	0.25	0.44	10099	6930	3169	

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{50} = 10.68

N_{50} = 0.635

Flow (weighted c)

Qwc= 6.80 cfs

Flow (time of concentration)

Qtc= 6.80 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)
385						
395	23700	0.24	0.42	9939	7110	2829
405	24300	0.24	0.42	10190	7290	2900
415	24900	0.23	0.40	9998	7470	2528
425	25500	0.23	0.40	10238	7650	2588
435	26100	0.22	0.38	10015	7830	2185
445	26700	0.22	0.38	10244	8010	2234
455	27300	0.21	0.36	9989	8190	1799
465	27900	0.21	0.36	10207	8370	1837
475	28500	0.20	0.35	9921	8550	1371
485	29100	0.20	0.35	10129	8730	1399
495	29700	0.19	0.33	9810	8910	900
505	30300	0.19	0.33	10007	9090	917
515	30900	0.18	0.31	9657	9270	387
525	31500	0.18	0.31	9844	9450	394
535	32100	0.17	0.29	9461	9630	-169
545	32700	0.17	0.29	9637	9810	-173
555	33300	0.16	0.28	9223	9990	-767
565	33900	0.16	0.28	9389	10170	-781
575	34500	0.15	0.26	8943	10350	-1407
585	35100	0.15	0.26	9098	10530	-1432
595	35700	0.14	0.24	8620	10710	-2090
605	36300	0.14	0.24	8764	10890	-2126
615	36900	0.13	0.22	8255	11070	-2815
625	37500	0.13	0.22	8388	11250	-2862
635	38100	0.12	0.21	7847	11430	-3583
645	38700	0.12	0.21	7970	11610	-3640
655	39300	0.11	0.19	7397	11790	-4393
665	39900	0.11	0.19	7509	11970	-4461
675	40500	0.10	0.17	6904	12150	-5246
685	41100	0.10	0.17	7006	12330	-5324
695	41700	0.09	0.15	6369	12510	-6141
705	42300	0.09	0.15	6460	12690	-6230
715	42900	0.08	0.13	5792	12870	-7078
725	43500	0.08	0.13	5872	13050	-7178
735	44100	0.07	0.12	5172	13230	-8058
745	44700	0.07	0.12	5242	13410	-8168

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,172	cu ft
Provided Treatment Volume - Min.	2,172	cu ft
STORAGE REQ. - 50 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	4,444	cu ft
Provided Pond Storage Volume to Inlet - Min.	13,157	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**14,357**	**cu ft**

PEAK FLOW CALCULATION PROJECT: 3130

50-Year Design Storm **Lennar - 21st Avenue**

BASIN: A & B

Tot. Area	457,165	SF	10.50	Acres
Imp. Area	60,326	SF	C=	0.9
Perv. Area	396,839	SF	C=	0.15
Wt. C =	0.25	PGIS Area =		50,236

WCE Applicable Travel Time Ground Cover Coefficients						
Per Table 5-6 SRSM						
Type of Cover			K (ft/min)			
Short Pasture			420			
Nearly Bare Ground			600			
Small Roadside Ditch/ Grass			900			
Paved Area (use for parking lots)			1200			
Gutter - 4 inches deep			1500			
Gutter - 6 inches deep			2400			
Pipe - 12-inch PVC/DI			3000			
Pipe - 15/18-inch PVC/DI			3900			
Pipe - 24-inch PVC/DI			4700			
Reaches						
Reach 1	Offsite	also applicable for Pre-Developed Tc				
Length	250.00					
K	420.00					
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000				
Travel Time	4.21	Minutes				
Reach 2	Finished Lot from House to Street					
Length	85.00					
K	420.00					
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000				
Travel Time	1.43	Minutes				
Reach 3	Gutter Flow to Inlet/Catch Basin					
Length	300.00					
K	2400.00					
Slope (ft/ft)	0.0300	be sure this is decimal equivalent slope 0.0000				
Travel Time	0.72	Minutes				
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)				
Length	650.00					
K	3000.00	12-inch Pipe minimum				
Slope (ft/ft)	0.0500	Average Slope for total pipe run				
Travel Time	0.97	Minutes				
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia				
Length	0.00					
K	3900.00	15/18-inch Pipe				
Slope (ft/ft)	0.0050	Average Slope for total pipe run				
Travel Time	0.00	Minutes				
Sum of Tc	7.33	Minutes				
Tc for Analysis	7.33	Minutes				

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: A & B

DESIGNER: BNG

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	7.33
Outflow (cfs)	0.3000
Design Year Flow	50
Area (acres)	10.50
Impervious Area (sq ft)	60326
'C' Factor	0.25
Area * C	2.613
PGIS Area	50,236

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
7.33	440	3.01	7.88	4642	132	4510	
15	900	1.91	5.00	5247	270	4977	
25	1500	1.38	3.61	5962	450	5512	
35	2100	1.12	2.92	6566	630	5936	
45	2700	0.95	2.49	7091	810	6281	
55	3300	0.84	2.19	7557	990	6567	
65	3900	0.75	1.97	7978	1170	6808	
75	4500	0.69	1.80	8365	1350	7015	
85	5100	0.64	1.66	8722	1530	7192	
95	5700	0.59	1.55	9057	1710	7347	
105	6300	0.56	1.45	9371	1890	7481	
115	6900	0.52	1.37	9668	2070	7598	
125	7500	0.50	1.30	9949	2250	7699	
135	8100	0.47	1.24	10218	2430	7788	
145	8700	0.45	1.18	10475	2610	7865	
155	9300	0.43	1.13	10721	2790	7931	
165	9900	0.42	1.09	10958	2970	7988	
175	10500	0.40	1.05	11187	3150	8037	
185	11100	0.39	1.01	11407	3330	8077	
195	11700	0.38	0.98	11621	3510	8111	
205	12300	0.36	0.95	11827	3690	8137	
215	12900	0.35	0.92	12028	3870	8158	
225	13500	0.34	0.90	12223	4050	8173	
235	14100	0.33	0.87	12413	4230	8183	
245	14700	0.32	0.85	12598	4410	8188	
255	15300	0.32	0.83	12778	4590	8188	<==
265	15900	0.31	0.81	12954	4770	8184	
275	16500	0.30	0.79	13126	4950	8176	
285	17100	0.29	0.77	13294	5130	8164	
295	17700	0.29	0.75	13458	5310	8148	
305	18300	0.28	0.74	13619	5490	8129	
315	18900	0.28	0.72	13777	5670	8107	
325	19500	0.27	0.71	13932	5850	8082	
335	20100	0.27	0.70	14084	6030	8054	
345	20700	0.26	0.68	14232	6210	8022	
355	21300	0.26	0.67	14358	6390	7968	
365	21900	0.25	0.66	14475	6570	7905	
375	22500	0.25	0.64	14569	6750	7819	
385	23100	0.25	0.64	14955	6930	8025	

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{50} = 10.68

N_{50} = 0.635

Flow (weighted c)

Qwc= 10.04 cfs

Flow (time of concentration)

Qtc= 7.88 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)
385						
395	23700	0.24	0.62	14718	7110	7608
405	24300	0.24	0.62	15088	7290	7798
415	24900	0.23	0.59	14804	7470	7334
425	25500	0.23	0.59	15158	7650	7508
435	26100	0.22	0.56	14827	7830	6997
445	26700	0.22	0.56	15166	8010	7156
455	27300	0.21	0.54	14788	8190	6598
465	27900	0.21	0.54	15111	8370	6741
475	28500	0.20	0.51	14686	8550	6136
485	29100	0.20	0.51	14993	8730	6263
495	29700	0.19	0.49	14521	8910	5611
505	30300	0.19	0.49	14813	9090	5723
515	30900	0.18	0.46	14293	9270	5023
525	31500	0.18	0.46	14569	9450	5119
535	32100	0.17	0.43	14003	9630	4373
545	32700	0.17	0.43	14263	9810	4453
555	33300	0.16	0.41	13650	9990	3660
565	33900	0.16	0.41	13895	10170	3725
575	34500	0.15	0.38	13234	10350	2884
585	35100	0.15	0.38	13463	10530	2933
595	35700	0.14	0.36	12756	10710	2046
605	36300	0.14	0.36	12969	10890	2079
615	36900	0.13	0.33	12215	11070	1145
625	37500	0.13	0.33	12413	11250	1163
635	38100	0.12	0.30	11611	11430	181
645	38700	0.12	0.30	11793	11610	183
655	39300	0.11	0.28	10944	11790	-846
665	39900	0.11	0.28	11111	11970	-859
675	40500	0.10	0.25	10215	12150	-1935
685	41100	0.10	0.25	10366	12330	-1964
695	41700	0.09	0.23	9423	12510	-3087
705	42300	0.09	0.23	9558	12690	-3132
715	42900	0.08	0.20	8569	12870	-4301
725	43500	0.08	0.20	8688	13050	-4362
735	44100	0.07	0.17	7651	13230	-5579
745	44700	0.07	0.17	7755	13410	-5655

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,093	cu ft
Provided Treatment Volume - Min.	2,372	cu ft
STORAGE REQ. - 50 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	8,188	cu ft
Provided Pond Storage Volume to Inlet - Min.	12,784	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**13,984**	**cu ft**

4.c. SESM - 1604
BOWSTRING

PEAK FLOW CALCULATION PROJECT: 3130

100-Year Design Storm **Lennar - 21st Avenue**

BASIN: C

Tot. Area	200,850	SF	4.61	Acres
Imp. Area	62,518	SF	C=	0.9
Perv. Area	138,332	SF	C=	0.15
Wt. C =	0.38	PGIS Area =		52,118

WCE Applicable Travel Time Ground Cover Coefficients			
Per Table 5-6 SRSM			
Type of Cover		K (ft/min)	
Short Pasture		420	
Nearly Bare Ground		600	
Small Roadside Ditch/ Grass		900	
Paved Area (use for parking lots)		1200	
Gutter - 4 inches deep		1500	
Gutter - 6 inches deep		2400	
Pipe - 12-inch PVC/DI		3000	
Pipe - 15/18-inch PVC/DI		3900	
Pipe - 24-inch PVC/DI		4700	

Reaches		
Reach 1	Offsite	also applicable for Pre-Developed Tc
Length	170.00	
K	1200.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	1.00	Minutes
Reach 2	Finished Lot from House to Street	
Length	85.00	
K	2400.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	0.25	Minutes
Reach 3	Gutter Flow to Inlet/Catch Basin	
Length	150.00	
K	3000.00	
Slope (ft/ft)	0.0600	be sure this is decimal equivalent slope 0.0000
Travel Time	0.20	Minutes
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)
Length	600.00	
K	3900.00	12-inch Pipe minimum
Slope (ft/ft)	0.0600	Average Slope for total pipe run
Travel Time	0.63	Minutes
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia
Length	0.00	
K	4700.00	15/18-inch Pipe
Slope (ft/ft)	0.0050	Average Slope for total pipe run
Travel Time	0.00	Minutes
Sum of Tc	2.08	Minutes
Tc for Analysis	5.00	Minutes

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: C

DESIGNER: BNG

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	5.00
Outflow (cfs)	0.3000
Design Year Flow	50
Area (acres)	4.61
Impervious Area (sq ft)	62518
'C' Factor	0.38
Area * C	1.768
PGIS Area	52,118

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel. (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
5.00	300	4.38	7.74	3113	90	3023	
15	900	2.16	3.82	3829	270	3559	
25	1500	1.56	2.75	4408	450	3958	
35	2100	1.25	2.22	4880	630	4250	
45	2700	1.07	1.89	5283	810	4473	
55	3300	0.94	1.66	5638	990	4648	
65	3900	0.84	1.49	5957	1170	4787	
75	4500	0.77	1.36	6248	1350	4898	
85	5100	0.71	1.25	6516	1530	4986	
95	5700	0.66	1.17	6766	1710	5056	
105	6300	0.62	1.09	7001	1890	5111	
115	6900	0.58	1.03	7222	2070	5152	
125	7500	0.55	0.98	7431	2250	5181	
135	8100	0.53	0.93	7631	2430	5201	
145	8700	0.50	0.89	7821	2610	5211	
155	9300	0.48	0.85	8004	2790	5214	<==
165	9900	0.46	0.82	8179	2970	5209	
175	10500	0.45	0.79	8348	3150	5198	
185	11100	0.43	0.76	8511	3330	5181	
195	11700	0.42	0.73	8668	3510	5158	
205	12300	0.40	0.71	8820	3690	5130	
215	12900	0.39	0.69	8968	3870	5098	
225	13500	0.38	0.67	9112	4050	5062	
235	14100	0.37	0.65	9251	4230	5021	
245	14700	0.36	0.63	9387	4410	4977	
255	15300	0.35	0.62	9520	4590	4930	
265	15900	0.34	0.60	9649	4770	4879	
275	16500	0.33	0.59	9775	4950	4825	
285	17100	0.33	0.58	9899	5130	4769	
295	17700	0.32	0.56	10019	5310	4709	
305	18300	0.31	0.55	10137	5490	4647	
315	18900	0.31	0.54	10253	5670	4583	
325	19500	0.30	0.53	10366	5850	4516	
335	20100	0.29	0.52	10477	6030	4447	
345	20700	0.29	0.51	10586	6210	4376	
355	21300	0.28	0.50	10721	6390	4331	
365	21900	0.28	0.49	10808	6570	4238	
375	22500	0.27	0.48	10923	6750	4173	
385	23100	0.27	0.48	11213	6930	4283	

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{100} = 12.33

N_{100} = 0.643

Flow (weighted c)

Qwc= 7.74 cfs

Flow (time of concentration)

Qtc= 7.74 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
385							
395	23700	0.26	0.47	11082	7110	3972	
405	24300	0.26	0.47	11361	7290	4071	
415	24900	0.25	0.45	11198	7470	3728	
425	25500	0.25	0.45	11467	7650	3817	
435	26100	0.24	0.43	11273	7830	3443	
445	26700	0.24	0.43	11531	8010	3521	
455	27300	0.23	0.41	11304	8190	3114	
465	27900	0.23	0.41	11552	8370	3182	
475	28500	0.22	0.39	11294	8550	2744	
485	29100	0.22	0.39	11531	8730	2801	
495	29700	0.21	0.38	11241	8910	2331	
505	30300	0.21	0.38	11467	9090	2377	
515	30900	0.20	0.36	11145	9270	1875	
525	31500	0.20	0.36	11361	9450	1911	
535	32100	0.19	0.34	11007	9630	1377	
545	32700	0.19	0.34	11212	9810	1402	
555	33300	0.18	0.32	10827	9990	837	
565	33900	0.18	0.32	11021	10170	851	
575	34500	0.17	0.31	10604	10350	254	
585	35100	0.17	0.31	10788	10530	258	
595	35700	0.16	0.29	10339	10710	-371	
605	36300	0.16	0.29	10512	10890	-378	
615	36900	0.15	0.27	10031	11070	-1039	
625	37500	0.15	0.27	10194	11250	-1056	
635	38100	0.14	0.25	9681	11430	-1749	
645	38700	0.14	0.25	9833	11610	-1777	
655	39300	0.13	0.24	9288	11790	-2502	
665	39900	0.13	0.24	9430	11970	-2540	
675	40500	0.12	0.22	8854	12150	-3296	
685	41100	0.12	0.22	8984	12330	-3346	
695	41700	0.11	0.20	8376	12510	-4134	
705	42300	0.11	0.20	8496	12690	-4194	
715	42900	0.10	0.18	7856	12870	-5014	
725	43500	0.10	0.18	7966	13050	-5084	
735	44100	0.09	0.17	7294	13230	-5936	
745	44700	0.09	0.17	7393	13410	-6017	

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,172	cu ft
Provided Treatment Volume - Min.	2,172	cu ft
STORAGE REQ. - 100 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	5,214	cu ft
Provided Pond Storage Volume to Inlet - Min.	13,157	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**14,357**	**cu ft**

PEAK FLOW CALCULATION PROJECT: 3130

100-Year Design Storm **Lennar - 21st Avenue**

BASIN: A & B

Tot. Area	457,165	SF	10.50	Acres
Imp. Area	60,326	SF	C=	0.9
Perv. Area	396,839	SF	C=	0.15
Wt. C =	0.25	PGIS Area =		50,236

WCE Applicable Travel Time Ground Cover Coefficients		
Per Table 5-6 SRSM		
Type of Cover	K (ft/min)	
Short Pasture	420	
Nearly Bare Ground	600	
Small Roadside Ditch/ Grass	900	
Paved Area (use for parking lots)	1200	
Gutter - 4 inches deep	1500	
Gutter - 6 inches deep	2400	
Pipe - 12-inch PVC/DI	3000	
Pipe - 15/18-inch PVC/DI	3900	
Pipe - 24-inch PVC/DI	4700	

Reaches		
Reach 1	Offsite	also applicable for Pre-Developed Tc
Length	250.00	
K	420.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	4.21	Minutes
Reach 2	Finished Lot from House to Street	
Length	85.00	
K	420.00	
Slope (ft/ft)	0.0200	be sure this is decimal equivalent slope 0.0000
Travel Time	1.43	Minutes
Reach 3	Gutter Flow to Inlet/Catch Basin	
Length	300.00	
K	2400.00	
Slope (ft/ft)	0.0300	be sure this is decimal equivalent slope 0.0000
Travel Time	0.72	Minutes
Reach 4	Pipe Flow	Pipe Reach One (only need one if no Dia change)
Length	650.00	
K	3000.00	12-inch Pipe minimum
Slope (ft/ft)	0.0500	Average Slope for total pipe run
Travel Time	0.97	Minutes
Reach 5	Pipe Flow	Add additional pipe reacheds for other Dia
Length	0.00	
K	3900.00	15/18-inch Pipe
Slope (ft/ft)	0.0050	Average Slope for total pipe run
Travel Time	0.00	Minutes
Sum of Tc	7.33	Minutes
Tc for Analysis	7.33	Minutes

BOWSTRING METHOD PROJECT: 0

DETENTION BASIN DESIGN BASIN: A & B

DESIGNER: BNG

DATE: 22-Feb-22

Time Increment (min)	10
Time of Conc. (min)	7.33
Outflow (cfs)	0.3000
Design Year Flow	50
Area (acres)	10.50
Impervious Area (sq ft)	60326
'C' Factor	0.25
Area * C	2.613
PGIS Area	50,236

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel. (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)	
7.33	440	3.43	8.95	5275	132	5143	
15	900	2.16	5.65	5927	270	5657	
25	1500	1.56	4.07	6708	450	6258	
35	2100	1.25	3.28	7368	630	6738	
45	2700	1.07	2.79	7941	810	7131	
55	3300	0.94	2.45	8449	990	7459	
65	3900	0.84	2.20	8908	1170	7738	
75	4500	0.77	2.01	9329	1350	7979	
85	5100	0.71	1.85	9718	1530	8188	
95	5700	0.66	1.72	10082	1710	8372	
105	6300	0.62	1.62	10423	1890	8533	
115	6900	0.58	1.52	10745	2070	8675	
125	7500	0.55	1.44	11051	2250	8801	
135	8100	0.53	1.37	11343	2430	8913	
145	8700	0.50	1.31	11621	2610	9011	
155	9300	0.48	1.26	11888	2790	9098	
165	9900	0.46	1.21	12145	2970	9175	
175	10500	0.45	1.16	12392	3150	9242	
185	11100	0.43	1.12	12631	3330	9301	
195	11700	0.42	1.09	12862	3510	9352	
205	12300	0.40	1.05	13085	3690	9395	
215	12900	0.39	1.02	13302	3870	9432	
225	13500	0.38	0.99	13513	4050	9463	
235	14100	0.37	0.96	13718	4230	9488	
245	14700	0.36	0.94	13918	4410	9508	
255	15300	0.35	0.91	14112	4590	9522	
265	15900	0.34	0.89	14302	4770	9532	
275	16500	0.33	0.87	14488	4950	9538	
285	17100	0.33	0.85	14669	5130	9539	
295	17700	0.32	0.83	14846	5310	9536	
305	18300	0.31	0.81	15020	5490	9530	
315	18900	0.31	0.80	15190	5670	9520	
325	19500	0.30	0.78	15357	5850	9507	
335	20100	0.29	0.77	15520	6030	9490	
345	20700	0.29	0.75	15681	6210	9471	
355	21300	0.28	0.74	15880	6390	9490	
365	21900	0.28	0.73	16007	6570	9437	
375	22500	0.27	0.71	16176	6750	9426	
385	23100	0.27	0.71	16605	6930	9675	<==

Rainfall Intensity Coefficients for ***Spokane***

taken from Table 5-7 SRSM

M_{100} = 12.33

N_{100} = 0.643

Flow (weighted c)

Qwc= 11.45 cfs

Flow (time of concentration)

Qtc= 8.95 cfs

Time (min)	Time Inc. (sec)	Intens. (in/hr)	Q Devel (cfs)	Vol.In (cu ft)	Vol.Out (cu ft)	Storage (cu ft)
385						
395	23700	0.26	0.69	16410	7110	9300
405	24300	0.26	0.69	16823	7290	9533
415	24900	0.25	0.66	16581	7470	9111
425	25500	0.25	0.66	16978	7650	9328
435	26100	0.24	0.64	16690	7830	8860
445	26700	0.24	0.64	17071	8010	9061
455	27300	0.23	0.61	16735	8190	8545
465	27900	0.23	0.61	17101	8370	8731
475	28500	0.22	0.58	16718	8550	8168
485	29100	0.22	0.58	17069	8730	8339
495	29700	0.21	0.56	16639	8910	7729
505	30300	0.21	0.56	16973	9090	7883
515	30900	0.20	0.53	16496	9270	7226
525	31500	0.20	0.53	16815	9450	7365
535	32100	0.19	0.51	16291	9630	6661
545	32700	0.19	0.51	16594	9810	6784
555	33300	0.18	0.48	16023	9990	6033
565	33900	0.18	0.48	16311	10170	6141
575	34500	0.17	0.45	15693	10350	5343
585	35100	0.17	0.45	15965	10530	5435
595	35700	0.16	0.43	15300	10710	4590
605	36300	0.16	0.43	15556	10890	4666
615	36900	0.15	0.40	14844	11070	3774
625	37500	0.15	0.40	15084	11250	3834
635	38100	0.14	0.37	14325	11430	2895
645	38700	0.14	0.37	14550	11610	2940
655	39300	0.13	0.35	13744	11790	1954
665	39900	0.13	0.35	13953	11970	1983
675	40500	0.12	0.32	13100	12150	950
685	41100	0.12	0.32	13293	12330	963
695	41700	0.11	0.30	12393	12510	-117
705	42300	0.11	0.30	12571	12690	-119
715	42900	0.10	0.27	11623	12870	-1247
725	43500	0.10	0.27	11785	13050	-1265
735	44100	0.09	0.24	10791	13230	-2439
745	44700	0.09	0.24	10937	13410	-2473

"1815A" TREATMENT REQUIREMENTS		
Minimum "1815A" Volume Required	2,093	cu ft
Provided Treatment Volume - Min.	2,372	cu ft
STORAGE REQ. - 100 YEAR DESIGN STORM		
Maximum Storage Required by Bowstring	9,675	cu ft
Provided Pond Storage Volume to Inlet - Min.	12,784	cu ft
Provided Drywell/Gallery Storage Volume	1,200	cu ft
Total Provided Volume	**13,984**	**cu ft**

5.2.
EVAP w/o INFIL

OVERALL POND A - W/O INFILTRATION

Notes: User to fill in the shaded areas
Spokane County Water Budget Calculation Sheet

Project:	**Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No.	**2021-3130 and 3109**
Basin:	**Pond Sizing / Adequacy Calculations**
Date:	**31-Jan-22**
Reviewer:	**TRW**

Basin Data		
Total Basin Area (acres) =	**47.00**	acres
Developed Conditions:		
Pervious Area (acres) =	**33.43**	acres
Impervious Area (acres) =	13.57	acres

Precipitation
Adjustment Factor = **17** /16.18 = 1.051

	Curve Numbers (CN) AMC II Apr - Oct	AMC III Nov, Mar	Winter Dec - Feb
Pre-Developed Conditions	**70.0**	**91.0**	95.0
Post-Developed Conditions			
Pervious Area	**85.0**	**95.0**	95.0
Impervious Area	98.0	98.0	98.0

100 - YEAR STORM CALCULATION FOR PRE-EVENT	
100 YEAR RAINFALL	**2.80**
PERVIOUS S	1.76
PERVIOUS I	0.35
PERVIOUS Q (IN)	**1.42**
100 YEAR RAINFALL	**2.80**
IMPERVIOUS S	0.20
IMPERVIOUS I	0.04
IMPERVOUS Q (IN)	**2.57**

	Precipitation (inches)	Adjusted Precipitation (inches)	Pre-Developed Conditions CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, Pervious Area CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, Impervious Area CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, SUMMARY MONTHLY TOTAL RUNOFF	(cubic ft.)	MONTHLY TOTAL INCREASE	(cubic ft.)
Jan.	**2.05**	2.15	95.0	0.53	1.63	277,965	95.0	0.53	1.63	197,729	98.0	0.20	1.93	94,860	292,589		14,624	
Feb.	**1.57**	1.65	95.0	0.53	1.15	196,425	95.0	0.53	1.15	139,726	98.0	0.20	1.43	70,280	210,005		13,581	
Mar.	**1.38**	1.45	91.0	0.99	0.70	119,306	95.0	0.53	0.97	117,239	98.0	0.20	1.23	60,592	177,832		58,526	
Apr.	**1.11**	1.17	70.0	4.29	0.02	3,546	85.0	1.76	0.26	31,127	98.0	0.20	0.95	46,899	78,026		74,479	
May	**1.37**	1.44	70.0	4.29	0.07	11,878	85.0	1.76	0.41	50,227	98.0	0.20	1.22	60,084	110,310		98,432	
June	**1.27**	1.33	70.0	4.29	0.05	8,154	85.0	1.76	0.35	42,550	98.0	0.20	1.12	55,001	97,551		89,397	
July	**0.50**	0.53	70.0	4.29	0.00	0	85.0	1.76	0.02	1,861	98.0	0.20	0.34	16,783	18,644		18,644	
Aug.	**0.60**	0.63	70.0	4.29	0.00	0	85.0	1.76	0.04	4,573	98.0	0.20	0.44	21,561	26,135		26,135	
Sept.	**0.80**	0.84	70.0	4.29	0.00	0	85.0	1.76	0.11	12,806	98.0	0.20	0.64	31,365	44,171		44,171	
Oct.	**1.22**	1.28	70.0	4.29	0.04	6,530	85.0	1.76	0.32	38,860	98.0	0.20	1.07	52,465	91,325		84,795	
Nov.	**2.02**	2.12	91.0	0.99	1.27	216,806	95.0	0.53	1.60	194,067	98.0	0.20	1.90	93,321	287,388		70,582	
Dec.	**2.22**	2.33	95.0	0.53	1.80	307,236	95.0	0.53	1.80	218,551	98.0	0.20	2.10	103,590	322,141		14,905	
					6.73													
Annual Total =	**16.11**	**16.93**				**1,147,847 c.f.**				**1,049,317 c.f.**				**706,800**	**1,756,117**		**608,270**	

Increase in Runoff Volume/year = [(Post Impervious) + (Post Pervious)] - PreDeveloped

Increase in Runoff Volume/year = **608,270** **cubic ft.** Mean Annual Increase in Runoff Volume

CN = Curve Number
S = 1000/CN-10
I = 0.2S
Q = ((P-I)^2)/((P-I)+S)

Q = Runoff (in)
P = Rainfall (in)
S = Potential Maximum Retention after Runoff
I = Initial Abstraction

N/A

Project:	**Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No.	**2021-3130 and 3109**
Basin:	**Pond Sizing / Adequacy Calculations**
Date:	**31-Jan-22**
Reviewer:	**TRW**

Design Infiltration Rate (Evap. Pond) =	**0.00E+00**	cfs/sf of Pond Bottom				
Available Bottom Area (Evap. Pond) =	**187,308**	sq. ft.				
Outlet Weir Elevation (Evap. Pond) =	**3.20**	ft				
Design Infiltration Rate (Infil. Pond) =	**0.00E+00**	cfs/sf of Pond Bottom				
Available Bottom Area (Infil. Pond) =	**187,308**	sq. ft.				
Surf. Area =	187957.7	s.f. @ 3" depth	0.25	Pond Volume	46989.4	CF @ 3" depth
Surf. Area =	188608.6	s.f. @ 6" depth	0.5	Pond Volume	94304.3	CF @ 6" depth
Surf. Area =	189913.7	s.f. @ 1' depth	1	Pond Volume	189913.7	CF @ 1' depth
Surf. Area =	192537.5	s.f. @ 2' depth	2	Pond Volume	385075.0	CF @ 2' depth
Surf. Area =	195179.2	s.f. @ 3' depth	3	Pond Volume	585537.7	CF @ 3' depth

MONTH	INITIAL STORM EVENT (CF) (INFIL FACTOR)	TOTAL RUNOFF (CF)	ALLOWABLE RUNOFF OFFSITE (CF)	RUNOFF TO POND VOLUME (CF)	END OF MONTH RUNOFF VOLUME (CF)	POND BOTTOM INFILT. VOLUME (CF)	POND VOLUME BEFORE EVAP (CF)	POND SURFACE ELEVATION BEFORE EVAP	INITIAL POND SURFACE AREA	PAN EVAP (IN)	ADJ EVAP (IN)	EVAP VOLUME (CF)	FINAL POND VOLUME (CF)	FINAL POND ELEVATION
INITIAL ELEV	**2236**													
PRE EVENT	November storm	287,387.66	216,806.05	70,581.62										
DECEMBER	0.20	322,140.79	307,236.14	14,904.65	85,486.26	0.00	85,486.26	2236.4	188,348.14	0.51	0.37	5,763	79,722.81	2236.4
JANUARY	0.40	292,589.27	277,964.82	14,624.45	94,347.26	0.00	94,347.26	2236.5	188,608.62	0.61	0.44	6,903	87,444.18	2236.4
FEBRUARY	0.60	210,005.41	196,424.67	13,580.74	101,024.92	0.00	101,024.92	2236.5	188,608.62	1.11	0.80	12,561	88,463.58	2236.4
MARCH	0.80	177,831.89	119,306.30	58,525.58	146,989.17	0.00	146,989.17	2236.7	189,130.13	2.28	1.64	25,873	121,116.17	2236.6
APRIL	1.00	78,025.73	3,546.44	74,479.29	195,595.46	0.00	195,595.46	2237	189,913.75	4.45	3.20	50,707	144,888.49	2236.7
MAY	1.00	110,310.32	11,878.36	98,431.96	243,320.45	0.00	243,320.45	2237.2	190,437.05	6.69	4.82	76,441	166,879.01	2236.8
JUNE	1.00	97,551.24	8,154.44	89,396.79	256,275.81	0.00	256,275.81	2237.3	190,698.98	8.14	5.86	93,137	163,138.42	2236.8
JULY	1.00	18,644.36	0.00	18,644.36	181,782.78	0.00	181,782.78	2236.9	189,652.36	10.70	7.70	121,757	60,025.96	2236.3
AUGUST	1.00	26,134.53	0.00	26,134.53	86,160.49	0.00	86,160.49	2236.4	188,348.14	9.42	6.78	106,454	0.00	2236
SEPTEMBER	1.00	44,170.91	0.00	44,170.91	44,170.91	0.00	44,170.91	2236.2	187,827.71	5.90	4.25	66,491	0.00	2236
OCTOBER	1.00	91,324.90	6,529.95	84,794.95	84,794.95	0.00	84,794.95	2236.4	188,348.14	2.58	1.86	29,156	55,638.66	2236.2
NOVEMBER	0.60	287,387.66	216,806.05	70,581.62	126,220.28	0.00	126,220.28	2236.6	188,869.29	0.92	0.66	10,426	115,794.69	2236.6
DECEMBER	0.20	322,140.79	307,236.14	14,904.65	130,699.34	0.00	130,699.34	2236.6	188,869.29	0.51	0.37	5,779	124,919.94	2236.6
JANUARY	0.40	292,589.27	277,964.82	14,624.45	139,544.39	0.00	139,544.39	2236.7	189,130.13	0.61	0.44	6,922	132,622.22	2236.7
FEBRUARY	0.60	210,005.41	196,424.67	13,580.74	146,202.96	0.00	146,202.96	2236.7	189,130.13	1.11	0.80	12,596	133,606.89	2236.7
MARCH	0.80	177,831.89	119,306.30	58,525.58	192,132.48	0.00	192,132.48	2237	189,913.75	2.28	1.64	25,980	166,152.28	2236.8
APRIL	1.00	78,025.73	3,546.44	74,479.29	240,631.57	0.00	240,631.57	2237.2	190,437.05	4.45	3.20	50,847	189,784.88	2236.9
MAY	1.00	110,310.32	11,878.36	98,431.96	288,216.83	0.00	288,216.83	2237.5	191,223.37	6.69	4.82	76,757	211,459.77	2237.1
JUNE	1.00	97,551.24	8,154.44	89,396.79	300,856.57	0.00	300,856.57	2237.5	191,223.37	8.14	5.86	93,393	207,463.07	2237
JULY	1.00	18,644.36	0.00	18,644.36	226,107.43	0.00	226,107.43	2237.1	190,175.31	10.70	7.70	122,093	104,014.88	2236.5
AUGUST	1.00	26,134.53	0.00	26,134.53	130,149.41	0.00	130,149.41	2236.6	188,869.29	9.42	6.78	106,749	23,400.49	2236.1
SEPTEMBER	1.00	44,170.91	0.00	44,170.91	67,571.40	0.00	67,571.40	2236.3	188,087.83	5.90	4.25	66,583	988.30	2236
OCTOBER	1.00	91,324.90	6,529.95	84,794.95	85,783.26	0.00	85,783.26	2236.4	188,348.14	2.58	1.86	29,156	56,626.96	2236.3
NOVEMBER	0.60	287,387.66	216,806.05	70,581.62	127,208.58	0.00	127,208.58	2236.6	188,869.29	0.92	0.66	10,426	116,782.99	2236.6
TOTALS	**November storm**	**3,512,234.00**	**2,295,694.36**	**1,216,539.64**	**3,721,272.93**	**0.00**	**3,721,272.93**		**4,543,067.88**	**106.62**	**76.77**	**1,212,952.24**	**2,550,934.67**	

Note: Assumes and infiltration rate shown in cfs/sf of pond bottom area for 24 hrs after the event for 3 events per month. This is not a 24/7/365 calculation

Note: Assumes a November 100 year storm event prior to beginning Yearly Rainfall Events - Assumes that the pond is empty prior to the initial 100 year storm event

Annual Evaporation Volume (cf/yr): 606,476.12

RUNOFF = RAINFALL X AREA X FACTORS
POND VOLUME = RUNOFF - ALLOWABLE DISCHARGE
POND ELEVATIONS = POND VOLUME - EVAPORATION - INFILTRATION

Project:	Project: **Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No.	Job No. **2021-3130 and 3109**
Basin:	Basin: **Pond Sizing / Adequacy Calculations**
Date:	Date: **31-Jan-22**
Reviewer:	Reviewer: **TRW**

MONTH	INITIAL STORM EVENT (CF) (INFIL. FACTOR)	OUTFLOW FROM INFIL. POND (CF/MONTH)
JANUARY	0.40	0
FEBUARY	0.60	0
MARCH	0.80	0
APRIL	1.00	0
MAY	1.00	0
JUNE	1.00	0
JULY	1.00	0
AUGUST	1.00	0
SEPTEMBER	1.00	0
OCTOBER	1.00	0
NOVEMBER	0.60	0
DECEMBER	0.20	0
TOTAL		**0**

Volume infiltrated per year = **0** **cubic ft.** Mean Annual Maximum Infiltration

Note: Assumes a November 100 year storm event prior to beginning Yearly Rainfall Events - Assumes that the pond is empty prior to the initial 100 year storm event

5.b.
EVAP w/ INFIL

OVERALL POND A - W/ INFILTRATION

Notes: User to fill in the shaded areas
Spokane County Water Budget Calculation Sheet

Project:	**Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No.	**2021-3130 and 3109 w/ Pond Bottom Infiltration**
Basin:	**Pond Sizing / Adequacy Calculations**
Date:	**31-Jan-22**
Reviewer:	**TRW**

Basin Data

Total Basin Area (acres) =	**47.00**	acres
Developed Conditions:		
Pervious Area (acres) =	**33.43**	acres
Impervious Area (acres) =	13.57	acres

Precipitation Adjustment Factor = **17** /16.18 = 1.051

	Curve Numbers (CN) AMC II Apr - Oct	AMC III Nov, Mar	Winter Dec - Feb
Pre-Developed Conditions	**70.0**	**91.0**	95.0
Post-Developed Conditions			
Pervious Area	**85.0**	**95.0**	95.0
Impervious Area	98.0	98.0	98.0

100 - YEAR STORM CALCULATION FOR PRE-EVENT	
100 YEAR RAINFALL	**2.80**
PERVIOUS S	1.76
PERVIOUS I	0.35
PERVIOUS Q (IN)	**1.42**
100 YEAR RAINFALL	**2.80**
IMPERVIOUS S	0.20
IMPERVIOUS I	0.04
IMPERVOUS Q (IN)	**2.57**

Month	Precipitation (inches)	Adjusted Precipitation (inches)	Pre-Developed Conditions CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, Pervious Area CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, Impervious Area CN	S	Runoff (inches)	Runoff (cubic ft.)	Post-Developed, SUMMARY MONTHLY TOTAL RUNOFF	(cubic ft.)	MONTHLY TOTAL INCREASE (cubic ft.)	
Jan.	**2.05**	2.15	95.0	0.53	1.63	277,965	95.0	0.53	1.63	197,729	98.0	0.20	1.93	94,860	292,589		14,624	
Feb.	**1.57**	1.65	95.0	0.53	1.15	196,425	95.0	0.53	1.15	139,726	98.0	0.20	1.43	70,280	210,005		13,581	
Mar.	**1.38**	1.45	91.0	0.99	0.70	119,306	95.0	0.53	0.97	117,239	98.0	0.20	1.23	60,592	177,832		58,526	
Apr.	**1.11**	1.17	70.0	4.29	0.02	3,546	85.0	1.76	0.26	31,127	98.0	0.20	0.95	46,899	78,026		74,479	
May	**1.37**	1.44	70.0	4.29	0.07	11,878	85.0	1.76	0.41	50,227	98.0	0.20	1.22	60,084	110,310		98,432	
June	**1.27**	1.33	70.0	4.29	0.05	8,154	85.0	1.76	0.35	42,550	98.0	0.20	1.12	55,001	97,551		89,397	
July	**0.50**	0.53	70.0	4.29	0.00	0	85.0	1.76	0.02	1,861	98.0	0.20	0.34	16,783	18,644		18,644	
Aug.	**0.60**	0.63	70.0	4.29	0.00	0	85.0	1.76	0.04	4,573	98.0	0.20	0.44	21,561	26,135		26,135	
Sept.	**0.80**	0.84	70.0	4.29	0.00	0	85.0	1.76	0.11	12,806	98.0	0.20	0.64	31,365	44,171		44,171	
Oct.	**1.22**	1.28	70.0	4.29	0.04	6,530	85.0	1.76	0.32	38,860	98.0	0.20	1.07	52,465	91,325		84,795	
Nov.	**2.02**	2.12	91.0	0.99	1.27	216,806	95.0	0.53	1.60	194,067	98.0	0.20	1.90	93,321	287,388		70,582	
Dec.	**2.22**	2.33	95.0	0.53	1.80	307,236	95.0	0.53	1.80	218,551	98.0	0.20	2.10	103,590	322,141		14,905	
					6.73													
Annual Total =	**16.11**	**16.93**				**1,147,847 c.f.**				**1,049,317 c.f.**				**706,800**	**1,756,117**		**608,270**	

Increase in Runoff Volume/year = [(Post Impervious) + (Post Pervious)] - PreDeveloped

Increase in Runoff Volume/year = **608,270** **cubic ft.** Mean Annual Increase in Runoff Volume

CN = Curve Number
S = 1000/CN-10
I = 0.2S
Q = ((P-I)^2)/((P-I)+S)

Q = Runoff (in)
P = Rainfall (in)
S = Potential Maximum Retention after Runoff
I = Initial Abstraction

w/

Project: **Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No. **2021-3130 and 3109 w/ Pond Bottom Infiltration**
Basin: **Pond Sizing / Adequacy Calculations**
Date: **31-Jan-22**
Reviewer: **TRW**

Design Infiltration Rate (Evap. Pond) =	**1.70E-07**	cfs/sf of Pond Bottom					
Available Bottom Area (Evap. Pond) =	**187,308**	sq. ft.					
Outlet Weir Elevation (Evap. Pond) =	**3.20**	ft					
Design Infiltration Rate (Infil. Pond) =	**1.70E-07**	cfs/sf of Pond Bottom					
Available Bottom Area (Infil. Pond) =	**187,308**	sq. ft.					
Surf. Area =	187957.7	s.f. @ 3" depth	0.25	Pond Volume	46989.4	CF @ 3" depth	
Surf. Area =	188608.6	s.f. @ 6" depth	0.5	Pond Volume	94304.3	CF @ 6" depth	
Surf. Area =	189913.7	s.f. @ 1' depth	1	Pond Volume	189913.7	CF @ 1' depth	
Surf. Area =	192537.5	s.f. @ 2' depth	2	Pond Volume	385075.0	CF @ 2' depth	
Surf. Area =	195179.2	s.f. @ 3' depth	3	Pond Volume	585537.7	CF @ 3' depth	

MONTH	INITIAL STORM EVENT (CF) (INFIL FACTOR)	TOTAL RUNOFF (CF)	ALLOWABLE RUNOFF OFFSITE (CF)	RUNOFF TO POND VOLUME (CF)	END OF MONTH RUNOFF VOLUME (CF)	POND BOTTOM INFILT. VOLUME (CF)	POND VOLUME BEFORE EVAP (CF)	POND SURFACE ELEVATION BEFORE EVAP	INITIAL POND SURFACE AREA	PAN EVAP (IN)	ADJ EVAP (IN)	EVAP VOLUME (CF)	FINAL POND VOLUME (CF)	FINAL POND ELEVATION
INITIAL ELEV	**2236**													
PRE EVENT	November storm	287,387.66	216,806.05	70,581.62										
DECEMBER	0.20	322,140.79	307,236.14	14,904.65	85,486.26	1,064.97	84,421.29	2236.4	188,348.14	0.51	0.37	5,763	78,657.84	2236.4
JANUARY	0.40	292,589.27	277,964.82	14,624.45	93,282.29	0.00	93,282.29	2236.4	188,348.14	0.61	0.44	6,894	86,388.74	2236.4
FEBRUARY	0.60	210,005.41	196,424.67	13,580.74	99,969.48	3,537.23	96,432.25	2236.5	188,608.62	1.11	0.80	12,561	83,870.91	2236.4
MARCH	0.80	177,831.89	119,306.30	58,525.58	142,396.50	12,779.67	129,616.82	2236.6	188,869.29	2.28	1.64	25,837	103,779.50	2236.5
APRIL	1.00	78,025.73	3,546.44	74,479.29	178,258.80	33,014.16	145,244.64	2236.7	189,130.13	4.45	3.20	50,498	94,746.89	2236.5
MAY	1.00	110,310.32	11,878.36	98,431.96	193,178.85	33,014.16	160,164.69	2236.8	189,391.16	6.69	4.82	76,022	84,143.08	2236.4
JUNE	1.00	97,551.24	8,154.44	89,396.79	173,539.87	33,014.16	140,525.72	2236.7	189,130.13	8.14	5.86	92,371	48,154.56	2236.2
JULY	1.00	18,644.36	0.00	18,644.36	66,798.92	8,253.54	58,545.38	2236.3	188,087.83	10.70	7.70	120,752	0.00	2236
AUGUST	1.00	26,134.53	0.00	26,134.53	26,134.53	8,253.54	17,880.99	2236	187,308.00	9.42	6.78	105,866	0.00	2236
SEPTEMBER	1.00	44,170.91	0.00	44,170.91	44,170.91	8,253.54	35,917.37	2236.1	187,567.76	5.90	4.25	66,399	0.00	2236
OCTOBER	1.00	91,324.90	6,529.95	84,794.95	84,794.95	33,014.16	51,780.79	2236.2	187,827.71	2.58	1.86	29,076	22,705.06	2236.1
NOVEMBER	0.60	287,387.66	216,806.05	70,581.62	93,286.68	19,808.50	73,478.18	2236.3	188,087.83	0.92	0.66	10,382	63,095.74	2236.3
DECEMBER	0.20	322,140.79	307,236.14	14,904.65	78,000.38	1,064.97	76,935.41	2236.4	188,348.14	0.51	0.37	5,763	71,171.96	2236.3
JANUARY	0.40	292,589.27	277,964.82	14,624.45	85,796.41	0.00	85,796.41	2236.4	188,348.14	0.61	0.44	6,894	78,902.86	2236.4
FEBRUARY	0.60	210,005.41	196,424.67	13,580.74	92,483.60	3,537.23	88,946.37	2236.4	188,348.14	1.11	0.80	12,544	76,402.38	2236.4
MARCH	0.80	177,831.89	119,306.30	58,525.58	134,927.97	12,779.67	122,148.29	2236.6	188,869.29	2.28	1.64	25,837	96,310.97	2236.5
APRIL	1.00	78,025.73	3,546.44	74,479.29	170,790.27	33,014.16	137,776.11	2236.7	189,130.13	4.45	3.20	50,498	87,278.36	2236.4
MAY	1.00	110,310.32	11,878.36	98,431.96	185,710.32	33,014.16	152,696.16	2236.8	189,391.16	6.69	4.82	76,022	76,674.55	2236.4
JUNE	1.00	97,551.24	8,154.44	89,396.79	166,071.34	33,014.16	133,057.18	2236.7	189,130.13	8.14	5.86	92,371	40,686.03	2236.2
JULY	1.00	18,644.36	0.00	18,644.36	59,330.38	8,253.54	51,076.84	2236.2	187,827.71	10.70	7.70	120,585	0.00	2236
AUGUST	1.00	26,134.53	0.00	26,134.53	26,134.53	8,253.54	17,880.99	2236	187,308.00	9.42	6.78	105,866	0.00	2236
SEPTEMBER	1.00	44,170.91	0.00	44,170.91	44,170.91	8,253.54	35,917.37	2236.1	187,567.76	5.90	4.25	66,399	0.00	2236
OCTOBER	1.00	91,324.90	6,529.95	84,794.95	84,794.95	33,014.16	51,780.79	2236.2	187,827.71	2.58	1.86	29,076	22,705.06	2236.1
NOVEMBER	0.60	287,387.66	216,806.05	70,581.62	93,286.68	19,808.50	73,478.18	2236.3	188,087.83	0.92	0.66	10,382	63,095.74	2236.3
TOTALS	**November storm**	**3,512,234.00**	**2,295,694.36**	**1,216,539.64**	**2,502,795.77**	**388,015.26**	**2,114,780.52**		**4,520,888.89**	**106.62**	**76.77**	**1,204,660.05**	**1,278,770.25**	

Note: Assumes and infiltration rate shown in cfs/sf of pond bottom area for 24 hrs after the event for 3 events per month. This is not a 24/7/365 calculation
Note: Assumes a November 100 year storm event prior to beginning Yearly Rainfall Events - Assumes that the pond is empty prior to the initial 100 year storm event

Annual Evaporation Volume (cf/yr): 602,330.02

RUNOFF = RAINFALL X AREA X FACTORS
POND VOLUME = RUNOFF - ALLOWABLE DISCHARGE
POND ELEVATIONS = POND VOLUME - EVAPORATION - INFILTRATION

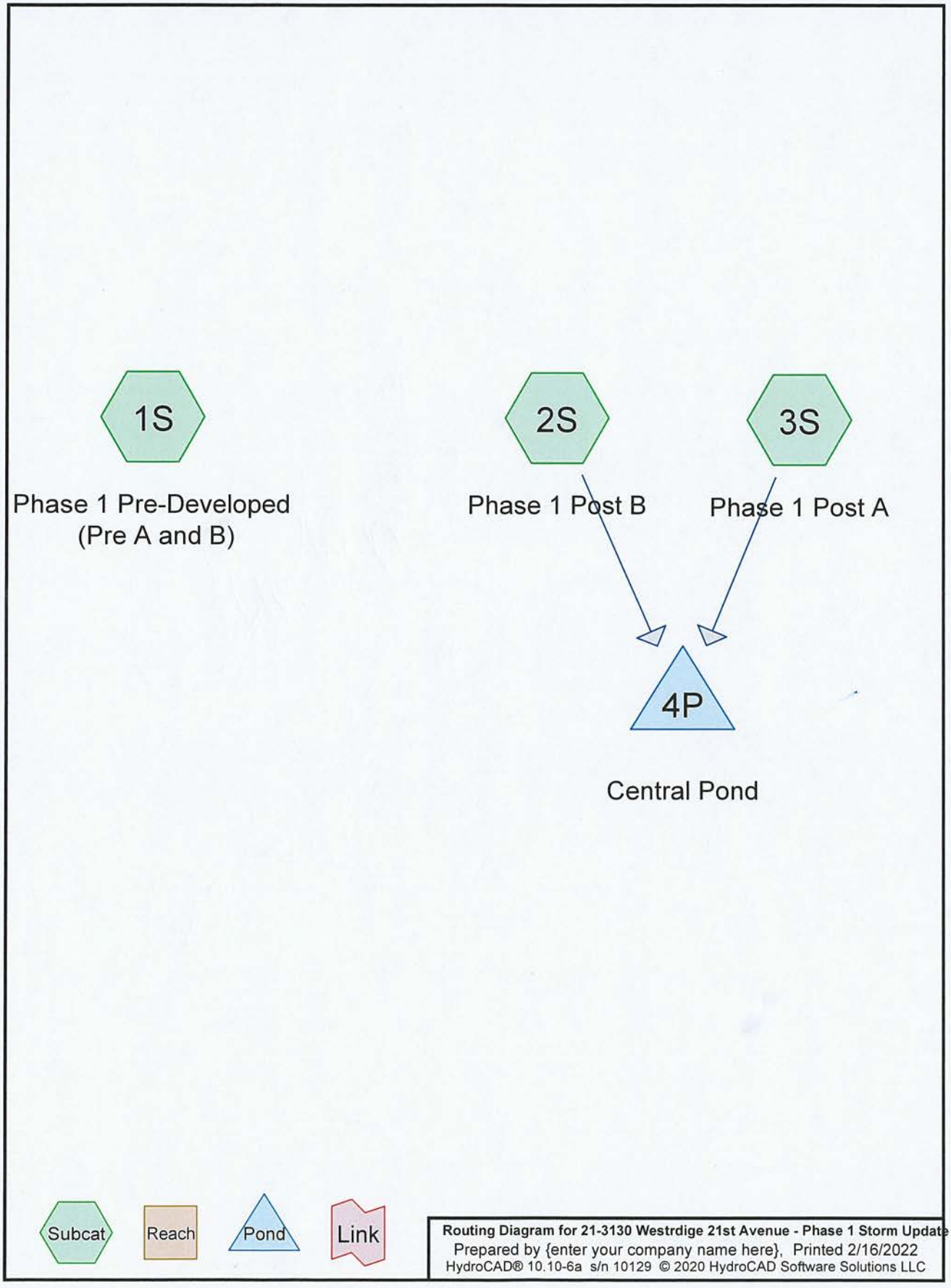
Project:	Project: **Lennar - 21st - Grandview to Westwood and Overall Beard**
Job No.	Job No. **2021-3130 and 3109 w/ Pond Bottom Infiltration**
Basin:	Basin: **Pond Sizing / Adequacy Calculations**
Date:	Date: **31-Jan-22**
Reviewer:	Reviewer: **TRW**

MONTH	INITIAL STORM EVENT (CF) (INFIL. FACTOR)	OUTFLOW FROM INFIL. POND (CF/MONTH)
JANUARY	0.40	7,483
FEBUARY	0.60	11,225
MARCH	0.80	14,966
APRIL	1.00	18,708
MAY	1.00	18,708
JUNE	1.00	18,708
JULY	1.00	18,708
AUGUST	1.00	18,708
SEPTEMBER	1.00	18,708
OCTOBER	1.00	18,708
NOVEMBER	0.60	11,225
DECEMBER	0.20	3,742
TOTAL		**179597**

Volume infiltrated per year = **179,597** **cubic ft.** Mean Annual Maximum Infiltration

Note: Assumes a November 100 year storm event prior to beginning Yearly Rainfall Events - Assumes that the pond is empty prior to the initial 100 year storm event

6. HydroCAD
CALCS


1S
Phase 1 Pre-Developed
(Pre A and B)
2S
Phase 1 Post B
3S
Phase 1 Post A
4P
Central Pond
Subcat
Reach
Pond
Link

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25 year	Type II 24-hr		Default	24.00	1	2.00	2
2	50 year	Type II 24-hr		Default	24.00	1	2.20	2
3	100 year	Type II 24-hr		Default	24.00	1	2.40	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.490	70	1/2 acre lots, 25% imp, HSG B (2S)
29.510	85	1/8 acre lots, 65% imp, HSG B (3S)
47.000	65	Woods/grass comb., Fair, HSG B (1S)
94.000	**72**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	3S	0.00	0.00	1,500.0	0.0300	0.010	0.0	18.0	0.0

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Phase 1 Pre-Developed Runoff Area=47.000 ac 0.00% Impervious Runoff Depth>0.14"
Flow Length=1,300' Tc=468.7 min CN=65 Runoff=0.52 cfs 0.529 af

Subcatchment2S: Phase 1 Post B Runoff Area=17.490 ac 25.00% Impervious Runoff Depth>0.24"
Flow Length=613' Tc=457.6 min CN=70 Runoff=0.37 cfs 0.351 af

Subcatchment3S: Phase 1 Post A Runoff Area=29.510 ac 65.00% Impervious Runoff Depth=0.80"
Flow Length=2,200' Slope=0.0300 '/' Tc=79.2 min CN=85 Runoff=9.75 cfs 1.955 af

Pond 4P: Central Pond Peak Elev=2,236.52' Storage=2.306 af Inflow=9.76 cfs 2.306 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 94.000 ac Runoff Volume = 2.835 af Average Runoff Depth = 0.36"
74.94% Pervious = 70.446 ac 25.06% Impervious = 23.554 ac

Summary for Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)

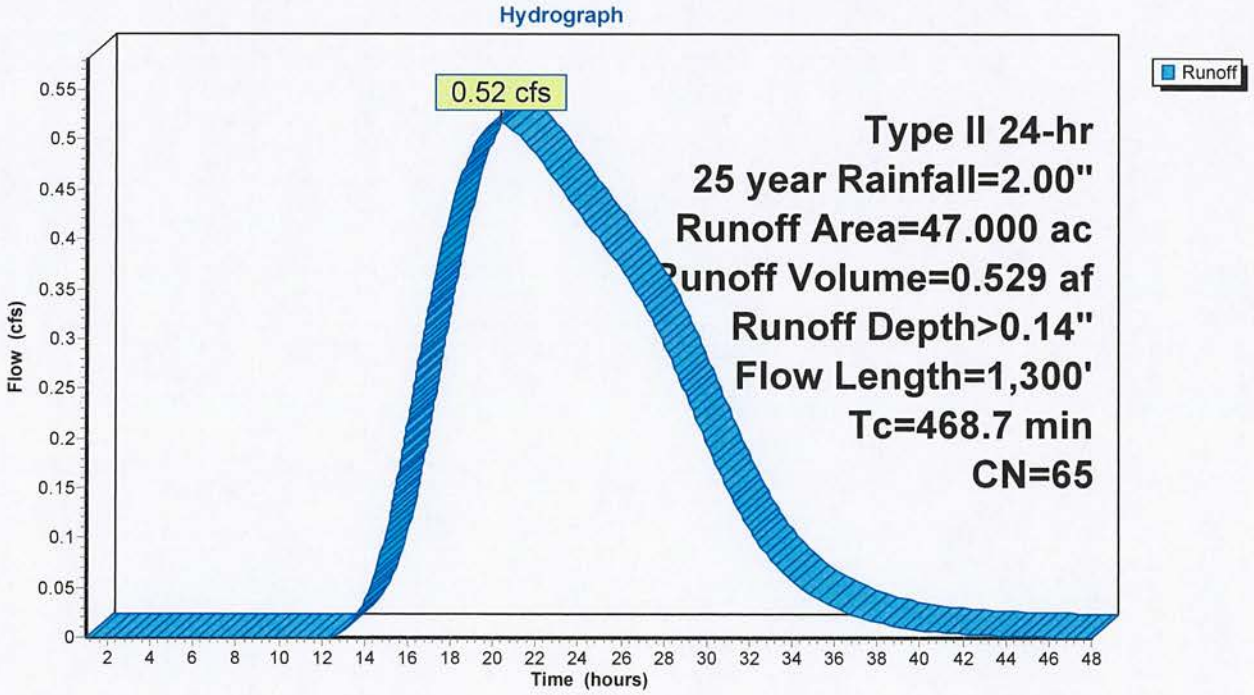
Runoff = 0.52 cfs @ 20.30 hrs, Volume= 0.529 af, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 year Rainfall=2.00"

Area (ac)	CN	Description
47.000	65	Woods/grass comb., Fair, HSG B
47.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
9.3	400	0.0207	0.72		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
3.2	600	0.0050	3.10	310.17	**Channel Flow, Bottom of Pond Area** Area= 100.0 sf Perim= 120.0' r= 0.83' n= 0.030 Earth, grassed & winding
468.7	1,300	Total			

Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)



Summary for Subcatchment 2S: Phase 1 Post B

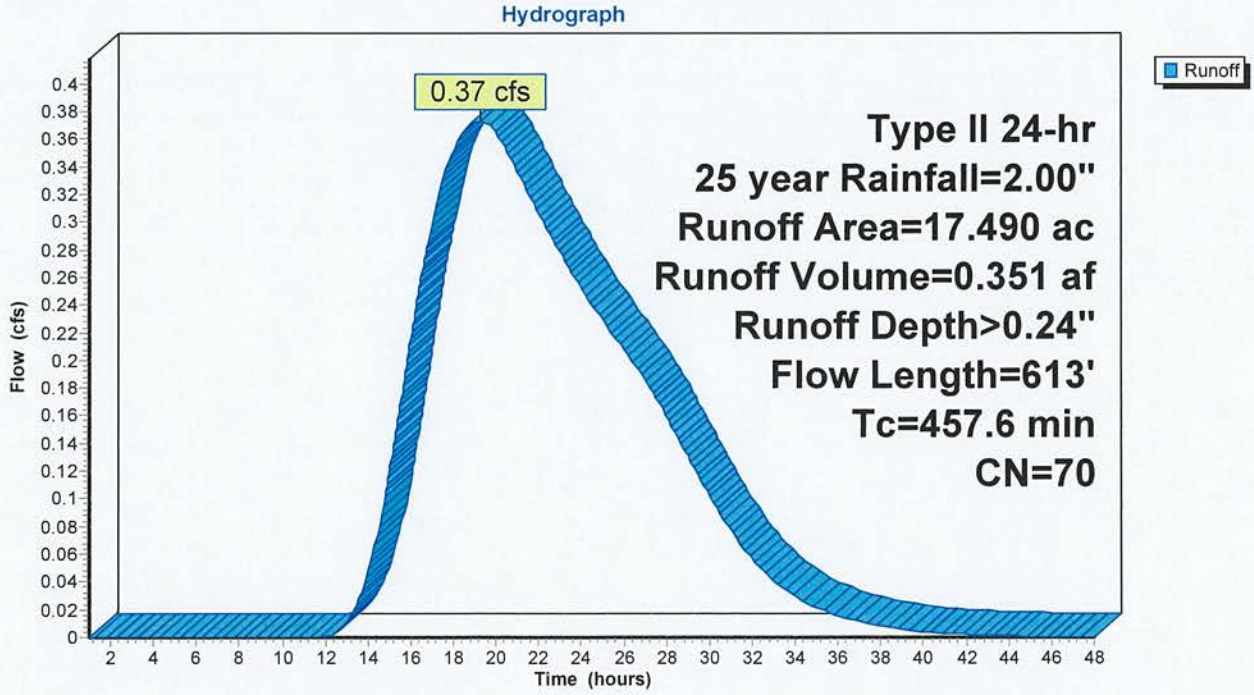
Runoff = 0.37 cfs @ 19.30 hrs, Volume= 0.351 af, Depth> 0.24"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 year Rainfall=2.00"

Area (ac)	CN	Description
17.490	70	1/2 acre lots, 25% imp, HSG B
13.118		75.00% Pervious Area
4.372		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
1.0	138	0.0207	2.32		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.4	175	0.0200	7.36	22.80	**Channel Flow, Bottom of Pond Area** Area= 3.1 sf Perim= 10.1' r= 0.31' n= 0.013 Concrete, trowel finish
457.6	613	Total			

Subcatchment 2S: Phase 1 Post B



Summary for Subcatchment 3S: Phase 1 Post A

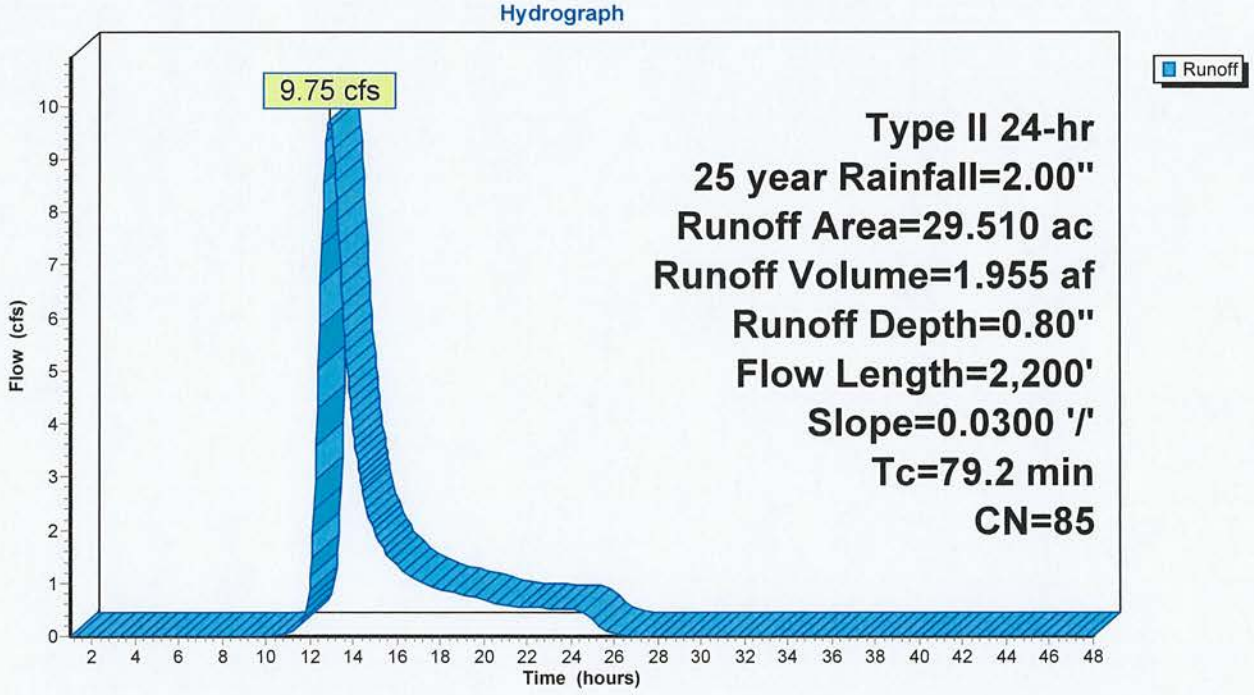
Runoff = 9.75 cfs @ 12.92 hrs, Volume= 1.955 af, Depth= 0.80"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 year Rainfall=2.00"

Area (ac)	CN	Description
29.510	85	1/8 acre lots, 65% imp, HSG B
10.328		35.00% Pervious Area
19.182		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
74.5	100	0.0300	0.02		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 0.04"
2.8	600	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
1.9	1,500	0.0300	13.38	23.65	**Pipe Channel, Pipe Flow to Pond** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
79.2	2,200	Total			

Subcatchment 3S: Phase 1 Post A



Summary for Pond 4P: Central Pond

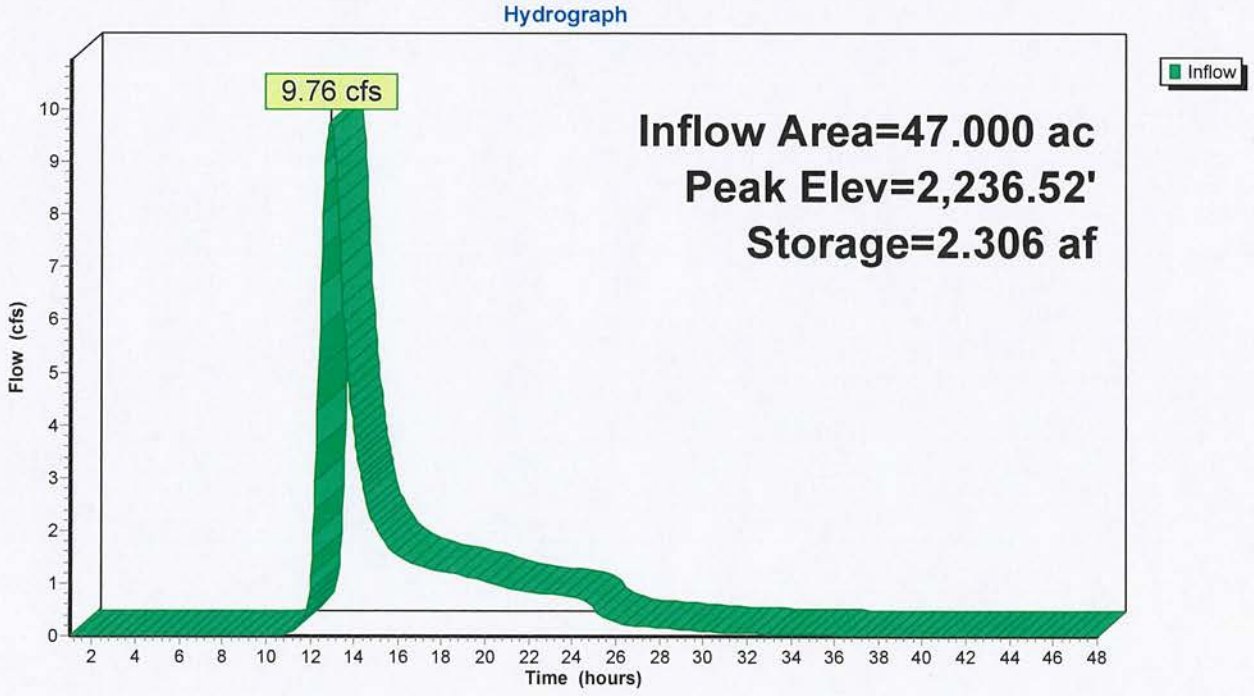
Inflow Area = 47.000 ac, 50.11% Impervious, Inflow Depth = 0.59" for 25 year event
Inflow = 9.76 cfs @ 12.92 hrs, Volume= 2.306 af
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,236.52' @ 48.00 hrs Surf.Area= 4.951 ac Storage= 2.306 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	2,236.00'	23.054 af	**515.00'W x 415.00'L x 5.00'H Prismatoid Z=2.0** 25.615 af Overall x 90.0% Voids

Pond 4P: Central Pond



Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Phase 1 Pre-Developed Runoff Area=47.000 ac 0.00% Impervious Runoff Depth>0.19"
Flow Length=1,300' Tc=468.7 min CN=65 Runoff=0.77 cfs 0.759 af

Subcatchment2S: Phase 1 Post B Runoff Area=17.490 ac 25.00% Impervious Runoff Depth>0.32"
Flow Length=613' Tc=457.6 min CN=70 Runoff=0.51 cfs 0.467 af

Subcatchment3S: Phase 1 Post A Runoff Area=29.510 ac 65.00% Impervious Runoff Depth=0.94"
Flow Length=2,200' Slope=0.0300 '/' Tc=79.2 min CN=85 Runoff=11.74 cfs 2.323 af

Pond 4P: Central Pond Peak Elev=2,236.63' Storage=2.790 af Inflow=11.75 cfs 2.790 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 94.000 ac Runoff Volume = 3.549 af Average Runoff Depth = 0.45"
74.94% Pervious = 70.446 ac 25.06% Impervious = 23.554 ac

Summary for Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)

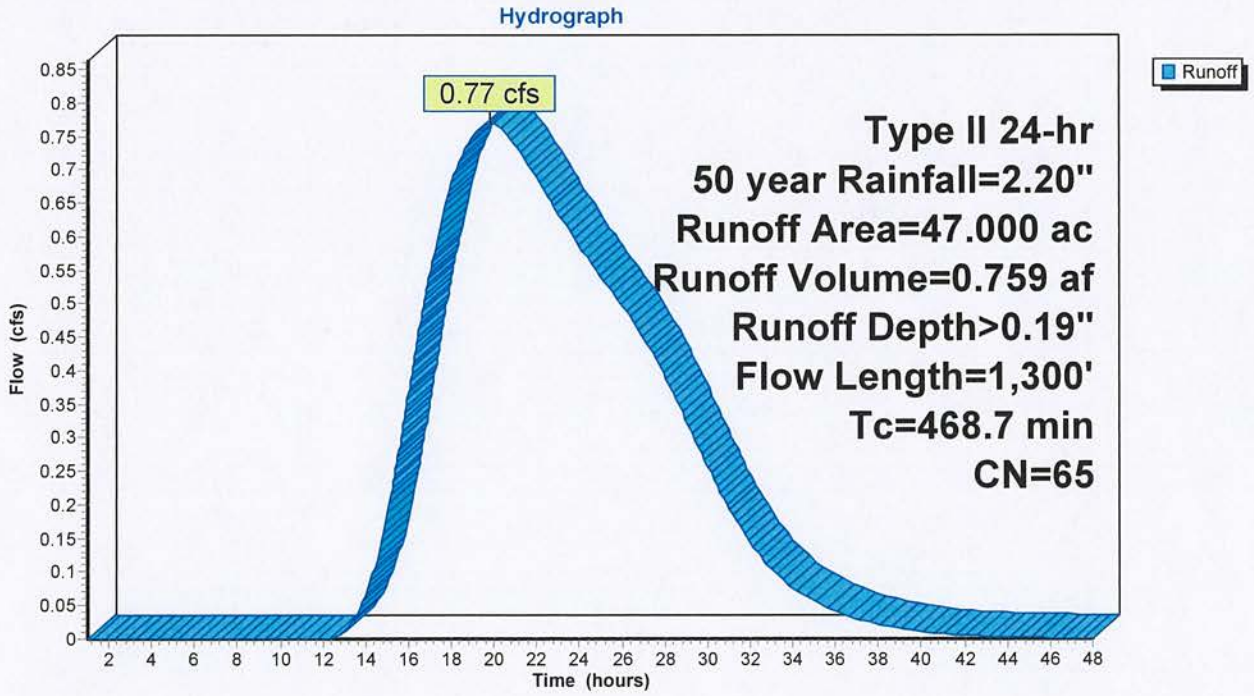
Runoff = 0.77 cfs @ 19.80 hrs, Volume= 0.759 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 year Rainfall=2.20"

Area (ac)	CN	Description
47.000	65	Woods/grass comb., Fair, HSG B
47.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
9.3	400	0.0207	0.72		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
3.2	600	0.0050	3.10	310.17	**Channel Flow, Bottom of Pond Area** Area= 100.0 sf Perim= 120.0' r= 0.83' n= 0.030 Earth, grassed & winding
468.7	1,300	Total			

Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)



Summary for Subcatchment 2S: Phase 1 Post B

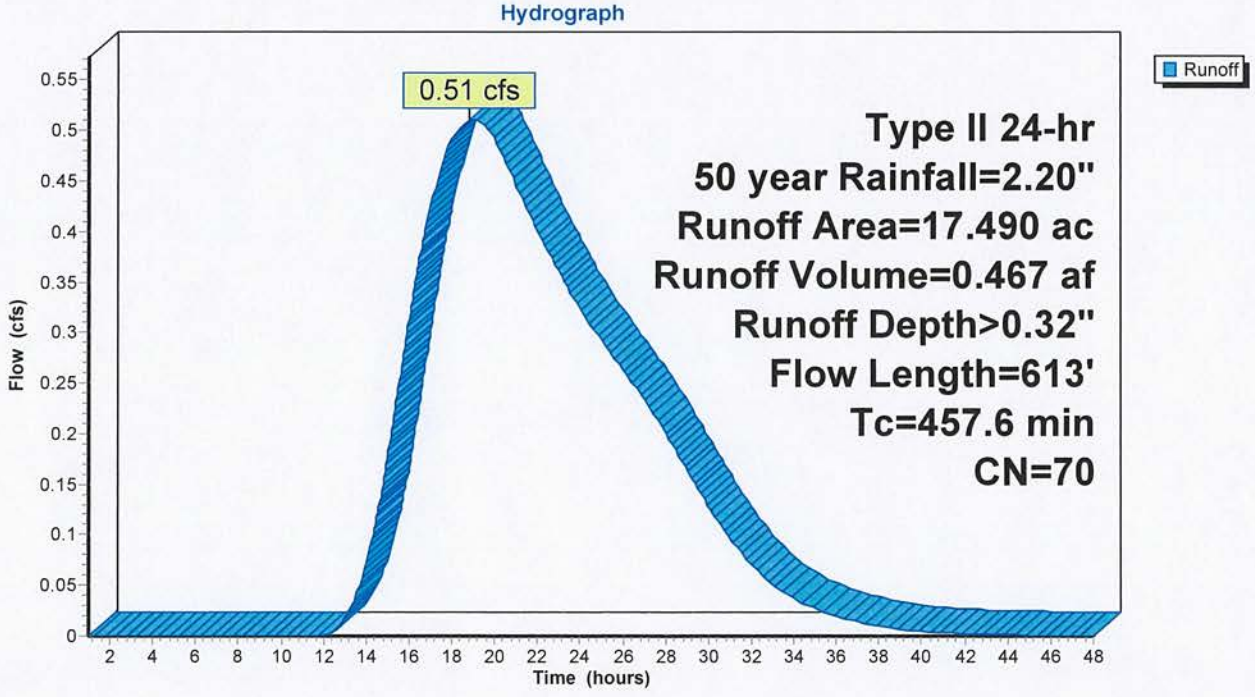
Runoff = 0.51 cfs @ 18.85 hrs, Volume= 0.467 af, Depth> 0.32"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 year Rainfall=2.20"

Area (ac)	CN	Description
17.490	70	1/2 acre lots, 25% imp, HSG B
13.118		75.00% Pervious Area
4.372		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
1.0	138	0.0207	2.32		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.4	175	0.0200	7.36	22.80	**Channel Flow, Bottom of Pond Area** Area= 3.1 sf Perim= 10.1' r= 0.31' n= 0.013 Concrete, trowel finish
457.6	613	Total			

Subcatchment 2S: Phase 1 Post B



Summary for Subcatchment 3S: Phase 1 Post A

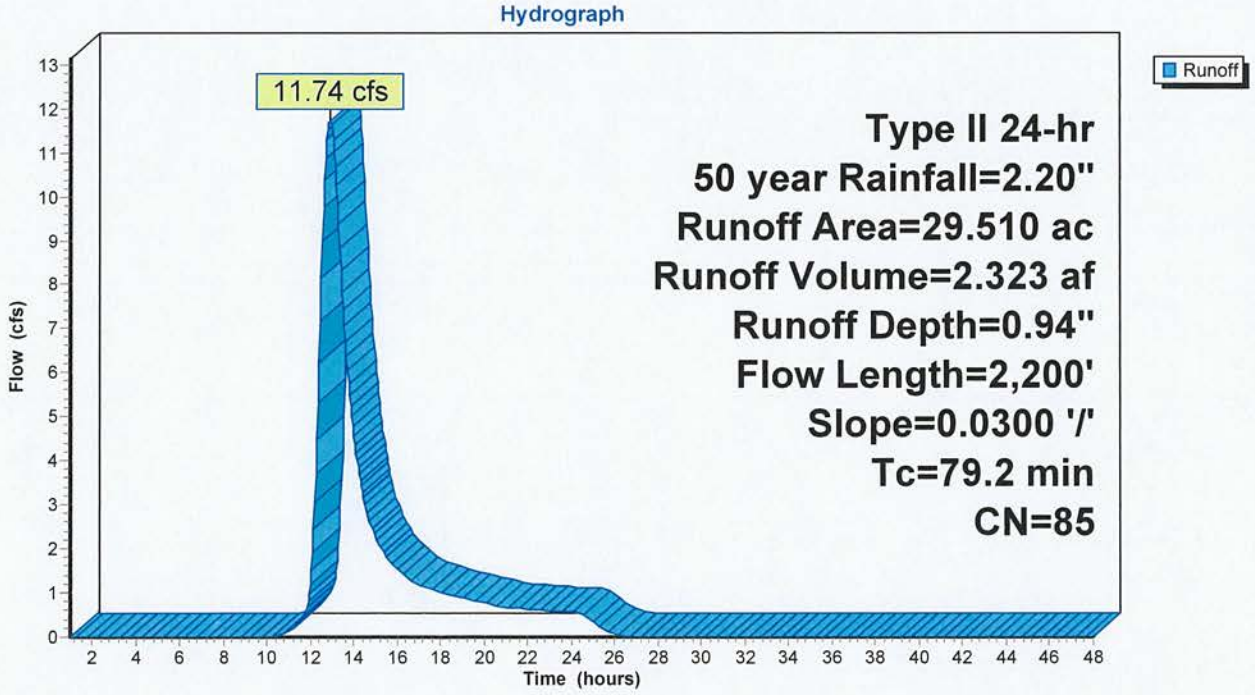
Runoff = 11.74 cfs @ 12.91 hrs, Volume= 2.323 af, Depth= 0.94"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 50 year Rainfall=2.20"

Area (ac)	CN	Description
29.510	85	1/8 acre lots, 65% imp, HSG B
10.328		35.00% Pervious Area
19.182		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
74.5	100	0.0300	0.02		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 0.04"
2.8	600	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
1.9	1,500	0.0300	13.38	23.65	**Pipe Channel, Pipe Flow to Pond** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
79.2	2,200	Total			

Subcatchment 3S: Phase 1 Post A



Summary for Pond 4P: Central Pond

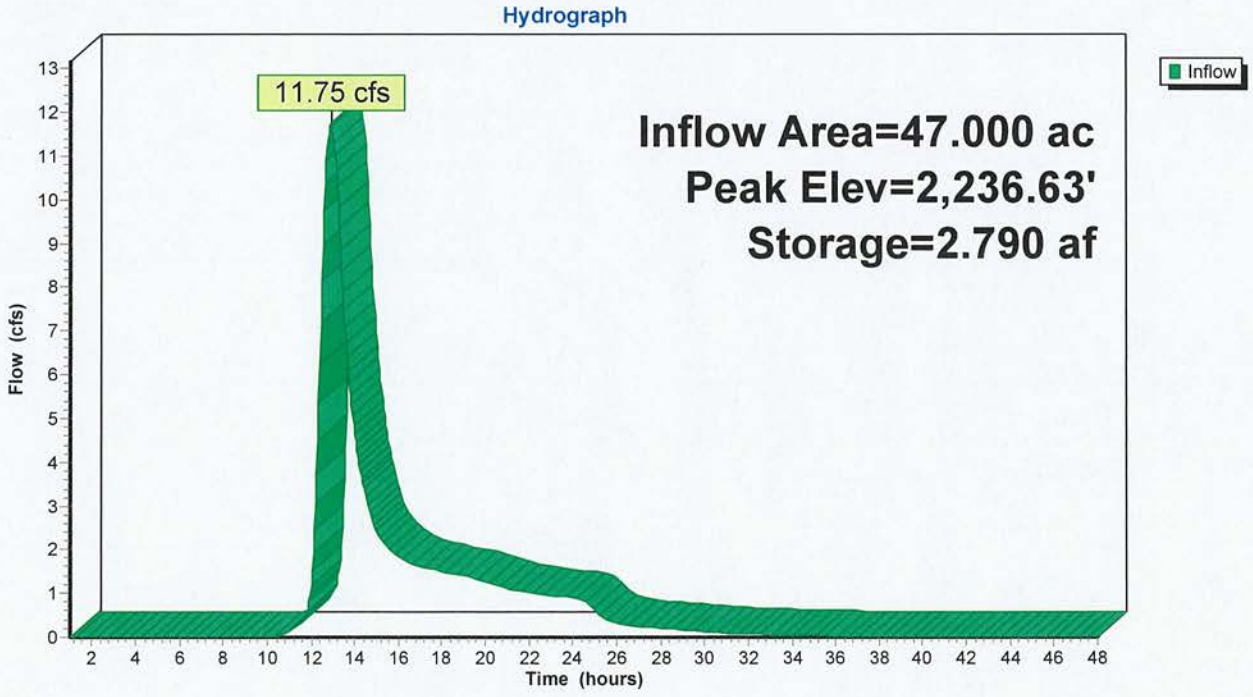
Inflow Area = 47.000 ac, 50.11% Impervious, Inflow Depth = 0.71" for 50 year event
Inflow = 11.75 cfs @ 12.91 hrs, Volume= 2.790 af
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,236.63' @ 48.00 hrs Surf.Area= 4.960 ac Storage= 2.790 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	2,236.00'	23.054 af	**515.00'W x 415.00'L x 5.00'H Prismatoid Z=2.0** 25.615 af Overall x 90.0% Voids

Pond 4P: Central Pond



Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Phase 1 Pre-Developed Runoff Area=47.000 ac 0.00% Impervious Runoff Depth>0.26"
Flow Length=1,300' Tc=468.7 min CN=65 Runoff=1.07 cfs 1.022 af

Subcatchment2S: Phase 1 Post B Runoff Area=17.490 ac 25.00% Impervious Runoff Depth>0.41"
Flow Length=613' Tc=457.6 min CN=70 Runoff=0.67 cfs 0.595 af

Subcatchment3S: Phase 1 Post A Runoff Area=29.510 ac 65.00% Impervious Runoff Depth=1.10"
Flow Length=2,200' Slope=0.0300 '/' Tc=79.2 min CN=85 Runoff=13.79 cfs 2.703 af

Pond 4P: Central Pond Peak Elev=2,236.74' Storage=3.299 af Inflow=13.81 cfs 3.299 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 94.000 ac Runoff Volume = 4.321 af Average Runoff Depth = 0.55"
74.94% Pervious = 70.446 ac 25.06% Impervious = 23.554 ac

Summary for Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)

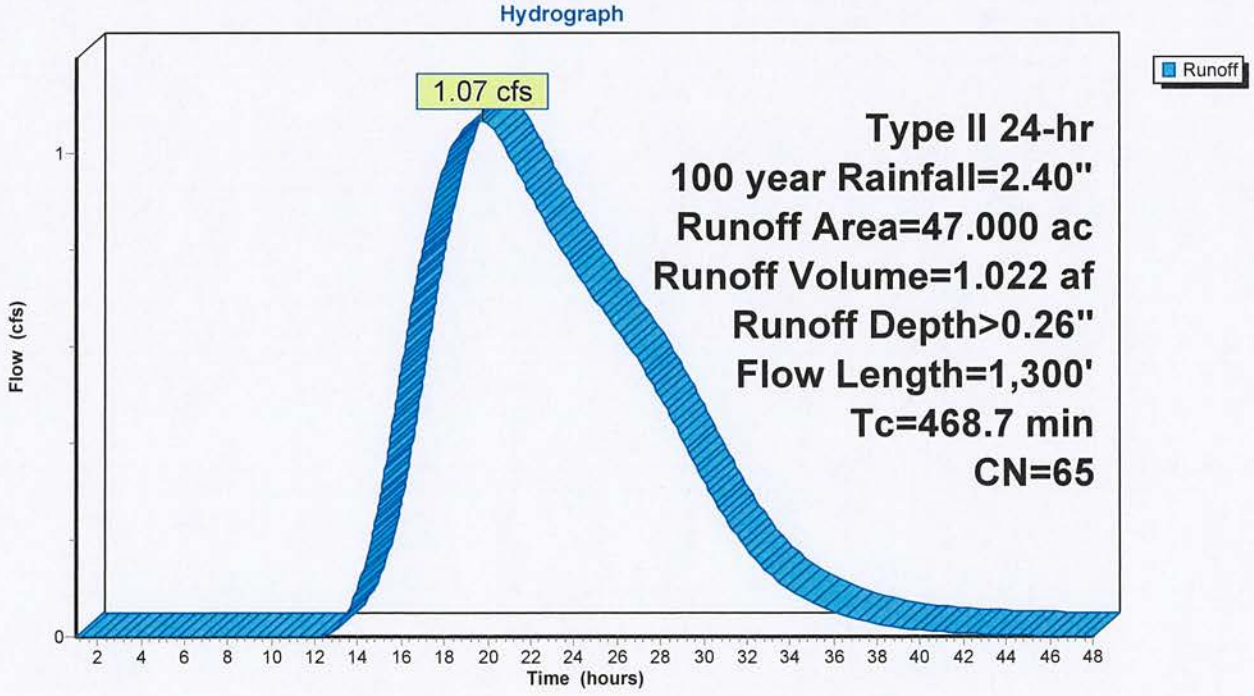
Runoff = 1.07 cfs @ 19.74 hrs, Volume= 1.022 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=2.40"

Area (ac)	CN	Description
47.000	65	Woods/grass comb., Fair, HSG B
47.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
9.3	400	0.0207	0.72		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
3.2	600	0.0050	3.10	310.17	**Channel Flow, Bottom of Pond Area** Area= 100.0 sf Perim= 120.0' r= 0.83' n= 0.030 Earth, grassed & winding
468.7	1,300	Total			

Subcatchment 1S: Phase 1 Pre-Developed (Pre A and B)



Summary for Subcatchment 2S: Phase 1 Post B

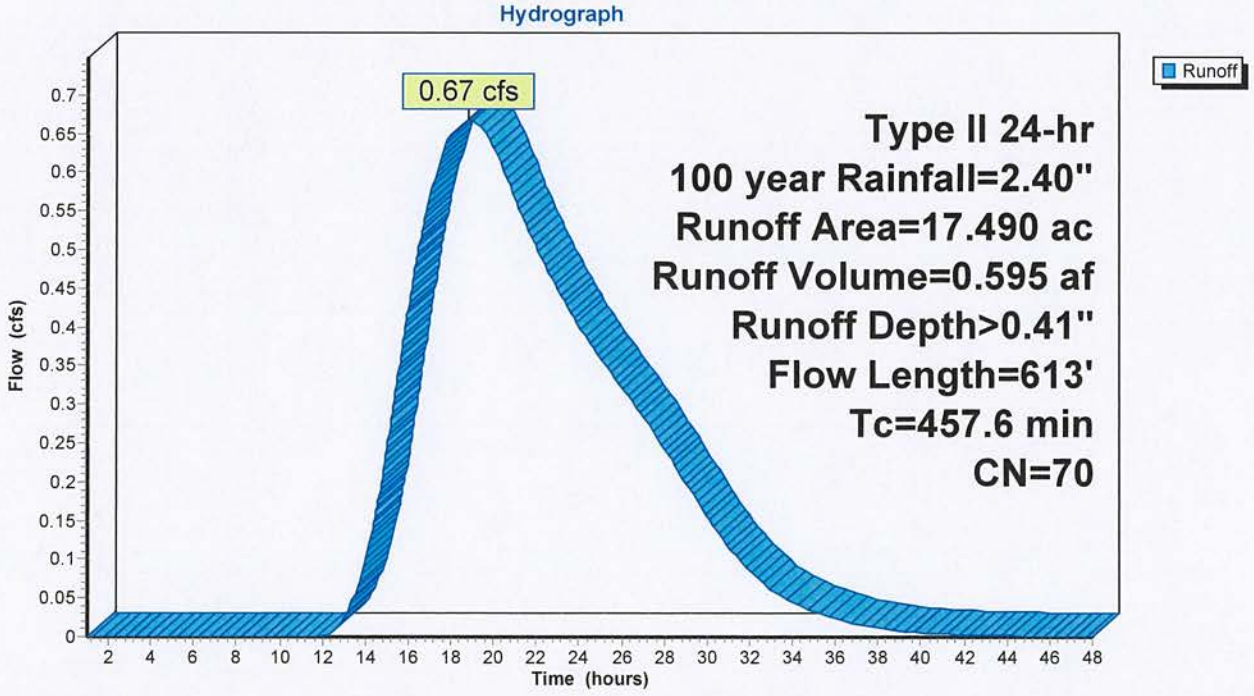
Runoff = 0.67 cfs @ 18.82 hrs, Volume= 0.595 af, Depth> 0.41"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=2.40"

Area (ac)	CN	Description
17.490	70	1/2 acre lots, 25% imp, HSG B
13.118		75.00% Pervious Area
4.372		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
456.2	300	0.0207	0.01		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 0.04"
1.0	138	0.0207	2.32		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.4	175	0.0200	7.36	22.80	**Channel Flow, Bottom of Pond Area** Area= 3.1 sf Perim= 10.1' r= 0.31' n= 0.013 Concrete, trowel finish
457.6	613	Total			

Subcatchment 2S: Phase 1 Post B



Summary for Subcatchment 3S: Phase 1 Post A

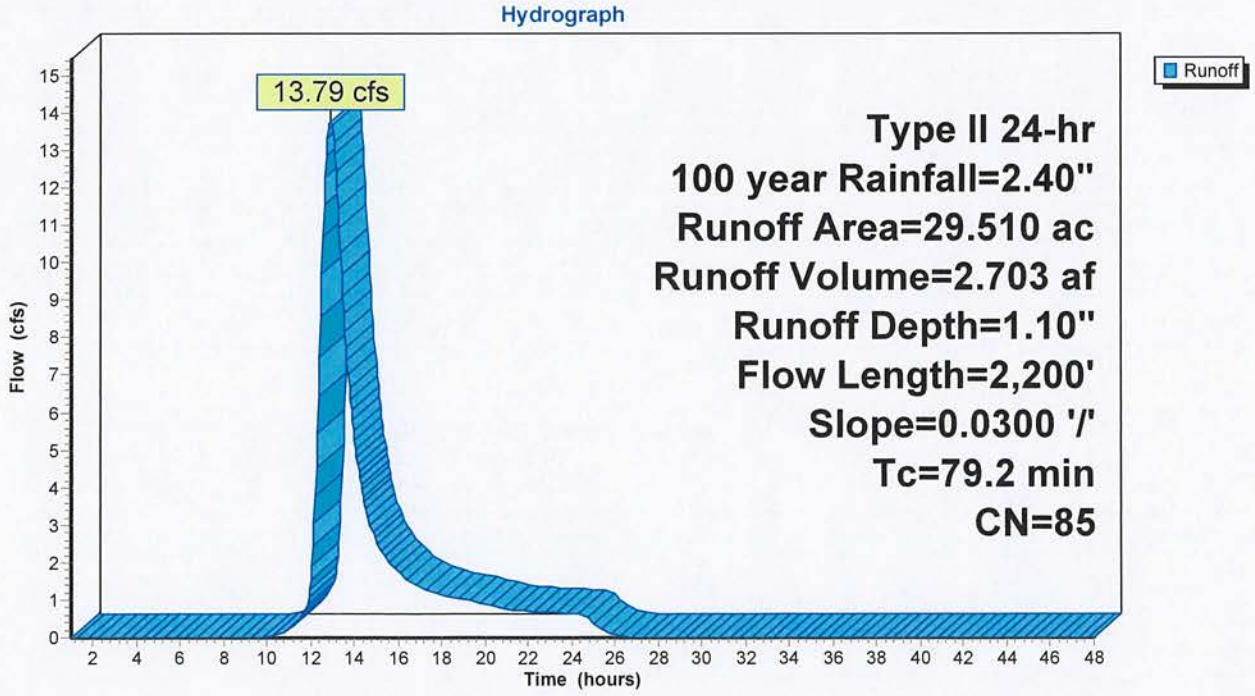
Runoff = 13.79 cfs @ 12.90 hrs, Volume= 2.703 af, Depth= 1.10"
Routed to Pond 4P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 year Rainfall=2.40"

Area (ac)	CN	Description
29.510	85	1/8 acre lots, 65% imp, HSG B
10.328		35.00% Pervious Area
19.182		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
74.5	100	0.0300	0.02		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 0.04"
2.8	600	0.0300	3.52		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
1.9	1,500	0.0300	13.38	23.65	**Pipe Channel, Pipe Flow to Pond** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
79.2	2,200	Total			

Subcatchment 3S: Phase 1 Post A



Summary for Pond 4P: Central Pond

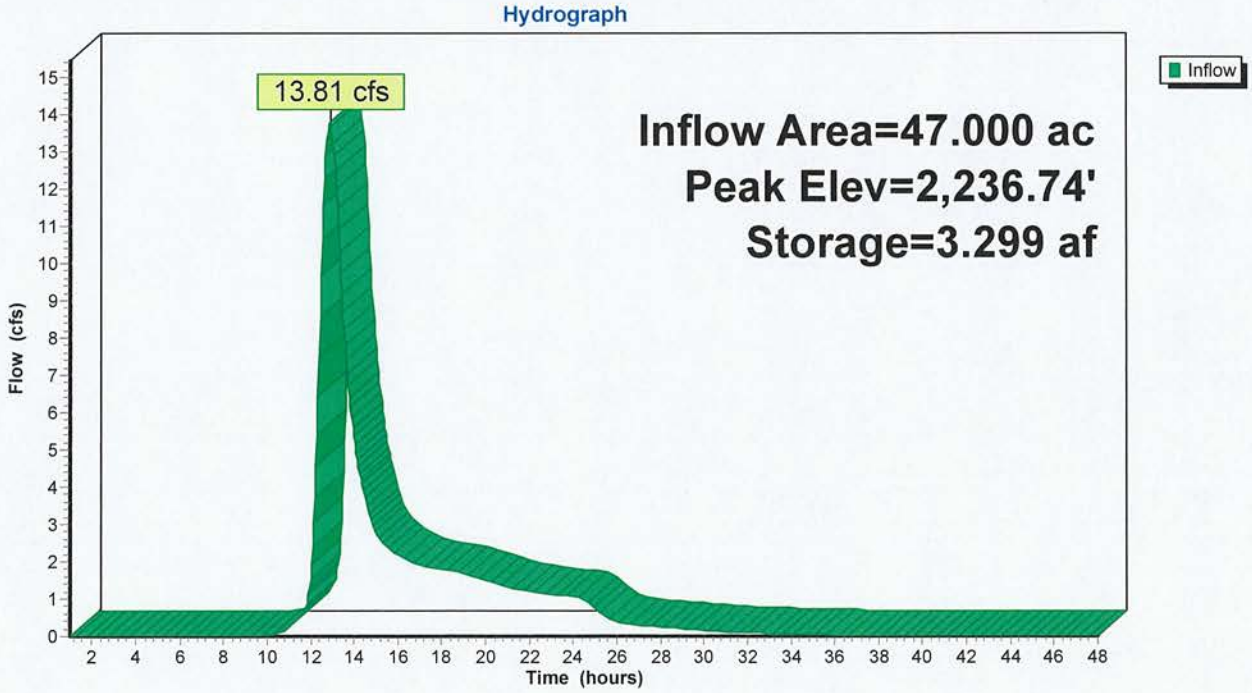
Inflow Area = 47.000 ac, 50.11% Impervious, Inflow Depth = 0.84" for 100 year event
Inflow = 13.81 cfs @ 12.90 hrs, Volume= 3.299 af
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,236.74' @ 48.00 hrs Surf.Area= 4.970 ac Storage= 3.299 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	2,236.00'	23.054 af	**515.00'W x 415.00'L x 5.00'H Prismatoid Z=2.0** 25.615 af Overall x 90.0% Voids

Pond 4P: Central Pond



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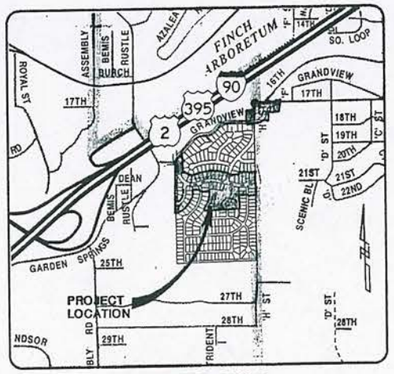
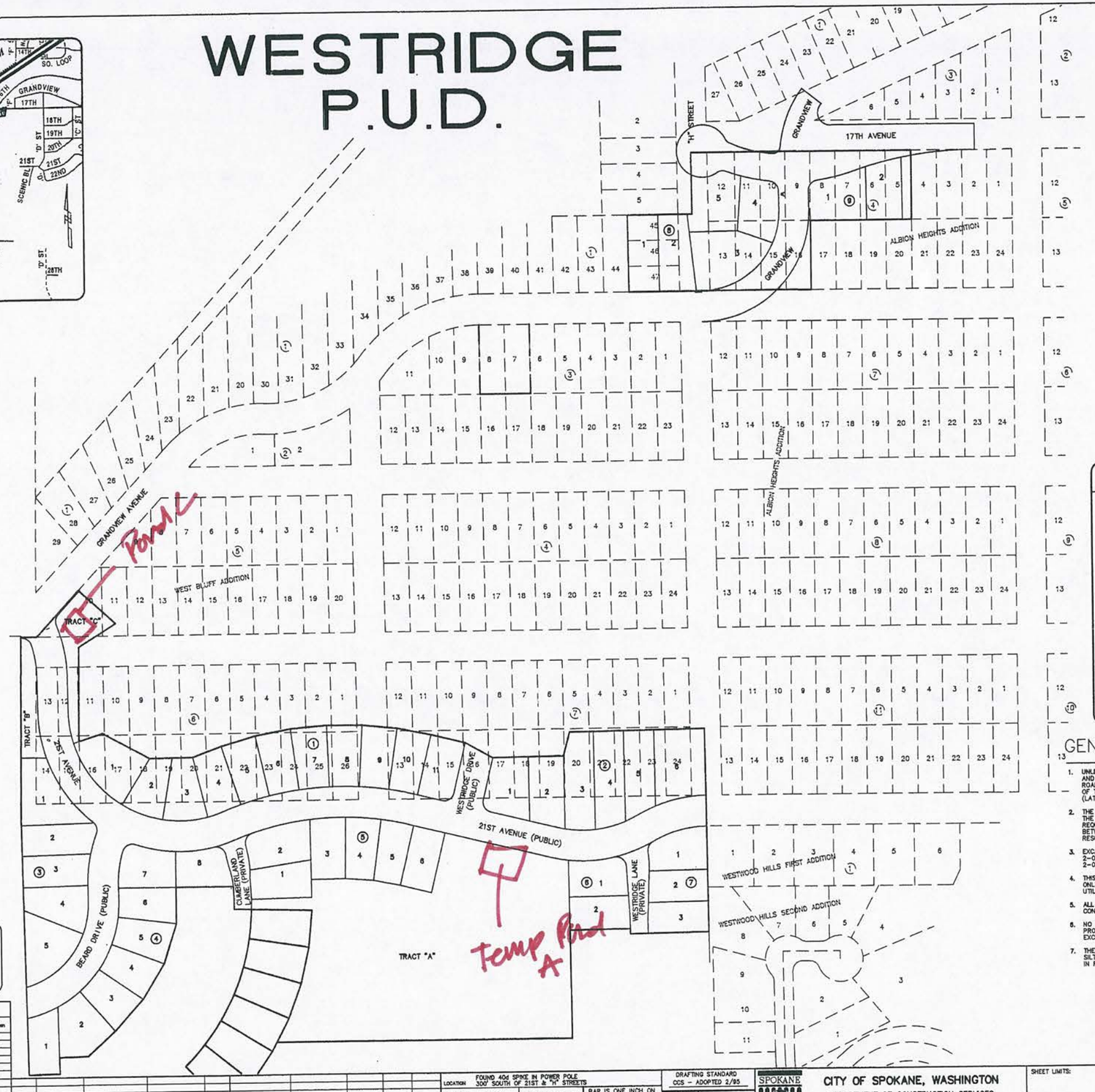
7. Supplemental
INFO

7a.
Previously Appld
Plans

WESTRIDGE P.U.D.



VICINITY MAP



GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
456·8000
CALL TWO BUSINESS DAYS BEFORE YOU DIG

NOTE:
THESE HAVE BEEN REDUCED FROM 12x18 to 11x17
∴
NO SPECIFIC SCALE

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GENERAL NOTES

1. UNLESS SPECIFICALLY EXCEPTED IN THE PLANS OR CONTRACT DOCUMENTS ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND STANDARD PLANS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION PROMULGATED BY THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, THE WASHINGTON CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION, (LATEST EDITION) AND THE CITY OF SPOKANE.
2. THE PLANS ARE SCHEMATIC AND ARE NOT INTENDED TO DEPICT ALL DETAILS OF THE WORK REQUIRED. THE CONTRACTOR SHALL BE RESPONSIBLE TO FAMILIARIZE HIMSELF WITH ACTUAL SITE CONDITIONS REQUIREMENTS AND FACTORS AFFECTING THE WORK. WHERE LACK OF DETAIL OR CONFLICT EXISTS BETWEEN THESE AND OTHER PLANS, THE CONTRACTOR SHALL NOTIFY THE OWNER & ENGINEER TO RESOLVE THE ISSUE PRIOR TO PROCEEDING.
3. EXCAVATION AND EMBANKMENT SHALL BE IN ACCORDANCE WITH APPLICABLE REQUIREMENTS OF SECTION 2-03 OF THE STANDARD SPECIFICATIONS. ALL COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 2-03.3(14)C, METHOD B, AND 2-03.3 (14) A, FOR ROCK EMBANKMENT.
4. THIS PLAN MAY NOT SHOW ALL EXISTING UTILITIES. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY THE EXISTENCE AND ACTUAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.
5. ALL FINISHED GRADING ELEVATIONS SHALL MATCH EXISTING ELEVATIONS AT THE SITE'S BOUNDARY. WHERE CONFLICTS EXIST THE CONTRACTOR SHALL NOTIFY THE OWNER TO RESOLVE THE ISSUE PRIOR TO PROCEEDING.
6. NO QUANTITIES HAVE BEEN CALCULATED TO DETERMINE VOLUMES OF EXCAVATION AND EMBANKMENT ON THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE OR DISPOSE OF ALL EMBANKMENT AND/OR EXCAVATED MATERIALS.
7. THE CONTRACTOR SHALL PROTECT ALL CATCH BASINS AND DRYWELLS FROM BEING CONTAMINATED WITH SILT BY INSTALLING FILTER FABRIC OVER THE METAL FRAME DURING THE INSTALLATION AND KEEPING IT IN PLACE UNTIL THE STREETS HAVE BEEN PAVED AND CLEANED.

TODD R. WHITE — STATE OF WASHINGTON — 25462 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 9/24/98

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

APPROVED FOR CONSTRUCTION
NOT
AS-BUILT
PLAN REVIEW
5/19/98

1/11

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

Proj. No.	Engineer's Name	Eng.'s No.	Date on plan

BY	REVISIONS	DATE	PROJ.	E.F.N.	FROM	TO	ACCEPT
	AS BUILT						

FROM	TO	ORD. NO.	DATE	FILE NO.

GRADE ORDINANCE LIST

LOCATION	FOUND 40¢ SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS
ELEVATION	2254.28
CON NO.	X
CITY DATUM	SCALE

HORIZONTAL 1" = 100'
VERTICAL 1" = 10'

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD
CDS – ADOPTED 2/95

DATE	09/03/97	
DRAWN	MJ	
CHECKED	MMK	
APPROVED		

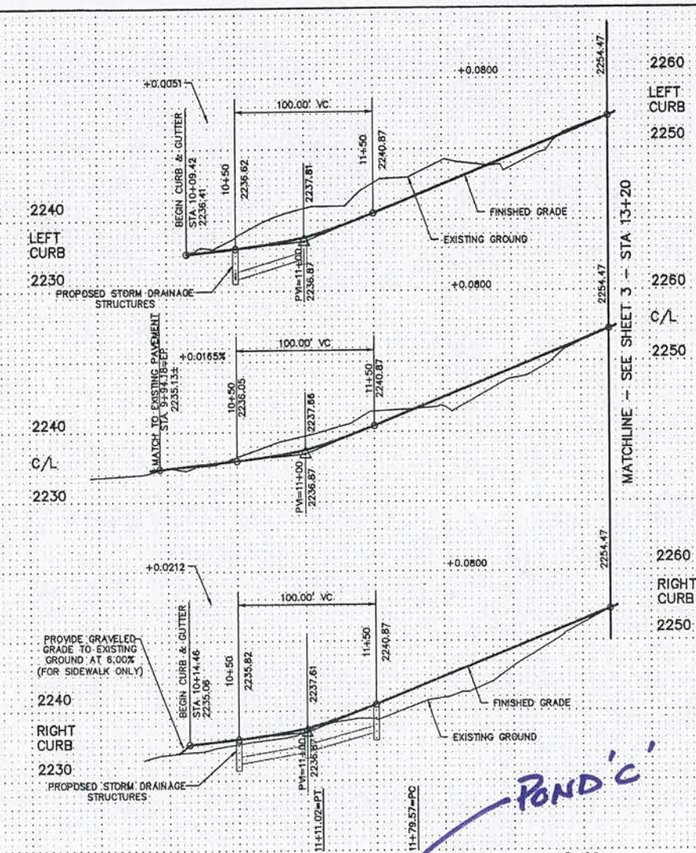
SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS: COVER SHEET

PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	COVER 26-25-42



CONSTRUCTION NOTES:

1. EXISTING OVERHEAD POWER LINE TO BE RELOCATED BY OTHERS.
2. INSTALL STOP/STREET SIGN PER M.U.T.C.D. & CITY OF SPOKANE STDS.
3. INSTALL WSDOT GRATE INLET TYPE 2
   STA 11+50, RIGHT GRATE EL.=2240.29
4. INSTALL 50 L.F. OF 12" DUCTILE IRON PIPE @ S=0.0504
   IE(S)=2238.71 IE(N)=2234.19
5. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STD B101C AND SPOKANE COUNTY METAL GRATE TYPE 1, STD B-12.
   STA 11+00, RIGHT GRATE EL.=2237.03
6. INSTALL 50 L.F. OF 12" DUCTILE IRON PIPE @ S=0.0342
   IE(S)=2234.11, IE(N)=2232.40
7. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STD B101C AND SPOKANE COUNTY METAL GRATE TYPE 1, STD B-12.
   STA 10+50, RIGHT, GRATE EL.=2235.24
8. INSTALL 40 L.F. OF 12" DUCTILE IRON PIPE @ S=0.0180
   IE(W)=2232.32, IE(E)=2231.60
9. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STD B101C AND SPOKANE COUNTY METAL GRATE TYPE 1, STD B-12.
   STA 10+50, LEFT GRATE EL.=2236.04
10. INSTALL 37 L.F. OF 12" CMP @ S=0.0141
    IE(W)=2231.52, IE(E)=2231.00
11. INSTALL 50 L.F. OF 12" DUCTILE IRON PIPE @ S=0.0542
    IE(S)=2234.31, IE(N)=2231.60
12. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STD B101C AND SPOKANE COUNTY METAL GRATE TYPE 1, STD B-12.
    STA 11+00, LEFT GRATE EL.=2237.23
13. REMOVE EXISTING ROCK WALL.
14. NOSE CURB DOWN IN 12"
15. EXISTING POWER POLE TO BE RELOCATED BY OTHERS.
16. INSTALL "KEEP RIGHT" SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STANDARDS.
17. 13' L.F. OF 8" DUCTILE IRON PIPE @ SLOPE OF 0.0246
    IE(E)=2233.15, IE(W)=2232.83
18. INSTALL CITY OF SPOKANE CATCH BASIN TYPE "0" WITH SOLID LID
    STA 10+00, 50' LEFT GRATE EL.=2236.50
19. 49.81 L.F. OF 8" DUCTILE IRON PIPE @ SLOPE OF 0.0246
    IE(E)=2232.73, IE(W)=2232.23

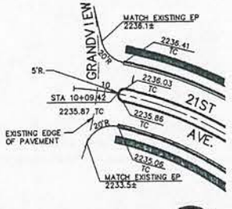
NOTE:

THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

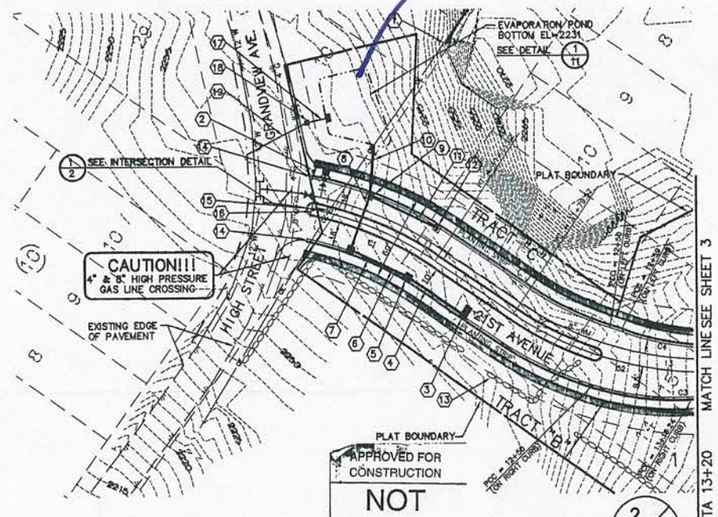
CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	254.56'	133.50'	68.32'	131.98'	30°02'52"
C2	250.00'	260.90'	143.74'	249.22'	59°47'38"
C3	268.00'	100.23'	50.71'	99.65'	21°25'44"
C4	227.00'	83.71'	42.33'	83.23'	21°07'41"

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.



INTERSECTION DETAIL 1/2



APPROVED FOR CONSTRUCTION
NOT AS-BUILT PLAN REVIEW 5/14/98

2/11

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

No.	Engineer's Name	Eng.'s No.	Date on plan

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 Spokane, WA 99204
(509) 458-6840 FAX: (509) 458-6844

UNDERGROUND SERVICE ALERT ONE-CALL NUMBER 456-8000 CALL TWO BUSINESS DAYS BEFORE YOU DIG

TODD R. WHITE — STATE OF WASHINGTON — 25462 — REGISTERED PROFESSIONAL ENGINEER — 3-15-98
EXPIRES 9/24/98

REVISIONS	DATE

AS BUILT

PROJ.	E.F.H.	FROM	TO	ACCEPT	FROM	TO	ORD. NO.	DATE	FILE NO.

GRADE ORDINANCE LIST

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & 'H' STREETS
ELEVATION	2254.28
CBM NO.	X
CITY DATUM	
HORIZONTAL	1" = 50'
VERTICAL	1" = 10'
SCALE	

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS - ADOPTED 2/95

DATE		
08/22/97	DRAWN	MJH MJH
08/22/97	CHECKED	MWK
08/22/97	APPROVED	

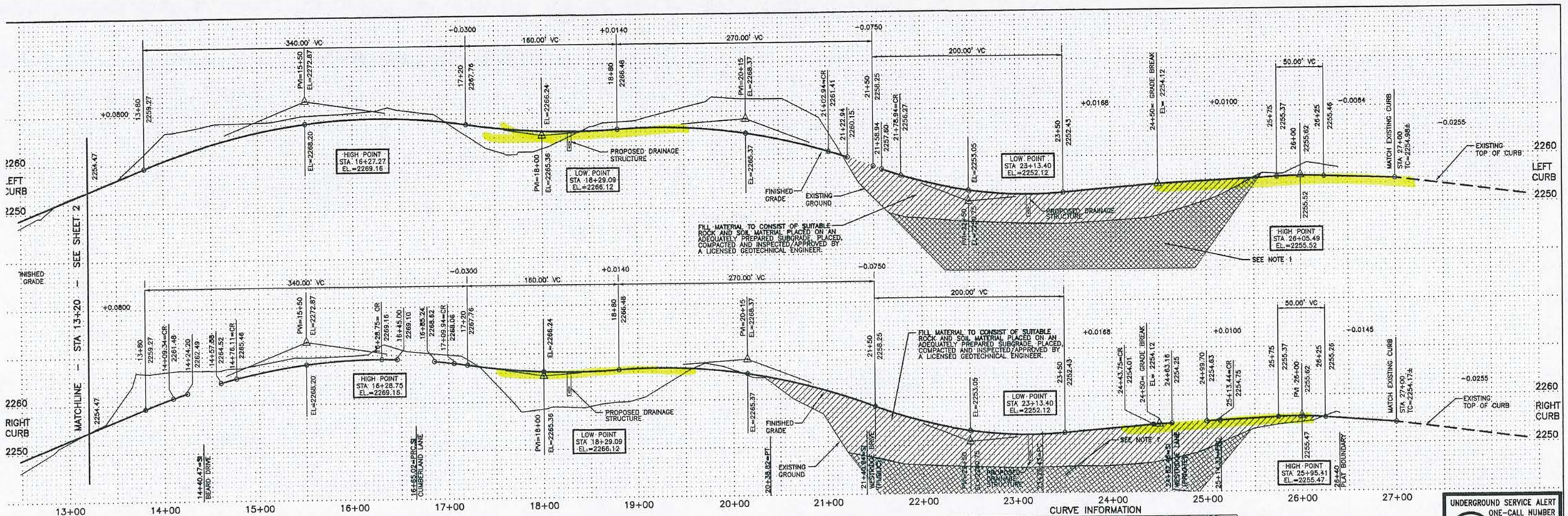
SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS:
21ST AVENUE
STA. 9+82±-STA. 13+20±

PROJECT LIMITS: WESTRIDGE, DIVISION NO. 1

TYPE OF IMPROVEMENT	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	21ST V(2)1 26-25-42



CONSTRUCTION NOTES

1. REMOVE EXISTING CURB & PAVEMENT.
2. PROPOSED CURB TO MATCH EXISTING CURB & SIDEWALK, STA 27+00.
3. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD F-105A
4. REMOVE EXISTING FENCE
5. INSTALL WSDOT GRATE INLET TYPE 2 PER W.S.D.O.T. STD. 8-4C. STA. 23+13.40, LEFT GRATE EL.=2251.54
6. INSTALL 35 L.F. OF 18" DUCTILE IRON PIPE @ S=0.0200 IE(N)=2248.54, IE(S)=2247.84
7. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STDS. B-101C & B-2A STA. 23+13.40, RIGHT GRATE EL.=2251.54
8. INSTALL 49 L.F. OF 18" D.I. @ S=0.0526 IE(N)=2247.76, IE(E)=2245.20 SEE PROFILE "D", SHEET 7
9. INSTALL DEAD END PLACARDS PER M.U.T.C.D. & CITY OF SPOKANE STANDARDS
10. INSTALL 15' X 20' X 24" THICK RIP RAP MAXIMUM STONE SIZE= 16" DIA. MEDIAN STONE SIZE= 12" DIA MINIMUM STONE SIZE= 8"
11. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STDS. B-101C & B-2A STA. 18+29.09, LEFT GRATE EL.=2265.54
12. INSTALL 35 L.F. OF 12" DUCTILE IRON PIPE @ S=0.0200 IE(N)=2262.62 IE(S)=2261.92
13. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STDS. B-101C & B-2A STA. 18+26.72, RIGHT GRATE EL.=2265.54
14. INSTALL "KEEP RIGHT" SIGNS PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
15. INSTALL STREET NAME PLACARDS PER M.U.T.C.D. & CITY OF SPOKANE STANDARDS

CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	250.00'	260.80'	143.74'	249.22'	59°47'58"
C2	600.00'	373.81'	193.19'	367.79'	35°41'49"
C3	250.00'	187.90'	98.64'	183.51'	43°03'50"
C4	250.00'	125.57'	64.19'	124.30'	28°46'04"
C10	20.00'	28.44'	15.56'	24.52'	81°29'31"
C11	20.00'	31.89'	20.48'	28.69'	91°21'19"
C12	20.00'	30.84'	19.43'	27.87'	88°21'06"
C13	20.00'	30.51'	19.31'	27.71'	87°24'19"
C14	20.00'	31.42'	20.00'	28.28'	90°00'00"
C15	20.00'	34.04'	22.81'	30.08'	97°30'23"
C16	20.00'	34.84'	24.31'	30.77'	99°48'59"
C17	200.00'	60.56'	30.51'	60.33'	17°20'59"
C18	200.00'	73.04'	36.93'	72.63'	20°55'28"
C19	213.00'	103.86'	52.56'	103.23'	27°47'49"

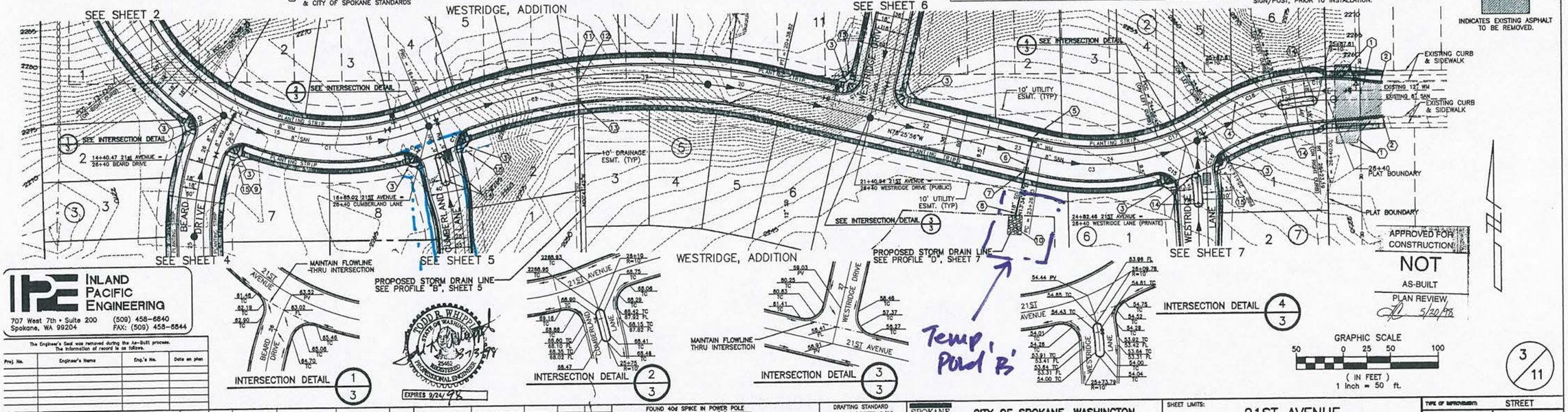
NOTE:

1.) APPROXIMATE VERTICAL EXTENT OF OVEREXCAVATION AND COMPACTED GRANULAR BACKFILL (8' TO 10' EXPECTED IN SOME AREAS). ACTUAL EXTENT OF OVER-OVER EXCAVATION TO BE DETERMINED DURING CONSTRUCTION.

2.) THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

UNDERGROUND SERVICE ALERT ONE-CALL NUMBER 456-8000 CALL TWO BUSINESS DAYS BEFORE YOU DIG

INDICATES EXISTING ASPHALT TO BE REMOVED.



APPROVED FOR CONSTRUCTION: NOT AS-BUILT PLAN REVIEW 5/20/98

GRAPHIC SCALE 50 0 25 50 100 (IN FEET) 1 inch = 50 ft.

3/11

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 Spokane, WA 99204
(509) 458-6840 FAX: (509) 458-6844

TODD R. WHIPPLE STATE OF WASHINGTON 25462 REGISTERED PROFESSIONAL ENGINEER 3/3/98 EXPIRES 9/24/98

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

Proj. No.	Engineer's Name	Eng.'s No.	Date on plan

BY	REVISIONS	DATE	PROJ.	E.F.N.	FROM	TO	ACCEPT
	AS BUILT						

GRADE ORDINANCE LIST

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS		BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
ELEVATION	2254.28	HORIZONTAL 1" = 50'	
CBM NO.	X	VERTICAL 1" = 10'	
CITY DATUM		SCALE	

DRAFTING STANDARD CCS – ADOPTED 2/95

DATE	DRAWN	MJH,MJS
08/22/97	CHECKED	MWK
08/22/97	APPROVED	

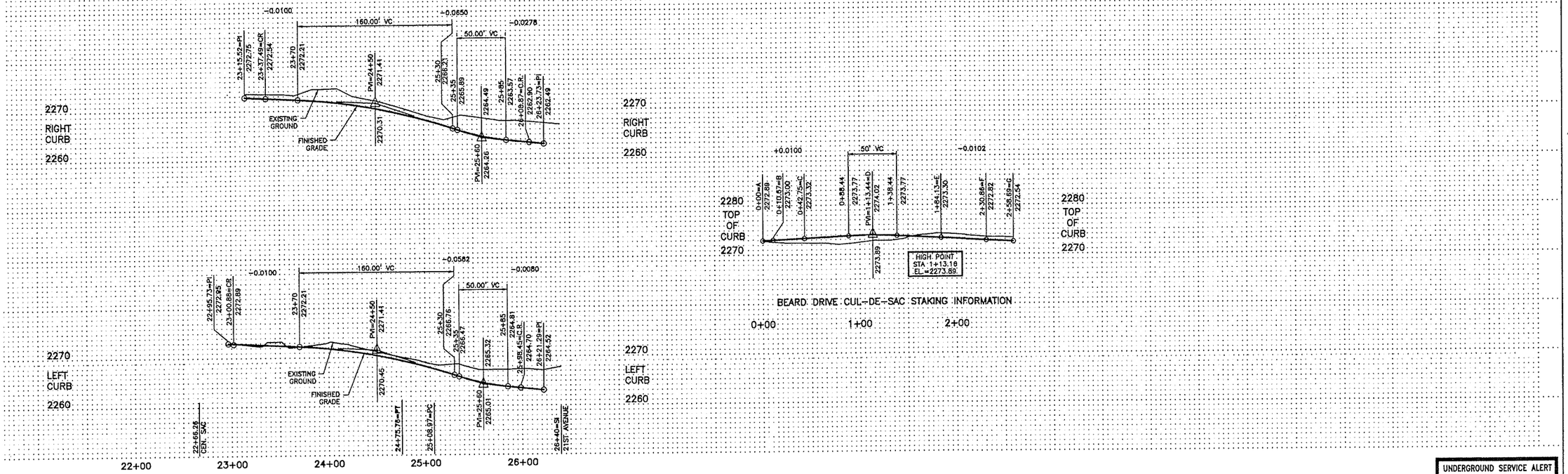
SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS: 21ST AVENUE STA. 13+20 TO STA. 26+40

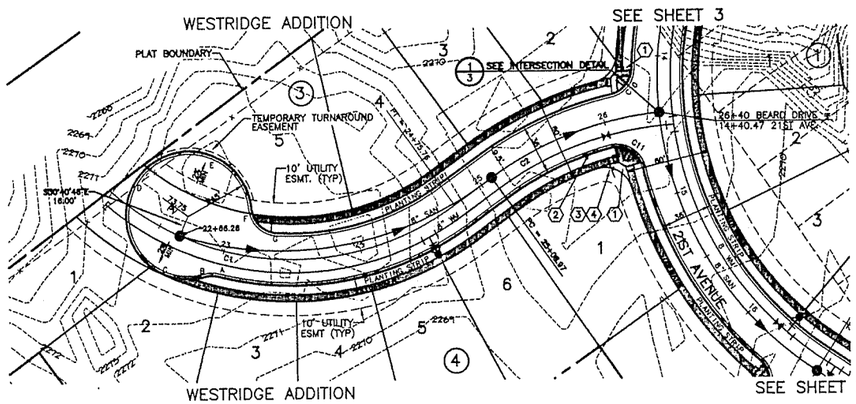
PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT:	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	21ST V(2)2 26-25-42
P.E.	



CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	200.00'	275.76'	164.88'	254.43'	78°59'54"
C2	250.00'	131.03'	67.06'	129.54'	30°01'49"
C10	20.00'	26.44'	15.55'	24.55'	75°43'51"
C11	20.00'	31.89'	20.48'	28.62'	91°21'19"



CONSTRUCTION NOTES

1. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD. F-105A.
2. CONSTRUCT CITY OF SPOKANE CURB & GUTTER W/ NEGATIVE SLOPE ON GUTTER PER STD. F-106 STA 25+35 TO STA 25+98.45
3. INSTALL STREET NAME/DEAD END SIGN PER M.U.T.C.D. & CITY OF SPOKANE STDS.
4. INSTALL DEAD END PLACARDS PER M.U.T.C.D. & CITY OF SPOKANE STDS.

NOTES

THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
456·8000
CALL TWO BUSINESS DAYS BEFORE YOU DIG

APPROVED FOR CONSTRUCTION
NOT AS-BUILT
PLAN REVIEW
5/19/98

4/11

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

Engineer's Name	Eng.'s No.	Date on plan

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

TODD R. WHIPPLE — STATE OF WASHINGTON — 25462 — REGISTERED PROFESSIONAL ENGINEER
5-13-98
EXPIRES 9/24/98

REVISIONS	DATE

PROJ.	E.F.N.	FROM	TO	ACCEPT
AS BUILT				

FROM	TO	ORD. NO.	DATE	FILE NO.
GRADE ORDINANCE LIST				

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS		
ELEVATION	2254.28	HORIZONTAL	1" = 50'
CRM NO.	X	VERTICAL	1" = 10'
CITY DATUM		SCALE	

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS - ADOPTED 2/95		
DATE		
09/03/97	DRAWN	MH,MK
09/03/97	CHECKED	MWK
09/03/97	APPROVED	

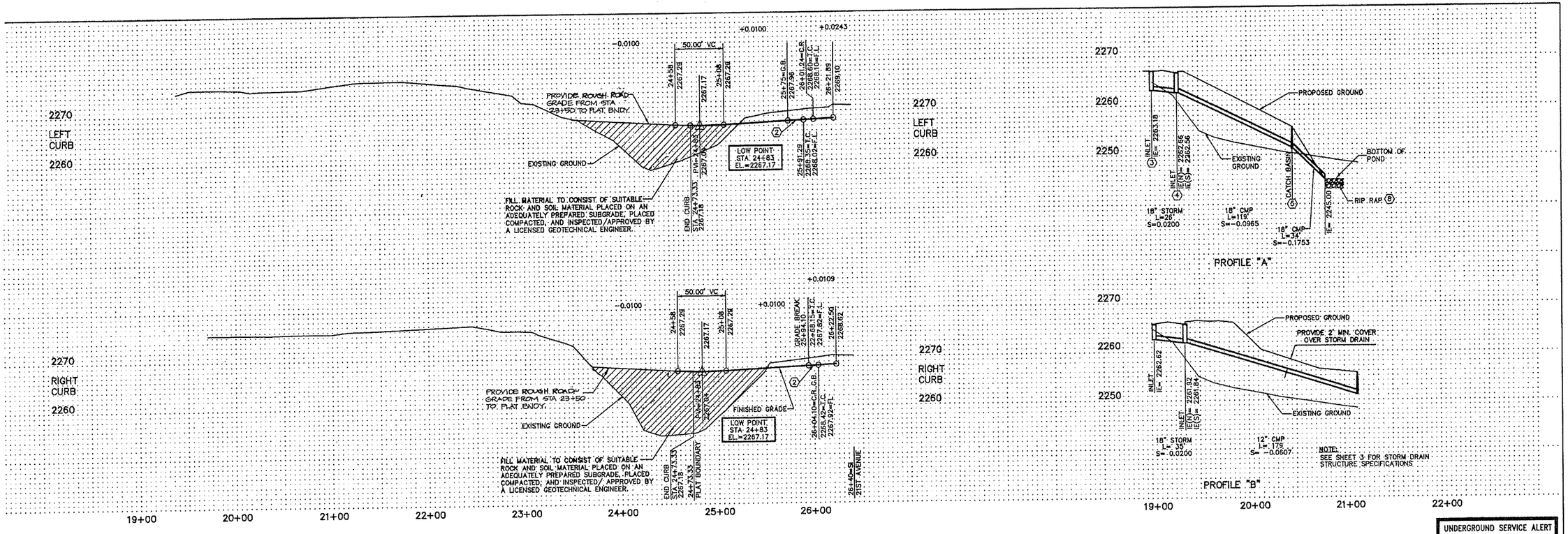
SPOKANE

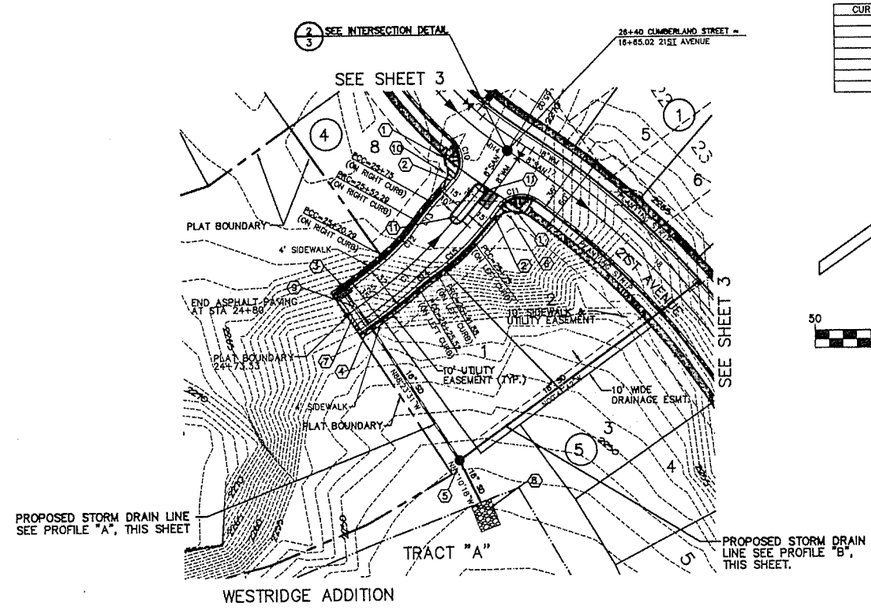
CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

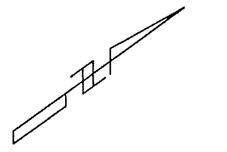
SHEET LIMITS: BEARD DRIVE
STA. 22+00 TO STA. 26+40

PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT: STREET	
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	BEARD D(3)2 26-25-42







CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	427.50'	544.34'	316.07'	508.30'	72°57'17"
C10	20.00'	30.84'	19.43'	27.87'	88°21'06"
C11	20.00'	30.61'	19.21'	27.71'	87°41'16"
*C12	150.00'	35.92'	18.05'	35.83'	13°43'14"
*C13	150.00'	16.72'	8.37'	16.71'	06°23'12"
*C14	150.00'	17.29'	8.65'	17.28'	06°36'15"
*C15	150.00'	34.73'	17.44'	34.65'	13°15'57"

* CURVE INFORMATION REFERS TO THE BACK OF ROLLED CURVE

CONSTRUCTION NOTES

1. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD. F-105A
2. CONSTRUCT 10' LONG CURB TRANSITION FROM ROLLED CURB TO CURB & GUTTER
3. INSTALL WSDOT GRATE INLET TYPE 2 STA. 24+83, LEFT GRATE EL.=2266.76
4. INSTALL CATCH BASIN TYPE 1 W/ METAL FRAME & GRATE PER CITY OF SPOKANE STDS. B-101C & B-2A STA. 24+83, RIGHT GRATE EL.=2266.76
5. INSTALL CATCH BASIN TYPE 0 PER CITY OF SPOKANE STD B-101B GRATE EL.=2255.59
6. INSTALL STREET NAME SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
7. INSTALL TYPE III BARRICADE PER W.S.D.O.T. STD PLAN H-2 WITH (2) "END OF ROADWAY" MARKERS, PER M.U.T.C.D. AND CITY OF SPOKANE STANDARDS, AND MOUNT TO BARRICADE. (BARRICADE AND SIGN TO REMAIN IN PLACE UNTIL ROAD EXTENSION)
8. INSTALL 15' X 20' X 24" THICK RIP RAP MAXIMUM STONE SIZE = 16" DIA. MEDIAN STONE SIZE = 12" DIA. MINIMUM STONE SIZE = 8" DIA.
9. INSTALL 26 L.F. OF 18" DUCTILE IRON PIPE @ S=0.0200 IE(W)=2263.18, IE(E)=2262.86
10. INSTALL "ROADWAY ENDS" SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
11. INSTALL "KEEP RIGHT" SIGNS PER M.U.T.C.D. AND CITY OF SPOKANE STDS.

NOTE:

THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

UNDERGROUND SERVICE ALERT ONE-CALL NUMBER 456-8000 CALL TWO BUSINESS DAYS BEFORE YOU DIG

APPROVED FOR CONSTRUCTION
NOT AS-BUILT
PLAN REVIEW 5/19/98

5/11

TODD R. WHIPPLE STATE OF WASHINGTON 25462 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 9/24/98

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

Engineer's Name	Eng.'s No.	Date on plan

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

REVISIONS	DATE

PROJ.	E.P.N.	FROM	TO	ACCEPT	FROM	TO	ORD. NO.	DATE	FILE NO.
AS BUILT					GRADE ORDINANCE LIST				

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS
ELEVATION	2254.25
HORIZONTAL	1" = 50'
CBM NO.	X
VERTICAL	1" = 10'
CITY DATUM	SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS - ADOPTED 2/95		
DATE	09/03/97	DRAWN MLH,MJ
	09/03/97	CHECKED MWK
	09/03/97	APPROVED

SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS: STA. 19+00 TO STA. 26+40

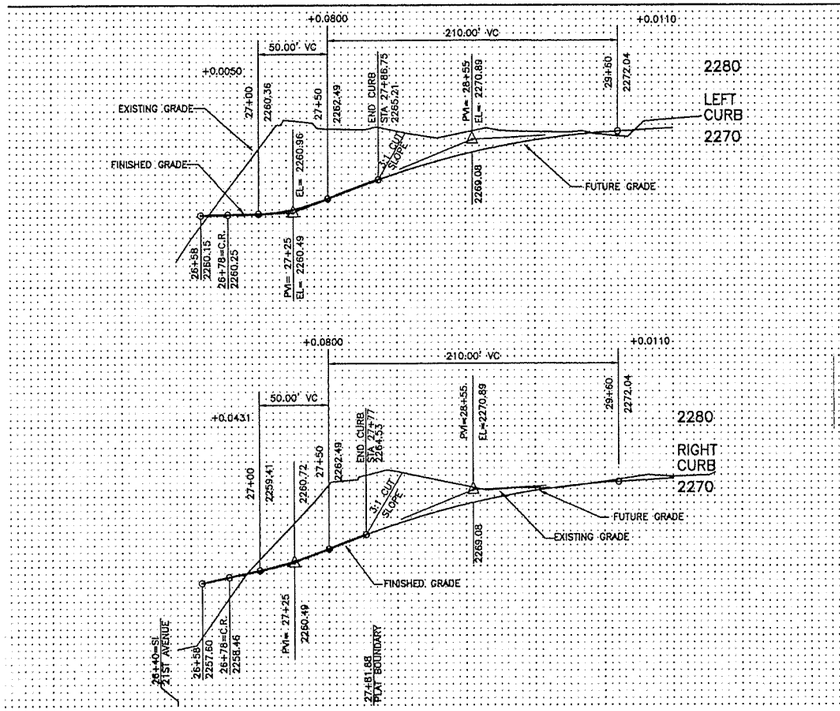
PROJECT LIMITS: WESTRIDGE ADDITION

CUMBERLAND LANE

TYPE OF IMPROVEMENT: Priv. STREET

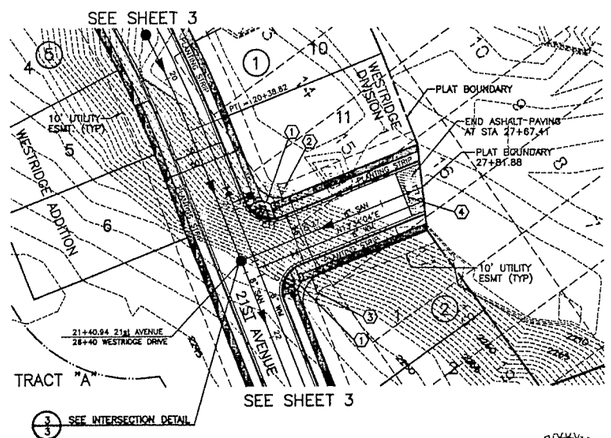
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	CUMBE L(2)2 26-25-42

PW



CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	500.00'	268.28'	137.45'	265.07'	30°44'33"
C11	20.00'	31.42'	20.00'	28.28'	90°00'00"



CONSTRUCTION NOTES

1. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD F-105A
2. INSTALL STREET NAME PLACARDS PER M.U.T.C.D & CITY OF SPOKANE STDS.
3. INSTALL "ROADWAY ENDS" SIGN PER M.U.T.C.D. & CITY OF SPOKANE STDS.
4. INSTALL "END OF ROADWAY" MARKERS PER M.U.T.C.D. & CITY OF SPOKANE STDS.

NOTE:

THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
456•8000
CALL TWO BUSINESS DAYS BEFORE YOU DIG

APPROVED FOR CONSTRUCTION
NOT
AS-BUILT
PLAN REVIEW, 5/19/98

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

6/11

Engineer's Seal was removed during the As-Built process. The information of record is as follows.

Engineer's Name	Eng's No.	Date on plan

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

TODD R. WHIPPLE — STATE OF WASHINGTON — 25463 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 9/24/98

REVISIONS	DATE

PROJ.	E.F.M.	FROM	TO	ACCEPT	FROM	TO	ORD. NO.	DATE	FILE NO.

AS BUILT — GRADE ORDINANCE LIST

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS
ELEVATION	2254.28
CBM NO.	X
CITY DATUM	
HORIZONTAL	1" = 50'
VERTICAL	1" = 10'
SCALE	

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS – ADOPTED 2/95

DATE		
09/03/97	DRAWN	MLH,MJS
09/03/97	CHECKED	MWK
09/03/97	APPROVED	

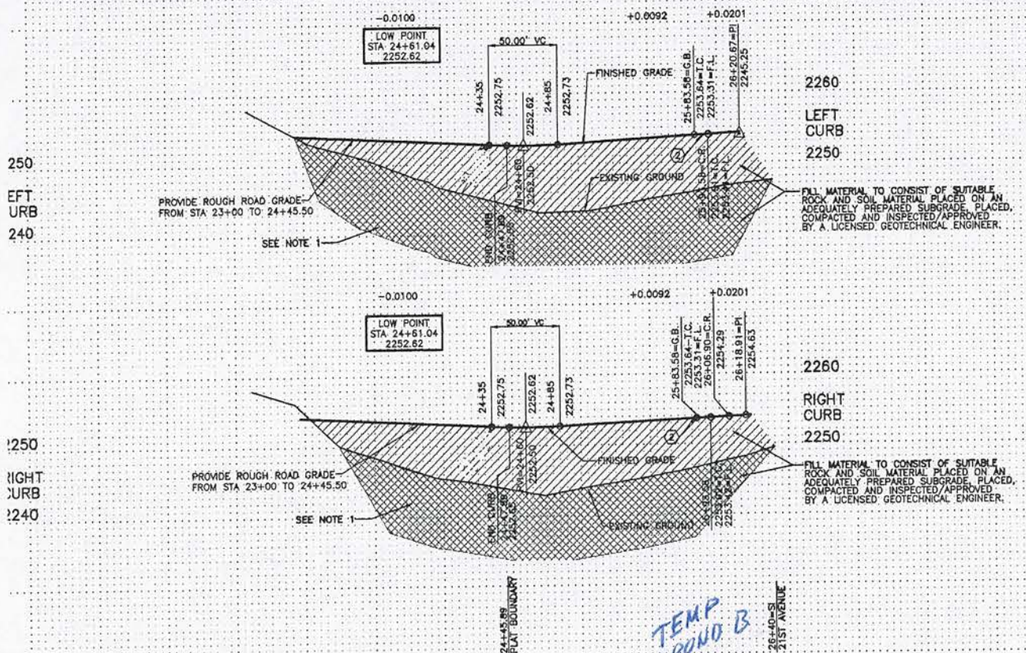
SPOKANE

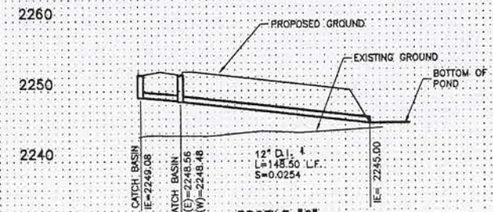
CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

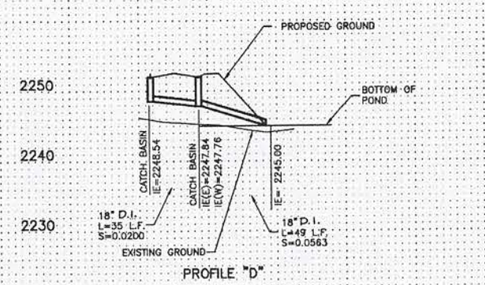
SHEET LIMITS: WESTRIDGE DRIVE (PUBLIC)
STA. 26+40 TO STA. 28+68

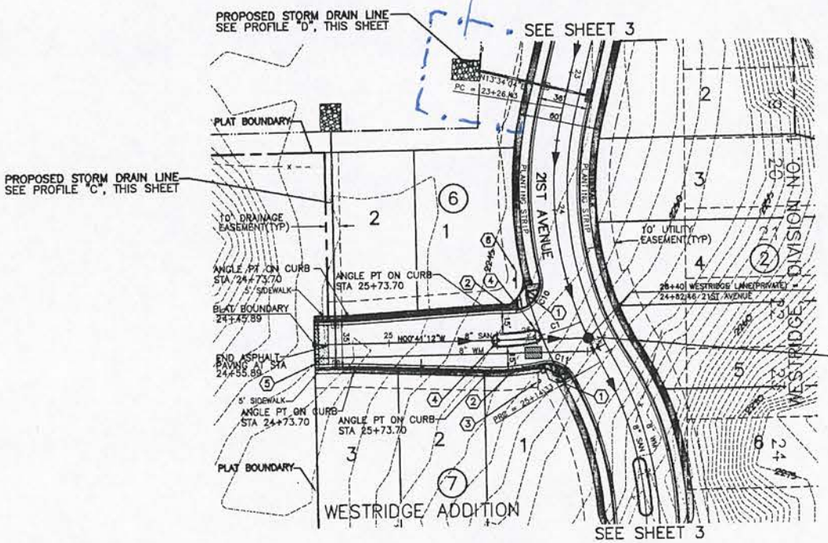
PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT:	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	WESTR D(2)2 26-25-42


-0.0100
LOW POINT
STA 24+61.04
2252.62
50.00' VC
+0.0092
+0.0201
24+35
2252.75
2252.62
24+85
2252.73
FINISHED GRADE
25+83.58=G.B.
2253.64=T.C.
2253.31=F.L.
26+06.30=C.R.
2254.29
26+18.91=PI
2254.63
2260
LEFT CURB
2250
EXISTING GROUND
PROVIDE ROUGH ROAD GRADE FROM STA 23+00 TO 24+45.50
SEE NOTE 1
FILL MATERIAL TO CONSIST OF SUITABLE ROCK AND SOIL MATERIAL PLACED ON AN ADEQUATELY PREPARED SUBGRADE, PLACED, COMPACTED AND INSPECTED/APPROVED BY A LICENSED GEOTECHNICAL ENGINEER.
RIGHT CURB
24+45.89
PLAT BOUNDARY
26+40=SI
21ST AVENUE







TEMP POND B

CURVE INFORMATION					
CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	150.00'	59.82'	30.31'	59.42'	22°50'52"
C10	20.00'	34.04'	22.81'	30.08'	97°30'22"
C11	20.00'	24.84'	14.31'	23.27'	71°09'29"

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

CONSTRUCTION NOTES

1. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD. F-105A
2. CONSTRUCT 10' CURB TRANSITION FROM TYPE "R" ROLLED CURB TO STD. CURB & GUTTER
3. INSTALL STREET NAME SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
4. INSTALL "KEEP RIGHT" SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
5. INSTALL TYPE III BARRICADE PER W.S.D.O.T. STANDARD PLAN H-2 WITH (2) "END OF ROAD" MARKERS, PER M.U.T.C.D. AND CITY OF SPOKANE STDS., MOUNTED TO BARRICADE. (BARRICADE AND SIGN TO REMIAN IN PLACE UNTIL ROAD EXTENSION)
6. INSTALL "ROADWAY ENDS" SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STANDARDS.

NOTE:

1.) APPROXIMATE VERTICAL EXTENT OF OVEREXCAVATION AND COMPACTED GRANULAR BACKFILL (8' TO 10' EXPECTED IN SOME AREAS). ACTUAL EXTENT OF OVEREXCAVATION TO BE DETERMINED DURING CONSTRUCTION.

2.) THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
456·8000
CALL TWO BUSINESS DAYS BEFORE YOU DIG

APPROVED FOR CONSTRUCTION
NOT AS-BUILT
PLAN REVIEW
5/1998

7/11

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

Proj No.	Engineer's Name	Eng's No.	Date on plan

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

TODD R. WHITAKER — STATE OF WASHINGTON — 25462 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 9/24/98

BY	REVISIONS	DATE

PROJ.	E.P.N.	FROM	TO	ACCEPT

AS BUILT

FROM	TO	ORD. NO.	DATE	FILE NO.

GRADE ORDINANCE LIST

LOCATION: FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "I" STREETS
ELEVATION: 2254.28 — HORIZONTAL 1" = 50' — VERTICAL 1" = 10'
CBM NO. X
CITY DATUM — SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD: CCS - ADOPTED 2/95

DATE		
09/03/97	DRAWN	MLH MJI
09/03/97	CHECKED	MWK
09/03/97	APPROVED	

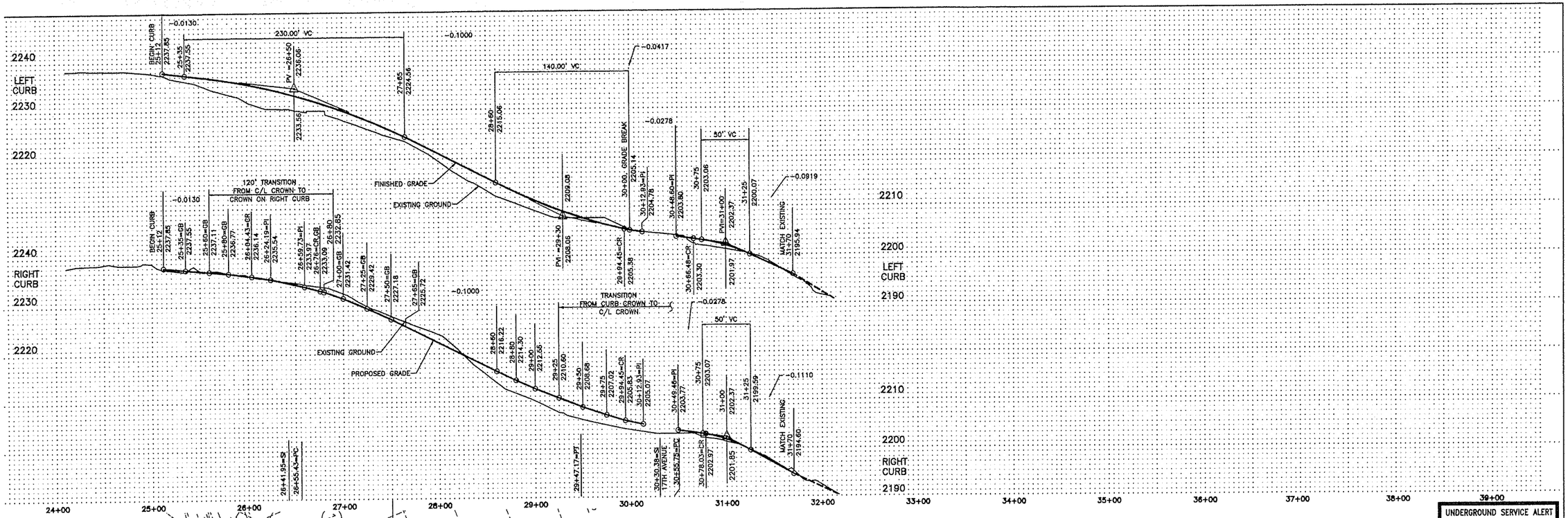
SPOKANE

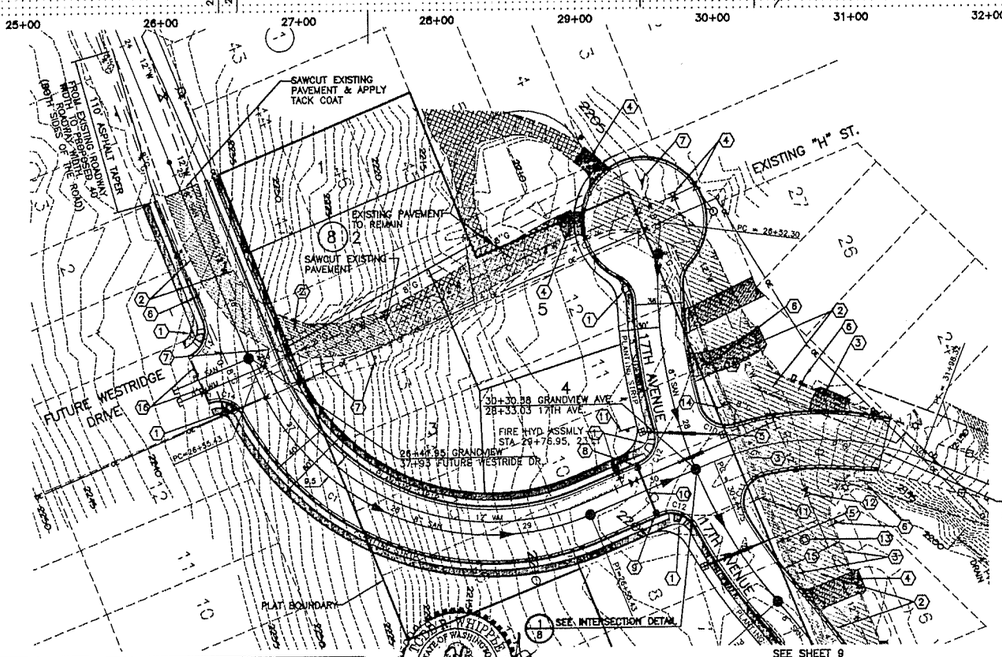
CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-8300

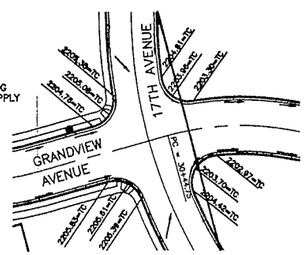
SHEET LIMITS: WESTRIDGE LANE (PRIVATE) STA 22+00 TO STA 26+40
PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT: PRIV STREET

CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	WESTR 1-3 26-25-42







INTERSECTION DETAIL 1/8

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	184.34'	291.74'	186.54'	262.23'	90°40'51"
C2	200.00'	153.57'	80.79'	149.82'	43°59'36"
C10	20.00'	31.72'	20.31'	28.50'	90°52'43"
C11	20.00'	37.46'	27.18'	32.22'	107°18'29"
C12	20.00'	29.35'	18.03'	26.79'	84°04'58"
C13	20.00'	31.18'	19.77'	28.12'	89°19'27"
C14	20.00'	29.42'	18.10'	26.84'	84°16'56"

INDICATES EXISTING PAVEMENT TO REMAIN

INDICATES EXISTING PAVEMENT TO BE REMOVED

UNDERGROUND SERVICE ALERT ONE-CALL NUMBER 456-8000 CALL TWO BUSINESS DAYS BEFORE YOU DIG

NOTES:

- W.W.P. HAS (2) EXISTING HIGH PRESSURE GAS MAINS IN 17TH AVE. & GRANDVIEW AVE. CONTRACTOR MUST COORDINATE ALL CONSTRUCTION ACTIVITIES AFFECTING THESE GAS MAINS W/ W.W.P.
- CONTRACTOR SHALL PROVIDE AND MAINTAIN AT ALL TIMES INGRESS/EGRESS TO ALL RESIDENCES.
- THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.

CONSTRUCTION NOTES

1. INSTALL CURB RAMP PER CITY OF SPOKANE STD. F-105A.
2. REMOVE EXISTING PAVEMENT.
3. REMOVE EXISTING CURB.
4. CONSTRUCT CEMENT CONCRETE DRIVEWAY APPROACH PER CITY OF SPOKANE STD. F-103.
5. EXISTING WATER METER TO BE RELOCATED, SEE WATER PLAN.
6. AFTER CITY FIELD INSPECTION AND LOCATION, RELOCATE EXISTING SIGNS PER CITY OF SPOKANE AND M.U.T.C.D. STANDARDS. IF THE CITY CHOOSES NOT TO RELOCATE ANY SIGNS, DELIVER SAID SIGN TO THE CITY OF SPOKANE.
7. EXISTING SIGNS & JERSEY BARRIERS TO BE REMOVED & RETURNED TO CITY OF SPOKANE
8. INSTALL PRECAST DRYWELL TYPE 2 PER CITY OF SPOKANE STD. B-102D WITH SPOKANE COUNTY METAL GRATE TYPE 1 PER COUNTY STD. B-12. STA 29+94.45 LT, GRATE EL.=2204.88
9. INSTALL PRECAST DRYWELL TYPE 2 PER CITY OF SPOKANE STD. B-102D WITH SPOKANE COUNTY METAL GRATE TYPE 1 PER COUNTY STD. B-12. STA. 29+94.45 RT, GRATE EL.=2205.33
10. INSTALL 38 L.F. OF 12" C.M.P. @ S=0.0105 IE(W)=2202.38, IE(E)=2201.98
11. INSTALL STOP/STREET NAME SIGN PER M.U.T.C.D. CITY OF SPOKANE STDS.
12. ADJUST EXISTING VALVE BOX TO FINISHED GRADE.
13. ADJUST EXISTING RIM TO FINISHED GRADE.
14. INSTALL "DEAD END" SIGNS PER M.U.T.C.D. AND CITY OF SPOKANE STDS.
15. CONTRACTOR SHALL FILL AND REGRADE AREA BE... PROPOSED CURB AND EXISTING EDGE OF ROAD.
16. INSTALL (2) "END OF ROADWAY" MARKERS PER M.U.T.C.D. AND CITY OF SPOKANE STANDARDS.

8/11

APPROVED FOR CONSTRUCTION
NOT AS-BUILT
PLAN REVIEW 5/19/98

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

No.	Engineer's Name	Eng.'s No.	Date on plan

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

EXPIRES 9/24/98

REVISIONS	DATE	PROJ.	E.F.N.	FROM	TO	ACCEPT

AS BUILT

FROM	TO	ORD. NO.	DATE	FILE NO.

GRADE ORDINANCE LIST

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS	BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	
ELEVATION	2254.28	HORIZONTAL	1" = 50'
CRM NO.	X	VERTICAL	1" = 10'
CITY DATUM		SCALE	

DRAFTING STANDARD CCS – ADOPTED 2/05		
DATE		
08/04/97	DRAWN	MLH MJH
08/04/97	CHECKED	MWK
08/04/97	APPROVED	

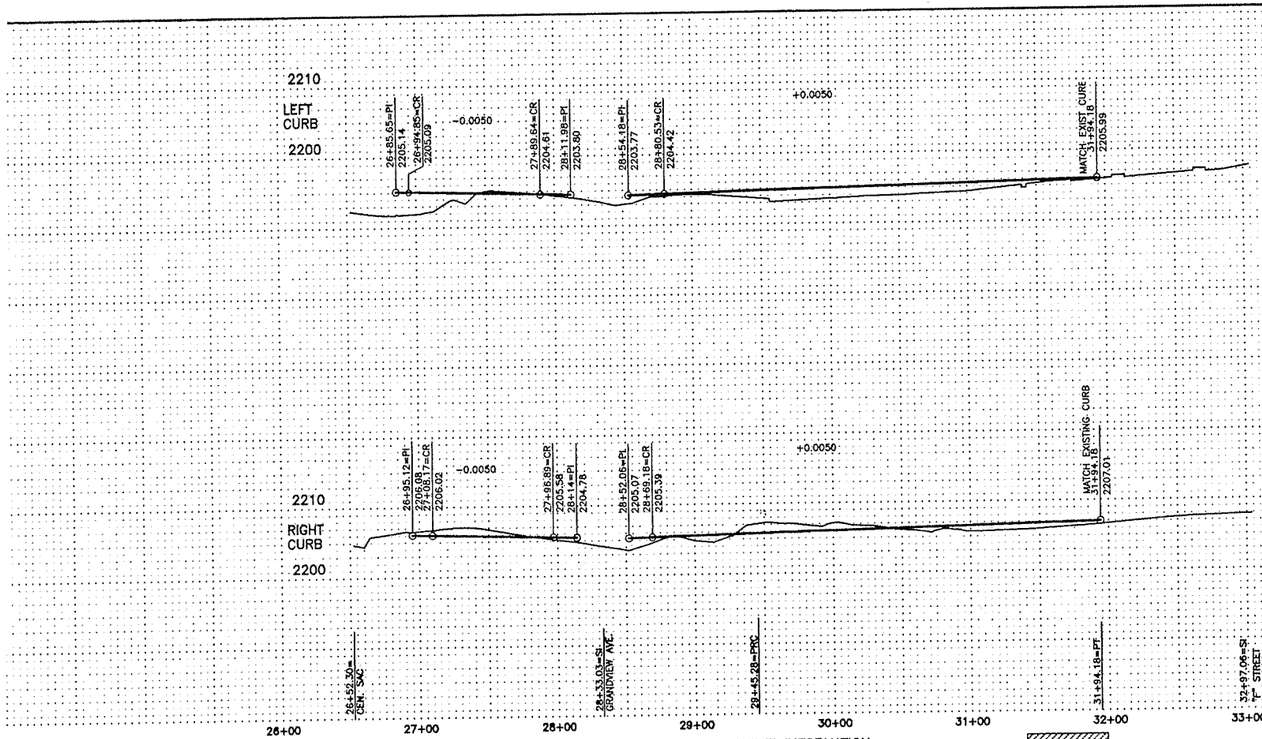
SPOKANE

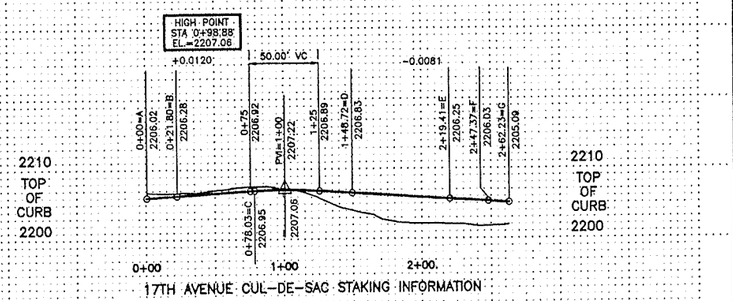
CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS:
GRANDVIEW DRIVE
STA 25+12 TO STA 31+70

PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT:	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	GRAND D(2)2 26-25-42





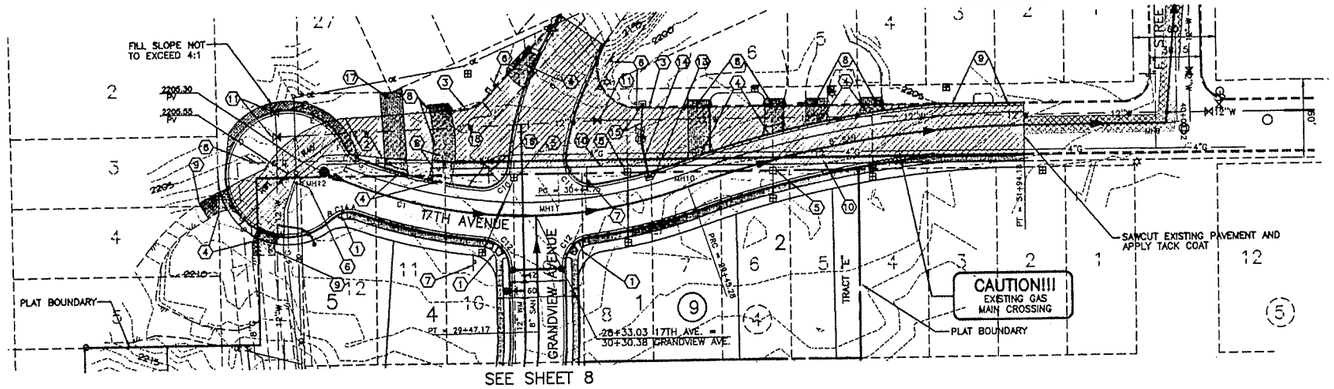
17TH AVENUE CUL-DE-SAC STAKING INFORMATION

CURVE INFORMATION

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	350.00'	292.98'	155.69'	284.50'	47°57'41"
C2	750.00'	248.90'	125.61'	247.76'	19°00'53"
C10	20.00'	31.72'	20.31'	28.50'	90°52'43"
C11	20.00'	37.46'	27.18'	32.22'	107°18'29"
C12	20.00'	29.35'	18.03'	26.79'	84°04'58"
C13	20.00'	14.12'	7.40'	13.80'	42°34'47"
C14	20.00'	20.71'	11.52'	19.70'	62°27'09"

INDICATES EXISTING PAVEMENT TO BE REMOVED

INDICATES EXISTING PAVEMENT TO BE REMOVED AND REPLACED



SEE SHEET 8

NOTE:

- W.W.P. HAS (2) EXISTING HIGH PRESSURE GAS MAINS IN 17TH AVE. & GRANDVIEW AVE. CONTRACTOR MUST COORDINATE ALL CONSTRUCTION ACTIVITIES AFFECTING THESE GAS MAINS WITH W.W.P.
- CONTRACTOR SHALL PROVIDE AND MAINTAIN AT ALL TIMES INGRESS/ EGRESS TO ALL RESIDENCES.
- THE SIGN/POST LOCATION SHALL BE FIELD LOCATED BY THE CITY OF SPOKANE PRIOR TO INSTALLATION. THE CONTRACTOR SHALL CONTACT THE CITY OF SPOKANE SIGN AND MARKING SUPERVISOR @ 625-7781, AT LEAST TWO CITY WORKDAYS, TO ARRANGE FOR A CITY REPRESENTITIVE TO FIELD LOCATE SAID SIGN/POST, PRIOR TO INSTALLATION.
- ALL MAILBOX'S ADJACENT TO REALIGNED ROADWAY SHALL BE RELOCATED TO BE ADJACENT TO NEW ROADWAY LOCATION.
- THESE PLANS ARE BASED ON EXISTING IMPROVEMENTS AS OF JULY 1997. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL FIELD VERIFY FOR ANY POSSIBLE CHANGES IN THE EXISTING CONDITIONS.

CONSTRUCTION NOTES

1. CONSTRUCT CURB RAMP PER CITY OF SPOKANE STD. F-105A
2. REMOVE EXISTING PAVEMENT.
3. REMOVE EXISTING CURB
4. CONSTRUCT CEMENT CONCRETE DRIVEWAY APPROACH PER SPOKANE STD. F-103, MATCH EXISTING DRIVEWAY WIDTH.
5. EXISTING WATER METER TO BE RELOCATED, SEE WATER PLAN
6. AFTER CITY FIELD INSPECTION AND LOCATION, RELOCATE EXISTING SIGNS PER CITY OF SPOKANE AND M.U.T.C.D. STANDARDS. IF THE CITY CHOOSES NOT TO RELOCATE ANY SIGNS, DELIVER SAID SIGN TO THE CITY OF SPOKANE.
7. INSTALL STOP AND STREET NAME SIGNS PER CITY OF SPOKANE AND M.U.T.C.D. STANDARDS
8. REMOVE EXISTING DRIVEWAY DROP AND EXTEND EXISTING CONCRETE DRIVEWAY AS SHOWN.
9. REESTABLISH DRIVEWAY APPROACH AS NECESSARY.
10. REMOVE EXISTING SIDEWALK.
11. ADJUST EXISTING VALVE BOX TO GRADE.
12. EXISTING GAS/ELECTRIC SERVICE TO BE EXTENDED BY OTHERS.
13. INSTALL GRATE INLET TYPE 3 WITH FRAME AND GRATE PER CITY OF SPOKANE STANDARDS B-2A AND B-119 STA 29+20, 18FT LT, GRATE EL=2204.04
14. INSTALL 27' L.F. OF 12" CMP @ S=0.0941 IE(S)=2201.54, IE(N)=2199± CORE DRILL EXISTING DRYWELL AND CONNECT NORTH END OF PIPE TO EXISTING DRYWELL . CONTRACTOR TO VERIFY EXISTING DRYWELL ELEVATIONS PRIOR TO CONSTRUCTION.
15. REMOVE EXISTING DRAINAGE STRUCTURE AND PERMANENTLY PLUG EXISTING PIPE.
16. INSTALL "DEAD END" SIGN PER M.U.T.C.D. AND CITY OF SPOKANE STANDARDS.
17. PROVIDE 16' WIDE, 4" THICK C.S.T.C. GRAVEL ACCESS FROM PROPOSED DRIVEWAY APPROACH TO EXISTING GATED ENTRY.
18. CONSTRUCTOR SHALL FILL AND REGRADE AREA BETWEEN PROPOSED CURB AND EXISTING EDGE OF ROAD. CONTRACTOR SHALL PROTECT EXISTING LANDSCAPING WHEREVER POSSIBLE.

Project Cancelled 15 Jun 04

APPROVED FOR CONSTRUCTION

NOT AS-BUILT

PLAN REVIEW 5/19/98

9/11

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
456-8000
CALL TWO BUSINESS DAYS BEFORE YOU DIG

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

The Engineer's Seal was removed during the As-Built process. The information of record is as follows.

No.	Engineer's Name	Eng's No.	Date on plan

TODD R. WHITE — STATE OF WASHINGTON — 25462 — REGISTERED PROFESSIONAL ENGINEER — 12-15-97 — EXPIRES 9/24/98

INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

REVISIONS	DATE

PROJ.	E.F.H.	FROM	TO	ACCEPT	FROM	TO	ORD. NO.	DATE	FILE NO.
AS BUILT					GRADE ORDINANCE LIST				

LOCATION	CITY DATUM- BASED ON FND SPIKE IN POWER POLE 300' SOUTH OF 21ST AND H		
ELEVATION	2245.28	HORIZONTAL	1" = 50'
CBM NO.	X	VERTICAL	1" = 10'
CITY DATUM		SCALE	

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

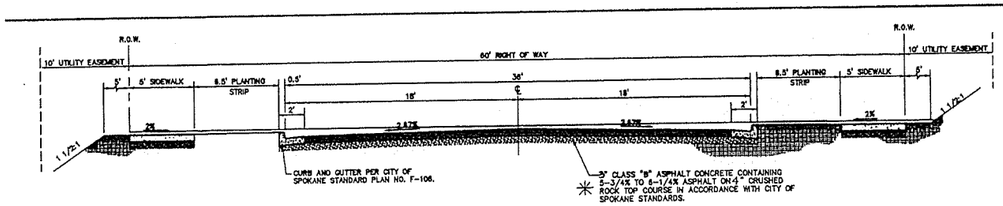
DRAFTING STANDARD CCS — ADOPTED 2/95		
DATE	09/04/97	DRAWN MLH,RLM2,MJ
	09/04/97	CHECKED NWK
	09/04/97	APPROVED

SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

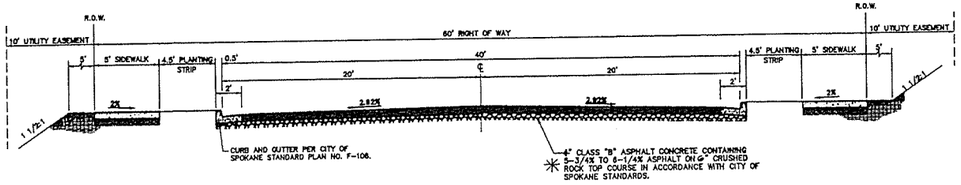
SHEET LIMITS:
17th AVENUE
STA 26+52.30 TO "F" STREET
PROJECT LIMITS: WESTRIDGE ADDITION

TYPE OF IMPROVEMENT:	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	17TH V(2)2 26-25-42
PE	



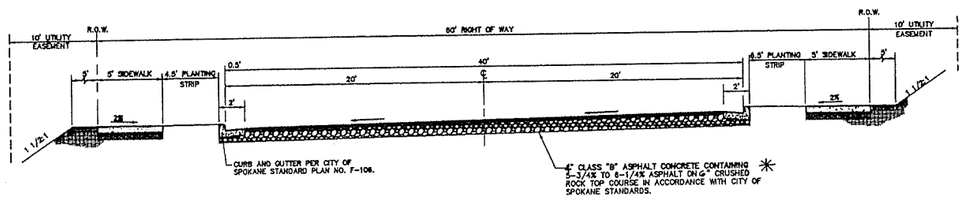
TYPICAL PUBLIC ROAD SECTION

21ST. AVENUE (WITHOUT ISLAND) BEARD DRIVE (PUBLIC) (CENTERLINE=TC)
WESTRIDGE DRIVE (PUBLIC)



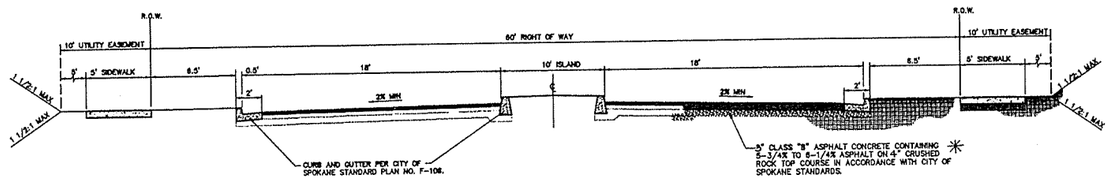
TYPICAL PUBLIC ROAD SECTION (CENTERLINE=TC+0.1)

GRANDVIEW ROAD (CENTERLINE CROWN SECTION)



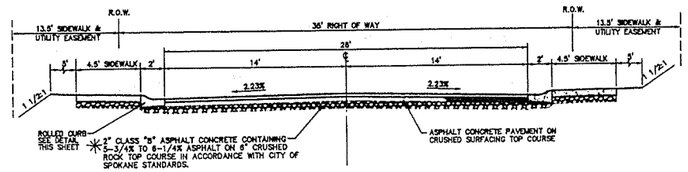
TYPICAL PUBLIC ROAD SECTION

GRANDVIEW ROAD (CURB CROWN SECTION)



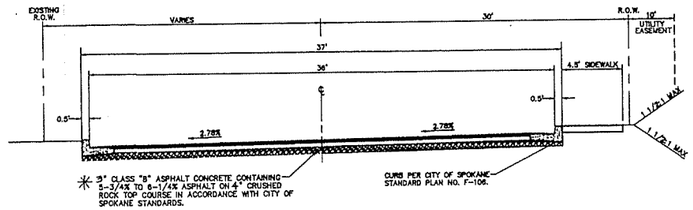
TYPICAL PUBLIC ROAD SECTION

21ST. AVENUE (WITH ISLAND)



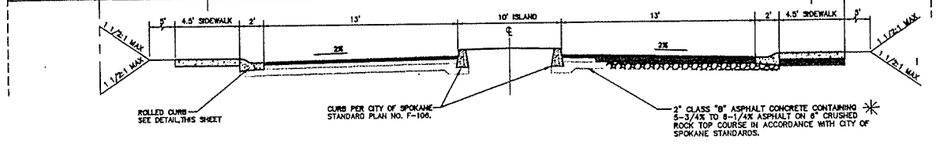
TYPICAL PRIVATE ROAD SECTION (WITHOUT ISLAND)

CUMBERLAND LANE, WESTRIDGE LANE (PRIVATE)



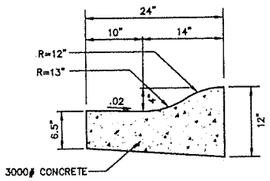
TYPICAL PUBLIC ROAD SECTION

17TH AVENUE (NOTE: 17TH SHALL HAVE A CURB CROWN SECTION)



TYPICAL PRIVATE ROAD SECTION

CUMBERLAND LANE, WESTRIDGE LANE (WITH ISLAND)



ROLLED CURB DETAIL

NOT TO SCALE

1/11

NOTE:

1. SEE CITY OF SPOKANE STANDARDS W-101A AND W-101B FOR TYPICAL ROADWAY PAVEMENT AND BASE REQUIREMENTS AND CROWN/SLOPE REQUIREMENTS FOR PUBLIC ROADS.
2. ROCK BASE COURSE DEPTHS VARY DEPENDING ON CONDITIONS ENCOUNTERED. ADDITIONAL BASE COURSE REQUIRED OVER SOLID ROCK. SEE CITY STDS. W-101A & W101B.

APPROVED FOR CONSTRUCTION
NOT AS-BUILT
PLAN REVIEW
5/19/98

10/11

INLAND PACIFIC ENGINEERING
07 West 7th • Suite 200 (509) 458-6840
pokane, WA 99204 FAX: (509) 458-6844

UNDERGROUND SERVICE ALERT ONE-CALL NUMBER 456-8000 CALL TWO BUSINESS DAYS BEFORE YOU DIG

TODD K. WHIPP — STATE OF WASHINGTON — 19145 — REGISTERED PROFESSIONAL ENGINEER
3-13-98
EXPIRES 9/24/98

REVISIONS	DATE	PROJ.	E.F.N.	FROM	TO	ACCEPT
AS BUILT						

FROM	TO	ORD. NO.	DATE	FILE NO.
GRADE ORDINANCE LIST				

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21st & "H" STREETS	
ELEVATION	2254.28	HORIZONTAL 1" = 50'
CBM NO.	X	VERTICAL 1" = 10'
CITY DATUM		SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS – ADOPTED 2/95

DATE 06/22/97	DRAWN	MJ
06/22/97	CHECKED	MMK
06/22/97	APPROVED	

SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS:

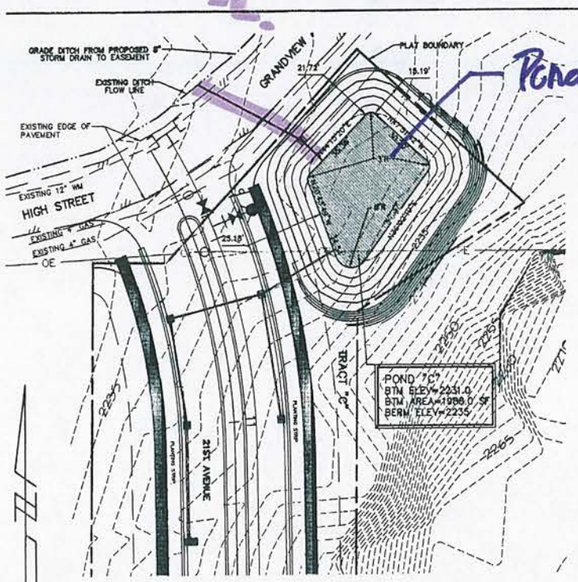
WESTRIDGE
STREET DETAILS

PROJECT LIMITS: WESTRIDGE ADDITION

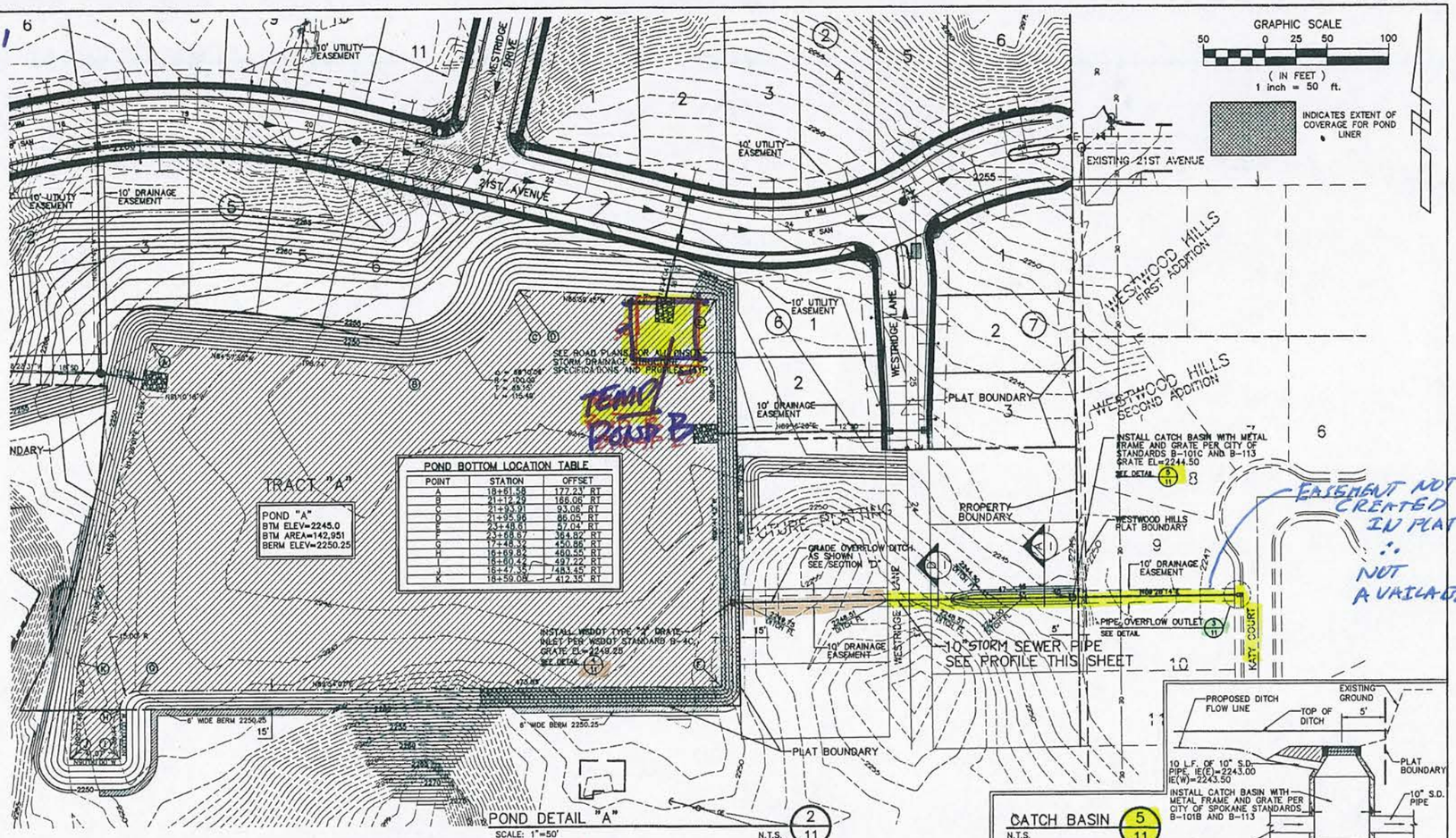
TYPE OF IMPROVEMENT	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	DETAILS 26-25-42

4.

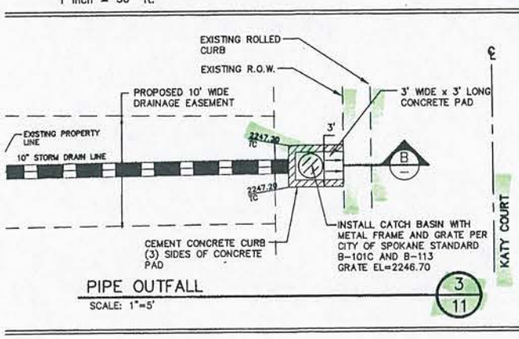
Pond 'C'



POND DETAIL "B" 1/11

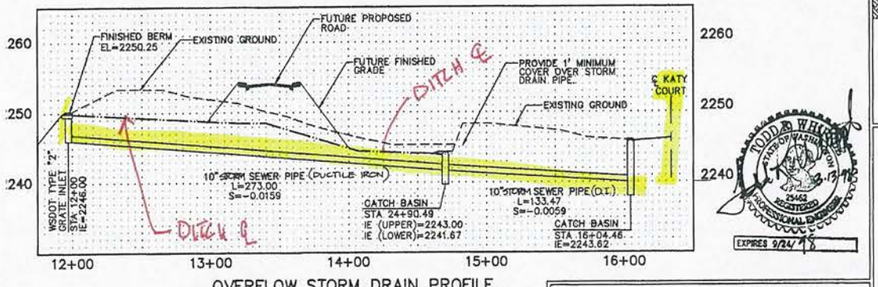


POND DETAIL "A" 2/11

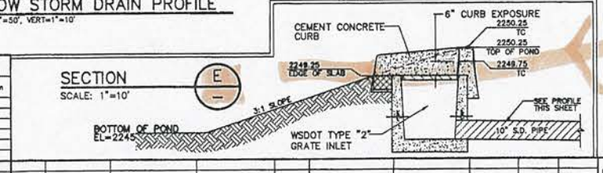


PIPE OUTFALL 3/11
SCALE: 1"=5'

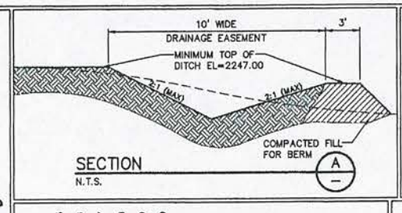
CATCH BASIN 5/11
N.T.S.



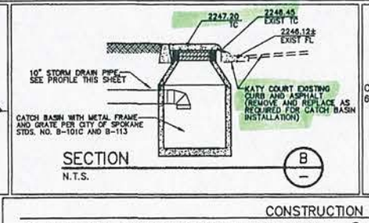
OVERFLOW STORM DRAIN PROFILE
SCALE: HORIZ:1"=50', VERT=1"=10'



SECTION E
SCALE: 1"=10'



SECTION A
N.T.S.



SECTION B
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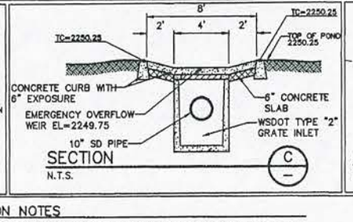
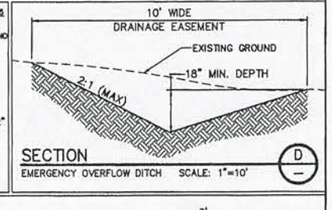
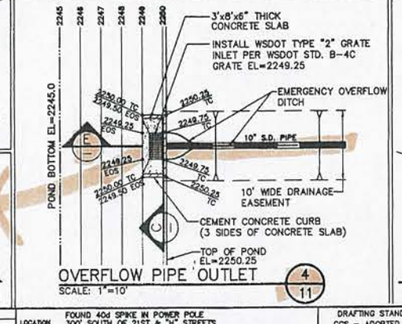


SECTION C
N.T.S.



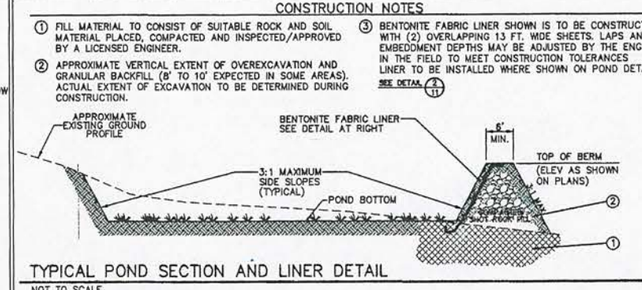
SECTION D
EMERGENCY OVERFLOW DITCH SCALE: 1"=10'



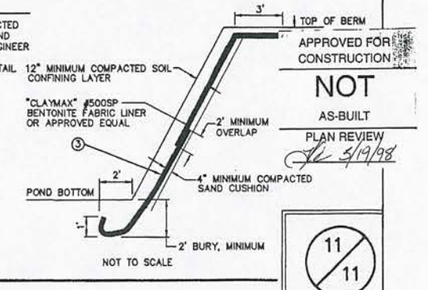
OVERFLOW PIPE OUTLET 4/11
SCALE: 1"=10'

CONSTRUCTION NOTES

1. FILL MATERIAL TO CONSIST OF SUITABLE ROCK AND SOIL MATERIAL PLACED, COMPACTED AND INSPECTED/APPROVED BY A LICENSED ENGINEER.
2. APPROXIMATE VERTICAL EXTENT OF OVEREXCAVATION AND GRANULAR BACKFILL (8' TO 10' EXPECTED IN SOME AREAS). ACTUAL EXTENT OF EXCAVATION TO BE DETERMINED DURING CONSTRUCTION.
3. BENTONITE FABRIC LINER SHOWN IS TO BE CONSTRUCTED WITH (2) OVERLAPPING 13 FT. WIDE SHEETS. LAPS AND EMBEDDMENT DEPTHS MAY BE ADJUSTED BY THE ENGINEER IN THE FIELD TO MEET CONSTRUCTION TOLERANCES LINER TO BE INSTALLED WHERE SHOWN ON POND DETAIL SEE DETAIL 4/11



TYPICAL POND SECTION AND LINER DETAIL
NOT TO SCALE



NOT TO SCALE

11/11

The Engineer's Seal was removed during the As-Built process. This information of record is as follows.

No.	Engineer's Name	Eng's No.	Date on plan

REVISIONS	DATE

PROJ.	E.P.N.	FROM	TO	ACCEPT	FROM	TO	ORD. NO.	DATE	FILE NO.

AS BUILT | GRADE ORDINANCE LIST

LOCATION	FOUND 40d SPIKE IN POWER POLE 300' SOUTH OF 21ST & "H" STREETS		
ELEVATION	2254.28	HORIZONTAL AS NOTED	
CSM NO.	X	VERTICAL AS NOTED	
CITY DATUM		SCALE	

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAFTING STANDARD CCS - ADOPTED 2/95

DATE		
07/14/97	DRAWN	CLK
07/14/97	CHECKED	MWK
07/14/97	APPROVED	

SPOKANE

CITY OF SPOKANE, WASHINGTON
DEPARTMENT OF CONSTRUCTION SERVICES
808 WEST SPOKANE FALLS BLVD.
SPOKANE, WASHINGTON 99201-3343
(509) 625-6300

SHEET LIMITS:

POND DETAILS

PROJECT LIMITS: WESTRIDGE, DIVISION NO. 1

TYPE OF IMPROVEMENT	STREET
CITY PROJECT NUMBER	CITY PLAN NUMBER
97067	DETAIL 26-25-42

PR

7.b. Previous
Storm Report

DRAINAGE REPORT

for

WESTRIDGE, PHASE I

The City of Spokane, Washington

September 2, 1997

OLD 14-1334
NEW 21-3130
REF 21-3109

Prepared by:

Inland Pacific Engineering Company
707 W. 7th Avenue, Suite 200
Spokane, WA 99204
(509)458-6840

This report has been prepared by the staff of Inland Pacific Engineering Company under the direction of the undersigned professional engineer whose seal and signature appear hereon.

Mike P. Yake

GENERAL

An overall preliminary drainage concept report has been completed by Inland Pacific Engineering under separate cover (*Preliminary Drainage Concept Report for Westridge, February 12, 1997*), and may be referenced in the report. The preliminary drainage report is an analysis of the overall project, determining the total site's predeveloped flow rates and storm volumes. This report will only address the storm drainage design and calculations associated with the construction of Phase I.

PURPOSE

The purpose of this drainage report is to determine adequate storm drainage facilities satisfying the City of Spokane requirements to be constructed to dispose of stormwater runoff created by Phase I of Westridge.

PROJECT DESCRIPTION

Phase I of Westridge consists of developing 41 lots for single family housing. The property is located south of the freeway in western Spokane, in Section 2, T. 25 N., R 42 E.W.M. The proposed PUD is bordered by Grandview Avenue to the north, 25th Avenue to the south, "H" Street to the east, and Kendall Street to the west. The location can be seen in the following vicinity and site maps.

Phase I will include the realignment of Grandview at 17th Avenue and the construction of 21st Avenue. Phase I will also include the construction of the large evaporation pond located in the center of the site, and the construction of a smaller retention/detention pond at the intersection of 21st Avenue and Grandview.

ANALYSIS METHODOLOGY

As required by the City of Spokane, the developed peak flow and runoff volume from the site cannot exceed that of the predeveloped condition for the 100-year storm event. Therefore, the increase in volume resulting from development will be retained and disposed of in an evaporation pond(s).

This development is within the Aquifer Sensitive Area (ASA) of Spokane County and is subject to '208' requirements.

SOILS DESCRIPTION

Sheet 73 of the Spokane County Soil Survey indicates that the proposed site primarily consists of Hesseltine soils with some small outcrops of Cheny & Uhlig, and Cocolalla soils. The Hesseltine (HvC, HsB, Hob) and Cheney & Uhlig (CnB) soils belong to soil group B. The small outcrop of Cocolalla (Cy) soil belongs to soil group C. The soil survey map can be seen in the appendix.

Curve Number & Time of Concentration

From the TR-55 manual, runoff curve numbers (CN) were obtained for the different land uses and soil types. In the undeveloped condition, the property is currently covered with rocky material, trees, and shrubs/weeds. However, with development, impervious roads, sidewalks, and structures along with individual lawns and yards will occupy the property. The property is nearly entirely composed of Type B soils and will be the soil type considered in calculations.

The developed CN was calculated for each basin using a weighted average, as summarized below.

CN Summary

DESCRIPTION	CN
HOUSE, DRIVEWAY, GARAGE	98
LAWN & YARD	61
ROAD & SIDEWALKS	98
PREDEVELOPED	65

The curve number for the lots developed in Phase I are calculated with the following information: a 960 sq.ft. house, 400 sq.ft. driveway, and 440 sq.ft. garage with the remaining area as lawn/yard. The impervious road and sidewalk surfaces within each basin were also used in the calculations. The CN for each basin was calculated using the above described soil cover and curve numbers. The weighted CN calculation sheets are included in the appendix.

Time of concentrations were calculated for the time of concentration paths shown on the basin maps. The time of concentration calculation sheets can be seen in the appendix.

EXISTING CONDITION

Predeveloped Basins

The predeveloped basins are delineated by the natural occurring high and low points of the terrain. The predeveloped area has been divided into Basins A, B, C, D and E. Below the basins are described and flow rates and storm volumes given for the 100-year storm.

Basin A, approximately 37.61 acres in size, currently drains into a sump area near the proposed eastern boundary of the plat. As runoff fills this low point, the stormwater will overflow this area and continue to the southeast as indicated by the existing contours. These 37.61 acres create a predeveloped peak flow of 10.3 cfs to the low point, with a peak flow of 2.5 cfs leaving the sump area and leaving the proposed site at its east boundary.

Basin B drains towards Grandview, flows over the street and continues over the bluff towards I-90. Basin B is 10.36 acres in size and has a predeveloped flow rate of 2.3 cfs and a predeveloped storm volume of 12,348 cu.ft. The predeveloped flow rate and runoff volume is not expected to change with the development of Phase I.

Basin C drains toward the west of the plat boundary toward Kendall Street. Basin C is 3.95 acres in size and has a predeveloped flow rate of 0.9 cfs and a predeveloped storm volume of 5,940 cu.ft.

Basin D drains toward the Grandview/17th Avenue intersection. Basin D has an area of 8.12 acres and a predeveloped flow rate of 2.2 cfs.

Basin E is located in the southwest corner of the proposed plat and drains westwardly. Basin E contains 4.78 acres and has a predeveloped flow rate of 1.3 cfs and a predeveloped storm volume of 6,480 cu.ft.

DEVELOPED CONDITION

Developed Basins.

Using the high and low points of the proposed road grades, basins were defined for the proposed plat. The developed plat has been divided into Basins A, B, C, D, & E.

Basin A contains the area that drains into the large evaporation pond near the center of the plat. Calculations for Basin A were performed assuming the plat at build out to ensure that the proposed evaporation pond constructed in Phase I could also handle the future phases of development. Basin A will retain and dispose of all increase in runoff on site in a large evaporation pond. During the 100 year storm event, this basin will produce approximately 97,146 cubic feet of stormwater runoff at build out. This is an increase of 50,490 cubic feet that requires

storage for evaporation. A water budget analysis for the approximate 43 acres within Basin A with the provided evaporation pond with a bottom area of 142,951 sq.ft has been performed and is included in the appendix. The evaporation pond will also provide '208' treatment.

Basin B is delineated by the ridge north of 21st Avenue and the proposed high points on Grandview Avenue. With the development of Phase I, this basin includes the back portion of 6 lots that front 21st Avenue. Basin B has a developed flow rate of 2.3 cfs and a developed storm volume of 12,348 cu.ft, equal to the predeveloped rate and volume.

Basin C is a relatively small basin located at the western boundary of the plat, containing Beard Court. This area will drain into a pond area (Pond C) at the intersection of 21st Avenue & Grandview Avenue. The pond will retain and evaporate the increase in volume from Basin C and will release runoff at no greater than the predeveloped rate as required by the City of Spokane. The developed flow rate is 3.0 cfs and 11,484 cu.ft. of storm volume. Therefore, a minimum of 5,544 cu.ft. is required to be stored onsite for evaporation. The remaining stormwater will be discharged at a flow rate no greater than 0.9 cfs.

Basin D consists of the improved Grandview Street. This street will continue to utilize existing drywells to control the runoff from its surface.

Basin E is located in the southwest corner of the proposed plat and drains westwardly and is not affected by the development of Phase I.

Stormwater Summary for the 100 Yr. Storm

Basin	Predev. Q	Dev. Q	Predev. Vol.	Dev. Vol.	Req'd. Storage	Prov'd. Storage
A	2.5 cfs	*2.29 cfs	46,656 cf	97,146 cf	50,490 cf	616,884 cf
B	2.3 cfs	2.3 cfs	12,348 cf	12,348 cf	0	0
C	0.9 cfs	**0.22 cfs	5,940 cf	11,484 cf	5,544 cf	5,590 cf
D	2.2 cfs	2.3 cfs	9,828 cf	9,972 cf	n/a	0
E	1.3 cfs	1.3 cfs	6,480 cf	6,480 cf	0	0

* This is the capacity of the 10" PVC allowing discharge from the plat at or below the predeveloped rate.
** The peak flow out of Pond C @ 21st Avenue & Grandview Avenue.

DRAINAGE DESIGN

Phase I Onsite Calculations

Phase I has been divided into developed basins to determine the peak flows at points where inlet facilities will be installed. The basins have been determined by the high and low points of the proposed streets in Westridge, including the streets that will be constructed with a later phase that contribute runoff to an inlet in this phase. The basins are labeled A through J and can be seen on the onsite basin map.

Phase I Developed Basins A and B drain toward the intersection of 21st Avenue and Grandview. At this intersection will be a retention/detention pond that will control the peak flow and volume leaving the site. This predeveloped basin is described in the preliminary drainage report. This pond (Pond C) will retain the increase in developed volume and dispose of it through evaporation. Stormwater above the developed volume increase will be discharged through an overflow pipe at the predeveloped flow rate or less.

Phase I Developed Basins C through J will produce stormwater that will be collected and disposed of in the large evaporation pond located near the center of the site. This pond will retain the increase in developed volume and dispose of it through evaporation. Stormwater above the developed volume increase will be allowed to be discharged off the plat through a pipe at the predeveloped rate or less.

The retention ponds will also be providing '208' treatment in the first 6" of pond bottom depth.

Peak Flow Calculations

Using the rational method, the peak flows for each Phase I Basin have been calculated for the 100-year storm. The runoff coefficient was determined based on the dwelling units per acre ratio. The calculation sheets can be found in the appendix.

Basin Peak Flow Summary

INLET BASIN	EXPECTED 100-YEAR STORM PEAK FLOW
A	4.12 cfs
B	2.11 cfs
C	0.86 cfs
D	1.54 cfs
E	7.89 cfs
F	1.27 cfs
G	4.22 cfs
H	2.04 cfs
I	1.51 cfs
J	1.46 cfs

Inlet Calculations

Based on the expected peak flow during the 100-year storm, and the grades of the proposed streets, calculations were performed to determine the size and number of inlets required to capture the developed runoff. Inlet calculations are in the appendix as well as the pipe flow calculations.

Backwater Calculations

Backwater calculations were performed to verify that the inlets and pipes were properly sized and that there is adequate freeboard for the grates. The backwater calculations can be found in the appendix.

Evaporation Calculations

Evaporation calculations have been performed following the Spokane County interim policy on evaporation ponds, a policy which has been adopted by the City of Spokane. The evaporation pond cycle begins with the increase of runoff volume due to the development from a 100 year storm and then adds the runoff volume expected for each month based on the average precipitation rate and subtracts the average evaporation and infiltration for each month from the pond and any overflow volumes.

BASIN	PRE. VOL.	DEV. VOL.	REQUIRED STORAGE	PROVIDED STORAGE
A	46,656 CF	97,146 CF	50,490 CF	619,128 CF
C	5,940 CF	11,484 CF	5,544 CF	5,590 CF

APPENDIX

VICINITY MAP & SOILS MAP

GEOTECHNICAL LETTER

PREDEVELOPED HYDROGRAPH CALCULATIONS

DEVELOPED HYDROGRAPH CALCULATIONS

PEAK FLOW CALCULATIONS

INLET CALCULATIONS

PIPE FLOW CALCULATIONS

BACKWATER CALCULATIONS

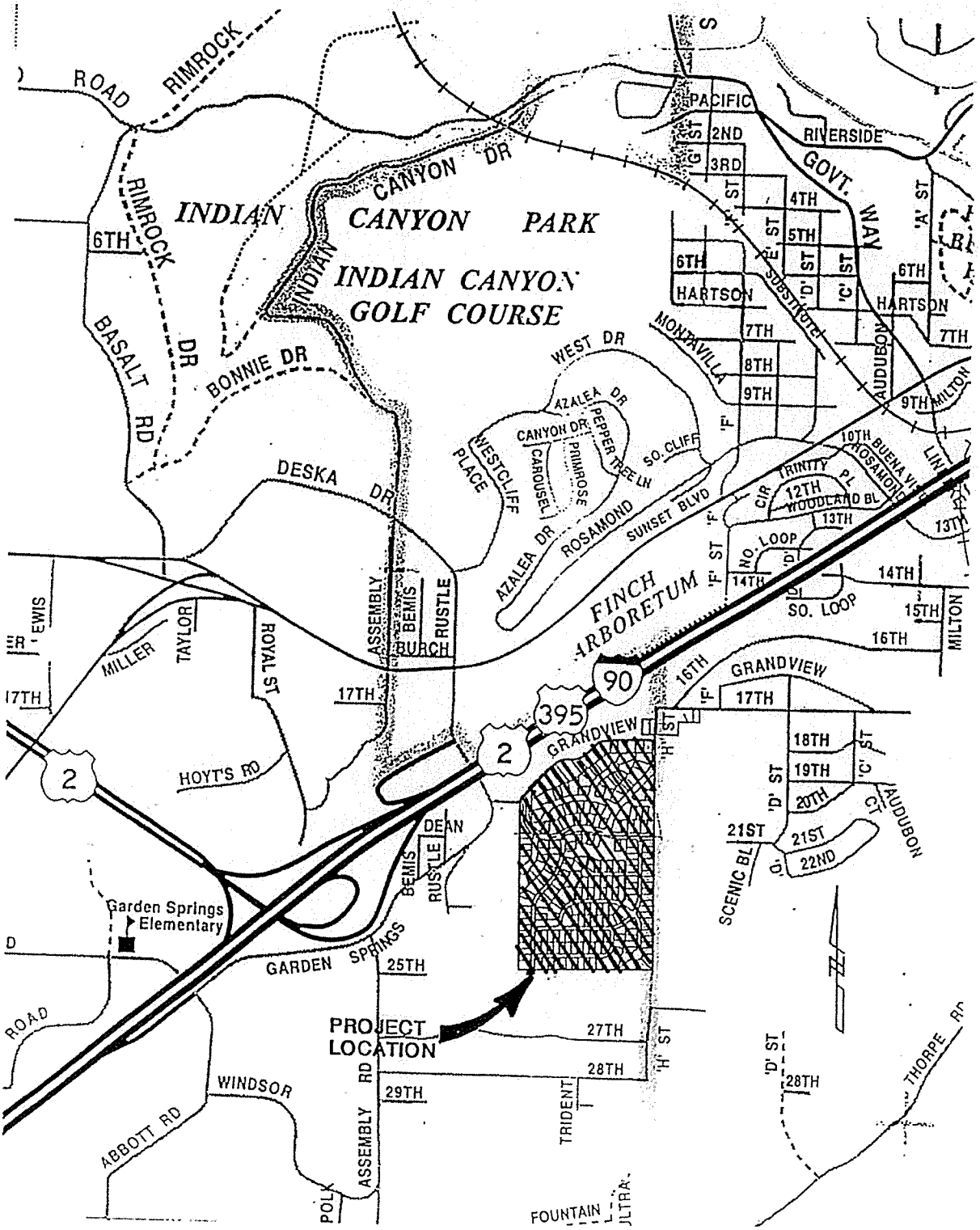
POND "C" ROUTING CALCULATIONS

EVAPORATION CALCULATIONS

BASIN MAPS

2/18/22 - CALCS can be printed in PDF - City has document on file.
TBW

VICINITY MAP
& SOILS MAP



INLAND PACIFIC ENGINEERING

707 West 7th • Suite 200 (509) 458-6840
Spokane, WA 99204 FAX: (509) 458-6844

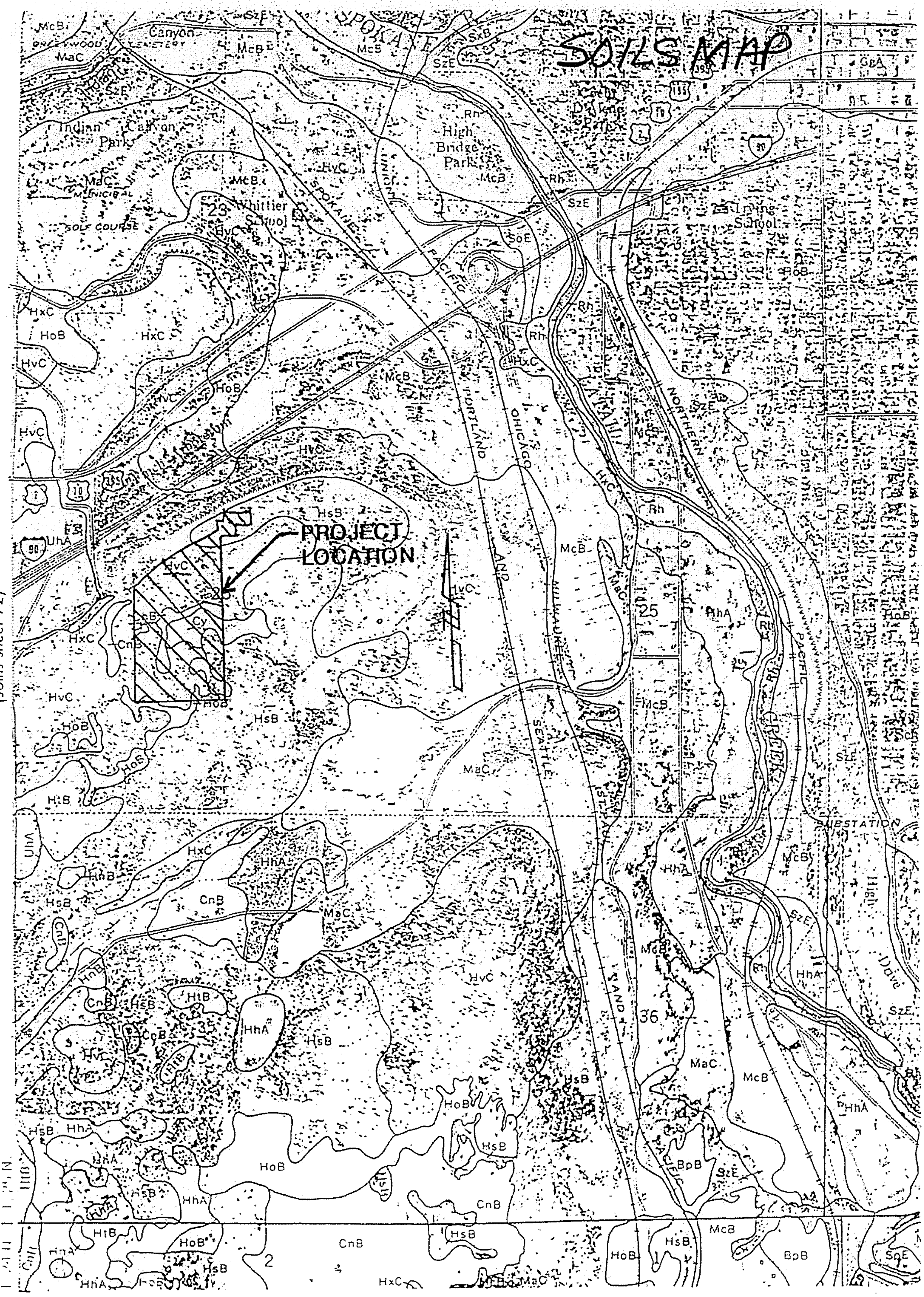
FIGURE 1

VICINITY MAP

WESTRIDGE PUD

TRAFFIC IMPACT ANALYSIS

(Joins sheet 72)



Scale 1:20000

SOILS MAP

GEOTECHNICAL INFORMATION

INLAND PACIFIC ENGINEERING, INC.

August 15, 1997

West Jackson Company, Inc.
108 South Jackson Street, Suite 300
Seattle, Washington 98104

Attention: Mr. Barry Margolese

Subject: **Geotechnical Review of Site Stormwater Disposal**
Proposed Westridge Residential Development
Spokane, Washington

Dear Barry:

Inland Pacific Engineering Company (IPEC) is pleased to present this review of geotechnical considerations that impact the proposed Westridge stormwater collection and disposal facilities.

Subsurface Conditions

Subsurface conditions in the proposed stormwater retention area were evaluated during site visits on September 12, 1996, and on March 5, 1997 by members of our staff.

During the first visit, we drilled three holes by hand auger methods to depths of approximately 6 to 8 feet below the existing ground surface, for the purpose of estimating the groundwater gradient across the central low area, which is to be reserved as open space for stormwater management. The general direction of the gradient, as calculated using the elevations of water in the holes determined with a standard optical level, is shown on Figure 1.

Our second set of explorations, also advanced by hand auger methods, was performed to evaluate the possibility of settlement of embankments founded on the suspected soft soils at the eastern margin of the central low area. Our explorations encountered dark brown topsoil, over soft clayey silt, over saturated fine to medium sand to the full depths explored. It appears that some excavation and replacement of settlement-prone soils will need to be accomplished during site development, to provide suitable soils for founding the proposed improvements along Westridge Drive and portions of 21st Avenue.

Drywells

Drywells will be of very limited use for stormwater disposal on this site, in our opinion. Portions of Phase 1 will be founded upon basalt bedrock, whose limited infiltration capacites can be improved somewhat by fracturing the rock with controlled blasting techniques. The fine-grained nature, as well as the high moisture content of the soils in the central low area will not provide sufficient infiltration rates to make drywells a feasible method of stormwater disposal.

Stormwater Retention Pond

Current Phase 1 grading plans show the proposed Westridge Drive to be founded upon an approximately 10 feet high fill enbankment, which will contain buried sewer and water, and storm drainage collection and distribution elements, as well as serve as foundation material for the adjoining residences. This embankment will cross the lower (down-gradient) margin of the lower central area, effectively serving as the eastern limit of the proposed stormwater management area.

The amount of impact of the maximum water elevation on the downstream development will likely depend on the permeability of the embankment material, which will control the head loss on the seepage through the embankment. The likely embankment material to be found or manufactured in quantity on this site (shot rock) would likely be more permeable than the silty soils which the water travels through now. With the increased hydraulic head coming from the higher water level in the pond, down-gradient water levels would also rise in proportion to the higher permeability and gradient.

Mitigation of possible elevated downstream water levels could include reducing the permeability of the embankment, or increasing the head loss through the embankment. The most feasible alternative would be to place a relatively impervious liner on the upstream face of the fill embankment, keyed into native silt and clay soils at the bottom. It should be possible to reduce the permeability of the embankment so that the preferential (easiest) flow direction is into the native silty pond subgrade soils, thus keeping the downstream groundwater conditions as close to the same as predevelopment conditions as possible, depending upon the liner type and construction practices utilized. The need for a blanket or chimney drain within the embankment would best be evaluated at the time of construction, depending on the embankment fill soil and pond liner types actually used.

Basements

Basements must be constructed with the overall site groundwater conditions in mind, to avoid conflicts with below-grade construction. In areas adjacent to the central low area, lowest floor slab elevations should be an appropriate distance above the highest anticipated water elevation in the site stormwater detention facility.

In other areas of the site, excavations for basements are likely to be hoe-rammed or blasted into basalt bedrock. Such excavations can easily become a relatively impermeable bathtub that will serve to hold water against the foundation walls. Four-sided (enclosed) basement excavations should be constructed with a bottom that has a relatively constant grade downward to a low side or corner, to make a pumped sump installation more efficient. Daylight basements in bedrock

excavations should have the bottom of the excavation grading downward to the daylight side, again to promote drainage of the excavation once the home has been constructed.

In any case, there is the potential for site groundwater conditions to negatively influence residential construction on this site. Without intimate knowledge of lot excavation/fill configurations, final lot grades, differences between lowest structure grades and highest water levels and other factors, the advisability of basement construction cannot be addressed in a general statement at this time. Specific subsurface and groundwater conditions particular to each building site should be addressed on a lot-by-lot basis by a geotechnical engineer prior to construction, to determine the limitations on or advisability of basement construction.

Closure

We are pleased to be able to present this letter, and look forward to successful construction of the project. If you should have any questions regarding this letter or other aspects of the project, please do not hesitate to call.

Respectively submitted,
Inland Pacific Engineering, Inc.

JERRY E. PETERSON
STATE OF WASHINGTON
9/15/97
REGISTERED
PROFESSIONAL ENGINEER

Jerry E. Peterson, P.E.
Geotechnical Engineer

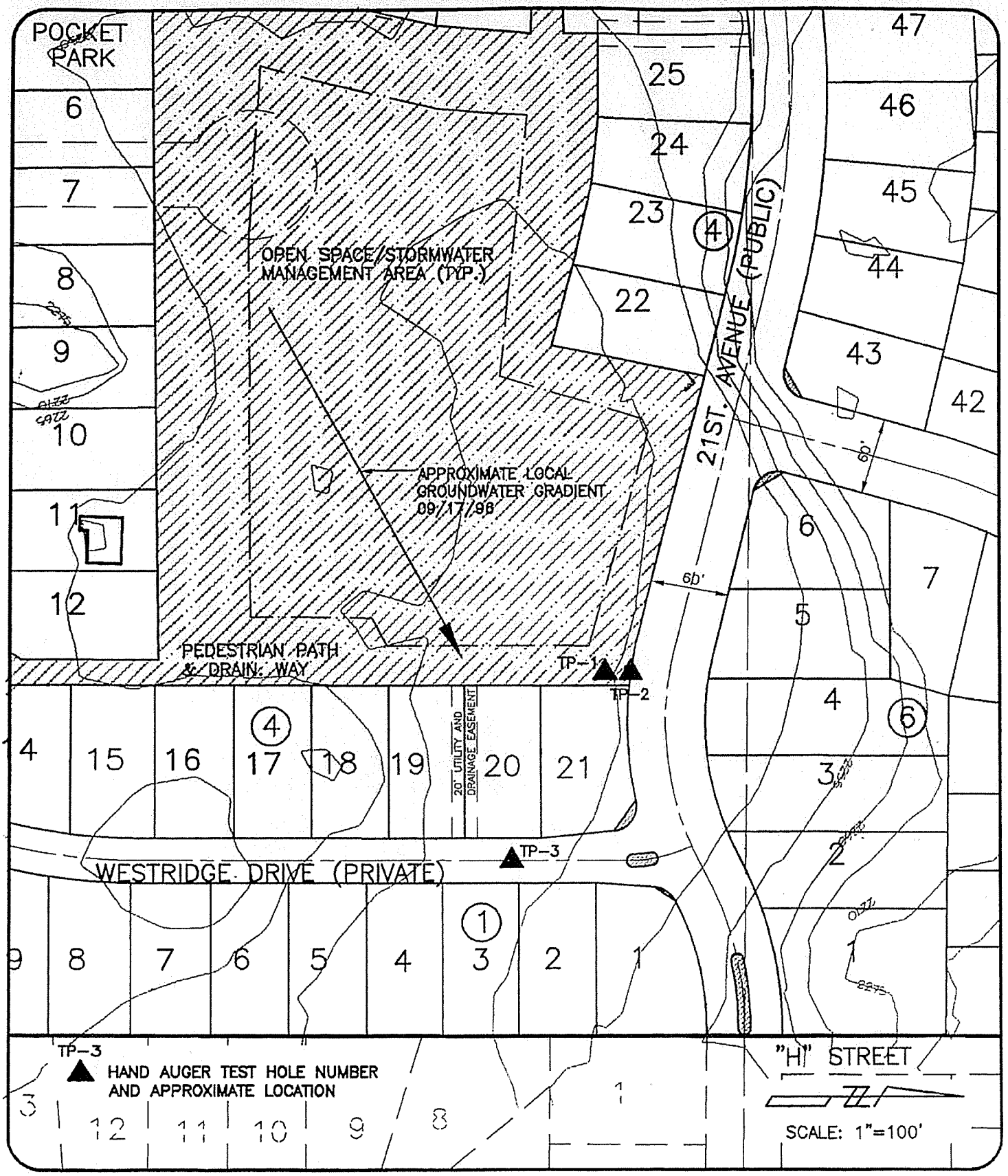
MIKE YAKE
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER
9/15/97

Mike Yake, P.E.
Principal

EXPIRES 5/01/

Enclosure: Site Plan, Figure 1

J:\Document\96133\Geostuff.wpd



INLAND PACIFIC ENGINEERING
707 West 7th • Suite 200
Spokane, WA 99204
(509) 458-6840
FAX: (509) 458-6844

FIGURE 1

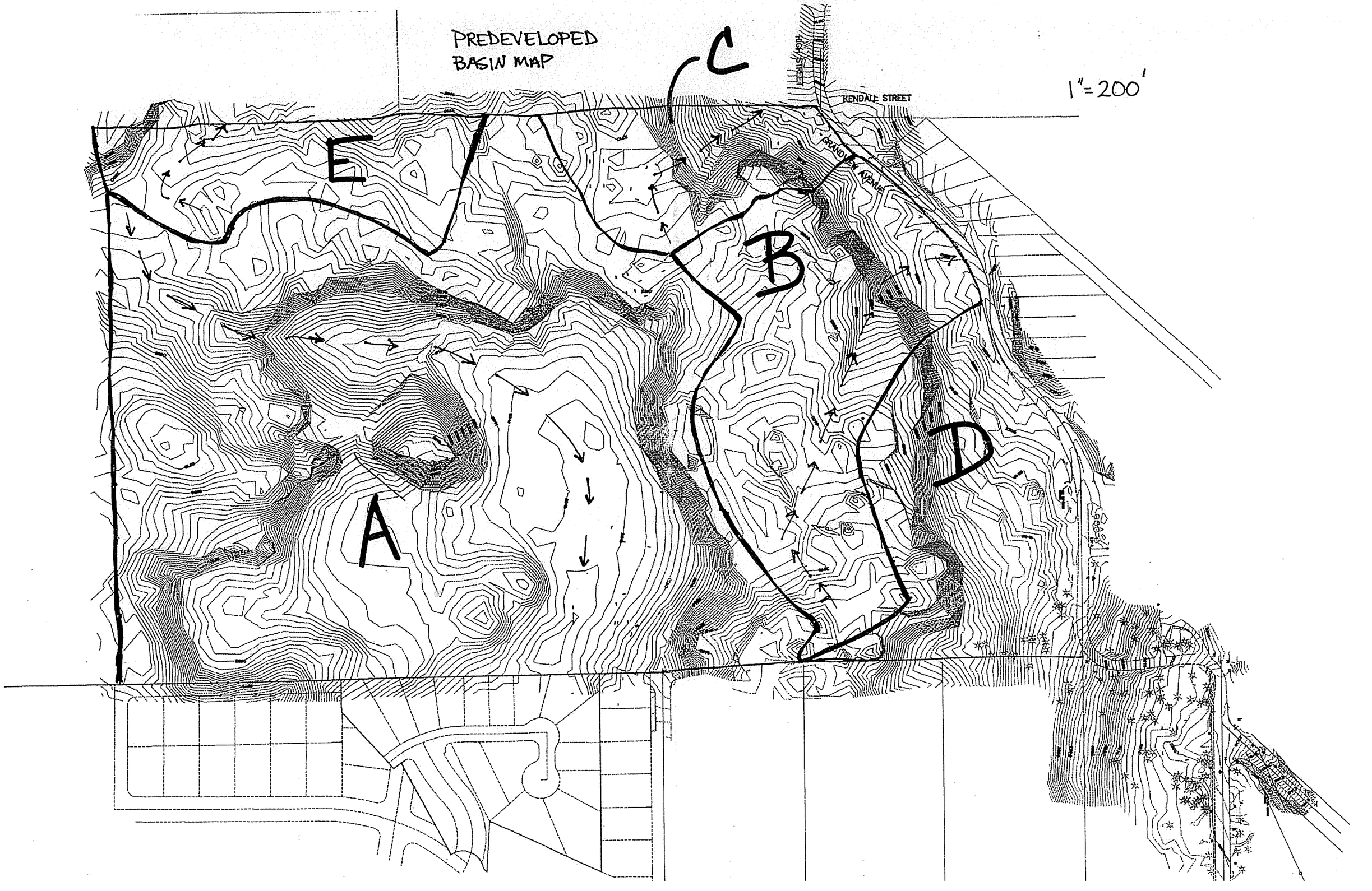
TEST PIT LOCATIONS

WESTRIDGE P.U.D.

PROJECT NO. 96134

PREDEVELOPED
BASIN MAP

1"=200'



DEVELOPED BASIN MAP

AT BUILD OUT

1"=200'

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

1 inch = 100 ft.

CONTOUR INTERVAL = 5 FEET

DATUM: CITY OF SPOKANE

A

B

D

ABERNETHY TRACT

KENDALL STREET

PUBLIC PARK

UMBERLAND STR.

25TH. AVENUE

TRIDENT STR.

WEST SPIRLING HEIGHTS

"H" STREET

POCKET PARK

BEARD COURT (PUBLIC)

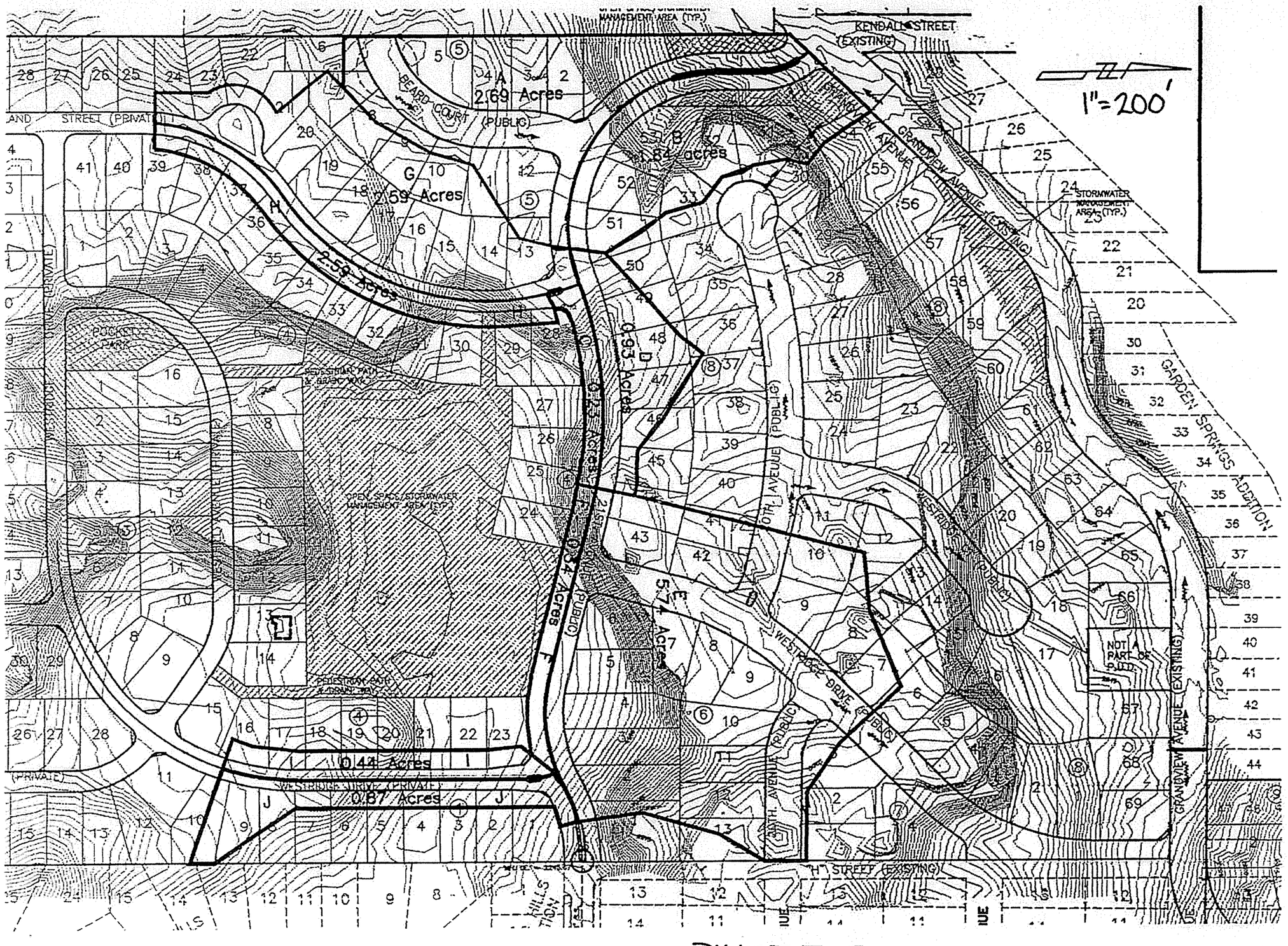
ENTRANCE GATE

GARDEN SPRINGS ADDITION

WESTWOOD HILLS REPLAT

WESTWOOD HILLS FIRST ADDITION

NOT A PART OF PLAT

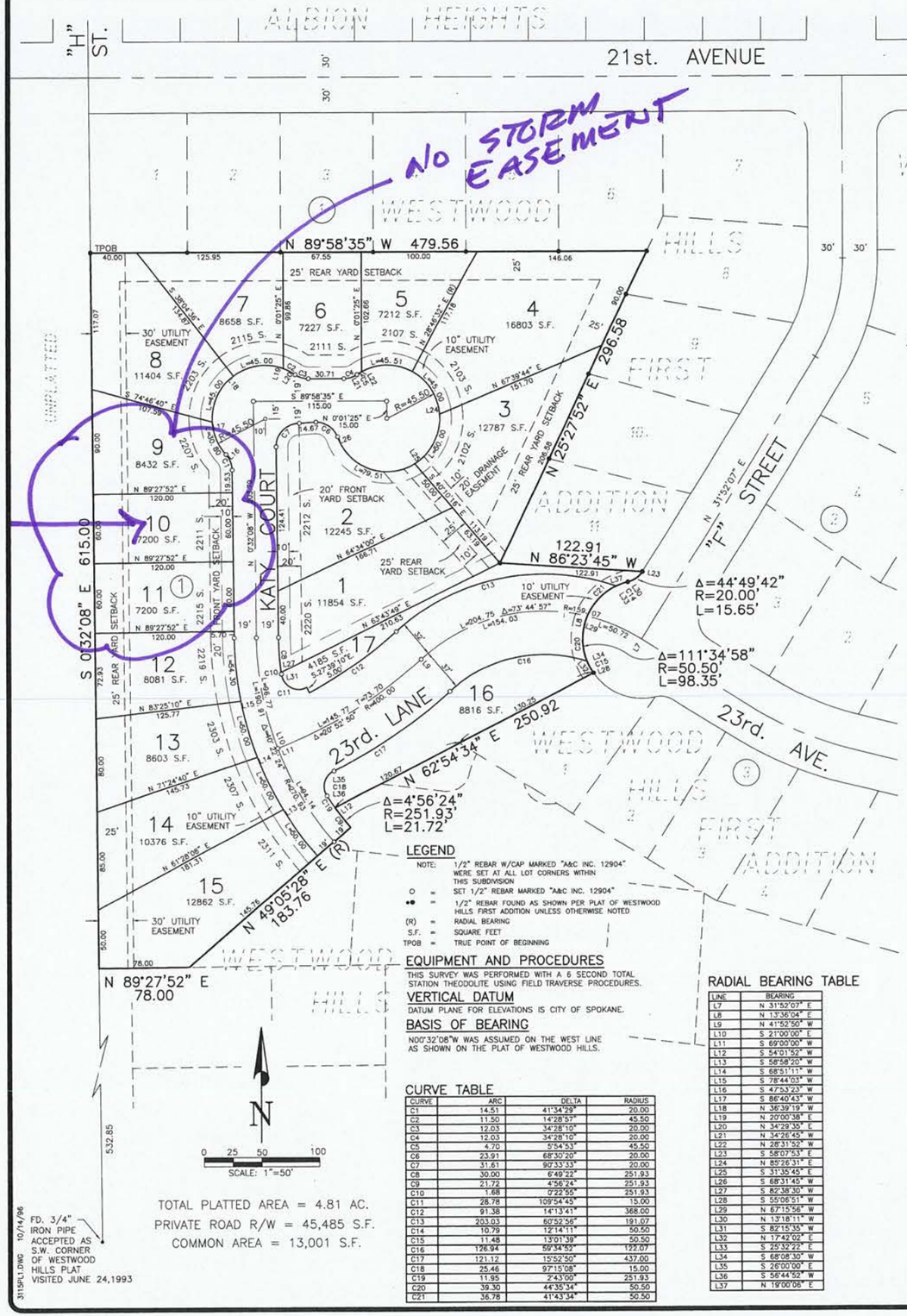


PHASE I BASINS

T.C.
Westwood Hills Plat

BK 24 Pg 43 Plat #3326

4048951



FINAL PLAT
WESTWOOD HILLS
SECOND ADDITION
PLANNED UNIT DEVELOPMENT

BEING A REPLAT OF PORTIONS OF WESTWOOD HILLS
LOCATED IN THE N.W. 1/4, OF THE S.E. 1/4, OF SECTION 26,
TOWNSHIP 25 NORTH, RANGE 42 EAST, W.M.,
CITY OF SPOKANE, SPOKANE COUNTY, WASHINGTON.

AUDITOR'S CERTIFICATE

FILED FOR RECORD THIS 28 DAY OF Oct 1996 AT 9:45 M. IN BOOK 24 OF PLATS AT PAGE 43 AT THE REQUEST OF Grimm, Patten, & Sauther

(Signed) January, County Auditor

DEDICATION

KNOW ALL MEN BY THESE PRESENTS, that Griner, Patten & Sauther Investments, a Washington General Partnership, has caused to be platted into Lots, Blocks, and Private Streets, the land shown hereon to be known as WESTWOOD HILLS SECOND ADDITION, Planned Unit Development, being a replat of portions of the plat of Westwood Hills and of adjoining street rights-of-way according to the plat recorded in Book 15, at Pages 76 and 77, in the NW1/4 of the SE1/4 of Section 26, Township 25 North, Range 42 East, W.M. City of Spokane, Spokane County, Washington, described as follows:

Beginning at the southwest corner of Lot 1, Block 1 of Westwood Hills First Addition, according to the plat recorded in Book 22, at Page 38; thence S00°32'08"E, along the west line of said plat of Westwood Hills, 615.00 feet; thence N89°27'52"E, 78.00 feet; thence N49°05'28"E, 183.76 feet to a point on a 251.93 foot radius nontangent curve to the right, the center of circle of which bears N49°05'28"E; thence along the arc of said curve, through a central angle of 4°56'24", 21.72 feet; thence N62°54'34"E, 120.67 feet to the most westerly corner of Lot 1, Block 3 of said plat of Westwood Hills First Addition; thence along the boundary of said plat the following six (6) calls: 1) N62°54'34"E, 130.25 feet to a point on a 50.50 foot radius nontangent curve to the right, the center of circle of which bears N55°06'51"E; 2) along the arc of said curve, through a central angle of 111°34'58", 98.35 feet to the point of reverse curve of a 20.00 foot radius curve to the left, the center of circle of which bears N13°18'11"W; 3) along the arc of said curve, through a central angle of 44°49'42", 15.65 feet; 4) N86°23'45"W, 122.91 feet; 5) N25°27'52"E, 296.58 feet; 6) N89°58'35"W, 479.56 feet to the POINT OF BEGINNING.

The owners adopt the plan of Lots, Blocks, Common Areas, and Private Streets shown hereon. The owners hereby waive all claims against any governmental authority for damage which may be occasioned to the adjacent land by the established construction, maintenance, and associated drainage facilities for the public street adjoining this plat. Slope easements are hereby granted to the City of Spokane for the construction of the public street adjoining this plat.

This PUD plat and all portions thereof shall be restricted by the terms of the Covenants, Conditions, and Restrictions of the Westwood Hills PUD. The property owner has created private streets and common areas as shown thereon and as further described in the Declaration of Covenants, Conditions, and Restrictions of Westwood Hills PUD as recorded on the 14th Day of October, 1996, under Auditor's File No. 4044798. The common areas and private streets as shown hereon are not for use by the general public, but are dedicated solely to the common use and enjoyment by the residents of the Westwood Hills PUD.

The Westwood Hills PUD Association, as created by document filed on the the 7th day of October, 1996, under Secretary of State U.B.I. No. 601-743-594, and its successors, as owners of the private streets and common areas, will be responsible for maintenance of these private streets and common areas and for the maintenance of the water, sewer, storm sewer, and drainage facilities located therein and in additional easements as shown hereon. No portion of the "Common Areas", Lots 16 and 17, Block 1, may be used for any residential structure or transferred as a lot to be used for any residential structure, but must be left in open space for the common use and together with the private streets, be held in common ownership by the Westwood Hills PUD Association, and shall be considered subservient estates for tax purposes to the other lots created herein.

Easements are hereby granted over the private streets and common areas shown hereon and over a ten-foot (10') wide strip adjoining the private streets shown hereon to the City of Spokane and its permittees and assigns for the construction, reconstruction, maintenance, and operation of utilities (including cable television), together with the right to inspect said utilities and to trim and/or remove brush and trees which may interfere with the construction, maintenance, and operation of same.

The private drainage easement shown hereon is hereby granted to the Westwood Hills PUD Association.

This plat is not in any Irrigation District. The land in this final plat is not in an irrigation district, drainage channel, or flood plain; it has no ponding areas or bodies of water.

The minimum rear building setback is 25 feet, the minimum front building setback is twenty feet (20') from the adjacent right-of-way, and the minimum side building setback is twelve feet (12'), with the combined side building setbacks totaling not less than twenty percent (20%) of the lot width, to a maximum of 20 feet.

This plat will be served by City sanitary sewer and water system only. individual on-site sewage systems and private wells and water systems are prohibited. The City water system approved by County and State health officials and the City Fire Department will be installed within this plat. The plattor will provide for individual domestic water service as well as fire protection to each lot prior to sale.

Prior to the sale of any lot with this subdivision, a functioning public sewer system complying with the requirements of the Department of Public Works, and the lot shall be adequately served by a fire hydrant as determined by the Spokane Fire Department.

Prior to the issuance of a Certificate of Occupancy for any residence within this subdivision, all improvements, including street improvements, shall be installed in accordance with the plans approved by the City of Spokane.

All or part of the land being platted hereon is subject to:
An easement including the terms, covenants, and provisions thereof granted to Per Victor Sjodin, husband, and Agnes Sjodin, as recorded September 24, 1941, under Auditor's File No. 515825A;
An avigation easement including the terms, covenants, and conditions thereof granted to the City of Spokane and County of Spokane as recorded September 17, 1979, under Auditor's File No. 7909170401;
The restrictions, setback lines, and easements or quasi-easements for slopes for cut or fills contained on the face of the plat of Westwood Hills;
Covenants, Conditions, and Restrictions contained in Declaration of Restrictions of Westwood Hills recorded April 10, 1986, under Auditor's File No. 8604100266;

This subdivision has been made with the free consent and in accordance with the desires of the owners of the land so divided. The signatories hereof hereby certify that they are the owners of, and the only parties having any interest in the land so divided, and that the property shown is not encumbered by any delinquent taxes or assessments. The agreement herein expressed shall be a covenant to run with the land and shall be carried as a provision in each deed drawn to transfer ownership of any and all property delineated within this plat.

IN WITNESS WHEREOF I have hereunto set my hand.

Griner, Patten & Sauther Investments

Thomas E. Griner

ACKNOWLEDGMENT

STATE OF WASHINGTON)
COUNTY OF SPOKANE)ss

On this 15th day of October, 1996, before me personally appeared **Thomas E.** Griner, of Griner, Patten & Sauther Investments, the Washington General Partnership that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said partnership for the uses and purposes therein mentioned and stated on oath that he was authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the day and year first above written.

Gracie Foster
Notary Public in and for the State of Washington residing in Spokane.
My commission expires 12/3/97

CITY COUNCIL

This plat has been reviewed on this 24th day of October 1996, and is found to be in full compliance with the Conditions of Approval stipulated in the Hearing Examiner's approval of the "Westwood Hills" preliminary plat file #92-63-PP/PUD.

Gregory A. Smith
Spokane City Hearing Examiner

CITY ATTORNEY

Examined and approved as to form this 24th day of October, 1996.

James C. Sloane
City Attorney

CITY TREASURER

I hereby certify that all assessments for which the property included within this subdivision may be liable, have been duly paid, satisfied, or discharged as of this 16th day of October, 1996

Dale Sciacchitano by Sandy Kenyon
City of Spokane Treasurer

COUNTY TREASURER

I hereby that all required taxes which have been levied against the land shown hereon have been fully paid this 25th day of October, 1996.

Linda Wolverton by Angela Golden
Spokane County Treasurer

COUNTY ASSESSOR

Examined and approved this 25th day of Oct, 1996.

B.C. Cooley Lynda Abbott
Spokane County Assessor

CITY SUBDIVISION ADMINISTRATOR

Approved the 30th day of October, 1992 by the City of Spokane Hearing Examiner and endorsed this 21st day of October, 1996.

Donald D. Carlson
City of Spokane, Subdivision Administrator

CITY ENGINEER

Examined and approved as this 18th day of October, 1996.

Paul W. Brogan
City Engineer

SURVEYOR'S CERTIFICATE

I, Daniel B. Clark, certify that I am a Professional Land Surveyor licensed in the State of Washington, (P.L.S. No. 12804); that this Plat represents a survey made by me or under my direction; that it is a true and correct representation of the lands actually surveyed; that all monuments shown hereon actually exist as shown, and that this Plat conforms in all respects to the provisions of the law.

DANIEL B. CLARK STATE OF WASHINGTON 12804 REGISTERED LAND SURVEYOR EXPIRES 4/2/97

10-15-96

LEGEND

NOTE: 1/2" REBAR W/CAP MARKED "A&C INC. 12904" WERE SET AT ALL LOT CORNERS WITHIN THIS SUBDIVISION
○ = SET 1/2" REBAR MARKED "A&C INC. 12904"
●● = 1/2" REBAR FOUND AS SHOWN PER PLAT OF WESTWOOD HILLS, FIRST ADDITION UNLESS OTHERWISE NOTED
(R) = RADIAL BEARING
S.F. = SQUARE FEET
TPOB = TRUE POINT OF BEGINNING

EQUIPMENT AND PROCEDURES

THIS SURVEY WAS PERFORMED WITH A 6 SECOND TOTAL STATION THEODOLITE USING FIELD TRAVERSE PROCEDURES.

VERTICAL DATUM

DATUM PLANE FOR ELEVATIONS IS CITY OF SPOKANE.

BASIS OF BEARING

N00°32'08"W WAS ASSUMED ON THE WEST LINE AS SHOWN ON THE PLAT OF WESTWOOD HILLS.

CURVE TABLE

CURVE	ARC	DELTA	RADIUS
C1	14.51	41°34'29"	20.00
C2	11.50	14°28'57"	45.50
C3	12.03	34°28'10"	20.00
C4	12.03	34°28'10"	20.00
C5	4.70	5°54'53"	45.50
C6	23.91	68°30'20"	20.00
C7	31.61	90°33'33"	20.00
C8	30.00	6°49'22"	251.93
C9	21.72	4°56'24"	251.93
C10	1.68	0°22'55"	251.93
C11	28.78	109°54'45"	15.00
C12	91.38	14°13'41"	368.00
C13	203.03	60°52'56"	191.07
C14	10.79	12°14'11"	50.50
C15	11.48	13°01'39"	50.50
C16	126.94	59°34'52"	122.07
C17	121.12	15°52'50"	437.00
C18	25.46	97°15'08"	15.00
C19	11.95	2°43'00"	251.93
C20	39.30	44°35'34"	50.50
C21	36.78	41°43'34"	50.50

RADIAL BEARING TABLE

LINE	BEARING
L7	N 31°52'07" E
L8	N 13°36'04" E
L9	N 41°52'50" W
L10	S 21°00'00" E
L11	S 69°00'00" W
L12	S 54°01'52" W
L13	S 58°58'20" W
L14	S 68°51'11" W
L15	S 78°44'03" W
L16	N 47°53'23" W
L17	S 86°40'43" W
L18	N 36°39'19" W
L19	N 20°00'38" E
L20	N 34°39'35" E
L21	N 34°26'45" W
L22	N 28°31'52" W
L23	S 58°07'53" E
L24	N 85°26'31" E
L25	S 31°35'45" E
L26	S 68°31'45" W
L27	S 82°38'30" W
L28	S 55°06'51" W
L29	N 67°15'56" W
L30	N 13°18'11" W
L31	S 82°15'35" W
L32	N 17°42'02" E
L33	S 25°32'22" E
L34	S 68°08'30" W
L35	S 26°00'00" E
L36	S 58°44'52" W
L37	N 19°00'08" E

TOTAL PLATTED AREA = 4.81 AC.
PRIVATE ROAD R/W = 45,485 S.F.
COMMON AREA = 13,001 S.F.

FD. 3/4" IRON PIPE ACCEPTED AS S.W. CORNER OF WESTWOOD HILLS PLAT VISITED JUNE 24,1993

3119PL1.DWG 10/14/96

P:\93-115\3119PL1 Mon Oct 14 17:18:33 1996 JSH

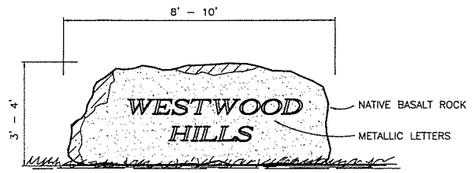
NW | NE
SW | SE
26-25-42

AC
Adams & Clark, Inc.
1720 W. Fourth Ave.
Spokane, WA 99204
(509) 747-4600 F(509) 747-8913
Project No. 93-115

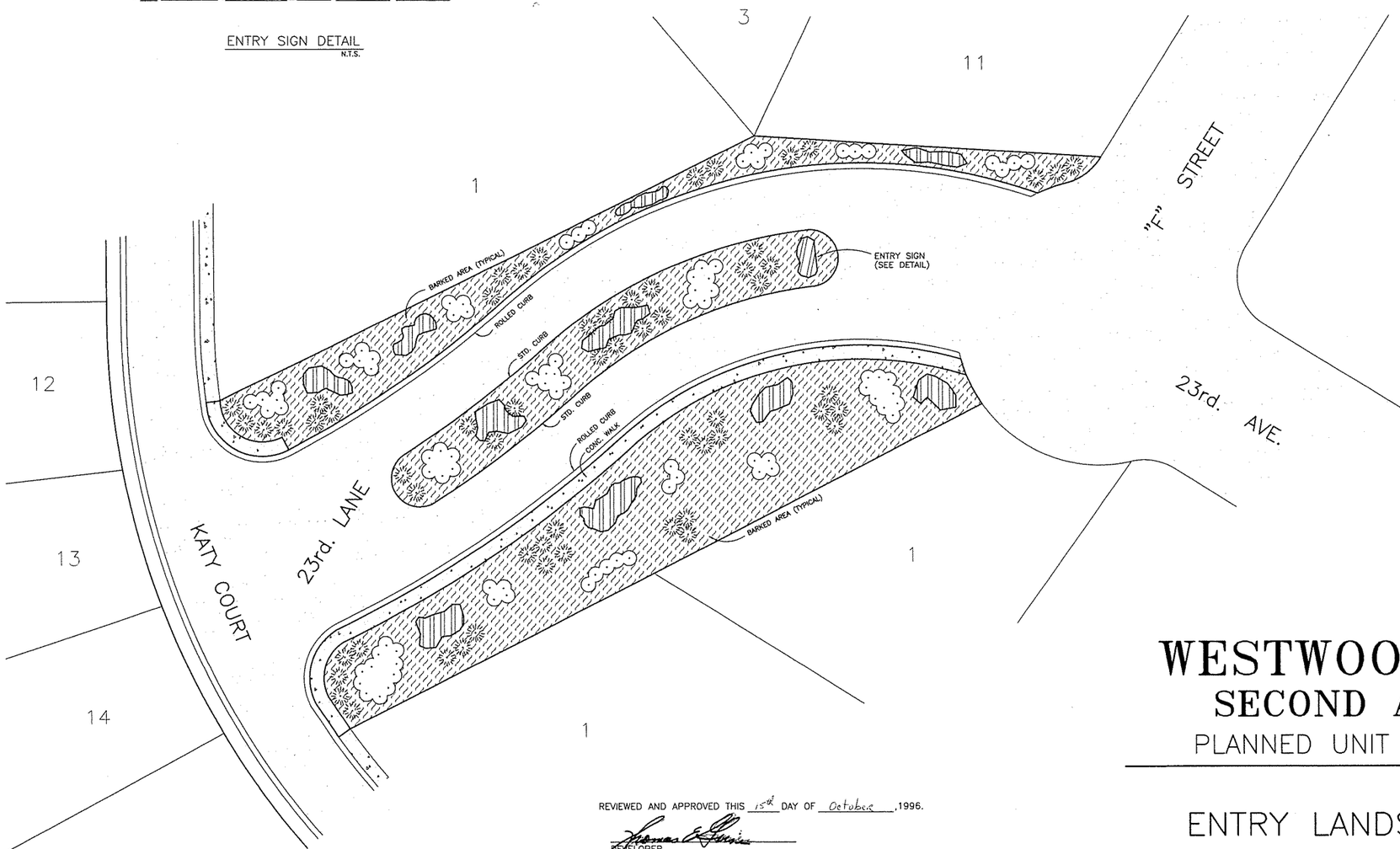
3326 24-43

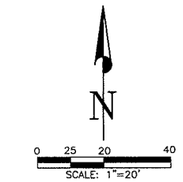
BK 24 Pg 44 Plat #3326

404895/



ENTRY SIGN DETAIL
N.T.S.





LEGEND:

= QUAKING ASPEN

= SPREADING JUNIPERS

= NATIVE BASALT ROCK

NOTES:

1. LANDSCAPED AREAS WILL BE COVERED WITH 3" OF SHREDDED BARK.
2. AUTOMATIC IRRIGATION SYSTEMS WILL BE INSTALLED.

REVIEWED AND APPROVED THIS 15th DAY OF October ,1996.

Thomas E. Stevens
DEVELOPER

REVIEWED AND APPROVED THIS 20TH DAY OF October ,1996.

Donald A. Carlson
ZONING & SUBDIVISION ADMINISTRATOR
CITY OF SPOKANE

WESTWOOD HILLS
SECOND ADDITION
PLANNED UNIT DEVELOPMENT

ENTRY LANDSCAPE PLAN
AND
SIGN DETAIL

AC
Adams & Clark, Inc.
1720 W. Fourth Ave.
Spokane, WA 99204
(509) 747-4600 F(509) 747-8913
Project No. 93-116

P:\93-115\3115PN1.DWG – W.O. 95-116

P:\93-115\3115PN1 Tue Oct 15 14:33:35 1996 JSH

3326 2444

8. NRCS
SOIL REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Spokane County, Washington

January 26, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,660 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- 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
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Spokane County, Washington
Survey Area Data: Version 13, Aug 23, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 12, 2020—Aug 14, 2020

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1021	Cocolalla-Hardesty complex, 0 to 3 percent slopes	6.7	20.1%
3115	Northstar-Rock outcrop complex, 3 to 15 percent slopes	21.7	65.0%
3126	Rock outcrop-Northstar complex, 15 to 30 percent slopes	3.4	10.2%
7131	Urban land-Northstar, disturbed complex, 3 to 8 percent slopes	1.6	4.8%
Totals for Area of Interest		**33.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Spokane County, Washington

1021—Cocolalla-Hardesty complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2wd5
Elevation: 1,950 to 2,400 feet
Mean annual precipitation: 15 to 18 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Cocolalla and similar soils: 50 percent
Hardesty and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cocolalla

Setting

Landform: Drainageways, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from volcanic ash with loess mixed in the upper part

Typical profile

A1 - 0 to 11 inches: ashy silt loam
A2 - 11 to 28 inches: ashy silt loam
Cg1 - 28 to 37 inches: ashy silt loam
Cg2 - 37 to 43 inches: ashy silt loam
Ab - 43 to 54 inches: ashy silt loam
Cgb - 54 to 60 inches: ashy silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 11 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: R009XY601WA - WET MEADOW 16-24 PZ
Hydric soil rating: Yes

Description of Hardesty

Setting

Landform: Depressions, drainageways, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from volcanic ash mixed with loess in the upper part

Typical profile

A1 - 0 to 4 inches: ashy silt loam
A2 - 4 to 11 inches: ashy silt loam
Bw1 - 11 to 23 inches: ashy silt loam
Bw2 - 23 to 32 inches: ashy silt loam
C1 - 32 to 39 inches: ashy very fine sandy loam
C2 - 39 to 60 inches: ashy loamy very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 23 to 30 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F009XY001WA - Mesic Xeric Loamy hills and canyons, Ponderosa Pine Moderately Warm Dry Shrub
Other vegetative classification: ponderosa pine/ninebark (CN190)
Hydric soil rating: No

Minor Components

Rockly

Percent of map unit: 4 percent
Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R009XY301WA - VERY SHALLOW 16-24 PZ
Hydric soil rating: No

Saltese

Percent of map unit: 3 percent
Landform: Flood plains, depressions, drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

Ecological site: R044AY501WA - Mesic, Aquic, Organic Depressions and Seeps
Hydric soil rating: Yes

Speigle

Percent of map unit: 1 percent
Landform: Escarpments
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Northstar

Percent of map unit: 1 percent
Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Water

Percent of map unit: 1 percent

3115—Northstar-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wgm
Elevation: 1,800 to 2,550 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 42 to 50 degrees F
Frost-free period: 90 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Northstar and similar soils: 50 percent
Rock outcrop: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Northstar

Setting

Landform: Plateaus
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Loess with an influence of volcanic ash over residuum and/or colluvium derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
A1 - 3 to 6 inches: extremely cobbly ashy loam
A2 - 6 to 11 inches: extremely cobbly ashy loam
BA - 11 to 17 inches: very gravelly ashy loam
Bw - 17 to 26 inches: extremely gravelly loam
R - 26 to 36 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 23 to 43 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F009XY001WA - Mesic Xeric Loamy hills and canyons, Ponderosa Pine Moderately Warm Dry Shrub
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Hardesty

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Other vegetative classification: ponderosa pine/ninebark (CN190)
Hydric soil rating: No

Rubble land

Percent of map unit: 5 percent
Hydric soil rating: No

Rockly

Percent of map unit: 5 percent
Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R009XY301WA - VERY SHALLOW 16-24 PZ
Hydric soil rating: No

Stutler

Percent of map unit: 4 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Cocolalla

Percent of map unit: 4 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R009XY601WA - WET MEADOW 16-24 PZ
Hydric soil rating: Yes

Klickson

Percent of map unit: 2 percent
Landform: Escarpments
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/ninebark (CN260)
Hydric soil rating: No

3126—Rock outcrop-Northstar complex, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1r4nv
Elevation: 1,800 to 2,500 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 40 percent
Northstar and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Northstar

Setting

Landform: Plateaus
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess with an influence of volcanic ash over residuum and/or colluvium derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
A1 - 3 to 6 inches: extremely cobbly ashy loam
A2 - 6 to 11 inches: extremely cobbly ashy loam
BA - 11 to 17 inches: very gravelly ashy loam
Bw - 17 to 26 inches: extremely gravelly loam
R - 26 to 36 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 23 to 43 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C

Ecological site: F009XY001WA - Mesic Xeric Loamy hills and canyons, Ponderosa Pine Moderately Warm Dry Shrub
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Minor Components

Speigle
Percent of map unit: 10 percent
Landform: Escarpments
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Rubble land
Percent of map unit: 5 percent
Hydric soil rating: No

Fourmound
Percent of map unit: 5 percent
Landform: Plateaus
Microfeatures of landform position: Mounds
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Rockly
Percent of map unit: 5 percent
Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R009XY301WA - VERY SHALLOW 16-24 PZ
Hydric soil rating: No

7131—Urban land-Northstar, disturbed complex, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2mdnh
Elevation: 1,800 to 2,360 feet
Mean annual precipitation: 17 to 19 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 60 percent
Northstar, disturbed, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Northstar, Disturbed

Setting

Landform: Plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess with an influence of volcanic ash over residuum and/or colluvium derived from basalt

Typical profile

A1 - 0 to 6 inches: extremely cobbly ashy loam
A2 - 6 to 11 inches: extremely cobbly ashy loam
BA - 11 to 17 inches: very gravelly ashy loam
Bw - 17 to 26 inches: extremely gravelly loam
R - 26 to 36 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F009XY001WA - Mesic Xeric Loamy hills and canyons, Ponderosa Pine Moderately Warm Dry Shrub
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

Minor Components

Rockly, disturbed

Percent of map unit: 5 percent
Landform: Plateaus

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R009XY301WA - VERY SHALLOW 16-24 PZ
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Lakespring, disturbed

Percent of map unit: 3 percent
Landform: Terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Other vegetative classification: ponderosa pine/ninebark (CN190)
Hydric soil rating: No

Springdale, disturbed

Percent of map unit: 2 percent
Landform: Outwash terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/common snowberry (CN170)
Hydric soil rating: No

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