

Memo

Project: Crestlake Subdivision – Detention Basins
(CDI Project No. C2190010)
To: Daniel Wilson, President
From: Nicholas Rademacher and Chris Gutkowski
Date: December 28, 2022
Subject: Sedimentation Study

Clark Dietz was contracted by the Crestlake Subdivision HOA in St. Joseph, IL to investigate the condition of the subdivision's detention basins. The goal of this study is to evaluate the sedimentation in the subdivision basins and document any changes since the original construction. This memo includes:

- Data Collection and Field Survey
- Sedimentation Evaluation
- Conclusions and Recommendations
- Attachment 1 – Basin Plans and Cross Sections

Data Collection and Field Survey

The locations of the basins are shown in Figure 1. In order to properly assess the current condition of the basin, a field survey of the 5 basins located within the Crestlake Subdivision was completed in October 2022. Subdivision as-built drawings were utilized to establish an original basin floor surface. This original surface was used to determine the volume of sediment deposited, when compared to the gathered field survey information.



Figure 1. Project Location Map



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Field Survey

Cross section locations (ranges) were selected to provide a comprehensive comparison between the field survey information and the original basin bottom geometry from the as-built drawings and to extrapolate the results to obtain sedimentation generalizations for the entire basin. Depth readings were gathered in 20' intervals along the cross sections and spacing between cross sections was approximately 100'. Cross section locations were surveyed with GPS equipment. As-built and existing elevations were correlated based on structure elevations surveyed in the field and shown on the as-built drawings. Cross section locations can be replicated as needed for future evaluation based on the collected horizontal and vertical information.

Observations

All pond banks appeared to be in good condition and shoreline erosion did not appear to be an issue. A majority of the banks have rip rap or rip rap with slurry seal to prevent erosion. Some algae growth was noticed in the south portions of Basins 3 and 5. Significant algae growth was not observed in the other basins. Chemical treatment may be required in the future if algae blooms increase.

The basin inlet and outfall structures appear to be free from debris and performing as expected. It is recommended that the 27" flared end section located in the center of the northeast area of Basin 1 be repaired. The pipe is separated from the end section with some erosion and is a potential safety hazard as shown in Figure 2.



Figure 2. Basin 1 Flared End Section Photo

Sedimentation Evaluation

The results of the sedimentation survey are presented in Attachment 1. The included exhibits show a plan view of each basin and the location of the cross sections taken. Cross section information based on the as-built surface are also shown on the exhibit for comparison. This comparison reveals that very little sediment has



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accumulated since a majority of the basins’ construction. Slight variation in original and current surface geometry may be attributed to standard “noise” based on the data collection techniques.

Basin Volume Comparison

Results of the basin volume analysis are shown in Table 1. Significant reduction in volume affects the health of the water body and how the aquatic systems function. Sediment deposition, reduction in water depth, and decrease in water volume can impact the aquatic plants and animals and lead to water stagnation, increased freezing depths, and extended drought/evaporation. These issues may be experienced as decrease in volume begins to approach 25-50%, but all of the basins are below this threshold.

Table 1. Basin Volume Evaluation Summary

	Year Constructed	Original Volume (cu yds)¹	Current Volume (cu yds)¹	Volume Change (cu yds)	Volume Change (%)
Pond 1	1993	25,040	23,310	-1,730	-7%
Pond 2	1997	14,640	12,010	-2,630	-18%
Pond 3 ³	2000	13,220	13,900	680	0% ²
Pond 4a	2003	10,570	10,620	50	0%
Pond 4b	2003	20,030	17,550	-2,480	-12%
Pond 5	2005	8,860	6,860	-2,000	-23%

Notes:

1. Volumes rounded to nearest 10 cubic yards.
2. Value changed to 0% from 5% which would have indicated an increased pond volume.
3. Apparent increase in Pond 3 value assumed to be within limits of accuracy of survey, estimated at +/- 5% based on survey techniques and assuming uniform conditions between cross sections.

Basin Sedimentation Rate

Average sediment depth for the basins is summarized in Table 2. Similar studies have shown that urban detention basins typically accumulate sediment at a rate of 0.1 to 1.0 inches per year and require sediment clean out on a 15 to 25 year cycle¹. The basins’ sediment accumulation rates were found to be reasonable based on this information. Ponds 3 and 4a have very slow accumulation rates. Ponds 1 and 4b have low to medium accumulation rates. Ponds 2 and 5 have higher accumulation rates.

¹ Schueler, Thomas R. "Pollutant Dynamics of Pond Muck." Watershed Protection Techniques, Vol. 1, No. 2 - Summer, 1994. Center for Watershed Protection.



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Table 2. Basin Sedimentation Rate Summary

	Year Constructed	Age (Years)	Pond Floor Surface Area (sq yd)	Average Sediment Depth (in)	Sediment Accumulation Rate (in/yr)
Pond 1	1993	29	13,940	4	0.2
Pond 2	1997	25	6,690	14	0.6
Pond 3 ¹	2000	22	10,980	-2	-0.1
Pond 4a	2003	19	5,720	0	0.0
Pond 4b	2003	19	11,300	8	0.4
Pond 5	2005	17	4,450	16	1.0

Notes:

1. Apparent increase in Pond 3 value assumed to be within limits of accuracy of survey.

Conclusions and Recommendations

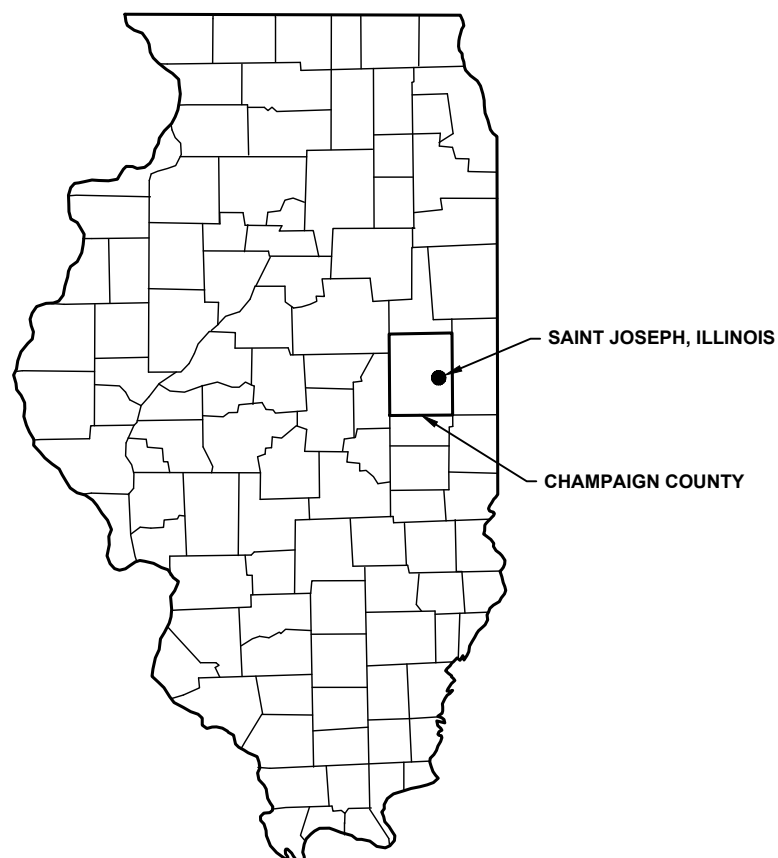
Basins 1, 3, and 4 still have a majority of the original volume capacity and appear to accumulate sediment at a slower rate than typical. Based on the information above, dredging is not recommended.

However, it is recommended to evaluate the sediment in at least Ponds 2 and 5 again in 10-15 years to confirm if they are experiencing the apparently high deposition rate. The reduction in volume is not a concern at the present time since the sediment accumulation rate is still within the expected range. Future analysis will be able to be analyzed more confidently as this field data is likely more accurate than the as-built plans used as a reference for the original basin floor surface.

It is recommended to begin budgeting now for a pond restoration project following the assessment in 10-15 years. Pond dredging costs are estimated at approximately \$40 per cubic yard of sediment removed in 2022 dollars. For reference, dredging only Basin 5 today is estimated at \$80,000 (2,000 cu yds x \$40). These cost estimates are for budgeting purposes only to assist in determining the level of magnitude of a future project. Actual quantity of basins dredged and volume of sediment removed would not be known until that time.

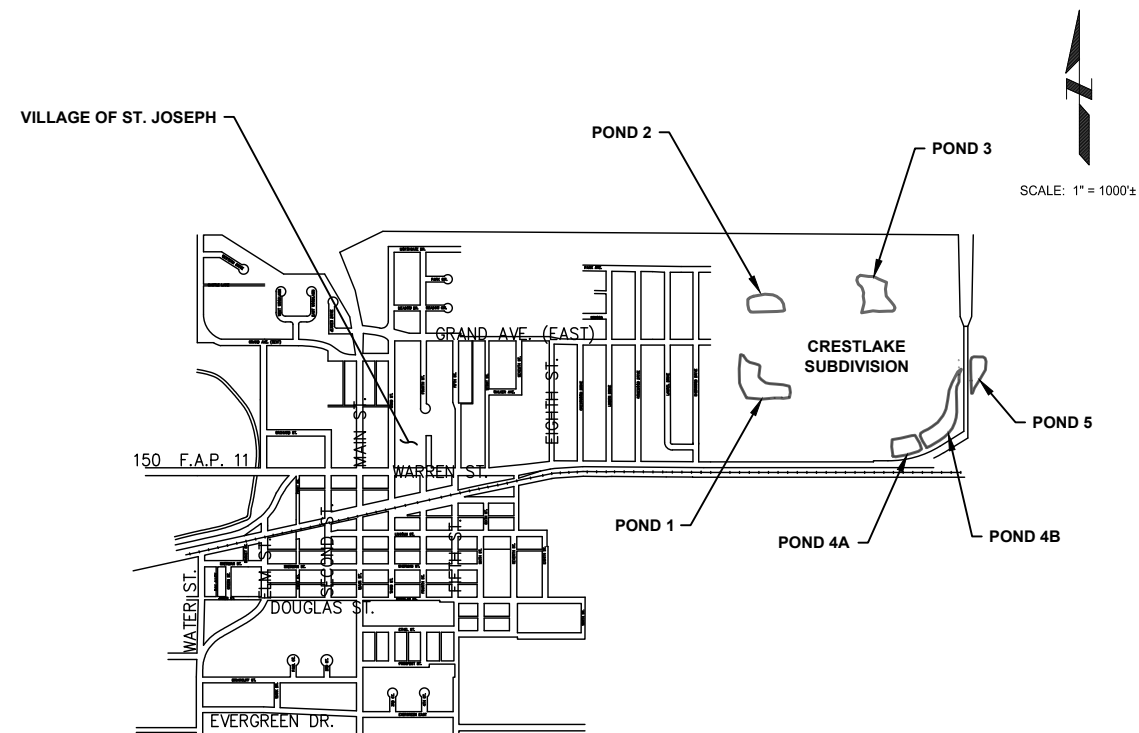
CRESTLAKE SUBDIVISION ST. JOSEPH, ILLINOIS SEDIMENTATION STUDY

DECEMBER 2022



GENERAL LOCATION MAP

DRAWING INDEX	
DRAWING NO.	DRAWING TITLE
G-1	COVER
C-1	POND 1
C-2	POND 2
C-3	POND 3
C-4	POND 4A
C-5	POND 4B
C-6	POND 5
C-7	SURVEY CONTROL INFORMATION



PROJECT LOCATION MAP

PROJECT TITLE
**CRESTLAKE SUBDIVISION
ST. JOSEPH, IL
SEDIMENTATION STUDY**

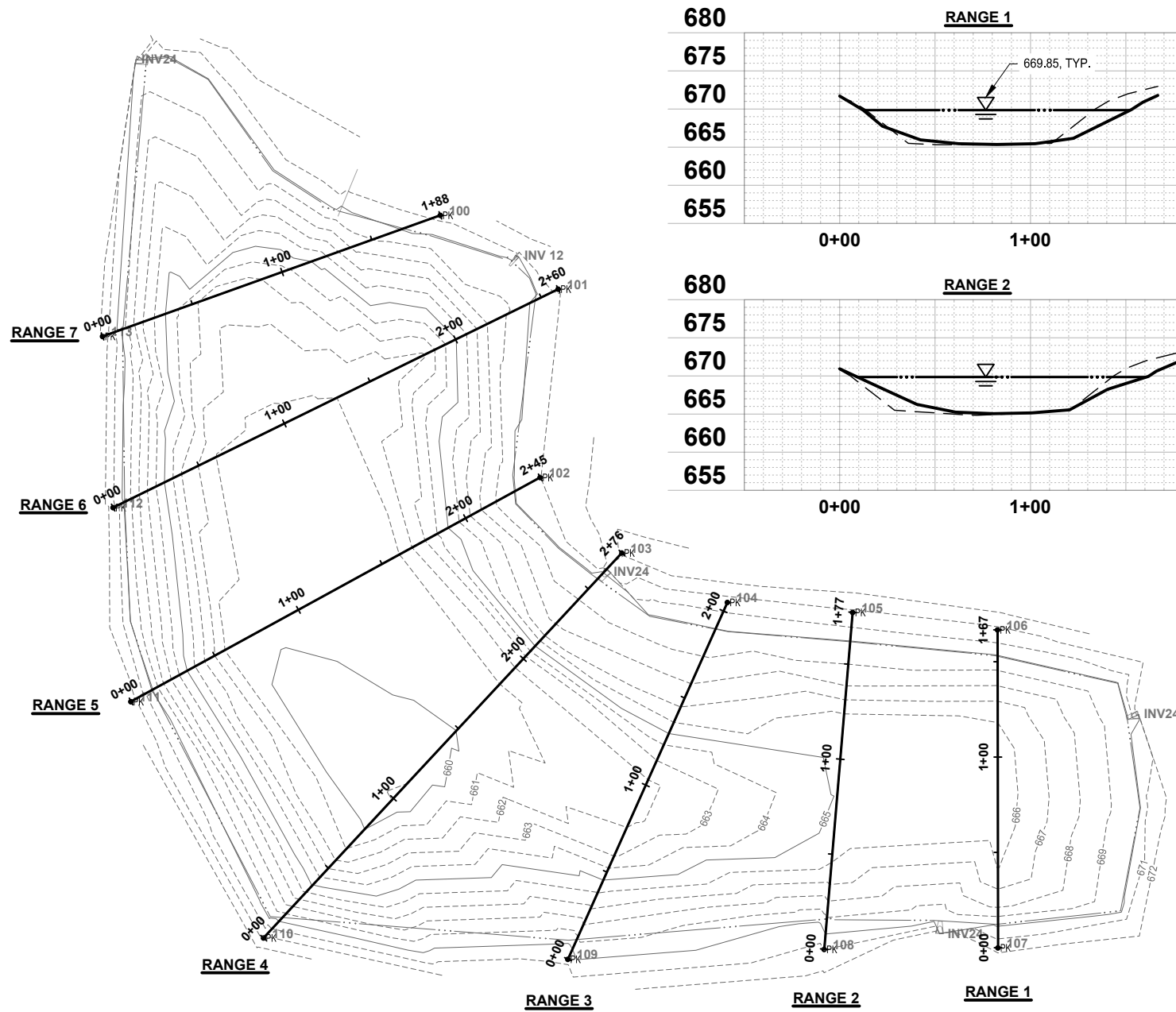
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CHECKED BY: CSG
DATE CHECKED: 11/22

DATE	REVISION

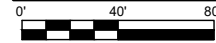
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COVER

PROJECT No.
C2190010

DRAWING No.
G-1

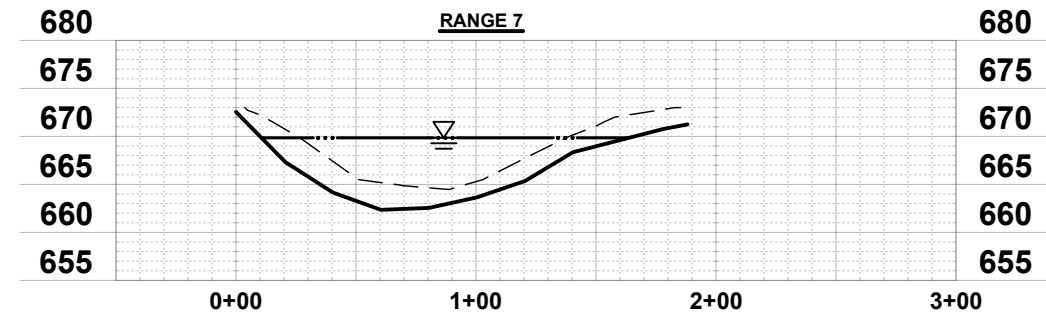
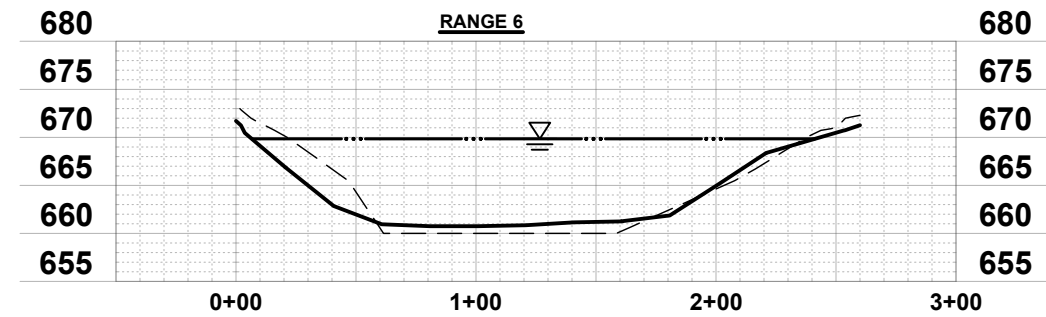
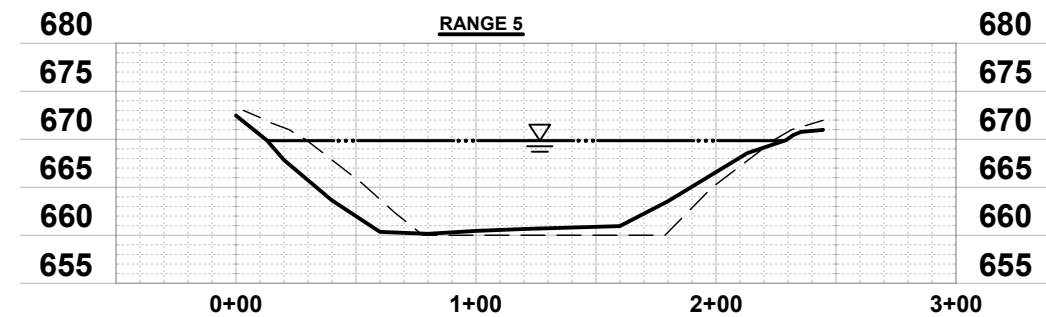
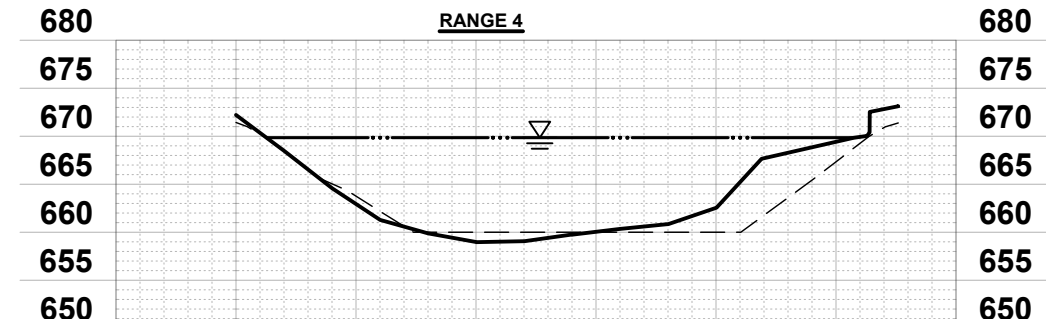
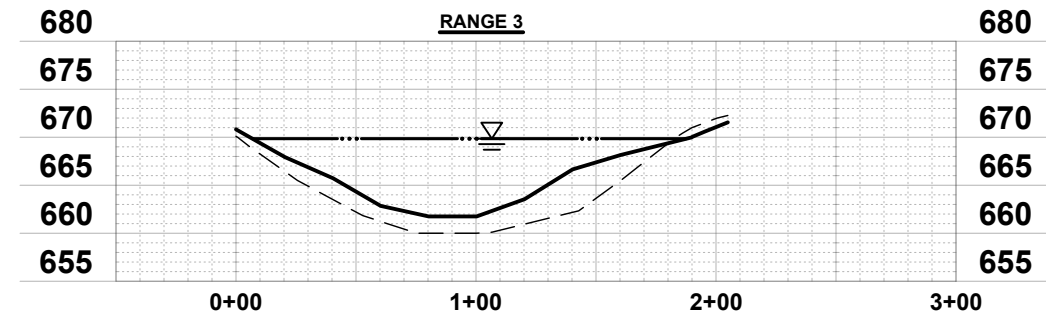
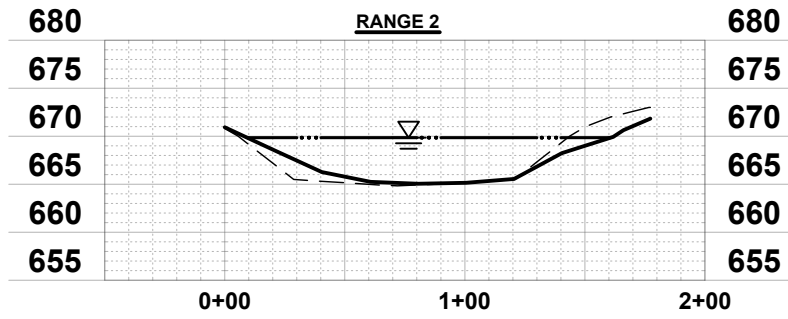
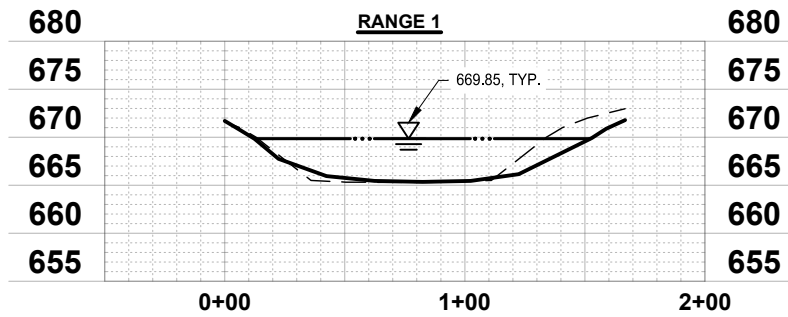


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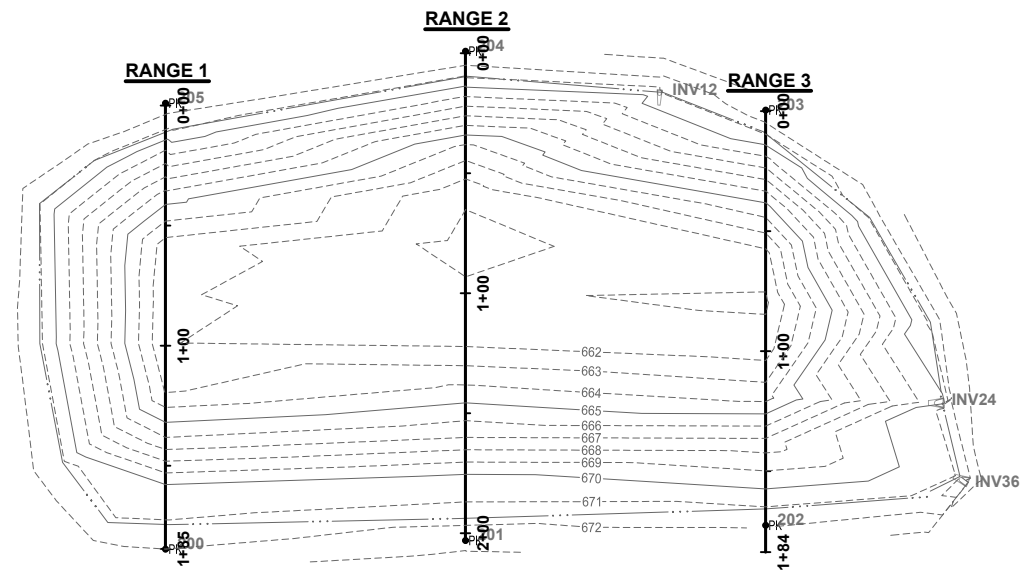


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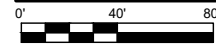
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- - - AS BUILT ELEVATION (1998)



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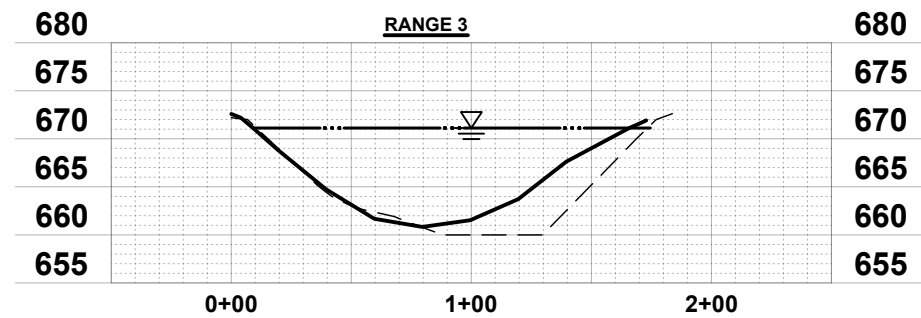
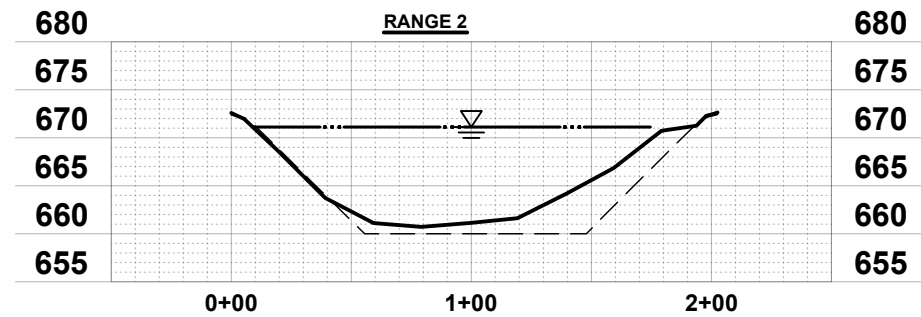
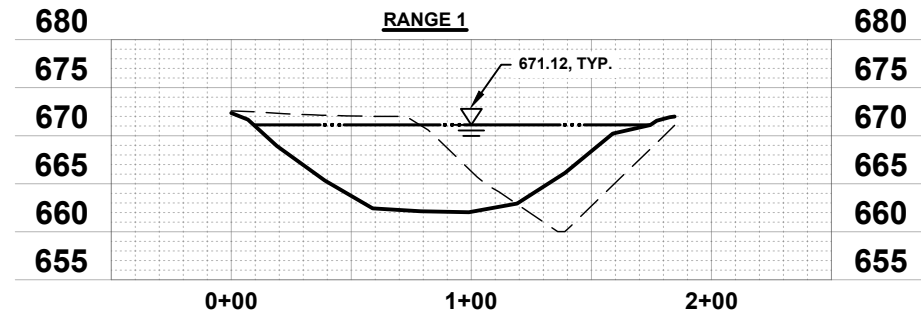


CRESTLAKE SUBDIVISION - POND 2



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- SURVEY ELEVATION (2022)
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PROJECT TITLE
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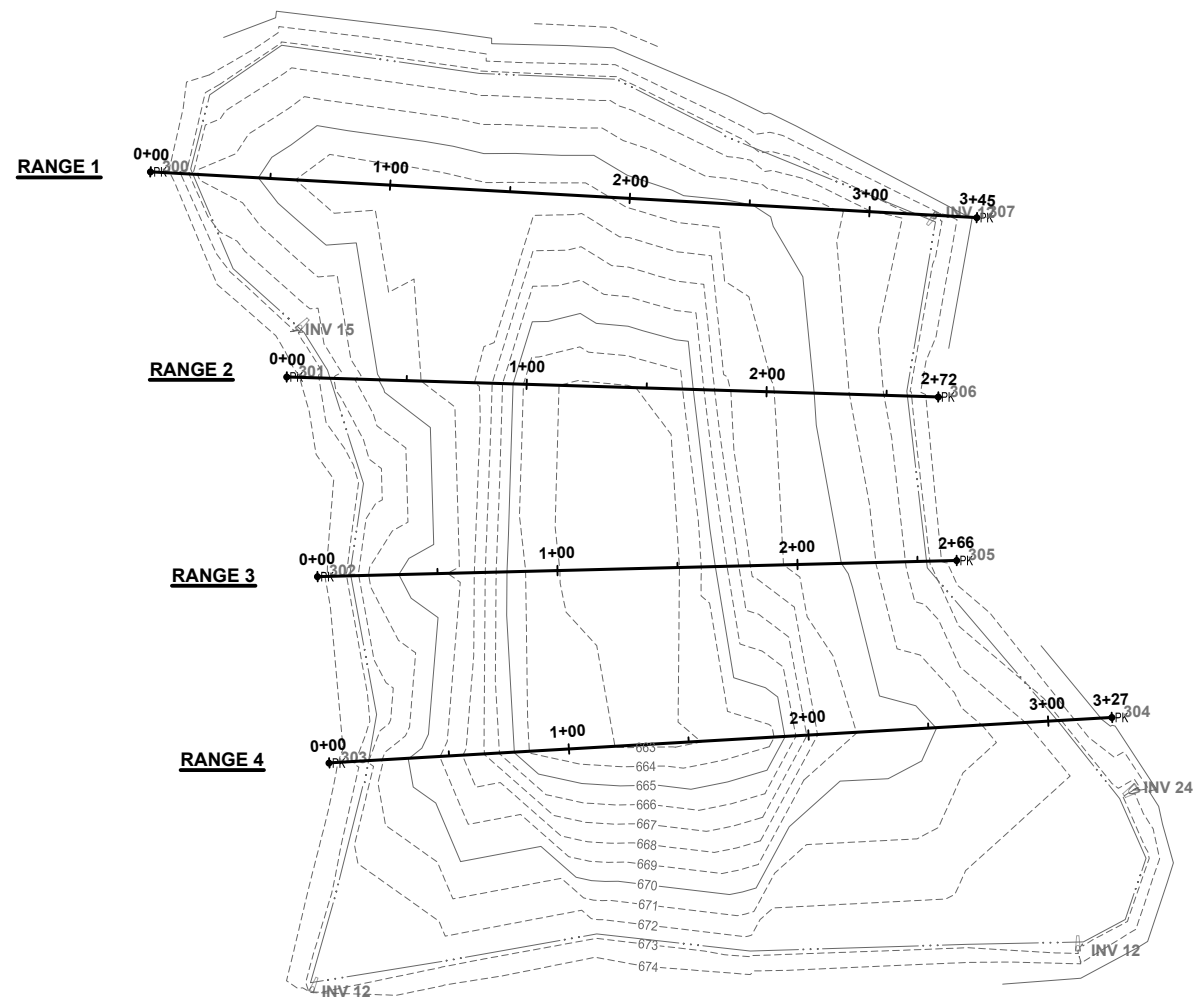
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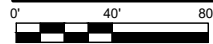
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C2190010

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C-2

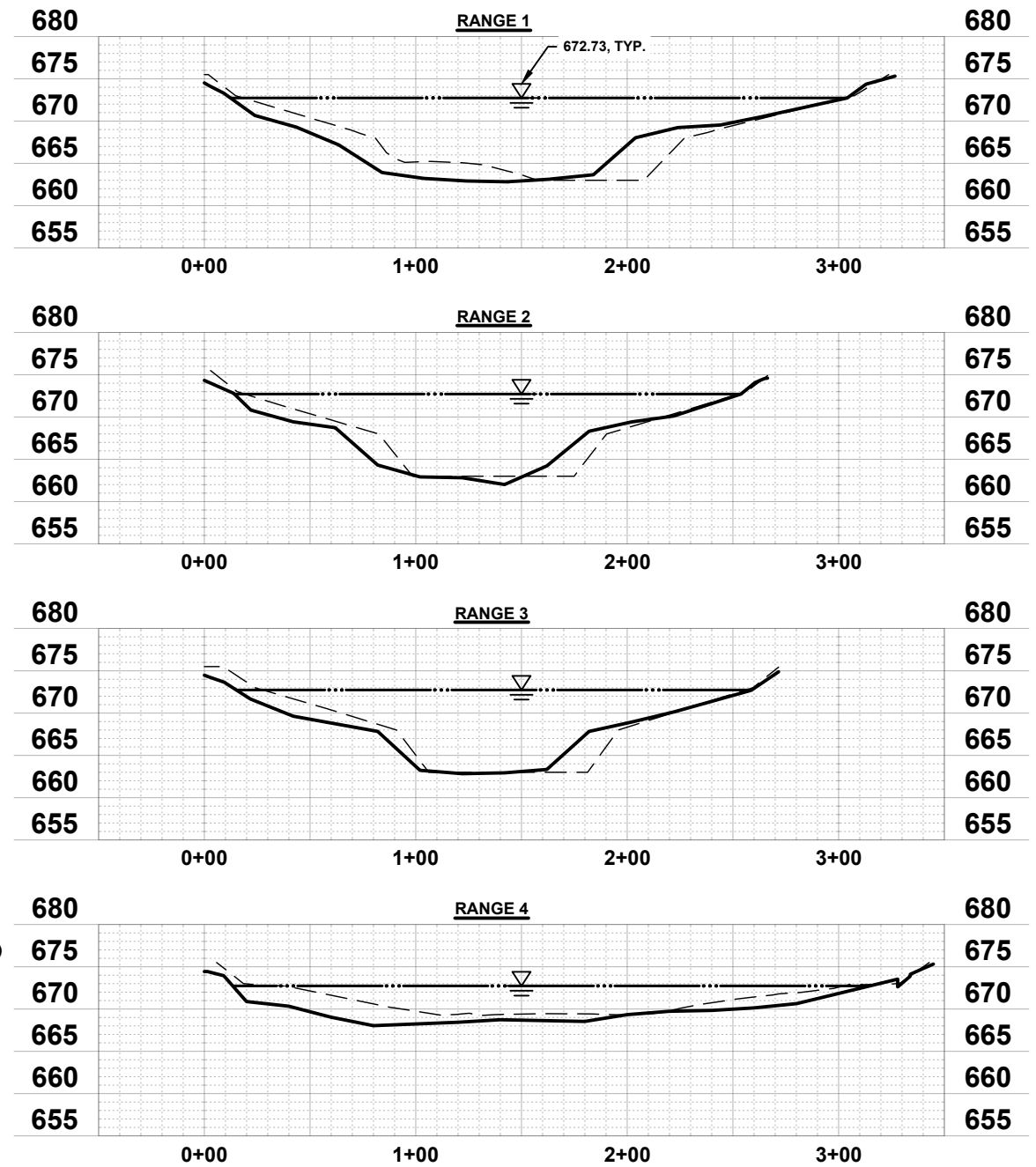


CRESTLAKE SUBDIVISION - POND 3



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- SURVEY ELEVATION (2022)
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PROJECT TITLE
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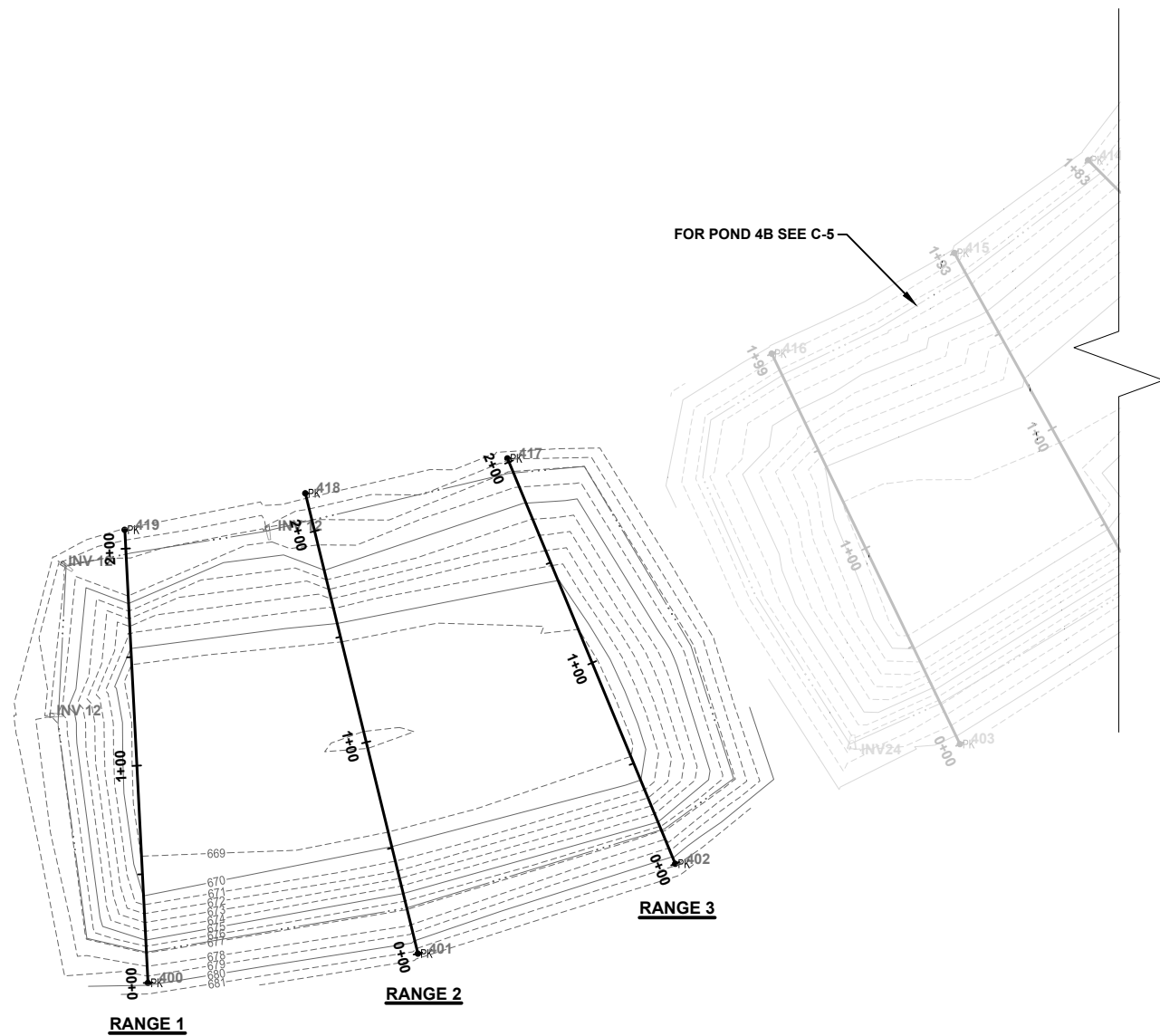
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DATE	REVISION

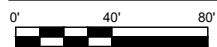
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PROJECT No.
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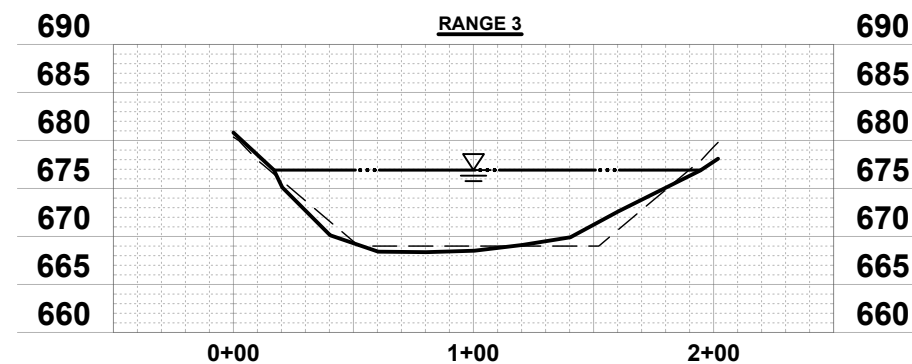
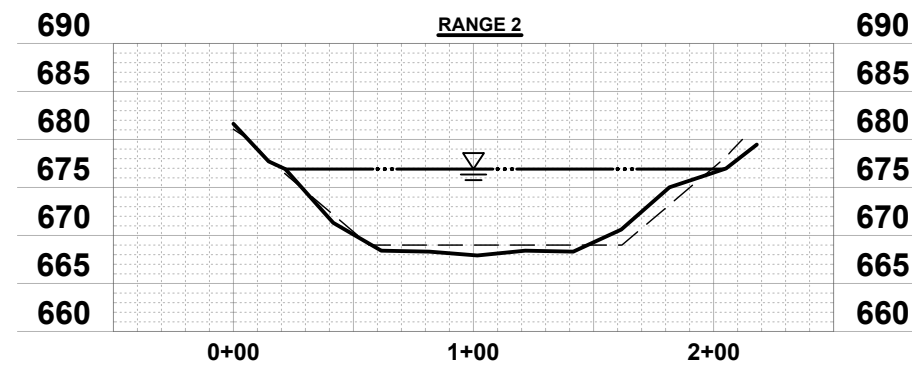
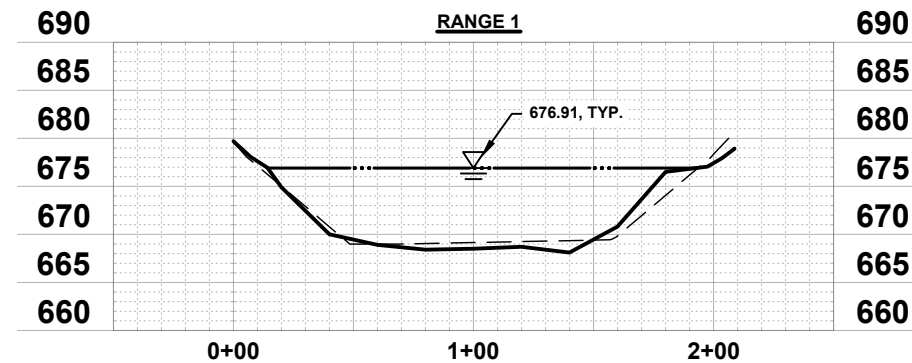


CRESTLAKE SUBDIVISION - POND 4A



LEGEND

- SURVEY ELEVATION (2022)
- - - AS BUILT ELEVATION (2003)



PROJECT TITLE
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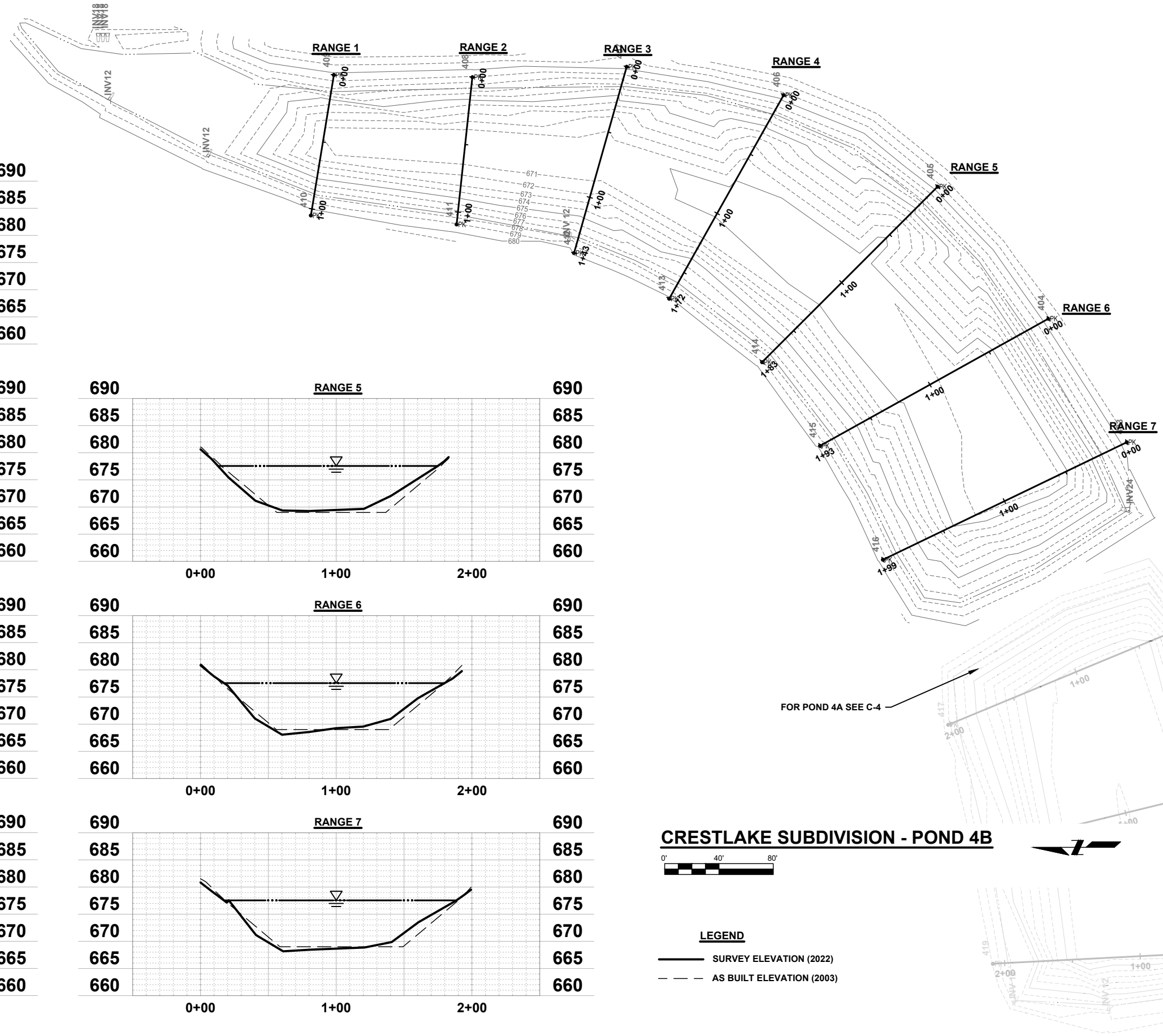
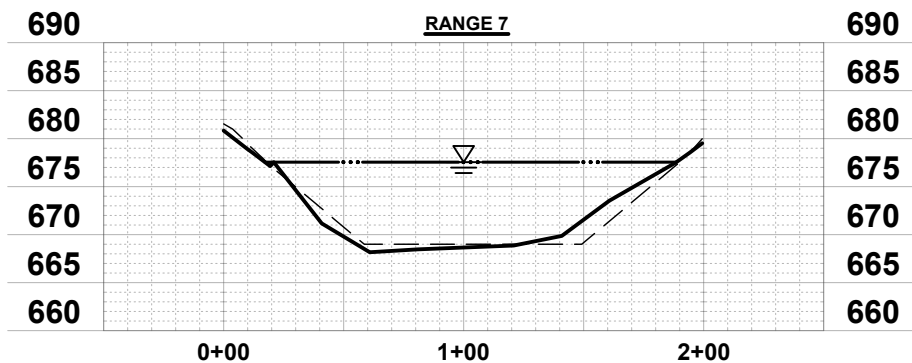
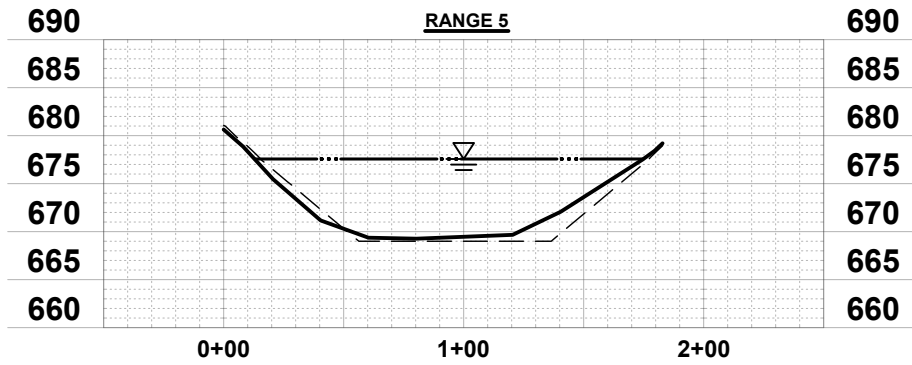
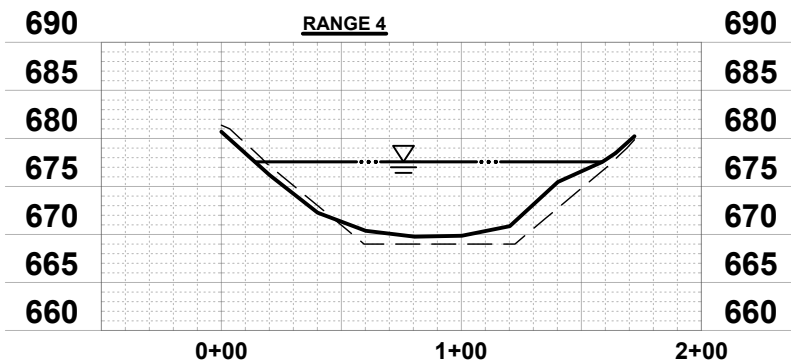
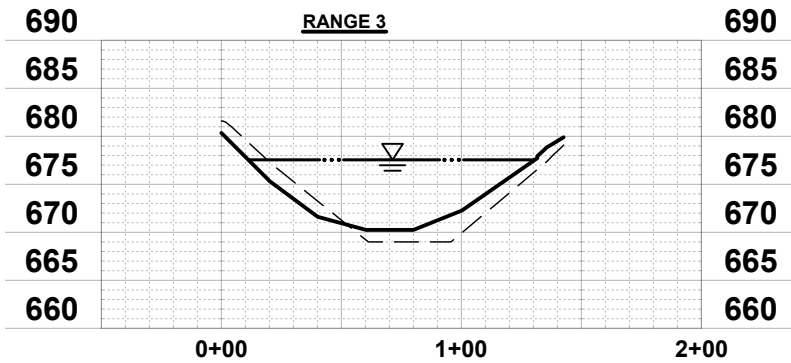
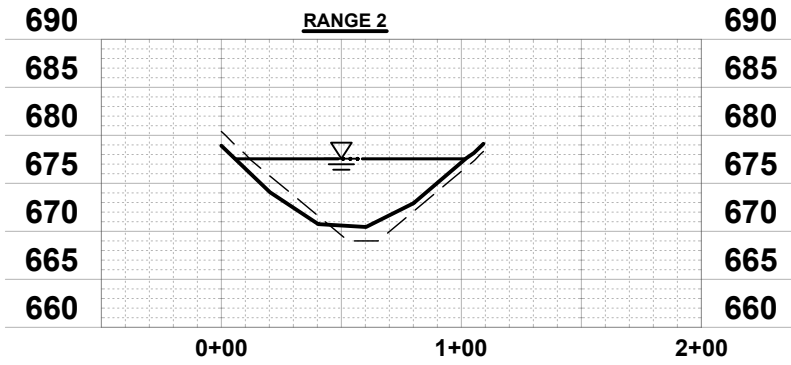
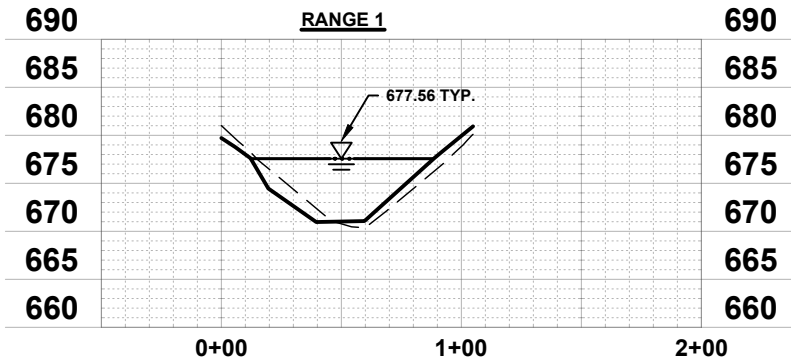
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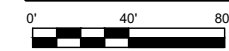
PROJECT No.
C2190010

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CRESTLAKE SUBDIVISION - POND 4B



- LEGEND**
- SURVEY ELEVATION (2022)
 - - - AS BUILT ELEVATION (2003)

PROJECT TITLE
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 ST. JOSEPH, IL
 SEDIMENTATION STUDY**

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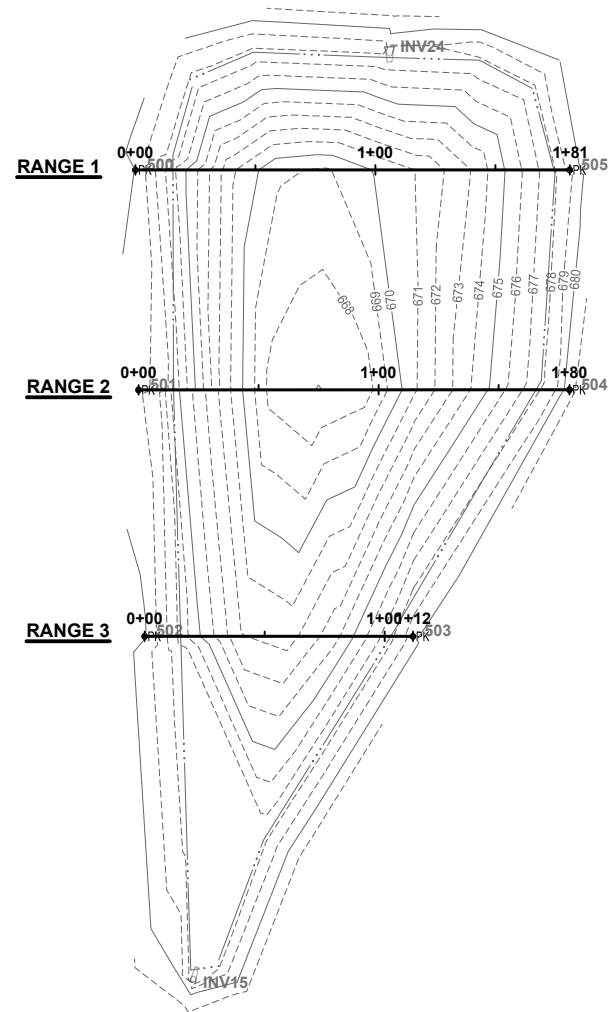
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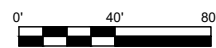
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C2190010

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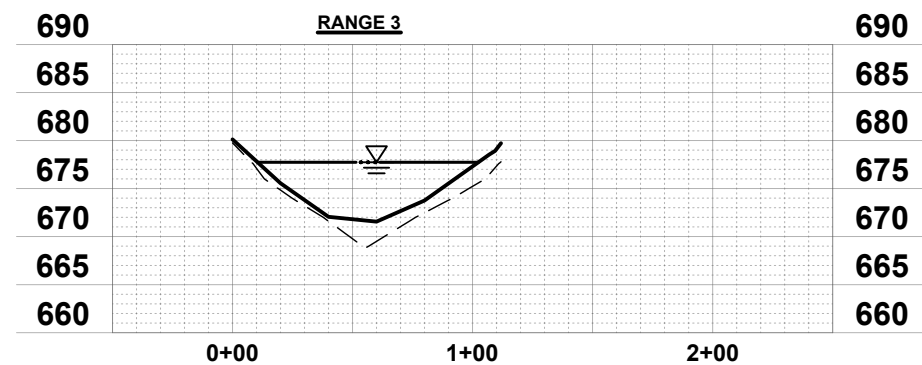
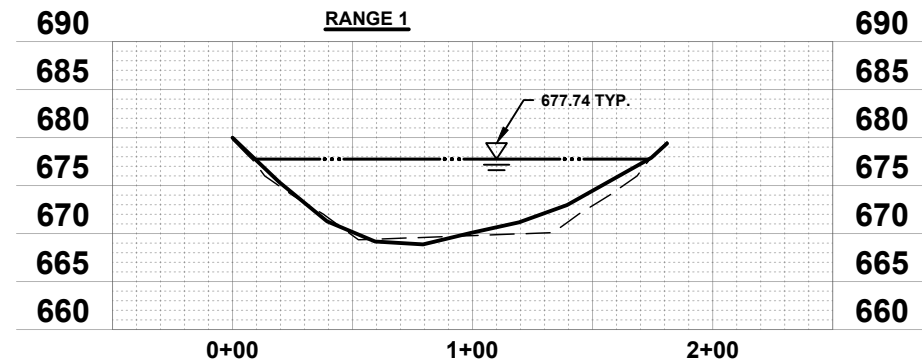


CRESTLAKE SUBDIVISION - POND 5



LEGEND

- SURVEY ELEVATION (2022)
- - - AS BUILT ELEVATION (2005)



PROJECT TITLE
**CRESTLAKE SUBDIVISION
 ST. JOSEPH, IL
 SEDIMENTATION STUDY**

DESIGNED BY: NDR
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 CHECKED BY: CSG
 DATE CHECKED: 11/22

DATE	REVISION

DRAWING TITLE
POND 5

PROJECT No.
C2190010

DRAWING No.
C-6

CROSS SECTION CONTROL POINTS		
Point #	Northing	Easting
100	1256417.0650	1069948.4830
101	1256378.3830	1070010.3160
102	1256279.5600	1070000.8160
103	1256239.9510	1070043.6600
104	1256214.0240	1070099.0450
105	1256208.7720	1070164.7210
106	1256199.6110	1070240.7150
107	1256032.8210	1070240.8670
108	1256032.0680	1070149.7790
109	1256026.8440	1070015.3840
110	1256038.0420	1069855.7680
111	1256162.0020	1069786.2430
112	1256263.7940	1069776.9620
113	1256353.5580	1069771.3900
200	1256932.6970	1069924.6210
201	1256936.3250	1070049.6210
202	1256942.6380	1070174.6210
203	1257115.6460	1070174.6210
204	1257140.1520	1070049.6210
205	1257118.4910	1069924.6210

CROSS SECTION CONTROL POINTS		
Point #	Northing	Easting
300	1257273.9920	1070989.7050
301	1257188.5380	1071046.4690
302	1257105.2920	1071059.2970
303	1257027.6500	1071064.1150
304	1257046.6650	1071390.2590
305	1257112.0630	1071325.5740
306	1257180.1980	1071317.8970
307	1257254.9070	1071333.9730
400	1255422.2600	1071412.0020
401	1255435.7360	1071536.1380
402	1255477.0420	1071654.5400
403	1255532.0710	1071785.5270
404	1255589.7940	1071876.5800
405	1255671.4330	1071973.8310
406	1255784.8750	1072041.2730
407	1255900.5260	1072062.1090
408	1256014.2380	1072054.4720
409	1256116.3300	1072056.0870
410	1256133.2700	1071952.6100
411	1256025.8480	1071945.9980

CROSS SECTION CONTROL POINTS		
Point #	Northing	Easting
412	1255939.3180	1071924.8920
413	1255869.2430	1071891.2950
414	1255800.7560	1071844.5390
415	1255758.0570	1071782.9150
416	1255711.7180	1071698.9520
417	1255663.5690	1071577.3870
418	1255647.4820	1071484.3810
419	1255630.6870	1071401.2360
500	1256429.7840	1072177.7670
501	1256338.1380	1072179.0990
502	1256235.4970	1072181.6540
503	1256235.4360	1072293.4760
504	1256338.1940	1072358.6900
505	1256429.7670	1072358.8220

STRUCTURE ELEVATIONS								
Point #	Northing	Easting	Survey Elevation	As Built Elevation	Description	Variance (IN)	Pond	Ave Variance (IN)
1034	1257124.0740	1070130.4830	670.589	670.80	INV12	-2.5"	2	-1.1"
1049	1256993.6120	1070248.8640	669.849	670.03	INV24	-2.2"		
1054	1256960.5740	1070259.0250	670.142	670.03	INV36	1.3"		
1098	1256932.3380	1071056.6070	672.862	673.01	INV 12	-1.78"	3	-0.3"
1116	1256949.3260	1071376.0280	672.766	672.99	INV 12	4.3"		
1139	1257256.9200	1071317.2970	672.632	672.93	INV 12	-3.6"		
5007	1256091.4350	1072201.6020	677.265	677.40	INV15	-1.6"	5	-1.6"
5089	1255529.828	1071735.708	677.278	677.40	INV24	-1.5"	4	-2.9"
5122	1255943.460	1071933.813	678.630	678.77	INV12	-1.7"		
5132	1256209.539	1071995.695	677.360	677.40	INV12	-0.5"		
5156	1256283.101	1072087.005	677.205	677.49	INV18	-3.4"		
5157	1256286.514	1072086.945	677.267	677.49	INV18	-2.7"		
5158	1256289.958	1072086.963	677.231	677.49	INV18	-3.1"		
5190	1255615.595	1071371.993	676.997	677.40	INV12	-4.8"		
5193	1255545.342	1071366.644	677.058	677.40	INV15	-4.1"		
5225	1255632.400	1071466.810	677.066	677.40	INV15	-4.0"		
5247	1256040.3470	1070210.2240	669.857	669.99	INV24	-1.6"	1	-0.9"
5259	1256155.0850	1070314.5820	669.924	670.00	INV24	-0.9"		
5278	1256230.8350	1070036.4510	670.088	670.03	INV24	0.7"		
5304	1256395.6820	1069988.8940	669.907	670.05	INV 12	-1.7"		

NOTE: NO ADJUSTMENTS MADE TO ELEVATIONS DUE TO VARYING DIFFERENCES IN STRUCTURE ELEVATIONS AND NEGLIGIBLE IMPACT ON ANALYSIS.



DESIGN FIRM REGISTRATION NO. 184-000450
125 West Church Street
Champaign, Illinois 61820
PHONE : 217.373.8900 www.clarkdietz.com

PROJECT TITLE

CRESTLAKE SUBDIVISION
ST. JOSEPH, IL
SEDIMENTATION STUDY

DESIGNED BY: NDR
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