

STORMWATER TECHNICAL REPORT

For: DEERFIELD SECTION 2

**Runyon Road
White River Township, Johnson County
Indiana**

Project #W21-0353-2

**Prepared for:
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Checked By: Jim E. Pence
Certified By: Travis P. Gaither, P.E.**

**Date:
April 27, 2023**

Revised:



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PROJECT NARRATIVE

Project Overview:

Lennar Homes of Indiana, LLC is proposing to develop a 96 lot single family residential subdivision to be known as “Deerfield” on a 51.6+/- acre tract of undeveloped land in Johnson County, Indiana. Section 1 of Deerfield is approved for construction and consists of 49 lots on 26.83 acres. Section 2 will be the final section consisting of 47 lots on 24.77 acres. Said development is located east of Runyon Road, between Smith Valley Road and Olive Branch Road. Refer to **Figure 1.1**.

The proposed development is on a site at a Latitude of N 39° 35' 52" and Longitude W 86° 11' 05", falling within White River Township. The site is located in part of the Northwest Quarter of the Southeast Quarter of Section 3, Township 13 North, and Range 3 East, in Johnson County, Indiana.

Floodzone:

Based upon a scaled interpretation of the Flood Insurance Map Nos.18081C0106E for Johnson County, Indiana, dated January 29, 2021, a portion of the subject tract ***IS NOT*** located within Zone AE (Special Flood Hazard Area inundated by 100-year flood-Base Flood Elevations determined). Turkey Pen Creek lies south of the proposed development and is the receiving water for the site. Refer to **Figure 1.2**.

Pre-Developed Conditions:

The overall tract was originally covered with agricultural land with tree lines along several boundary lines. There is wooded land in the northeast corner and along the southern portion. There is also an existing overhead power line at the southeast corner. There is an existing open channel located in the southern wooded area that drains offsite land from the east to the south. Said open channel is a tributary to Turkey Pen Creek. Section 1 of the development is approved for construction, which includes a large amount of mass grading of Section 2. The site is adjoined by large single-family estate lots to the north, east, and west, single family residential subdivisions to the north, northwest, and southeast, and agricultural land and woods to the east and northeast. Refer to **Figure 1.3**.

The tract consists of the following soil types: Eel Silt Loam, Fox Loam, Fox Complex, Ockley Loam, Rensselaer Silty Clay Loam, Sleeth Loam, Eel Silt Loam-Urban Land Complex, Fox-Urban Land Complex, Ockley loam-Urban Land Complex, and Rensselaer Silty Clay Loam-Urban Land Complex. A soil map has been included with this report. An abbreviated NRCS Soils Report can be found in **Section 1** of this report.

Section 1 proposes the full construction of the only pond on the site. Storm sewer networks will be constructed to drain Section 1 along with temporary diversion swales to drain undeveloped portions of the overall site. See **Figure 2.1** for Existing Conditions of the site.

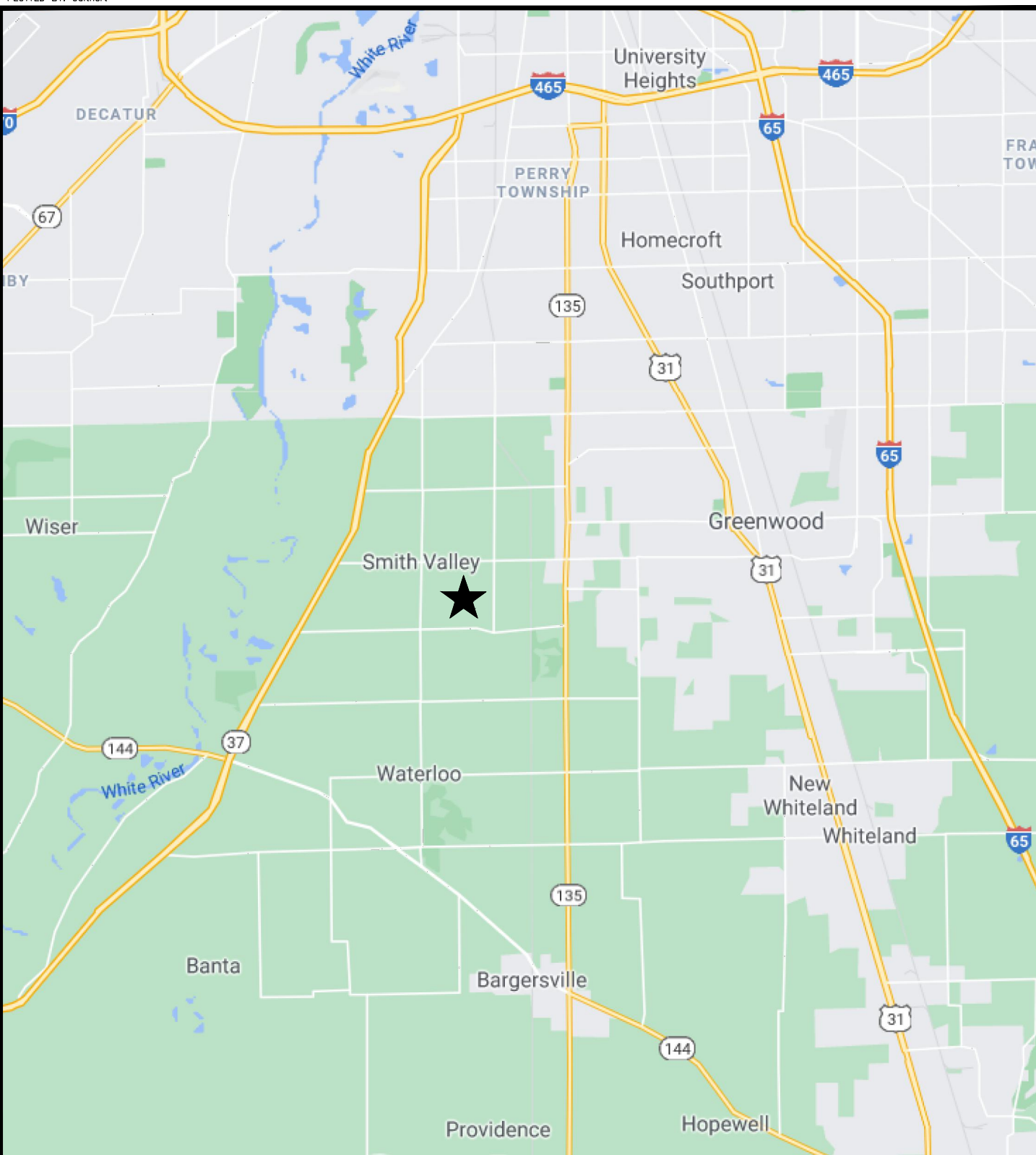
Post-Developed Conditions:

The overall development will be a single-family residential subdivision that consists of 96 lots with associated roads, sidewalks, driveways, and multi-use asphalt paths servicing the lots in the subdivision. There is one (1) wet pond to provide detention on the entire site, which will be fully constructed with Section 1. The pond will have an outlet control structure and 15" RCP to regulate the release of runoff from the pond. The outlet pipe will discharge into the existing open channel that drains to the south of the site.

The detention and water quality calculations have not changed since the approved Master Drainage Report dated November 11, 2022. Therefore, no additional detention or water quality calculations will be provided in this report. This report will only contain calculations of storm sewers that are proposed to be extended in Section 2.

Storm Sewers

The storm sewer system will be designed to meet Johnson County Surveyor's Office standards. They are to convey stormwater at a minimum velocity of 2.5 feet/second and a maximum velocity of 10 ft/second through reinforced concrete pipes, when the pipes are flowing full, while maintaining a hydraulic grade line (HGL) elevation below the top of castings during a 10-year storm event. Inlets have been spaced at 500' or less. Curb inlets were sized to stage less than 0.5' during the 10-year storm when 50% clogged and beehive inlets have been sized to stage less than 0.8' under the same conditions. There is one curb inlet that is sized as a double inlet to be less than 0.5' of ponding. Pipe sizing calculations for Section 2 are included in this submittal along with inlet capacity calculations.



★ PROJECT LOCATION

DEERFIELD SECTION 2
JOHNSON COUNTY, IN



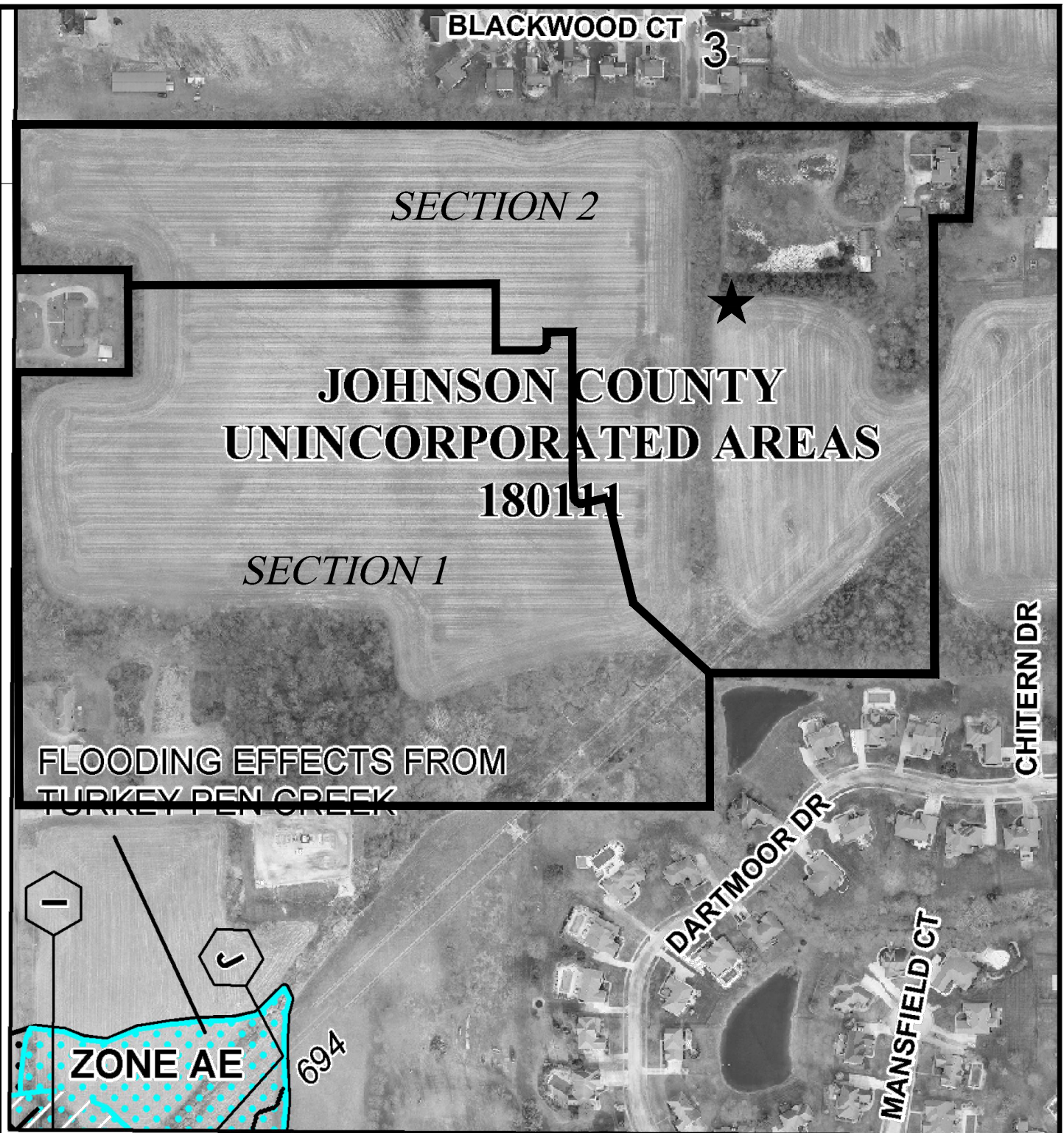
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LOCATION MAP

FIGURE 1.1

Date: April 27, 2023



★ PROJECT LOCATION

DEERFIELD SECTION 2
JOHNSON COUNTY, IN

FEMA MAP

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FIGURE 1.2

Date: April 27, 2023



★ PROJECT LOCATION

DEERFIELD SECTION 2
JOHNSON COUNTY, IN

AERIAL MAP

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FIGURE 1.3

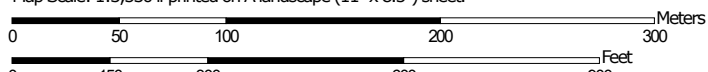
Date: April 27, 2023

Soil Map—Johnson County, Indiana



Soil Map may not be valid at this scale.

Map Scale: 1:3,530 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

2/28/2022
Page 1 of 3

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 1:15,800.

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: Johnson County, Indiana

Survey Area Data: Version 29, Sep 8, 2021

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

Date(s) aerial images were photographed: Oct 22, 2020—Nov 12, 2020

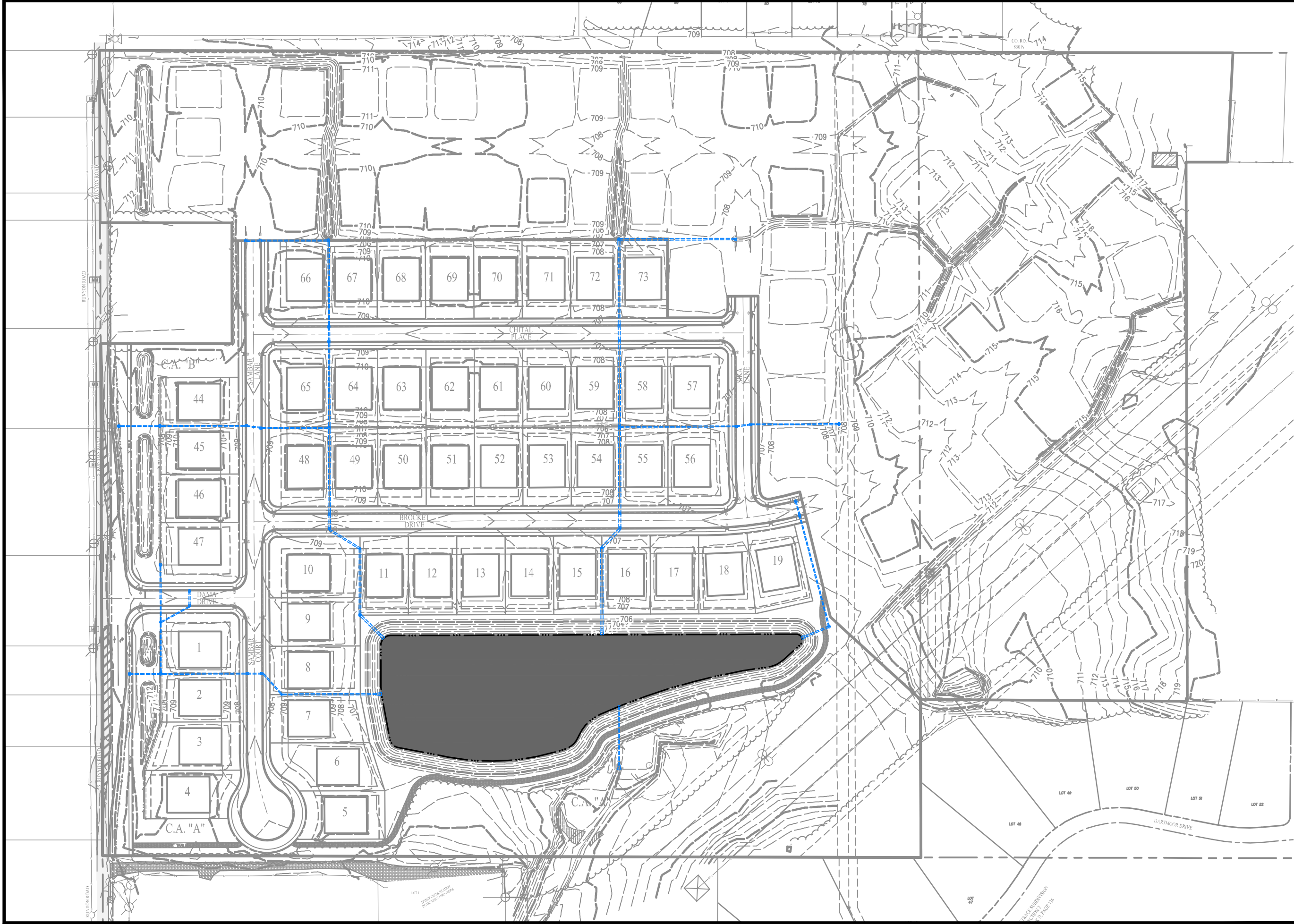
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ee	Eel silt loam, 0 to 2 percent slopes, frequently flooded	3.9	7.4%
FoB2	Fox loam, 2 to 6 percent slopes, eroded	17.3	33.1%
FxC2	Fox complex, 6 to 12 percent slopes, eroded	0.8	1.5%
ObaA	Ockley loam, 0 to 2 percent slopes	19.1	36.4%
Re	Rensselaer silty clay loam	9.3	17.8%
Sk	Sleeth loam	1.8	3.4%
YelAH	Eel silt loam-Urban land complex, 0 to 2 percent slopes, frequently flooded, brief duration	0.0	0.0%
YflB2	Fox loam-Urban land complex, 2 to 6 percent slopes, eroded	0.0	0.1%
YobA	Ockley loam-Urban land complex, 0 to 2 percent slopes	0.0	0.1%
YreA	Rensselaer silty clay loam-Urban land complex, 0 to 2 percent slopes	0.1	0.2%
Totals for Area of Interest		52.4	100.0%

PIPE SIZING CALCULATIONS

LOCATION: H:\2021\W210353\Section 2\Engineering\design\drainage\basin maps\W210353-2--Drainage Exhibits.dwg
DATE/TIME: April 25, 2023 - 1:28pm
PLOTED BY: Gathert



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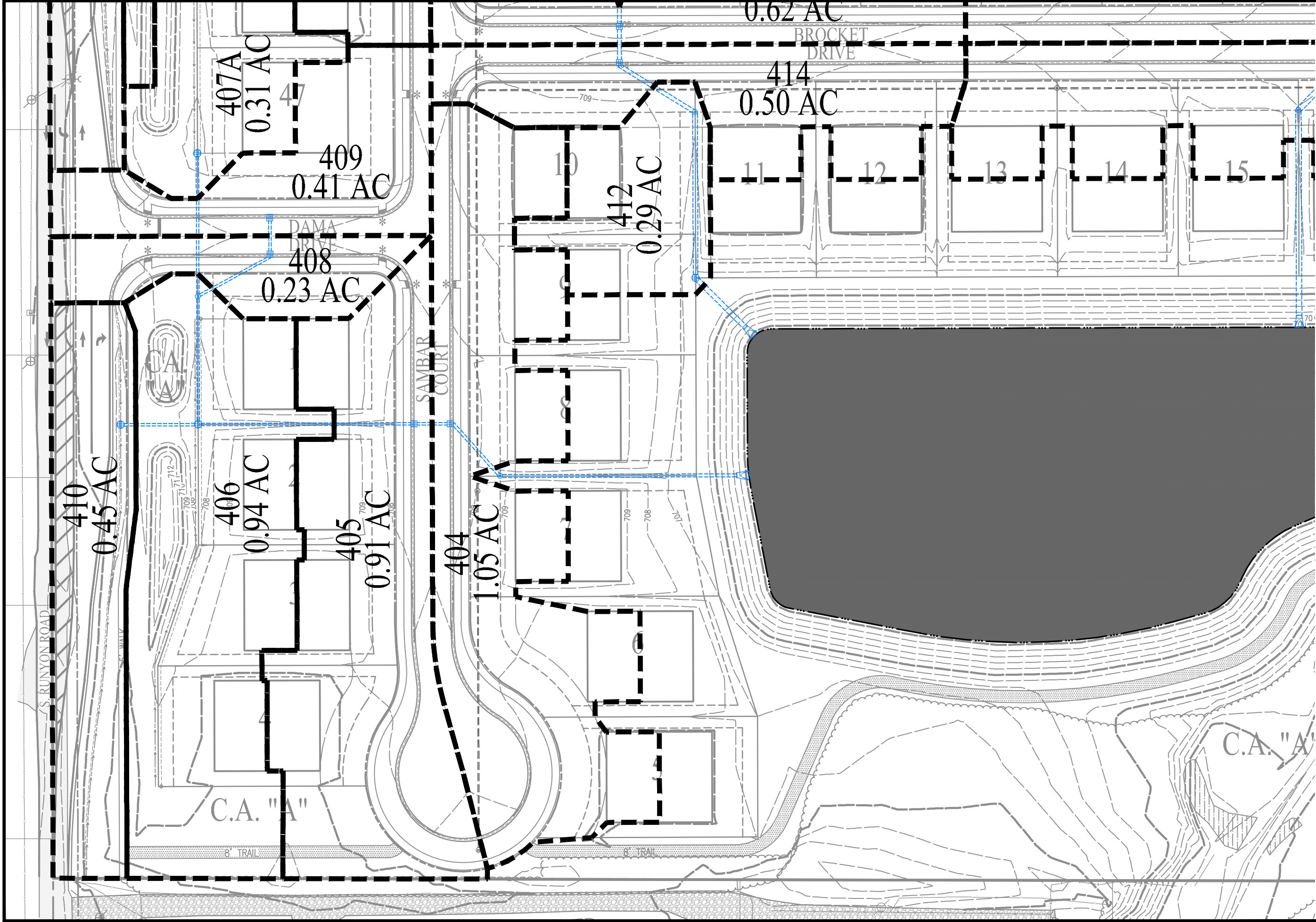


FIGURE 2.1

EXISTING CONDITIONS EXHIBIT

Date: April 27, 2023

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DATE/TIME: April 25, 2023 - 1:30pm
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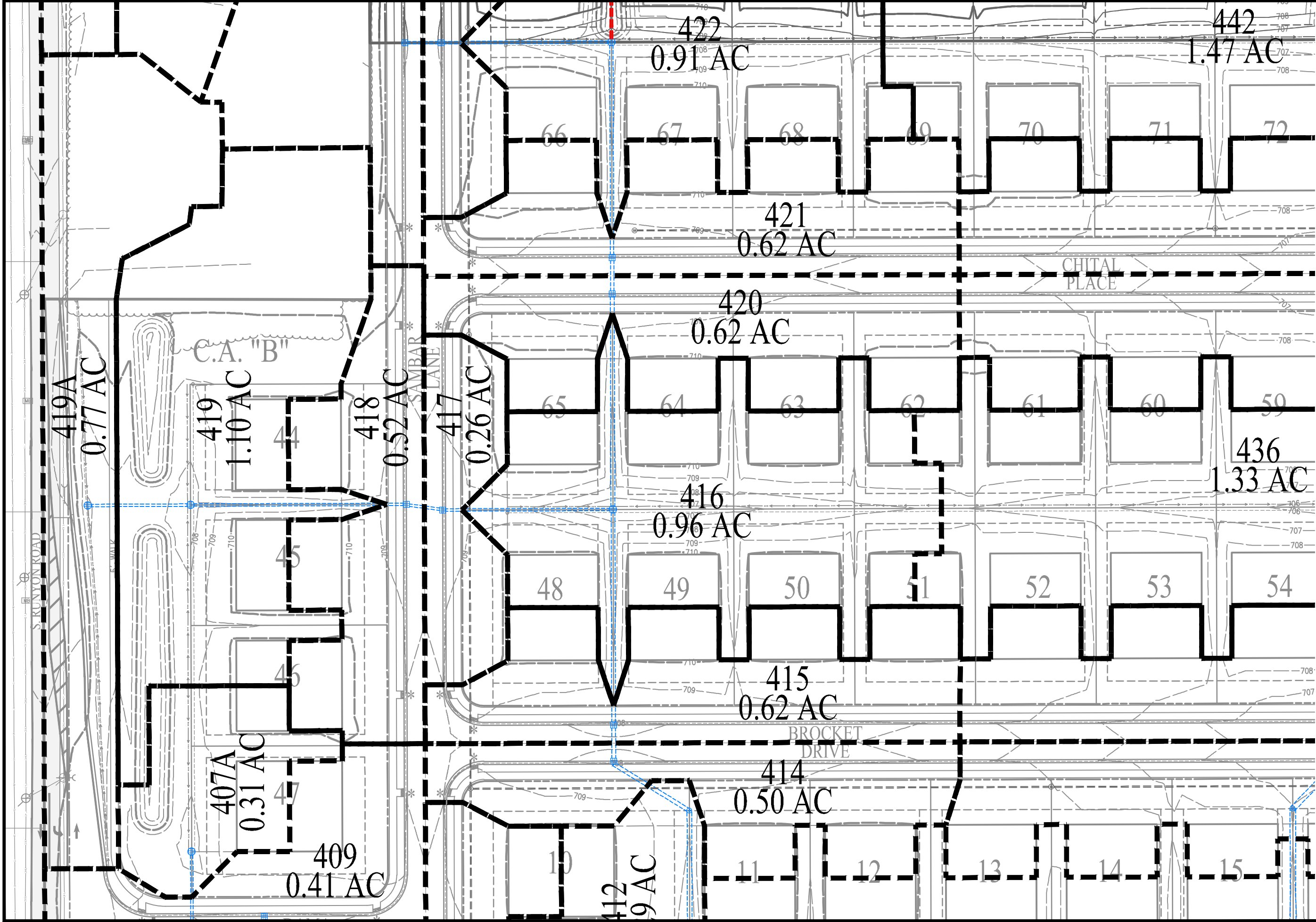


FIGURE 2.2

STORM INLET
BASIN MAP

Date: April 27, 2023

LOCATION: H:\2021\W210353\Section 2\Engineering\design\drainage\basin maps\W210353-2--Drainage Exhibits.dwg
DATE/TIME: April 25, 2023 - 1:32pm
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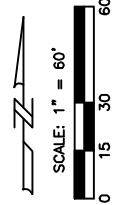
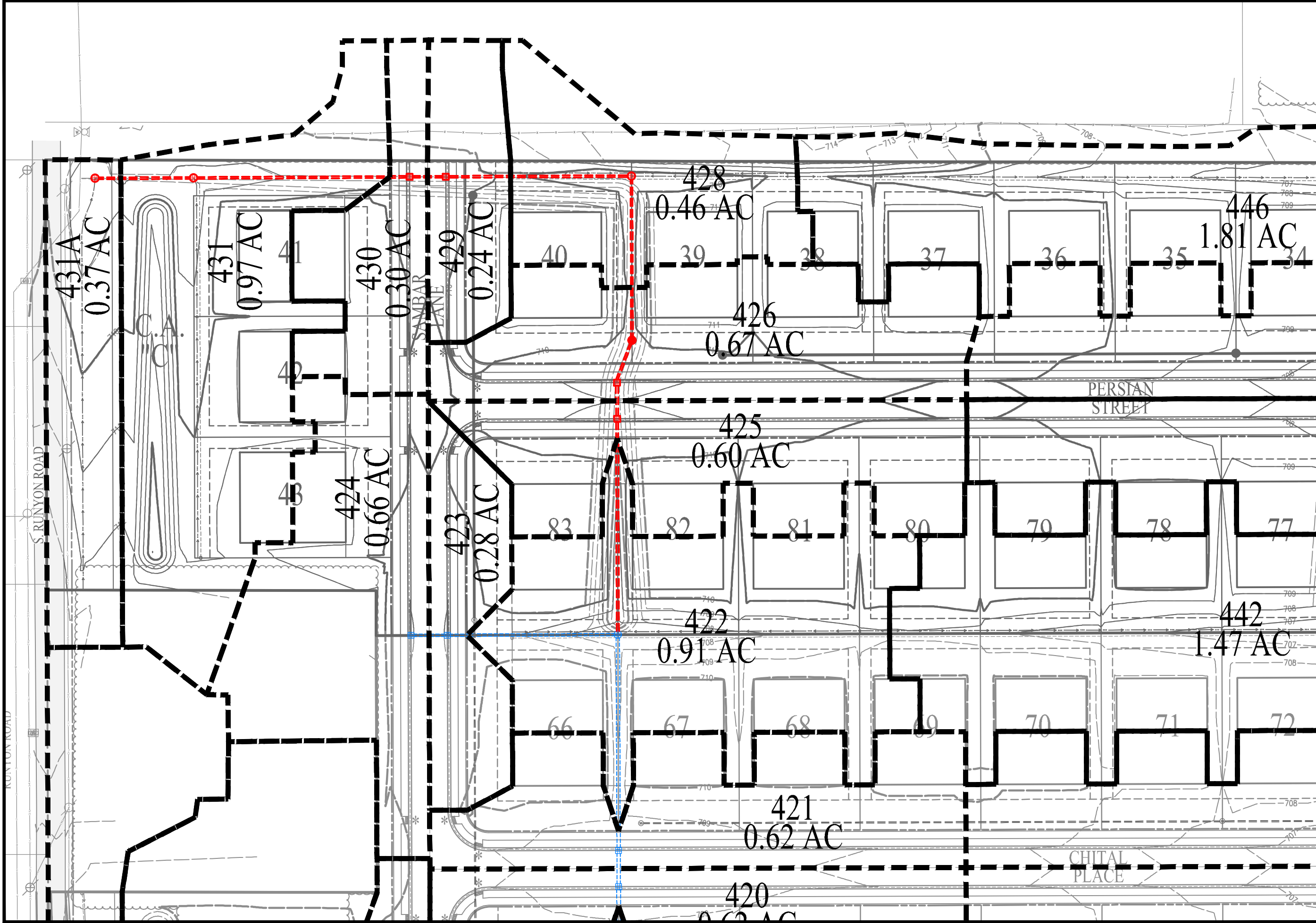


FIGURE 2.3

Date: April 27, 2023

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PLOTED BY: Gathert



STORM INLET
BASIN MAP

Date: April 27, 2023



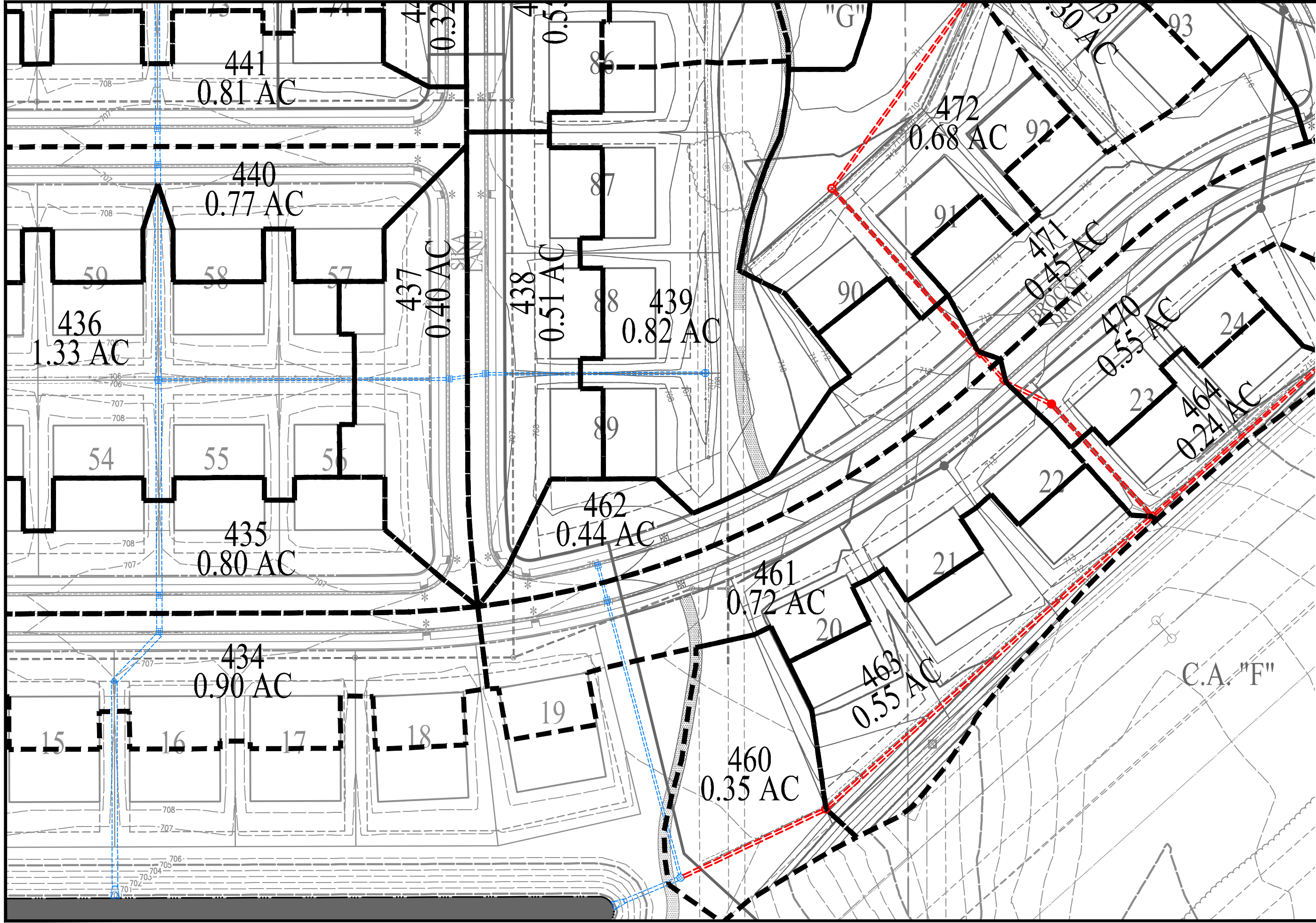
FIGURE 2.4

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PLOT BY: Gathert



STORM INLET
BASIN MAP

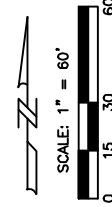
FIGURE 2.5

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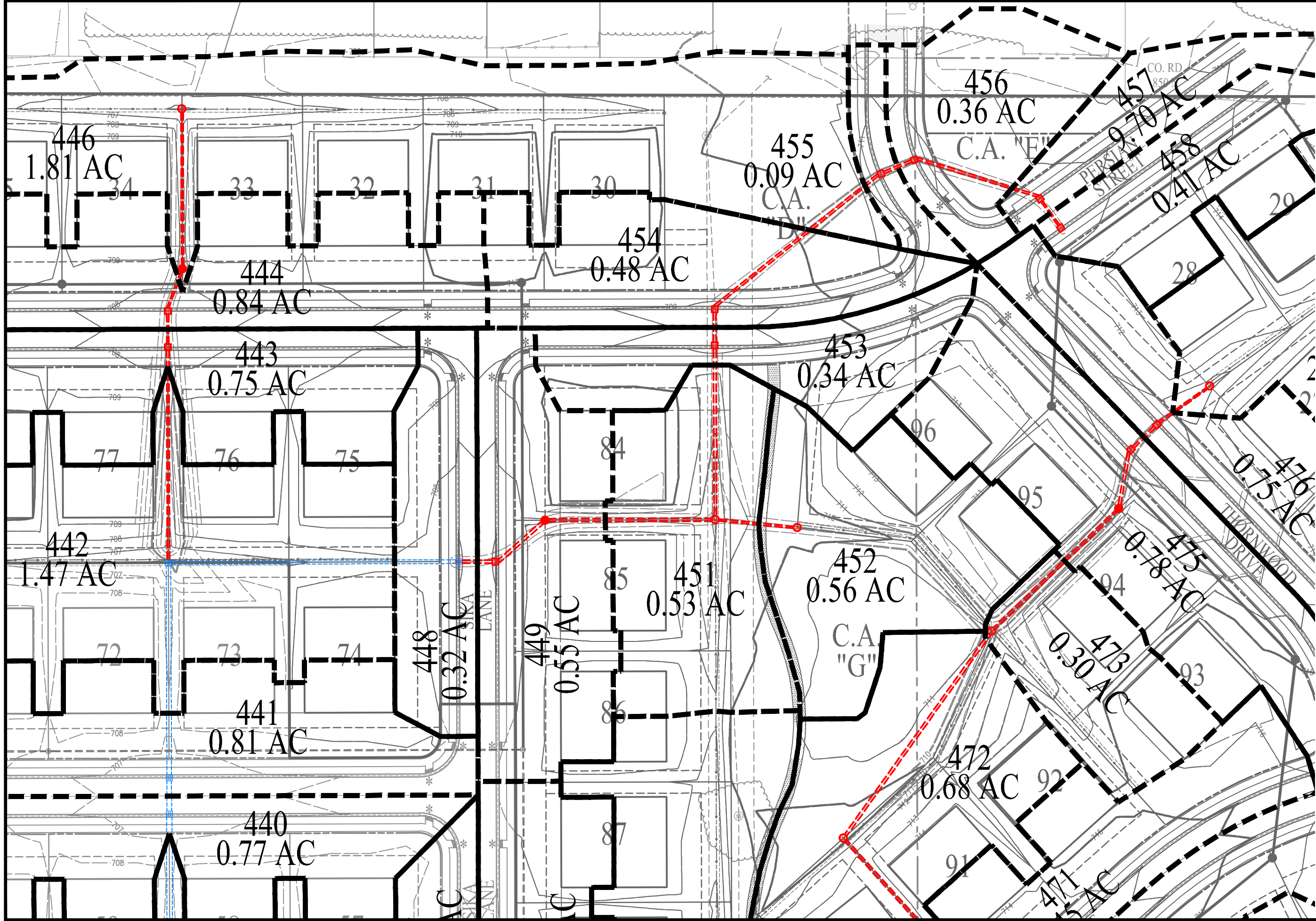
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DATE/TIME: April 25, 2023 - 3:05pm
PLOTTED BY: Gathert



STORM INLET
BASIN MAP

FIGURE 2.6

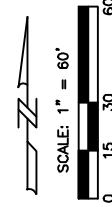
Date: April 27, 2023

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LOCATION: H:\2021\W210353\Section 2\Engineering\design\drainage\basin maps\W210353-2--Drainage Exhibits.dwg
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PLOT BY: Gathert

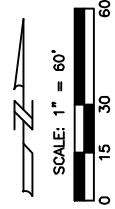
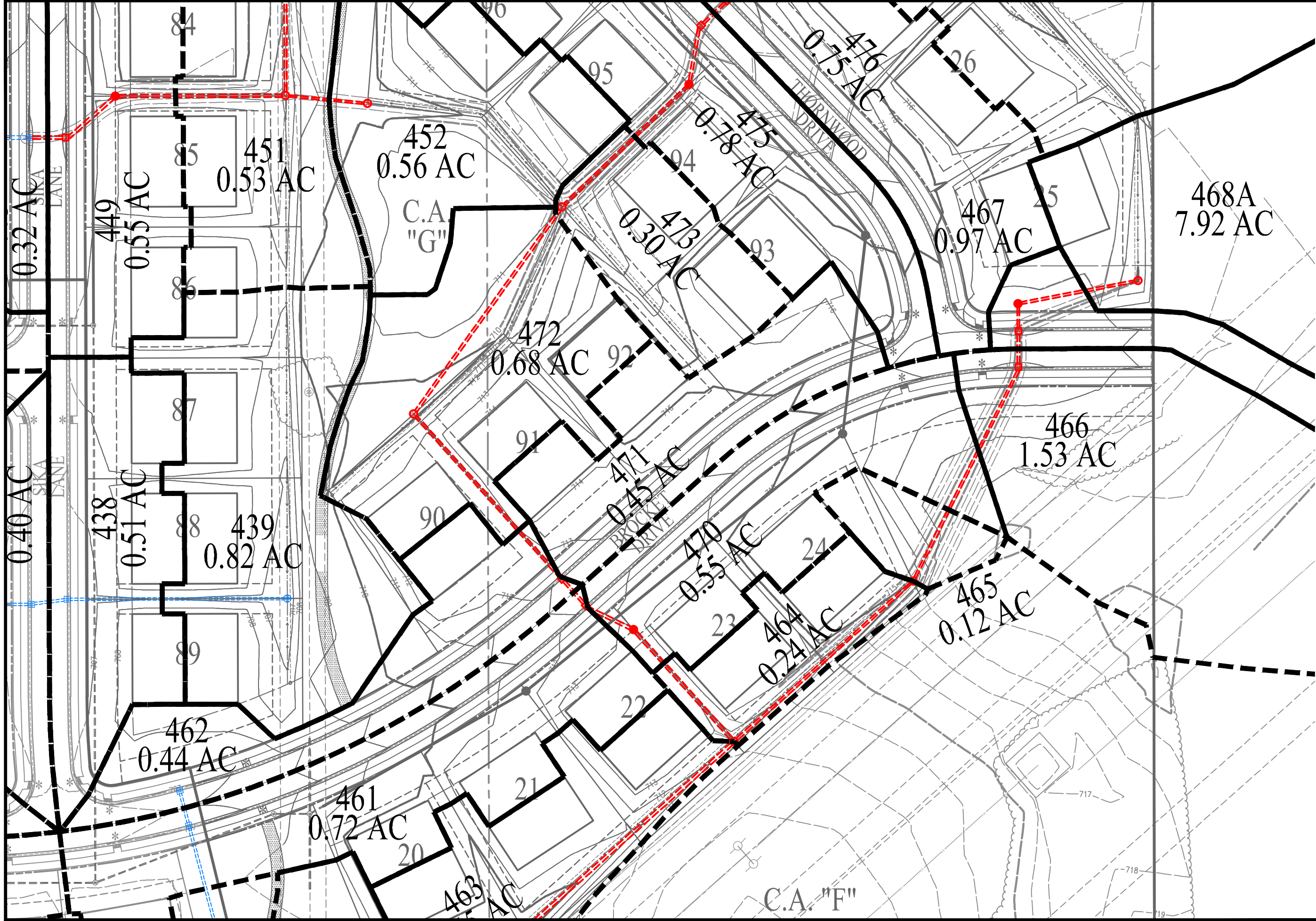
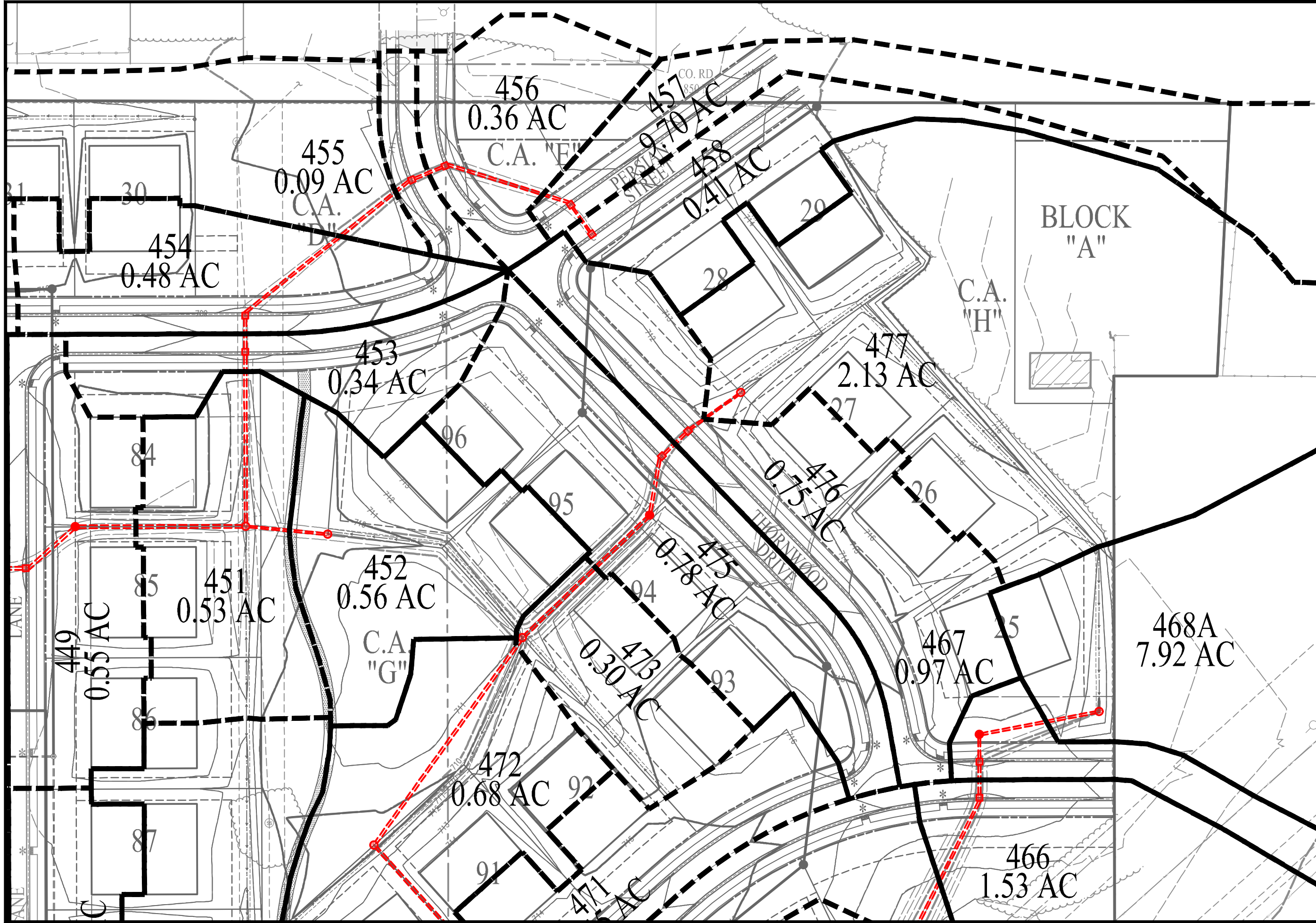


FIGURE 2.7

Date: April 27, 2023

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PLOT BY: Gathert



STORM INLET
BASIN MAP

Date: April 27, 2023

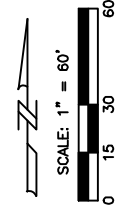


FIGURE 2.8

DEERFIELD SECTION 2
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 Land Surveying Civil Engineering Landscape Architecture <i>Build with confidence.</i>	Composite "c" Value Calculations	Project:	Deerfield Section 2
		Date:	4/27/2023
		Job No.:	W21-0353-2
		Checked By:	JEP
		Prepared By:	TPG

Typical Full Pad (L_p, W_p)	70	60
Typical Driveway (L_d, W_d)	36	16
Street Width, B-B (W_{st})	28	
Sidewalk Width (W_{sw})	5	
Walking Path Width (W_{wp})	8	

$$A_{imp} = \frac{(\#Pads)(L_p)(W_p) + (\#Drives)(L_d)(W_d) + (L_{st})(\frac{W_{st}}{2}) + (L_{sw})(W_{sw}) + (L_{wp})(W_{wp})}{43,560}$$

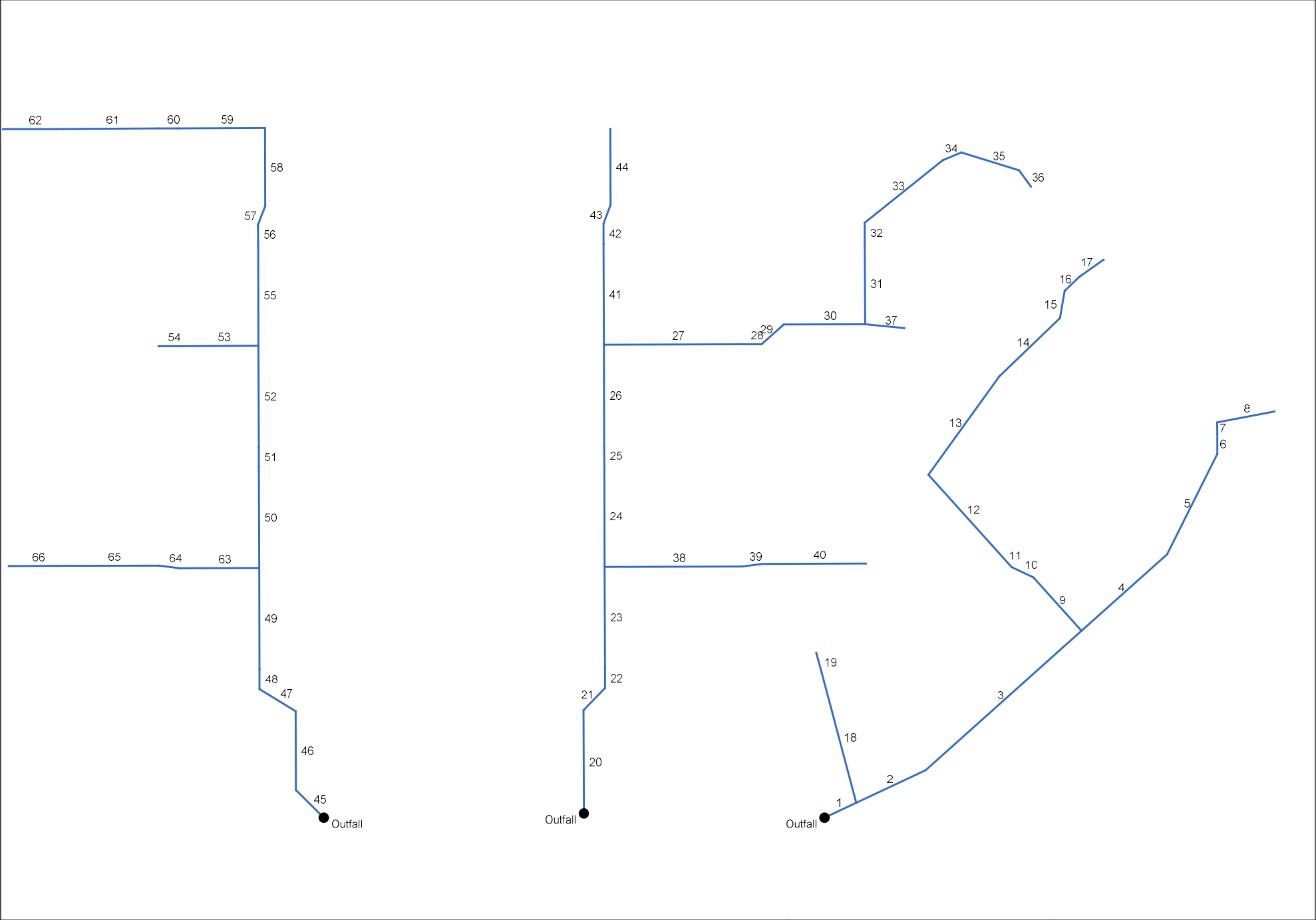
$$A_{per} = A_t - A_{imp}$$

$$C_w = \frac{(0.85A_{imp} + 0.2A_{per})}{A_t}$$

Str. #	Total Drainage Area, A_t (acre)	Number of Pads	Number of Driveways	Street Length L_{st} (ft)	Sidewalk Length L_{sw} (ft)	Walking Path Length L_{wp} (ft)	Total Impervious Area A_{imp} (acre)	Total Pervious Area A_{per} (acre)	Composite "c" Value C_w
412	0.29	0.75	0	0	0	0	0.07	0.21	0.36
414	0.50	1	2	380	343	0	0.28	0.21	0.57
415	0.62	2	4	380	343	0	0.41	0.21	0.63
416	0.96	3.5	0	0	0	0	0.34	0.62	0.43
417	0.26	0	0	232	232	0	0.10	0.16	0.45
418	0.52	1.5	3	317	317	0	0.32	0.19	0.61
419	1.10	1.25	0	0	0	0	0.22	0.89	0.33
419A	0.77	0	0		378	0	0.30	0.47	0.46
420	0.62	2	4	380	343	0	0.41	0.21	0.63
421	0.62	2	4	380	343	0	0.41	0.21	0.63
422	0.91	3.5	0	0	0	0	0.34	0.57	0.44
423	0.28	0	0	264	246	0	0.11	0.17	0.46
424	0.66	0.75	1	308	308	0	0.28	0.39	0.47
425	0.60	2	4	350	330	0	0.40	0.21	0.63
426	0.67	2	4	382	345	0	0.41	0.26	0.60
428	0.46	1.25	0	0	0	0	0.13	0.34	0.38
429	0.24	0	0	121	121	0	0.07	0.17	0.40
430	0.30	0.75	2	155	155	0	0.18	0.12	0.58
431	0.97	1.5	0	0	0	0	0.17	0.80	0.31
431A	0.37	0	0		285	0	0.10	0.27	0.38
434	0.90	3	6	462	464	0	0.57	0.33	0.61
435	0.80	2.5	5	455	432	0	0.50	0.30	0.61
436	1.33	5	0	0	0	0	0.48	0.85	0.44
437	0.40	0.5	0	291	256	0	0.17	0.23	0.48
438	0.51	1.5	3	308	284	0	0.32	0.20	0.60
439	0.82	1.75	0	0	0	214	0.21	0.61	0.36
440	0.77	2.5	5	448	428	0	0.50	0.27	0.62
441	0.81	2.5	5	480	443	0	0.51	0.30	0.61
442	1.47	5.5	0	0	0	0	0.53	0.94	0.43
443	0.75	2.5	5	415	415	0	0.49	0.26	0.62
444	0.84	2.75	5	461	461	0	0.53	0.30	0.61
446	1.81	4.25	0	0	0	0	0.41	1.40	0.35
448	0.32	0	0	296	260	0	0.12	0.20	0.45
449	0.55	1.5	3	326	290	0	0.32	0.23	0.58
451	0.53	1.25	0	0	0	109	0.14	0.39	0.37
452	0.56	1	0	0	0	112	0.12	0.45	0.33
453	0.34	0	0	294	290	17	0.13	0.21	0.45
454	0.48	0.75	2	325	287	0	0.24	0.24	0.52

[illegible]

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: W210353-2-STM.stm	Number of lines: 66	Date: 4/25/2023
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Line No.	Inlet ID	Known Q (cfs)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Pipe Travel (min)	Tc (min)	i Inlet (in/hr)	i Sys (in/hr)	Incr Q (cfs)	Flow Rate (cfs)	
1	460	0.00	0.35	18.47	0.23	0.08	6.39	20.8	0.12	26.9	3.98	3.43	0.32	21.93	
2	463	0.00	0.55	16.96	0.37	0.20	5.66	20.9	0.29	26.6	3.97	3.45	0.81	19.55	
3	464	0.00	0.24	16.41	0.47	0.11	5.46	16.6	0.78	25.8	4.49	3.52	0.51	19.18	
4	465	0.00	0.12	10.53	0.20	0.02	2.97	17.0	0.43	22.9	4.44	3.77	0.11	11.18	
5	466	0.00	1.53	10.41	0.22	0.34	2.94	16.4	0.42	22.5	4.52	3.81	1.52	11.20	
6	467	0.00	0.96	8.88	0.24	0.23	2.61	19.5	0.08	22.4	4.12	3.81	0.95	9.94	
7	468	0.00	0.00	7.92	0.00	0.00	2.38	0.0	0.05	22.4	0.00	3.82	0.00	9.08	
8	468A	0.00	7.92	7.92	0.30	2.38	2.38	22.1	0.26	22.1	3.85	3.85	9.14	9.14	
9	469	0.00	0.00	5.64	0.00	0.00	2.38	0.0	0.61	25.2	0.00	3.57	0.00	8.47	
10	470	0.00	0.55	5.64	0.50	0.28	2.38	13.9	0.20	25.0	4.91	3.58	1.35	8.51	
11	471	0.00	0.45	5.09	0.51	0.23	2.10	17.1	0.15	24.8	4.42	3.60	1.02	7.55	
12	472	0.00	0.68	4.64	0.35	0.24	1.87	19.2	0.84	24.0	4.16	3.67	0.99	6.86	
13	473	0.00	0.30	3.96	0.41	0.12	1.63	15.3	1.09	22.9	4.68	3.77	0.58	6.15	
14	474	0.00	0.00	3.66	0.00	0.00	1.51	0.0	0.80	22.1	0.00	3.85	0.00	5.81	
15	475	0.00	0.78	3.66	0.57	0.44	1.51	17.3	0.26	21.8	4.40	3.87	1.95	5.85	
16	476	0.00	0.75	2.88	0.54	0.41	1.07	14.7	0.20	21.6	4.78	3.89	1.94	4.15	
17	477	0.00	2.13	2.13	0.31	0.66	0.66	21.3	0.33	21.3	3.93	3.93	2.59	2.59	
18	461	0.00	0.72	1.16	0.58	0.42	0.65	12.9	1.16	12.9	5.09	5.09	2.13	3.31	
19	462	0.00	0.44	0.44	0.53	0.23	0.23	11.3	0.45	11.3	5.41	5.41	1.26	1.26	
20	433	0.00	0.00	24.55	0.00	0.00	10.28	0.0	0.63	39.0	0.00	2.72	0.00	27.97	
21	434	0.00	0.90	24.55	0.61	0.55	10.28	15.5	0.19	38.8	4.65	2.73	2.55	28.06	
22	435	0.00	0.80	23.65	0.61	0.49	9.73	14.1	0.13	38.7	4.88	2.74	2.38	26.62	
23	436	0.00	1.33	22.85	0.44	0.59	9.24	21.8	0.67	38.0	3.87	2.77	2.27	25.57	

Project File: W210353-2-STM.stm

Number of lines: 66

Date: 4/25/2023

NOTES: Intensity = 57.18 / (Inlet time + 8.60) ^ 0.79 -- Return period = 10 Yrs. ; ** Critical depth

Line No.	Inlet ID	Known Q (cfs)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Pipe Travel (min)	Tc (min)	i Inlet (in/hr)	i Sys (in/hr)	Incr Q (cfs)	Flow Rate (cfs)		
24	440	0.00	0.77	19.79	0.62	0.48	7.86	11.3	0.77	37.2	5.41	2.80	2.58	22.04		
25	441	0.00	0.81	19.02	0.61	0.49	7.39	14.1	0.11	37.1	4.88	2.81	2.41	20.75		
26	442	0.00	1.47	18.21	0.43	0.63	6.89	21.8	0.60	36.5	3.87	2.84	2.45	19.56		
27	448	0.00	0.32	13.34	0.45	0.14	4.65	8.3	0.76	35.8	6.16	2.88	0.89	13.38		
28	449	0.00	0.55	13.02	0.58	0.32	4.51	17.3	0.12	35.6	4.40	2.88	1.40	12.99		
29	450	0.00	0.00	12.47	0.00	0.00	4.19	0.0	0.18	35.5	0.00	2.89	0.00	12.11		
30	451	0.00	0.53	12.47	0.37	0.20	4.19	15.1	0.49	35.0	4.72	2.92	0.92	12.22		
31	453	0.00	0.34	11.38	0.45	0.15	3.81	8.7	0.41	34.6	6.04	2.94	0.92	11.19		
32	454	0.00	0.48	11.04	0.52	0.25	3.65	15.3	0.11	34.4	4.68	2.95	1.17	10.76		
33	455	0.00	0.09	10.56	0.67	0.06	3.40	5.0	0.41	34.0	7.31	2.97	0.44	10.10		
34	456	0.00	0.36	10.47	0.34	0.12	3.34	15.3	0.08	34.0	4.68	2.97	0.57	9.94		
35	457	0.00	9.70	10.11	0.31	3.01	3.22	33.7	0.26	33.7	2.99	2.99	8.98	9.62		
36	458	0.00	0.41	0.41	0.52	0.21	0.21	10.6	0.48	10.6	5.57	5.57	1.19	1.19		
37	452	0.00	0.56	0.56	0.33	0.18	0.18	13.8	1.23	13.8	4.93	4.93	0.91	0.91		
38	437	0.00	0.40	1.73	0.48	0.19	0.79	7.3	1.32	25.2	6.46	3.57	1.24	2.83		
39	438	0.00	0.51	1.33	0.60	0.31	0.60	13.8	0.26	24.9	4.93	3.59	1.51	2.16		
40	439	0.00	0.82	0.82	0.36	0.30	0.30	22.3	2.61	22.3	3.83	3.83	1.13	1.13		
41	443	0.00	0.75	3.40	0.62	0.47	1.61	11.4	0.64	20.9	5.39	3.97	2.51	6.39		
42	444	0.00	0.84	2.65	0.61	0.51	1.15	11.4	0.12	20.8	5.39	3.98	2.76	4.56		
43	445	0.00	0.00	1.81	0.00	0.00	0.63	0.0	0.22	20.5	0.00	4.01	0.00	2.54		
44	446	0.00	1.81	1.81	0.35	0.63	0.63	19.7	0.84	19.7	4.10	4.10	2.60	2.60		
45	412	0.00	0.29	11.72	0.36	0.10	5.63	20.0	0.24	27.6	4.07	3.37	0.42	19.00		
46	413	0.00	0.00	11.43	0.00	0.00	5.53	0.0	0.48	27.2	0.00	3.41	0.00	18.84		
Project File: W210353-2-STM.stm														Number of lines: 66		Date: 4/25/2023
NOTES: Intensity = 57.18 / (Inlet time + 8.60) ^ 0.79 -- Return period = 10 Yrs. ; ** Critical depth																

Line No.	Inlet ID	Known Q (cfs)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Pipe Travel (min)	Tc (min)	i Inlet (in/hr)	i Sys (in/hr)	Incr Q (cfs)	Flow Rate (cfs)		
47	414	0.00	0.50	11.43	0.57	0.29	5.53	11.9	0.16	27.0	5.29	3.42	1.51	18.91		
48	415	0.00	0.62	10.93	0.63	0.39	5.24	12.1	0.08	26.9	5.25	3.43	2.05	17.97		
49	416	0.00	0.96	10.31	0.43	0.41	4.85	21.0	0.43	26.5	3.96	3.46	1.63	16.79		
50	420	0.00	0.62	6.70	0.63	0.39	3.29	12.1	0.63	25.9	5.25	3.51	2.05	11.54		
51	421	0.00	0.62	6.08	0.63	0.39	2.90	12.1	0.11	25.8	5.25	3.52	2.05	10.19		
52	422	0.00	0.91	5.46	0.44	0.40	2.51	21.9	0.62	25.1	3.86	3.57	1.55	8.94		
53	423	0.00	0.28	0.94	0.46	0.13	0.44	10.7	1.08	14.8	5.54	4.77	0.71	2.09		
54	424	0.00	0.66	0.66	0.47	0.31	0.31	14.4	0.38	14.4	4.83	4.83	1.50	1.50		
55	425	0.00	0.60	3.61	0.63	0.38	1.67	12.1	0.67	24.5	5.25	3.63	1.98	6.04		
56	426	0.00	0.67	3.01	0.60	0.40	1.29	17.6	0.17	24.3	4.36	3.64	1.75	4.69		
57	427	0.00	0.00	2.34	0.00	0.00	0.89	0.0	0.17	24.1	0.00	3.66	0.00	3.24		
58	428	0.00	0.46	2.34	0.38	0.17	0.89	13.7	0.66	23.5	4.95	3.71	0.86	3.29		
59	429	0.00	0.24	1.88	0.40	0.10	0.71	8.2	0.89	22.6	6.18	3.80	0.59	2.70		
60	430	0.00	0.30	1.64	0.58	0.17	0.62	10.6	0.24	22.3	5.57	3.82	0.97	2.35		
61	431	0.00	0.97	1.34	0.31	0.30	0.44	20.7	1.64	20.7	3.99	3.99	1.20	1.76		
62	431A	0.00	0.37	0.37	0.38	0.14	0.14	5.0	1.48	5.0	7.31	7.31	1.03	1.03		
63	417	0.00	0.26	2.65	0.45	0.12	1.15	9.6	0.51	22.1	5.81	3.85	0.68	4.43		
64	418	0.00	0.52	2.39	0.61	0.32	1.03	11.3	0.14	21.9	5.41	3.86	1.72	4.00		
65	419	0.00	1.10	1.87	0.33	0.36	0.72	20.9	1.01	20.9	3.97	3.97	1.44	2.85		
66	419A	0.00	0.77	0.77	0.46	0.35	0.35	5.0	0.54	5.0	7.31	7.31	2.59	2.59		
Project File: W210353-2-STM.stm														Number of lines: 66		Date: 4/25/2023
NOTES: Intensity = 57.18 / (Inlet time + 8.60) ^ 0.79 -- Return period = 10 Yrs. ; ** Critical depth																

Pipe Calc

Line No.	Inlet ID	Line Length (ft)	Line Size (in)	Line Slope (%)	n-val Pipe	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Invert Up (ft)	Invert Dn (ft)	Cover Up (ft)	Cover Dn (ft)	HGL Up (ft)	HGL Dn (ft)	
1	460	48.650	24	1.64	0.013	21.93	29.00	8.98	706.45	701.02	700.30	699.50	4.15	-0.48	701.97	700.80	
2	463	106.739	24	1.03	0.013	19.55	22.96	7.14	707.45	706.45	701.40	700.30	4.05	4.15	702.99 j	701.97	
3	464	291.031	24	1.00	0.013	19.18	22.58	7.20	712.36	707.45	704.30	701.40	6.06	4.05	705.87 j	702.99	
4	465	159.659	18	1.57	0.013	11.18	13.14	7.66	715.05	712.36	707.80	705.30	5.75	5.56	709.08	706.36	
5	466	156.683	18	1.44	0.013	11.20	12.58	6.98	716.23	715.05	710.05	707.80	4.68	5.75	711.33	709.08	
6	467	28.000	18	1.07	0.013	9.94	10.87	6.34	716.23	716.23	710.35	710.05	4.38	4.68	711.56 j	711.33	
7	468	16.000	18	0.94	0.013	9.08	10.17	6.04	716.55	716.23	710.50	710.35	4.55	4.38	711.66	711.56	
8	468A	80.881	18	0.88	0.013	9.14	9.84	6.20	714.91	716.55	711.21	710.50	2.20	4.55	712.38	711.66	
9	469	100.000	24	0.19	0.013	8.47	9.86	3.24	713.04	712.36	704.49	704.30	6.55	6.06	706.02	705.87	
10	470	33.561	24	0.18	0.013	8.51	9.56	3.16	712.45	713.04	704.55	704.49	5.90	6.55	706.14	706.10	
11	471	28.000	21	0.36	0.013	7.55	9.47	3.69	712.45	712.45	704.90	704.80	5.80	5.90	706.26	706.21	
12	472	144.961	21	0.26	0.013	6.86	8.00	3.44	709.27	712.45	705.27	704.90	2.25	5.80	706.58	706.30	
13	473	169.019	21	0.22	0.013	6.15	7.51	2.94	711.00	709.27	705.65	705.27	3.60	2.25	707.01	706.77	
14	474	117.159	21	0.18	0.013	5.81	6.71	2.88	711.28	711.00	705.86	705.65	3.67	3.60	707.21	707.04	
15	475	38.444	21	0.18	0.013	5.85	6.76	2.79	710.78	711.28	705.93	705.86	3.10	3.67	707.34	707.29	
16	476	28.000	18	0.36	0.013	4.15	6.28	2.72	710.78	710.78	706.28	706.18	3.00	3.10	707.46	707.42	
17	477	41.435	15	1.67	0.013	2.59	8.33	3.33	710.67	710.78	707.22	706.53	2.20	3.00	707.86 j	707.48	
18	461	188.650	15	0.87	0.013	3.31	6.04	3.92	707.05	706.45	702.70	701.05	3.10	4.15	703.43 j	701.97	
19	462	28.000	15	0.36	0.013	1.26	3.86	1.82	707.05	707.05	702.80	702.70	3.00	3.10	703.45	703.43	
20	433	144.000	36	0.21	0.013	27.97	30.44	4.89	706.85	701.02	699.80	699.50	4.05	-1.48	702.07	701.77	
21	434	43.139	36	0.21	0.013	28.06	30.47	4.41	706.29	706.85	699.89	699.80	3.40	4.05	702.41	702.34	
22	435	28.000	36	0.21	0.013	26.62	30.87	3.94	706.29	706.29	699.95	699.89	3.34	3.40	702.67	702.63	
23	436	141.000	36	0.16	0.013	25.57	26.94	3.79	705.55	706.29	700.18	699.95	2.37	3.34	702.88	702.71	
Project File: W210353-2-STM.stm													Number of lines: 66			Date: 4/26/2023	
NOTES: ** Critical depth																	

Pipe Calc

Line No.	Inlet ID	Line Length (ft)	Line Size (in)	Line Slope (%)	n-val Pipe	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Invert Up (ft)	Invert Dn (ft)	Cover Up (ft)	Cover Dn (ft)	HGL Up (ft)	HGL Dn (ft)		
24	440	141.000	36	0.12	0.013	22.04	23.16	3.15	706.66	705.55	700.35	700.18	3.31	2.37	703.24	703.11		
25	441	28.000	30	0.32	0.013	20.75	23.25	4.23	706.66	706.66	700.44	700.35	3.72	3.81	703.34	703.26		
26	442	141.000	30	0.26	0.013	19.56	20.72	3.99	705.80	706.66	700.80	700.44	2.50	3.72	703.70	703.38		
27	448	191.000	24	0.43	0.013	13.38	14.82	4.26	707.25	705.80	701.82	701.00	3.43	2.80	704.61	703.94		
28	449	28.000	24	0.43	0.013	12.99	14.81	4.13	707.25	707.25	701.94	701.82	3.31	3.43	704.75	704.66		
29	450	41.318	24	0.34	0.013	12.11	13.17	3.85	707.78	707.25	702.08	701.94	3.70	3.31	705.06	704.94		
30	451	113.000	24	0.33	0.013	12.22	12.94	3.89	706.85	707.78	702.45	702.08	2.40	3.70	705.55	705.22		
31	453	113.684	21	1.13	0.013	11.19	16.87	4.65	708.94	706.85	703.99	702.70	3.20	2.40	706.35	705.78		
32	454	28.000	21	0.71	0.013	10.76	13.39	4.47	708.94	708.94	704.19	703.99	3.00	3.20	706.53	706.40		
33	455	139.339	18	1.14	0.013	10.10	11.22	5.72	710.83	708.94	706.03	704.44	3.30	3.00	708.08	706.79		
34	456	28.000	18	1.07	0.013	9.94	10.87	5.62	710.83	710.83	706.33	706.03	3.00	3.30	708.49	708.24		
35	457	83.959	18	0.95	0.013	9.62	10.25	5.44	711.73	710.83	707.13	706.33	3.10	3.00	709.54	708.83		
36	458	28.000	15	0.36	0.013	1.19	3.86	0.97	711.73	711.73	707.48	707.38	3.00	3.10	709.85	709.84		
37	452	54.599	15	3.39	0.013	0.91	11.89	0.98	709.00	706.85	705.05	703.20	2.70	2.40	705.79	705.78		
38	437	191.000	15	0.45	0.013	2.83	4.33	2.31	706.39	705.55	702.04	701.18	3.10	3.12	703.47	703.11		
39	438	28.196	15	0.35	0.013	2.16	3.85	1.76	706.39	706.39	702.14	702.04	3.00	3.10	703.52	703.49		
40	439	144.000	15	0.32	0.013	1.13	3.65	1.01	706.05	706.39	702.60	702.14	2.20	3.00	703.57	703.52		
41	443	141.000	18	0.48	0.013	6.39	7.29	3.62	707.75	705.80	701.88	701.20	4.37	3.10	704.47	703.94		
42	444	28.000	15	0.71	0.013	4.56	5.46	3.72	707.75	707.75	702.08	701.88	4.42	4.62	704.64	704.50		
43	445	27.857	15	0.32	0.013	2.54	3.67	2.07	707.82	707.75	702.17	702.08	4.40	4.42	704.77	704.73		
44	446	106.157	15	0.26	0.013	2.60	3.32	2.12	705.90	707.82	702.45	702.17	2.20	4.40	704.97	704.80		
45	412	54.711	30	0.46	0.013	19.00	27.72	6.08	706.50	701.02	699.75	699.50	4.25	-0.98	701.27	701.02		
46	413	110.000	30	0.32	0.013	18.84	23.13	4.74	708.26	706.50	700.10	699.75	5.66	4.25	701.93	701.70		
Project File: W210353-2-STM.stm													Number of lines: 66			Date: 4/26/2023		
NOTES: ** Critical depth																		

Pipe Calc

Line No.	Inlet ID	Line Length (ft)	Line Size (in)	Line Slope (%)	n-val Pipe	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Gnd/Rim El Up (ft)	Gnd/Rim El Dn (ft)	Invert Up (ft)	Invert Dn (ft)	Cover Up (ft)	Cover Dn (ft)	HGL Up (ft)	HGL Dn (ft)		
47	414	58.830	24	0.76	0.013	18.91	19.78	6.02	708.13	708.26	700.55	700.10	5.58	6.16	702.67	702.26		
48	415	28.000	24	0.71	0.013	17.97	19.12	5.72	708.13	708.13	700.75	700.55	5.38	5.58	703.34	703.16		
49	416	141.000	24	0.57	0.013	16.79	17.04	5.34	706.00	708.13	701.55	700.75	2.45	5.38	704.19	703.42		
50	420	141.000	24	0.30	0.013	11.54	12.49	3.67	708.35	706.00	701.98	701.55	4.37	2.45	705.01	704.64		
51	421	28.000	21	0.50	0.013	10.19	11.20	4.24	708.35	708.35	702.12	701.98	4.48	4.62	705.15	705.04		
52	422	141.000	21	0.34	0.013	8.94	9.24	3.72	707.00	708.35	702.60	702.12	2.65	4.48	705.65	705.20		
53	423	111.000	15	1.85	0.013	2.09	8.78	1.79	709.25	707.00	704.90	702.85	3.10	2.90	705.96	705.86		
54	424	28.000	15	0.36	0.013	1.50	3.86	1.39	709.25	709.25	705.00	704.90	3.00	3.10	705.98	705.97		
55	425	141.000	18	0.38	0.013	6.04	6.44	3.42	709.07	707.00	703.13	702.60	4.44	2.90	706.33	705.86		
56	426	28.000	18	0.25	0.013	4.69	5.25	2.65	709.07	709.07	703.20	703.13	4.37	4.44	706.41	706.35		
57	427	27.857	15	0.36	0.013	3.24	3.87	2.64	710.21	709.07	703.30	703.20	5.66	4.62	706.53	706.46		
58	428	108.811	15	0.30	0.013	3.29	3.56	2.68	709.00	710.21	703.63	703.30	4.12	5.66	706.85	706.57		
59	429	121.000	15	0.29	0.013	2.70	3.47	2.20	709.59	709.00	703.98	703.63	4.36	4.12	707.18	706.96		
60	430	28.000	15	0.29	0.013	2.35	3.45	1.92	709.59	709.59	704.06	703.98	4.28	4.36	707.22	707.19		
61	431	141.000	15	0.23	0.013	1.76	3.08	1.43	708.28	709.59	704.38	704.06	2.65	4.28	707.34	707.23		
62	431A	65.113	15	0.26	0.013	1.03	3.30	0.84	708.00	708.28	704.55	704.38	2.20	2.65	707.36	707.34		
63	417	111.000	15	1.13	0.013	4.43	6.85	3.61	708.64	706.00	703.55	702.30	3.84	2.45	705.16	704.64		
64	418	28.259	15	0.50	0.013	4.00	4.55	3.26	708.64	708.64	703.69	703.55	3.70	3.84	705.30	705.20		
65	419	141.000	15	0.28	0.013	2.85	3.40	2.32	707.53	708.64	704.08	703.69	2.20	3.70	705.61	705.33		
66	419A	68.052	15	0.53	0.013	2.59	4.70	2.11	707.89	707.53	704.44	704.08	2.20	2.20	705.69	705.62		
Project File: W210353-2-STM.stm														Number of lines: 66			Date: 4/26/2023	
NOTES: ** Critical depth																		

Curb Inlet Capacity Calculations

Project: Deerfield Section 2

Date: 4/27/2023

Job No.: W21-0353-2

Checked By: JEP

Prepared By: TPG

Neenah R-3501-TR/TL	Single Inlet	R-3501-TB
Open Area, A (ft ²) =	1.4	3.1
Weir Perimeter, P (ft) =	4.6	5.7
A, 50% Clogged (ft ²) =	0.7	1.55
P, 50% Clogged (ft) =	3.45	4.28

Weir Condition (d<0.3') $Q = 3.0Pd^{3/2}$
Orifice Condition (d>0.4') $Q = 4.89Ad^{1/2}$

Str. #	Q (cfs)	Depth Weir (ft)	Depth Orifice (ft)	Depth Controlling (ft)	Maximum Depth 0.5 ft
470	1.32	0.25	0.15	0.25	OK
471	1.01	0.21	0.09	0.21	OK
466	1.54	0.28	0.20	0.28	OK
467	0.96	0.20	0.08	0.20	OK
475	1.94	0.33	0.32	0.33	OK
476	1.88	0.32	0.30	0.32	OK
448	0.90	0.20	0.07	0.20	OK
449	1.41	0.26	0.17	0.26	OK
429	0.60	0.15	0.03	0.15	OK
430	0.97	0.21	0.08	0.21	OK
425	1.97	0.33	0.33	0.33	OK
426	1.74	0.31	0.26	0.31	OK
443	2.50	0.39	0.53	0.39	OK
444	2.75	0.41	0.65	0.65	R-3501-TB
444	2.75	0.36	0.13	0.36	OK
453	0.93	0.20	0.07	0.20	OK
454	1.15	0.23	0.11	0.23	OK
455	0.45	0.12	0.02	0.12	OK
456	0.56	0.14	0.03	0.14	OK
457	9.22	0.93	7.25	7.25	R-3501-TB
457	9.22	0.80	1.48	1.48	R-3501-TB
458	1.18	0.23	0.12	0.23	OK

Depth as R-3501-TR/TL

Depth as R-3501-TB

Depth as R-3501-TR/TL

Depth as R-3501-TB

 WEIHE ENGINEERS Land Surveying Civil Engineering Landscape Architecture <i>Build with confidence.</i>	Beehive Inlet Capacity Calculations	Project: Deerfield Section 2
		Date: 4/27/2023
		Job No.: W21-0353-2
		Checked By: JEP
		Prepared By: TPG

Neenah R-4342	Single Inlet	Double Inlet
Open Area, A (ft ²) =	2	4
Weir Perimeter, P (ft) =	6	12
A, 50% Clogged (ft ²) =	1	2
P, 50% Clogged (ft) =	3	6

Weir Condition (d<0.3') $Q = 3.0Pd^{3/2}$
Orifice Condition (d>0.4') $Q = 4.89Ad^{1/2}$

Str. #	Q (cfs)	Depth Weir (ft)	Depth Orifice (ft)	Depth Controlling (ft)	Maximum Depth 0.8 ft
428	0.85	0.21	0.03	0.21	OK
431	1.24	0.27	0.06	0.27	OK
431A	1.03	0.24	0.04	0.24	OK
439	1.18	0.26	0.06	0.26	OK
446	2.63	0.44	0.29	0.29	OK
451	0.91	0.22	0.03	0.22	OK
452	0.92	0.22	0.04	0.22	OK
460	0.33	0.11	0.00	0.11	OK
463	0.83	0.20	0.03	0.20	OK
464	0.49	0.14	0.01	0.14	OK
465	0.11	0.05	0.00	0.05	OK
468A	9.30	1.02	3.62	3.62	HIGHER THAN 0.8'
472	1.00	0.23	0.04	0.23	OK
473	0.56	0.16	0.01	0.16	OK
477	2.70	0.45	0.30	0.30	OK

 WEIHE ENGINEERS Land Surveying Civil Engineering Landscape Architecture <i>Build with confidence.</i>	Pipe Velocity Calculations	Project: Deerfield Section 2
		Date: 4/27/2023
		Job No.: W21-0353-2
		Checked By: JEP
		Prepared By: TPG

Pipe Diam. (in)	Min. Slope (Min. Velocity = 2.5 ft/sec) (%)	Max. Slope (Max. Velocity = 10 ft/sec) (%)
12	0.31	4.83
15	0.23	3.58
18	0.18	2.81
21	0.15	2.29
24	0.12	1.91
* 30	0.09	1.42
* 36	0.07	1.11
* 42	0.06	0.90
* 48	0.05	0.76
* 54	0.05	0.65
* 60	0.04	0.56
* 66	0.04	0.49
* 72	0.03	0.44

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

n = 0.013 (Manning Roughness Coefficient)

$$R = \frac{D}{4} \quad \text{(Hydraulic Radius when pipe flowing is full) (ft)}$$

S = Slope of Pipe (ft/ft)

2.5 Minimum flow velocity when pipe is flowing full

10 Maximum flow velocity when pipe is flowing full

* Note: Minimum Slope Set at 0.10% for Constructability