

CLARESHOLM SLUDGE SURVEY REPORT 2025

CLARESHOLM, AB STORMWATER PONDS

Location: Claresholm, AB

Name of stormwater ponds: Ponds 1, 2, 3, 4 & 5

Client: Town of Claresholm

Client contact(s): Jace McLean

Report prepared by: R. Machado

Surveyors: J. Sinclair, R. Aslouj

Date(s) of survey: 11 - 25/04/2025

Map grid reference: Horizontal Datum: NAD83(CSRS) (2010.0), Projection: UTM, Zone 12N

Vertical datum: CGVD2013

Control points: HCP1 – (Base occupied static control point for processing with NRCAN PPP Service)


Revision number: 1

Report print size: 11x17"



Figure 1 Claresholm, AB Stormwater Pond overview

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	Name	Date	HYDRASURVEY 	
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Reviewed by:	AA	16-05-2025		
Revised by:	RM	12-06-2025		
			Project Number	25001
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- Supplement C – 3D sludge blanket thickness map
- Supplement D – QField Sludge Survey Dataset
- Supplement E – Sludge and liner elevations in .csv format

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EXECUTIVE SUMMARY

Hydrasurvey conducted sludge surveys at the **Claresholm, AB Stormwater Pond** for the Town of Claresholm between 21 & 25/04/2025. The purpose of the sludge survey and this report is to map and quantify sludge accumulation in Ponds 1, 2, 3, 4 & 5. Ponds 1, 2, 3, 4 & 5 were not in service at the time of survey. A virtual site tour can be accessed [here](#).

Pond	Date of survey	Water elevation CGVD2013 (m)	Maximum measured liner depth inside toe (m)	Current hydraulic capacity (m³)	Freeboard (m)	Estimated sludge volume - 2025 (m³)	*Estimated dredgeable sludge volume - 2025 (m³)	Estimated bone dry tonnes (BDTs) of sludge to be removed	Estimated dredgeable bone dry tonnes (BDTs) of sludge to be removed	Percent of total pond volume occupied by sludge (at surveyed dimensions)
POND 1	25-Apr-25	1026.728	1.85	278	0.70	615	427	244	169	69%
POND 2	24-Apr-25	1026.748	1.87	1,495	0.50	1,138	595	380	198	43%
POND 3	21 & 23-Apr-25	1025.861	1.78	14,439	0.38	3,751	1,806	1,223	589	21%
POND 4	21 & 23-Apr-25	1025.625	2.94	7,191	0.66	747	269	174	63	9%
POND 5	22-Apr-25	1024.159	4.15	58,973	0.88	5,910	3,605	816	497	9%

*Note: For details regarding dredgeable volumes please refer to Appendix A - Glossary.

Table 1 Summary of sludge survey findings

Ponds 1, 2, 3, 4 & 6 findings:

- Ponds 1, 2, 3, 4 and 5 have 69%, 43%, 21%, 9%, and 9% of their volume occupied by sludge, respectively.
- Aquatic vegetation (algae) is present in all ponds, mainly around their inlets.
- Ponds 1, 2, 3 & 4 are connected to each other through surface channels, while ponds 4 and 5 are connected throughout an underground channel.
- Shoreline vegetation is overgrown (cattails) in all ponds.
- Floating synthetic solids (plastics) were observed in ponds 1 & 2.
- Ponds 1, 2, 3, 4 & 5 are clay lined.



Figure 3 Pond 2 inlet surrounded by cattails



Figure 4 Pond 5 inlet

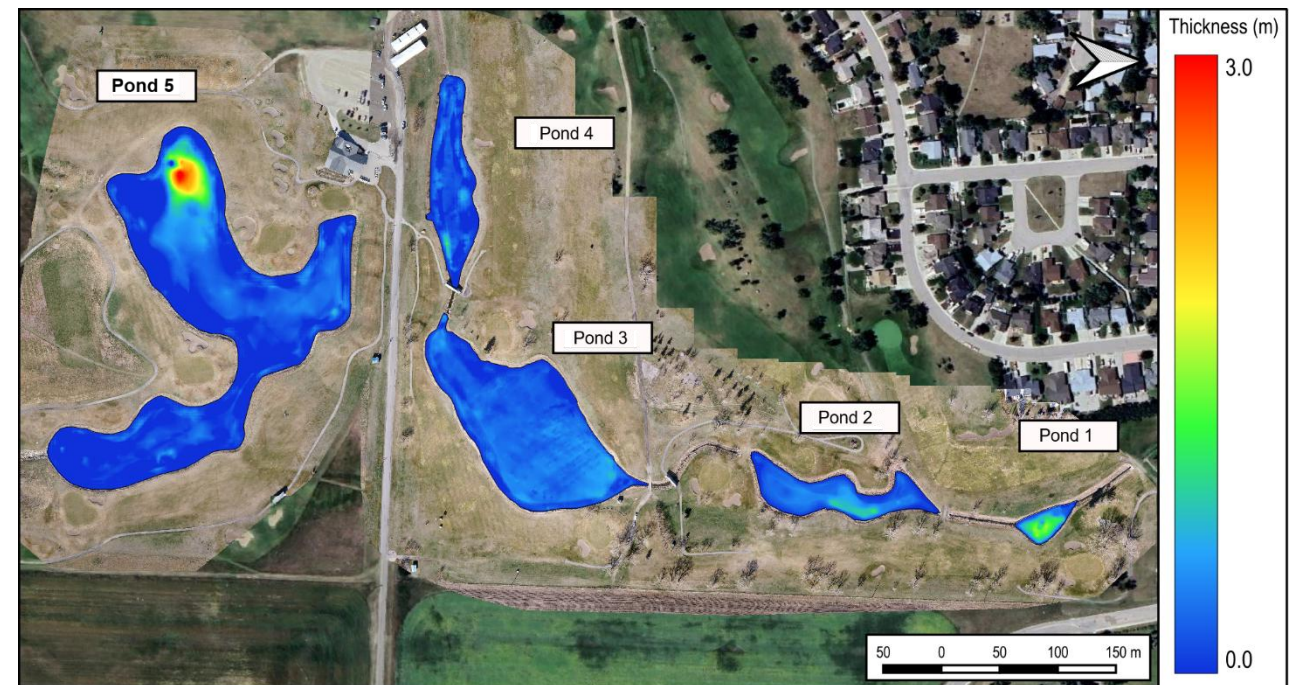



Figure 2 Claresholm, AB Stormwater Pond Ponds 1, 2, 3, 4 & 5 sludge blanket thickness

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POND 1 – SLUDGE BLANKET THICKNESS

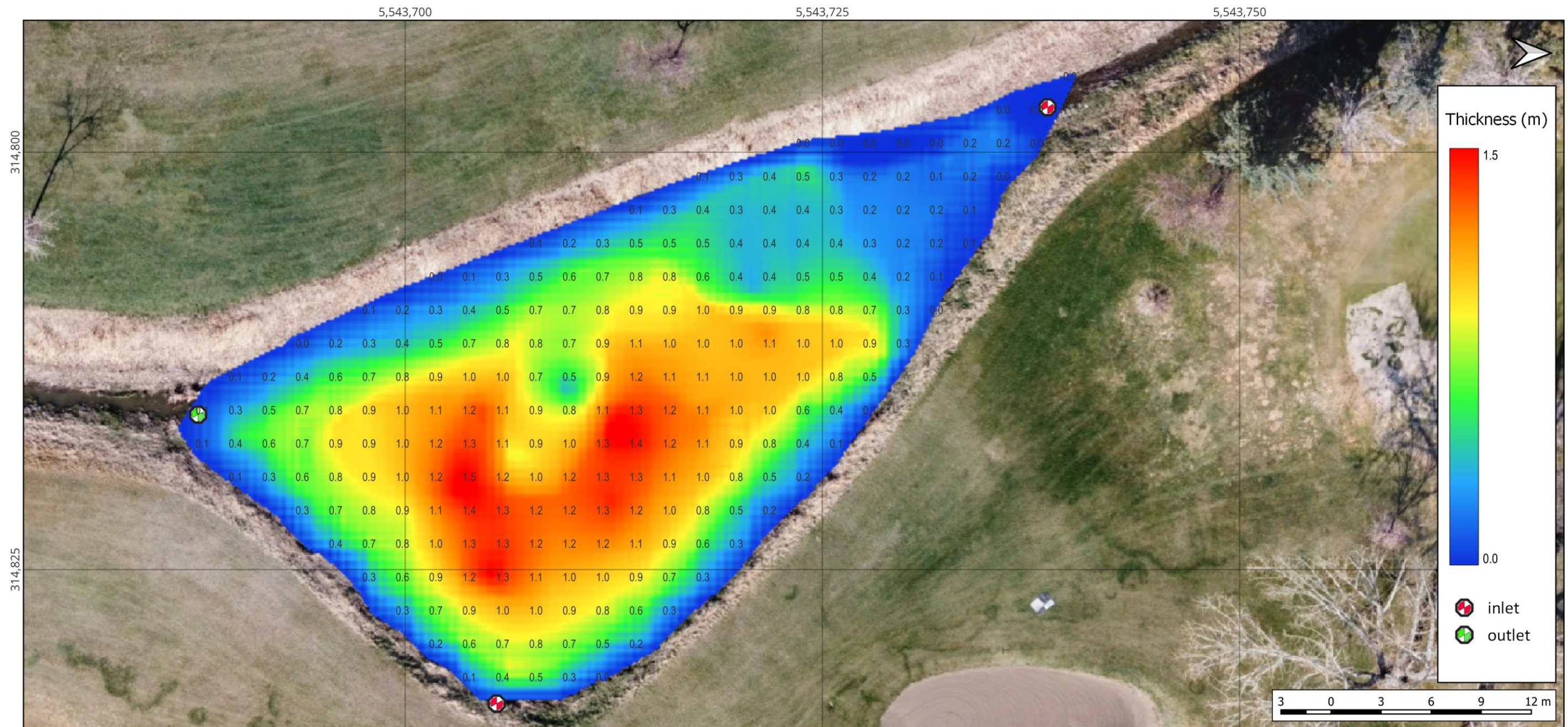



Figure 5 Pond 1 sludge blanket thickness

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POND 2 – SLUDGE BLANKET THICKNESS

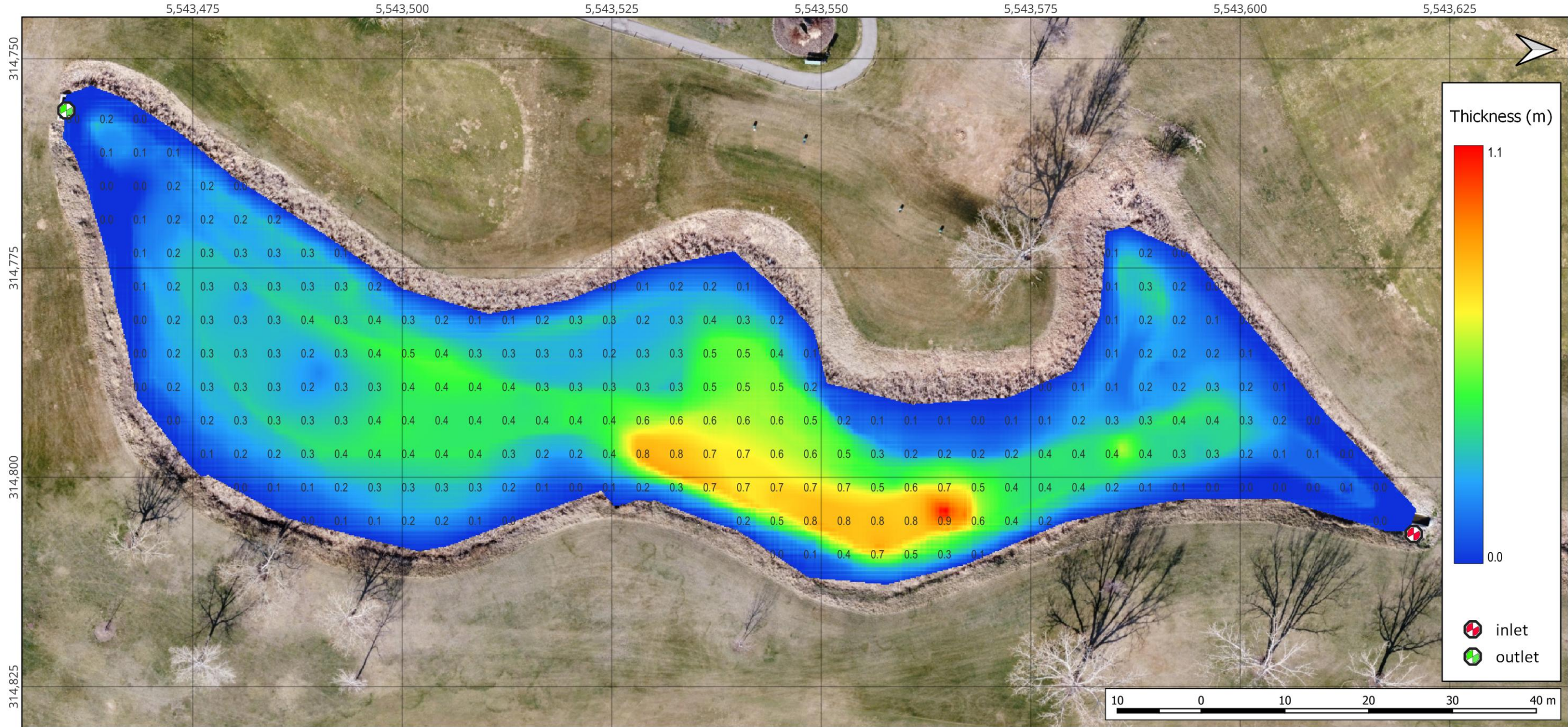



Figure 6 Pond 2 sludge blanket thickness

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POND 3 – SLUDGE BLANKET THICKNESS

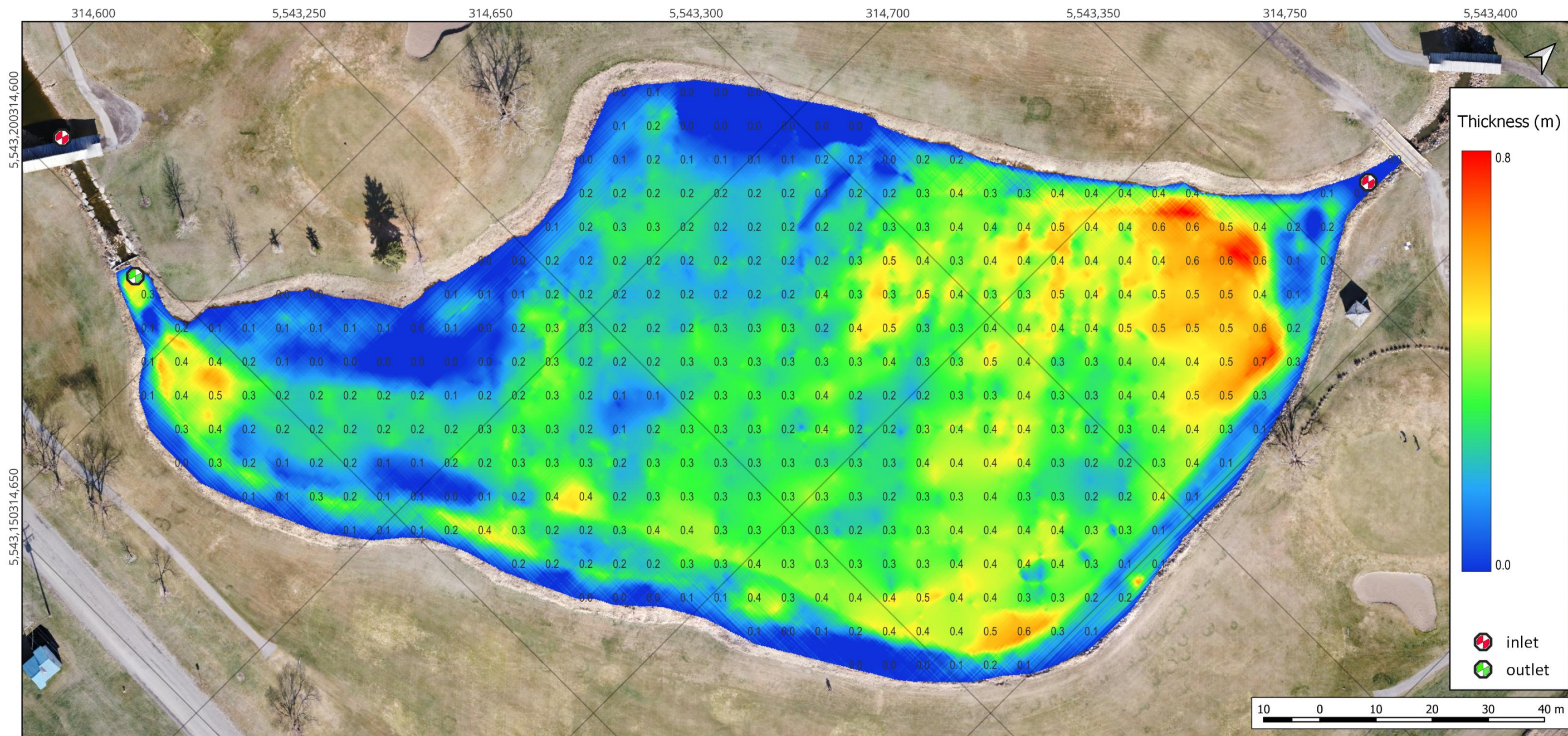



Figure 7 Pond 3 sludge blanket thickness

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POND 4 – SLUDGE BLANKET THICKNESS

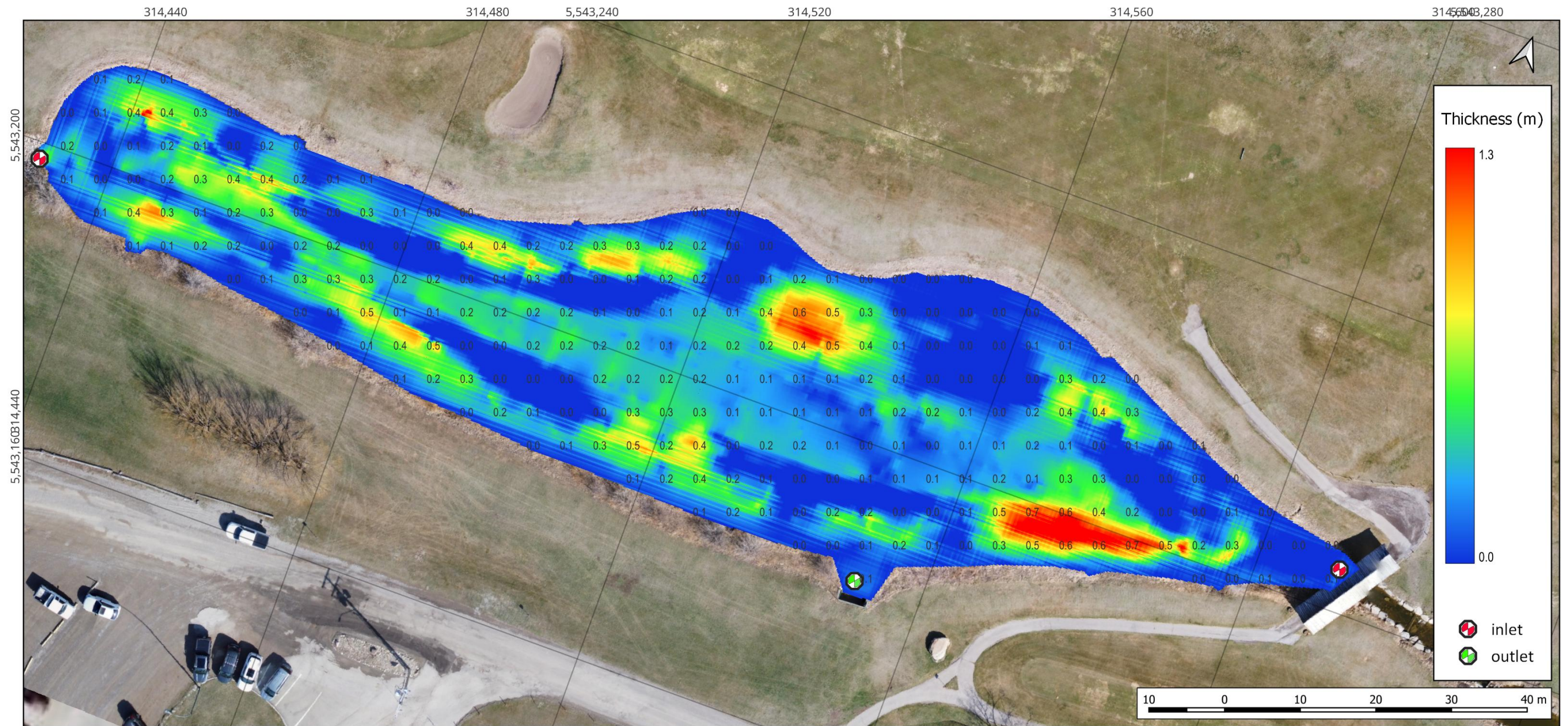



Figure 8 Pond 4 sludge blanket thickness

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POND 5 – SLUDGE BLANKET THICKNESS

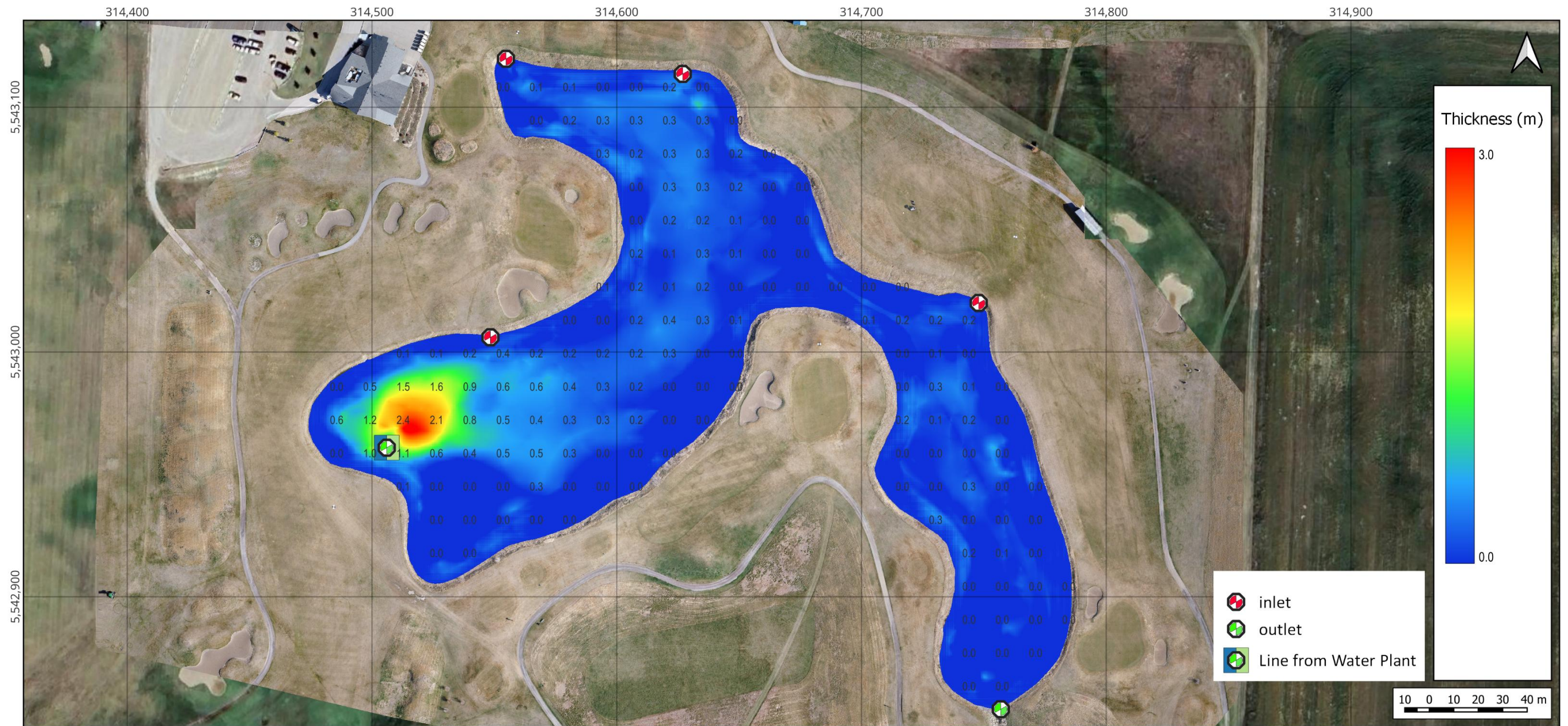



Figure 9 Pond 5 sludge blanket thickness

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POND 1 – TOP OF SLUDGE DEPTHS

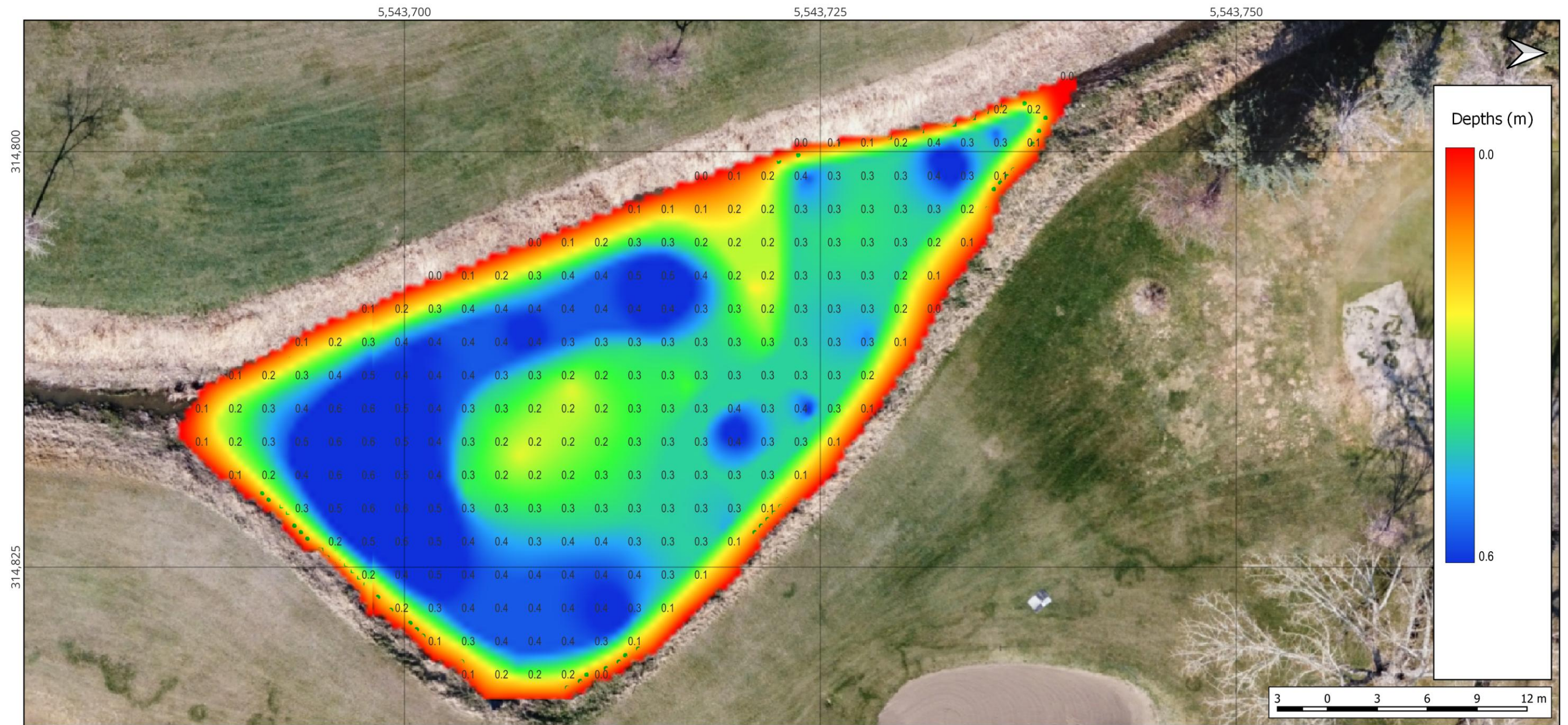



Figure 10 Pond 1 top of sludge blanket depths

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POND 2 – TOP OF SLUDGE DEPTHS

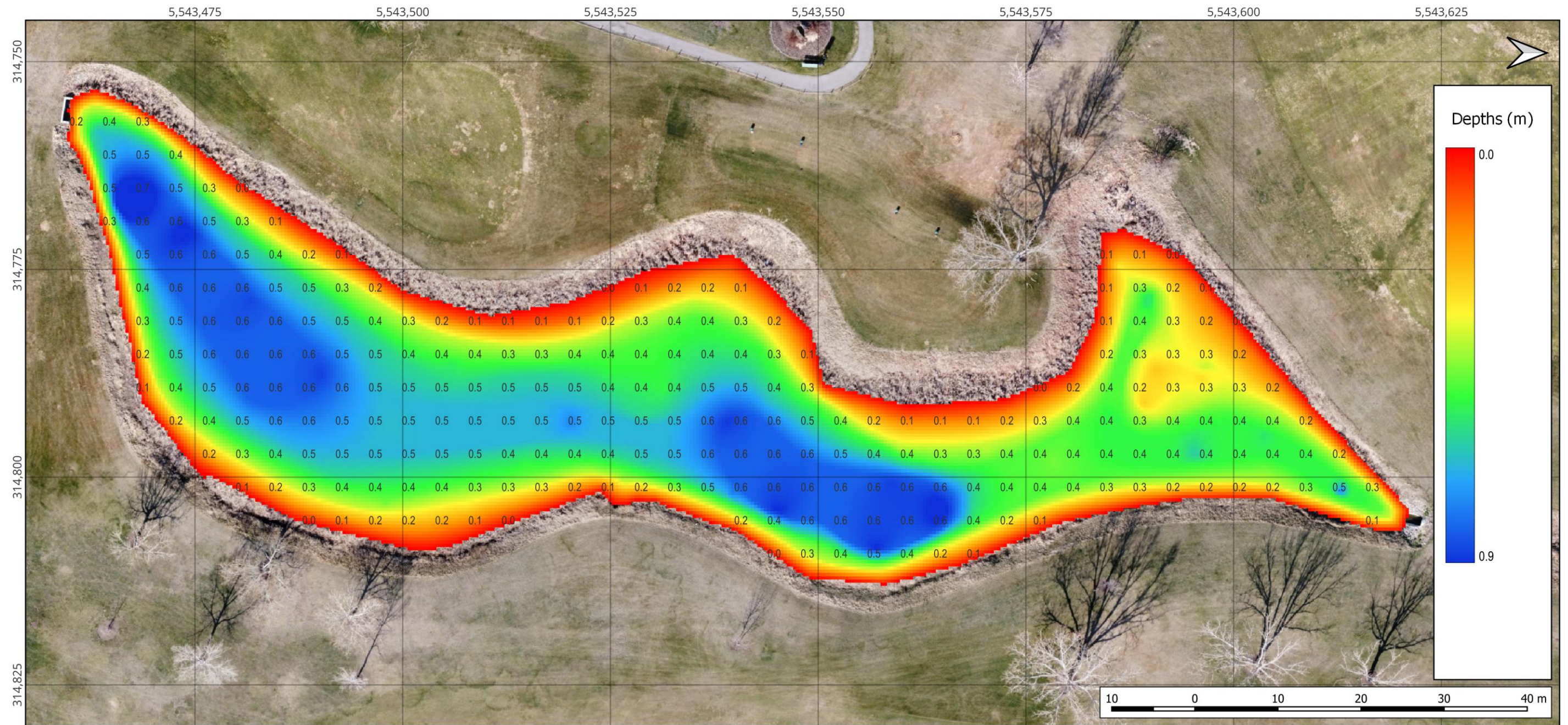



Figure 11 Pond 2 top of sludge blanket depths

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POND 3 – TOP OF SLUDGE DEPTHS

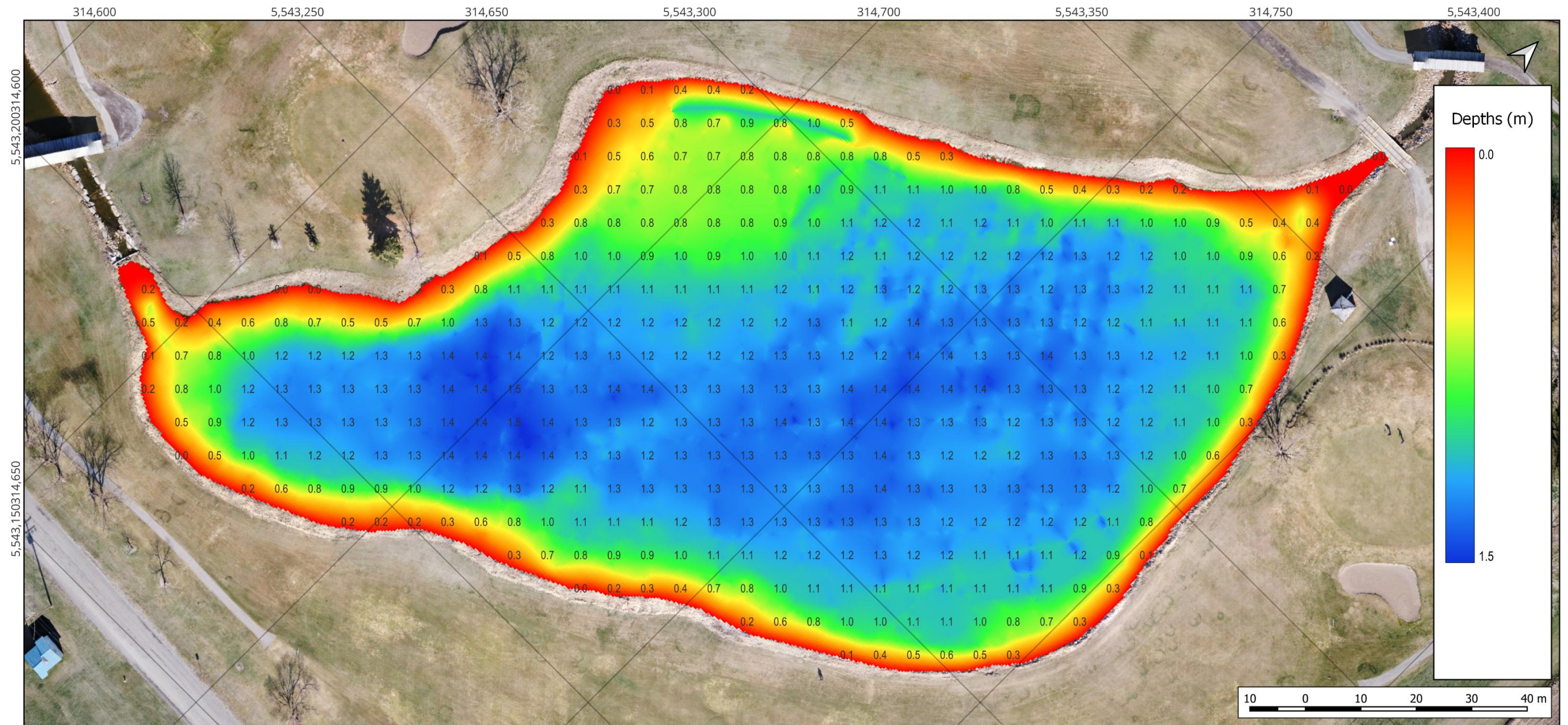



Figure 12 Pond 3 top of sludge blanket depths

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POND 4 – TOP OF SLUDGE DEPTHS

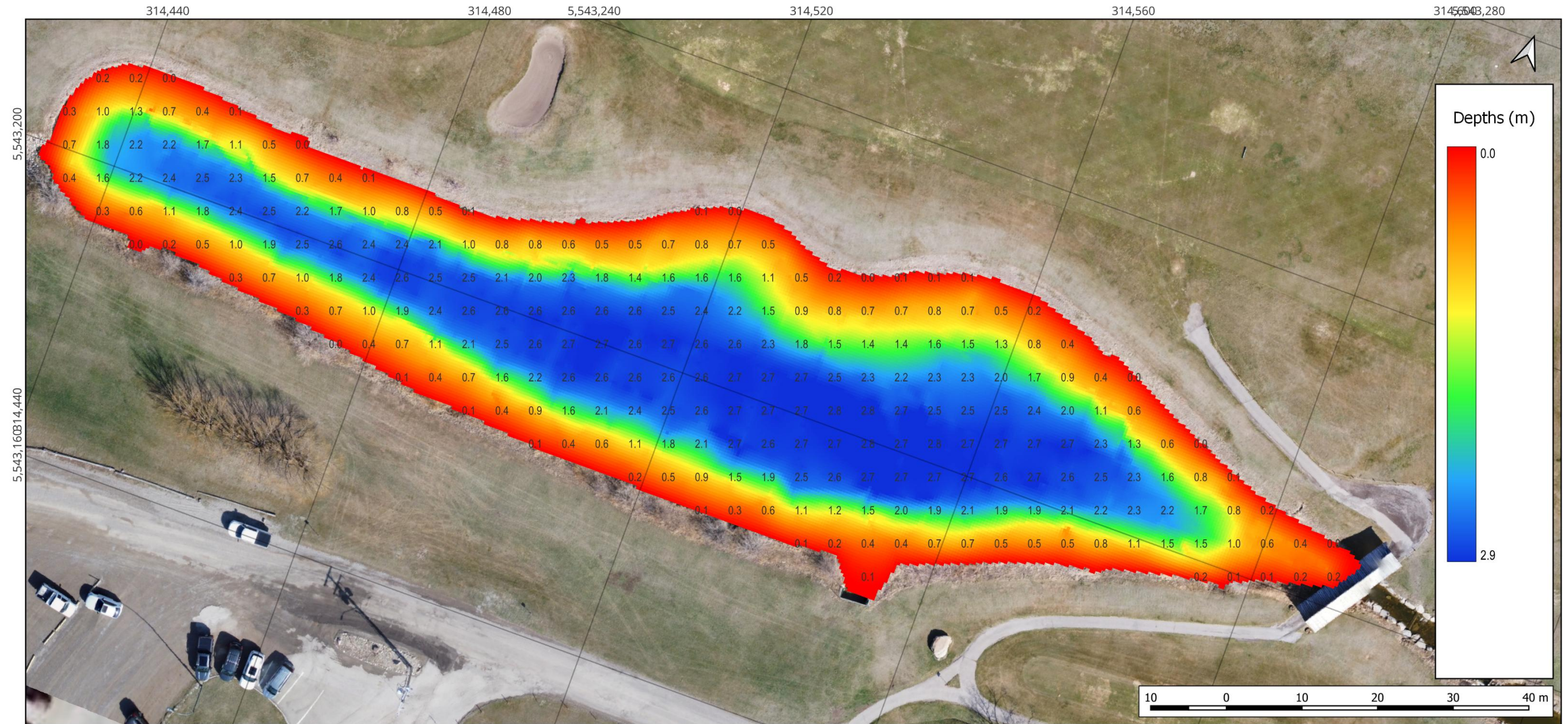


Figure 13 Pond 4 top of sludge blanket depths

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POND 5 – TOP OF SLUDGE DEPTHS

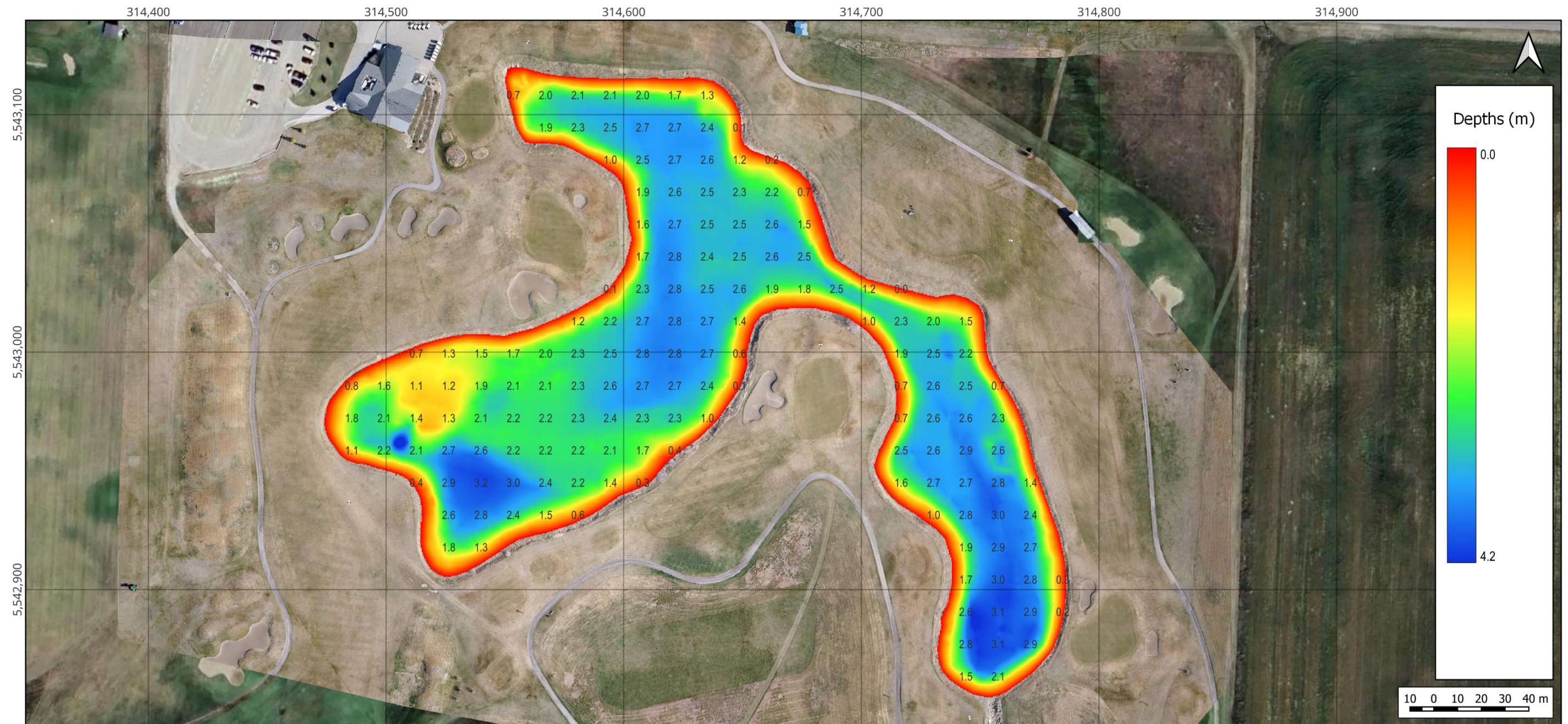


Figure 14 Pond 5 top of sludge blanket depths

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POND 1 – TOP OF SLUDGE ELEVATIONS

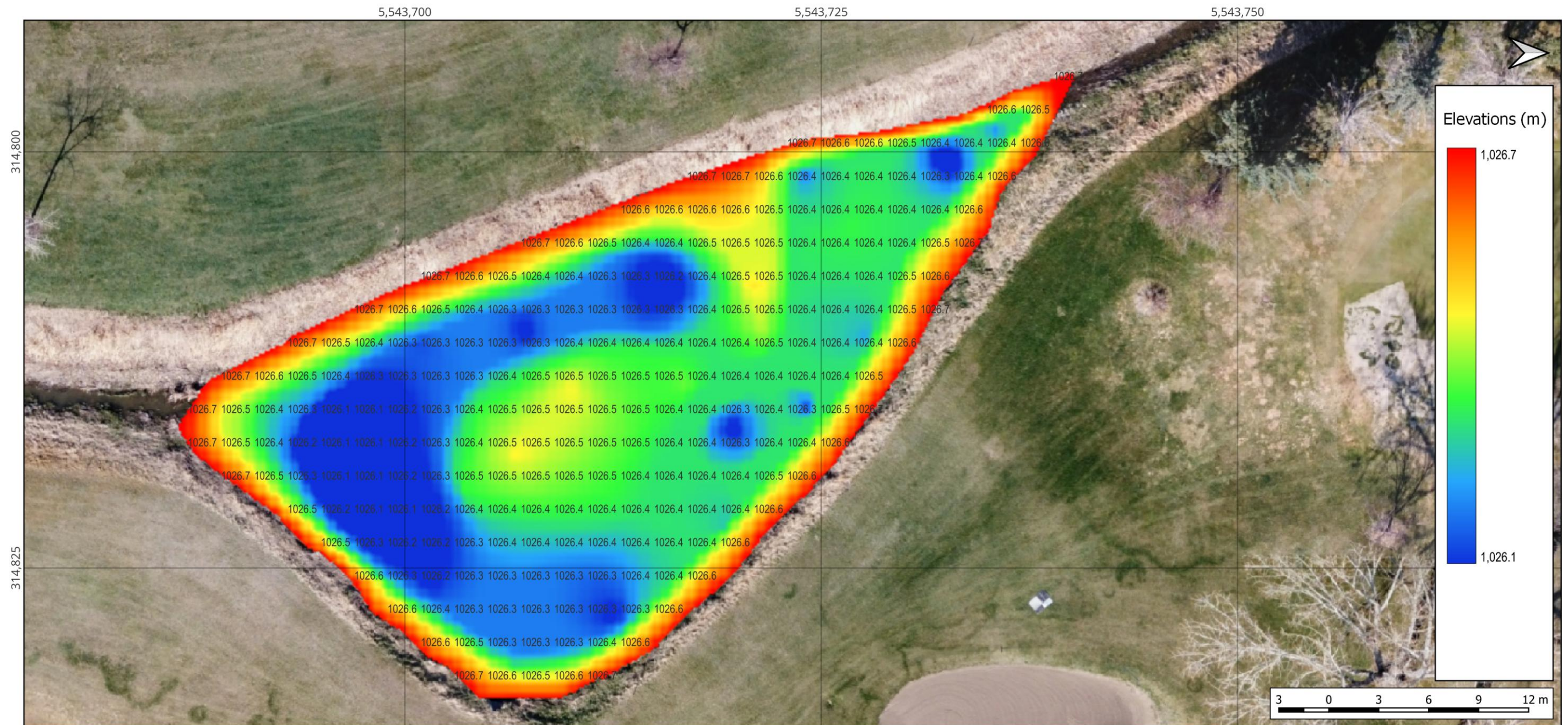


Figure 15 Pond 1 top of sludge blanket elevations

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POND 2 – TOP OF SLUDGE ELEVATIONS

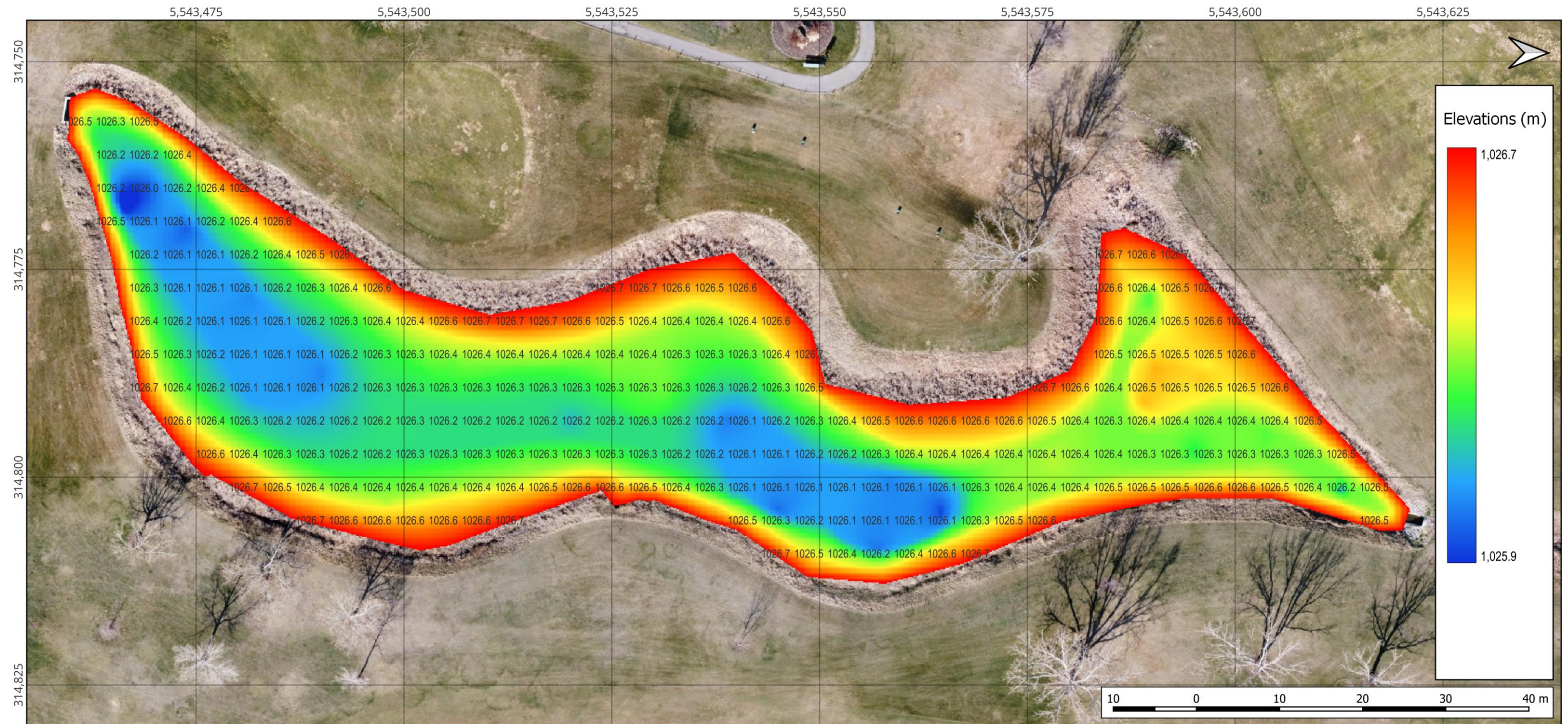



Figure 16 Pond 2 top of sludge blanket elevations

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POND 3 – TOP OF SLUDGE ELEVATIONS

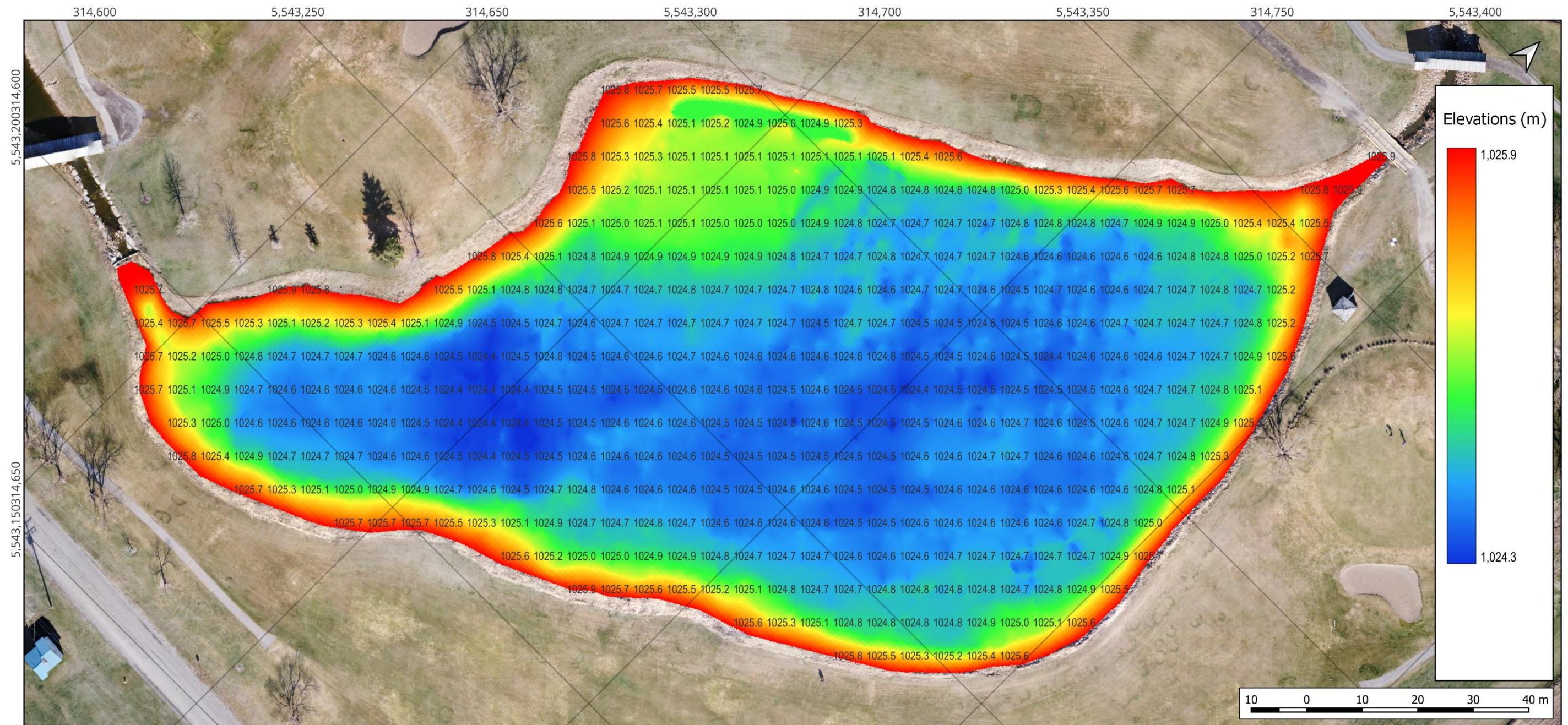


Figure 17 Pond 3 top of sludge blanket elevations

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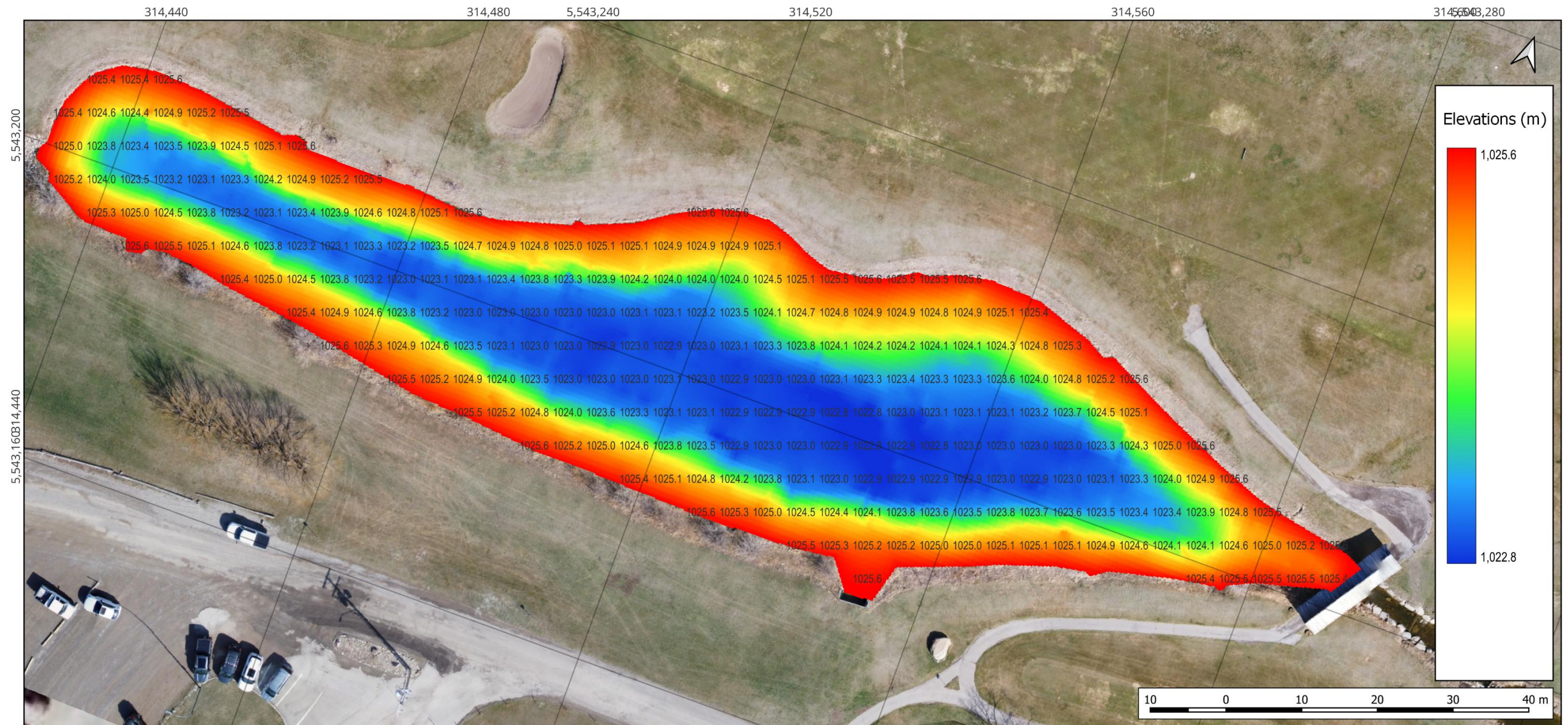



Figure 18 Pond 4 top of sludge blanket elevations

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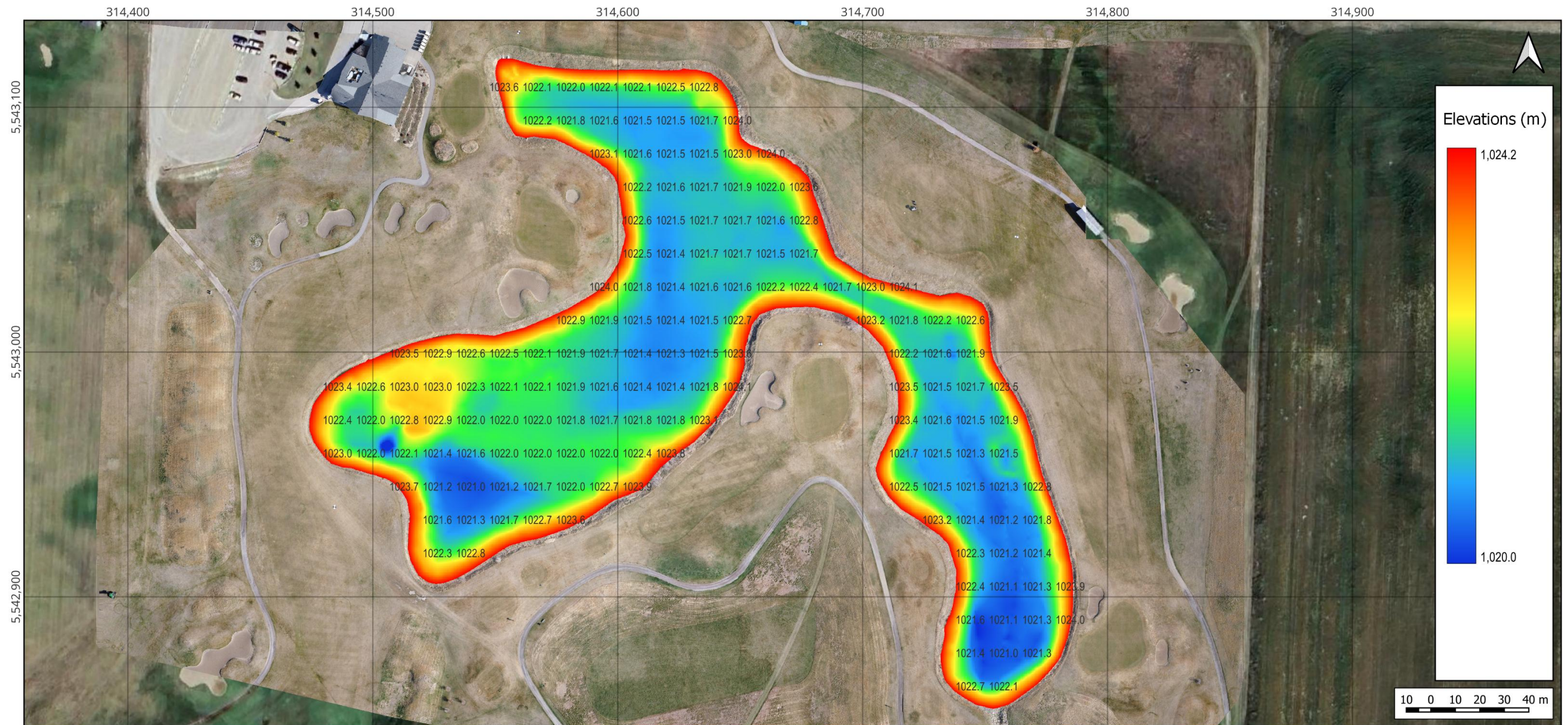



Figure 19 Pond 5 top of sludge blanket elevations

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POND 1 VOLUMES

POND 1 ESTIMATED SLUDGE QUANTITY	POND 1 APPROXIMATE DIMENSIONS AND VOLUMES (AS SURVEYED)
<p>Estimated sludge volume is calculated using software that compares the measured and interpolated sludge depths with the depths of the lagoon liner obtained from engineered drawings and/or field measurements. A sludge sample is taken for lab analysis to determine total solids and total volatile solids and to obtain dry volume.</p> <p>POND 1:</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (WET) = 615 m³</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (DRY) = 216 m³</p> <p style="margin-left: 80px;">SPECIFIC GRAVITY (DRY AS SAMPLED) = 1.13</p> <p style="margin-left: 40px;">TOTAL ESTIMATED MASS OF SLUDGE TO BE REMOVED = 244 BDT (Bone Dry Tonnes)</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLATILE SOLIDS QUANTITY (DRY) = 24 m³</p> <p style="margin-left: 80px;">IN-SITU SLUDGE DENSITY = 1,042 kg/m³</p>	<p>Shape / sides Triangular</p> <p>Length 55 m</p> <p>Width 30 m</p> <p>Area 959 m²</p> <p>Maximum liner depth 1.85 m</p> <p>Total volume 893 m³</p> <p>Total potential volume (high water level) 1562 m³</p> <p>Average sludge thickness 0.64 m</p> <p>Average top of liner depths 0.93 m</p> <p>Average top of sludge depths 0.29 m</p>
<p>POND 1 HYDRAULIC CAPACITY AT PRESENT SLUDGE LOADING</p> <p>Hydraulic capacity calculations for each pond are performed by comparing the water level at the time of survey to the sludge profile with results shown below.</p> <p style="margin-left: 40px;">ESTIMATED HYDRAULIC CAPACITY - WATER LEVEL @ 1026.728 m = 278 m³</p>	

REMAINING CAPACITY OF POND BASED ON SURVEYED SLUDGE VOLUME			
Stage	Depth (m)	Volume (m ³)	Area (m ²)
1	0.0	278	959
2	0.2	106	743
3	0.4	14	212
4	0.6	0	27
5	0.8	-	-

Figure 20 Pond 1 volumes

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POND 2 VOLUMES

POND 2 ESTIMATED SLUDGE QUANTITY	POND 2 APPROXIMATE DIMENSIONS AND VOLUMES (AS SURVEYED)																				
<p>Estimated sludge volume is calculated using software that compares the measured and interpolated sludge depths with the depths of the lagoon liner obtained from engineered drawings and/or field measurements. A sludge sample is taken for lab analysis to determine total solids and total volatile solids and to obtain dry volume.</p>	<table border="0"> <tr> <td>Shape / sides</td> <td>Irregular</td> </tr> <tr> <td>Length</td> <td>170 m</td> </tr> <tr> <td>Width</td> <td>50 m</td> </tr> <tr> <td>Area</td> <td>4131 m²</td> </tr> <tr> <td>Maximum liner depth</td> <td>1.87 m</td> </tr> <tr> <td>Total volume</td> <td>2634 m³</td> </tr> <tr> <td>Total potential volume (high water level)</td> <td>4703 m³</td> </tr> <tr> <td>Average sludge thickness</td> <td>0.28 m</td> </tr> <tr> <td>Average top of liner depths</td> <td>0.64 m</td> </tr> <tr> <td>Average top of sludge depths</td> <td>0.36 m</td> </tr> </table>	Shape / sides	Irregular	Length	170 m	Width	50 m	Area	4131 m ²	Maximum liner depth	1.87 m	Total volume	2634 m ³	Total potential volume (high water level)	4703 m ³	Average sludge thickness	0.28 m	Average top of liner depths	0.64 m	Average top of sludge depths	0.36 m
Shape / sides	Irregular																				
Length	170 m																				
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Average sludge thickness	0.28 m																				
Average top of liner depths	0.64 m																				
Average top of sludge depths	0.36 m																				
<p>POND 2:</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (WET) = 1,138 m³</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (DRY) = 330 m³</p> <p>SPECIFIC GRAVITY (DRY AS SAMPLED) = 1.15</p> <p>TOTAL ESTIMATED MASS OF SLUDGE TO BE REMOVED = 380 BDT (Bone Dry Tonnes)</p> <p>TOTAL ESTIMATED VOLATILE SOLIDS QUANTITY (DRY) = 36 m³</p> <p>IN-SITU SLUDGE DENSITY = 1,039 kg/m³</p>																					
<p>POND 2 HYDRAULIC CAPACITY AT PRESENT SLUDGE LOADING</p> <p>Hydraulic capacity calculations for each pond are performed by comparing the water level at the time of survey to the sludge profile with results shown below.</p> <p>ESTIMATED HYDRAULIC CAPACITY - WATER LEVEL @ 1026.748 m = 1,495 m³</p>																					

REMAINING CAPACITY OF POND BASED ON SURVEYED SLUDGE VOLUME			
Stage	Depth (m)	Volume (m ³)	Area (m ²)
1	0.0	1,495	4,131
2	0.2	758	3,251
3	0.4	222	1,875
4	0.6	8	498
5	0.8	0	1
6	1.0	-	-

Figure 21 Pond 2 volumes

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Reviewed by:	AA	16-05-2025		
Revised by:	RM	12-06-2025		
			Project Title	Clareholm, AB Stormwater Pond Sludge Surveys 2025 Report
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			Sheet	20 OF 32

POND 3 VOLUMES

POND 3 ESTIMATED SLUDGE QUANTITY	POND 3 APPROXIMATE DIMENSIONS AND VOLUMES (AS SURVEYED)
<p>Estimated sludge volume is calculated using software that compares the measured and interpolated sludge depths with the depths of the lagoon liner obtained from engineered drawings and/or field measurements. A sludge sample is taken for lab analysis to determine total solids and total volatile solids and to obtain dry volume.</p> <p>POND 3:</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (WET) = 3,751 m³</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (DRY) = 926 m³</p> <p style="margin-left: 80px;">SPECIFIC GRAVITY (DRY AS SAMPLED) = 1.32</p> <p style="margin-left: 40px;">TOTAL ESTIMATED MASS OF SLUDGE TO BE REMOVED = 1,223 BDT (Bone Dry Tonnes)</p> <p style="margin-left: 40px;">TOTAL ESTIMATED VOLATILE SOLIDS QUANTITY (DRY) = 109 m³</p> <p style="margin-left: 80px;">IN-SITU SLUDGE DENSITY = 1,064 kg/m³</p> <p>POND 3 HYDRAULIC CAPACITY AT PRESENT SLUDGE LOADING</p> <p>Hydraulic capacity calculations for each pond are performed by comparing the water level at the time of survey to the sludge profile with results shown below.</p> <p style="margin-left: 40px;">ESTIMATED HYDRAULIC CAPACITY - WATER LEVEL @ 1025.861 m = 14,439 m³</p>	<p>Shape / sides Irregular</p> <p>Length 230 m</p> <p>Width 130 m</p> <p>Area 14443 m²</p> <p>Maximum liner depth 1.78 m</p> <p>Total volume 18189 m³</p> <p>Total potential volume (high water level) 23649 m³</p> <p>Average sludge thickness 0.26 m</p> <p>Average top of liner depths 1.25 m</p> <p>Average top of sludge depths 1.00 m</p>

REMAINING CAPACITY OF POND BASED ON SURVEYED SLUDGE VOLUME			
Stage	Depth (m)	Volume (m ³)	Area (m ²)
1	0.0	14,439	14,443
2	0.3	10,283	13,287
3	0.6	6,469	12,123
4	0.9	3,101	10,138
5	1.2	558	5,707
6	1.5	0	11
7	1.8	-	-

Figure 22 Pond 3 volumes

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Reviewed by:	AA	16-05-2025		
Revised by:	RM	12-06-2025		
			Project Number	25001
Unless otherwise specified all dimensions are in meters				
			Sheet	21


POND 4 VOLUMES

POND 4 ESTIMATED SLUDGE QUANTITY	POND 4 APPROXIMATE DIMENSIONS AND VOLUMES (AS SURVEYED)																				
<p>Estimated sludge volume is calculated using software that compares the measured and interpolated sludge depths with the depths of the lagoon liner obtained from engineered drawings and/or field measurements. A sludge sample is taken for lab analysis to determine total solids and total volatile solids and to obtain dry volume.</p>	<table border="0"> <tr> <td>Shape / sides</td> <td>Irregular</td> </tr> <tr> <td>Length</td> <td>180 m</td> </tr> <tr> <td>Width</td> <td>50 m</td> </tr> <tr> <td>Area</td> <td>4868 m²</td> </tr> <tr> <td>Maximum liner depth</td> <td>2.94 m</td> </tr> <tr> <td>Total volume</td> <td>7938 m³</td> </tr> <tr> <td>Total potential volume (high water level)</td> <td>11156 m³</td> </tr> <tr> <td>Average sludge thickness</td> <td>0.15 m</td> </tr> <tr> <td>Average top of liner depths</td> <td>1.63 m</td> </tr> <tr> <td>Average top of sludge depths</td> <td>1.47 m</td> </tr> </table>	Shape / sides	Irregular	Length	180 m	Width	50 m	Area	4868 m ²	Maximum liner depth	2.94 m	Total volume	7938 m ³	Total potential volume (high water level)	11156 m ³	Average sludge thickness	0.15 m	Average top of liner depths	1.63 m	Average top of sludge depths	1.47 m
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Average sludge thickness	0.15 m																				
Average top of liner depths	1.63 m																				
Average top of sludge depths	1.47 m																				
<p>POND 4:</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (WET) = 747 m³</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (DRY) = 133 m³</p> <p>SPECIFIC GRAVITY (DRY AS SAMPLED) = 1.31</p> <p>TOTAL ESTIMATED MASS OF SLUDGE TO BE REMOVED = 174 BDT (Bone Dry Tonnes)</p> <p>TOTAL ESTIMATED VOLATILE SOLIDS QUANTITY (DRY) = 15 m³</p> <p>IN-SITU SLUDGE DENSITY = 1,044 kg/m³</p>																					
<p>POND 4 HYDRAULIC CAPACITY AT PRESENT SLUDGE LOADING</p> <p>Hydraulic capacity calculations for each pond are performed by comparing the water level at the time of survey to the sludge profile with results shown below.</p> <p>ESTIMATED HYDRAULIC CAPACITY - WATER LEVEL @ 1025.625 m = 7,191 m³</p>																					

REMAINING CAPACITY OF POND BASED ON SURVEYED SLUDGE VOLUME			
Stage	Depth (m)	Volume (m ³)	Area (m ²)
1	0.0	7,191	4,868
2	0.5	5,035	3,785
3	1.0	3,371	2,938
4	1.5	2,042	2,415
5	2.0	951	1,938
6	2.5	149	1,105
7	3.0	-	-

Figure 23 Pond 4 volumes

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POND 5 VOLUMES

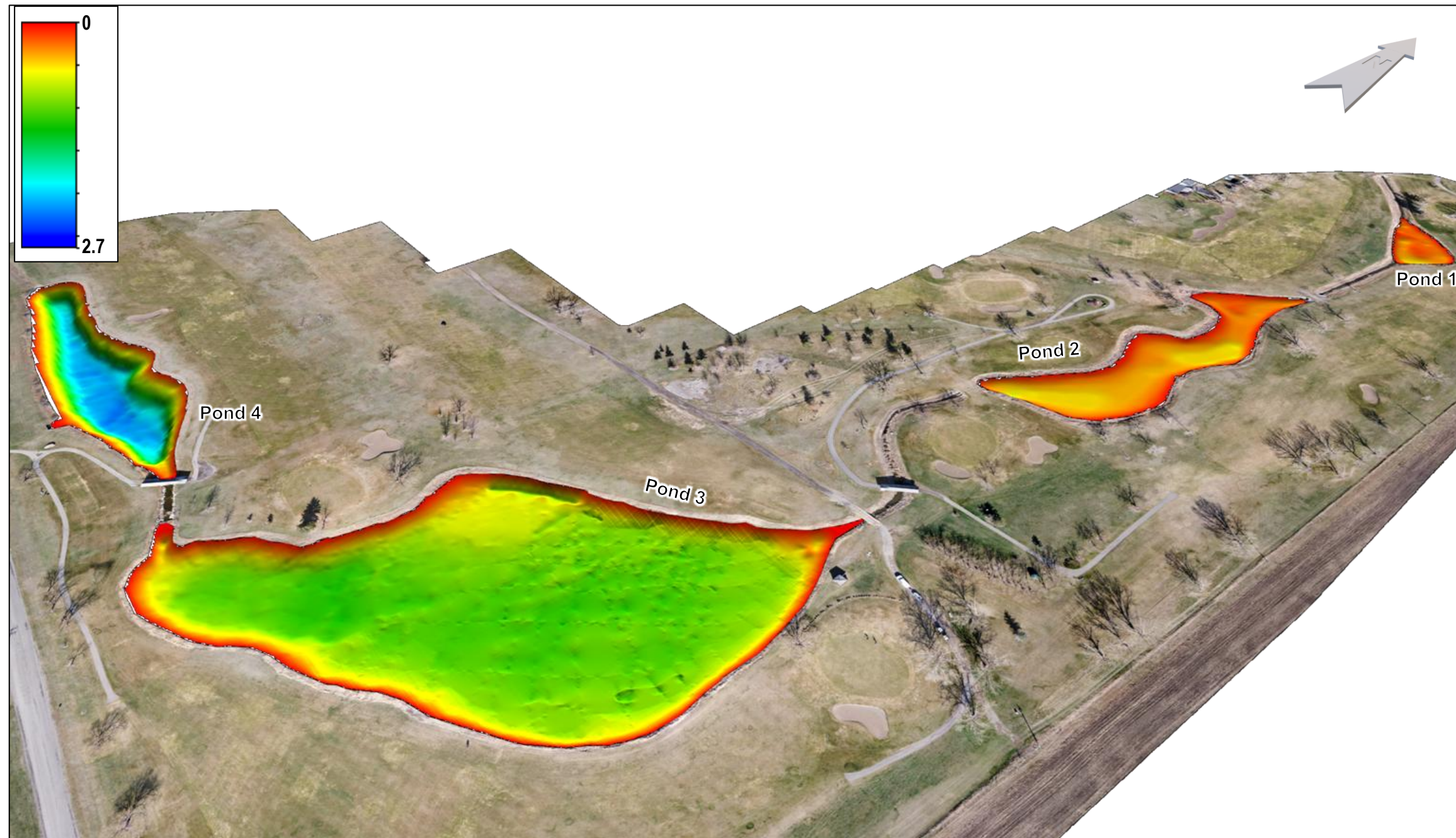
POND 5 ESTIMATED SLUDGE QUANTITY	POND 5 APPROXIMATE DIMENSIONS AND VOLUMES (AS SURVEYED)																																
<p>Estimated sludge volume is calculated using software that compares the measured and interpolated sludge depths with the depths of the lagoon liner obtained from engineered drawings and/or field measurements. A sludge sample is taken for lab analysis to determine total solids and total volatile solids and to obtain dry volume.</p>	<table border="0"> <tr> <td>Shape / sides</td> <td>Irregular</td> </tr> <tr> <td>Length</td> <td>320 m</td> </tr> <tr> <td>Width</td> <td>260 m</td> </tr> <tr> <td>Area</td> <td>29901 m²</td> </tr> <tr> <td>Maximum liner depth</td> <td>4.15 m</td> </tr> <tr> <td>Total volume</td> <td>64883 m³</td> </tr> <tr> <td>Total potential volume (high water level)</td> <td>91137 m³</td> </tr> <tr> <td>Average sludge thickness</td> <td>0.20 m</td> </tr> <tr> <td>Average top of liner depths</td> <td>2.17 m</td> </tr> <tr> <td>Average top of sludge depths</td> <td>1.97 m</td> </tr> </table>	Shape / sides	Irregular	Length	320 m	Width	260 m	Area	29901 m ²	Maximum liner depth	4.15 m	Total volume	64883 m ³	Total potential volume (high water level)	91137 m ³	Average sludge thickness	0.20 m	Average top of liner depths	2.17 m	Average top of sludge depths	1.97 m												
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Average top of sludge depths	1.97 m																																
<p>POND 5:</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (WET) = 5,910 m³</p> <p>TOTAL ESTIMATED VOLUME OF SLUDGE TO BE REMOVED (DRY) = 680 m³</p> <p>SPECIFIC GRAVITY (DRY AS SAMPLED) = 1.20</p> <p>TOTAL ESTIMATED MASS OF SLUDGE TO BE REMOVED = 816 BDT (Bone Dry Tonnes)</p> <p>TOTAL ESTIMATED VOLATILE SOLIDS QUANTITY (DRY) = 95 m³</p> <p>IN-SITU SLUDGE DENSITY = 1,020 kg/m³</p>																																	
<p>POND 5 HYDRAULIC CAPACITY AT PRESENT SLUDGE LOADING</p> <p>Hydraulic capacity calculations for each pond are performed by comparing the water level at the time of survey to the sludge profile with results shown below.</p> <p>ESTIMATED HYDRAULIC CAPACITY - WATER LEVEL @ 1024.16 m = 58,973 m³</p>																																	
<p>REMAINING CAPACITY OF POND BASED ON SURVEYED SLUDGE VOLUME</p> <table border="1"> <thead> <tr> <th>Stage</th> <th>Depth (m)</th> <th>Volume (m³)</th> <th>Area (m²)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.0</td> <td>58,973</td> <td>29,901</td> </tr> <tr> <td>2</td> <td>0.7</td> <td>39,257</td> <td>26,447</td> </tr> <tr> <td>3</td> <td>1.4</td> <td>22,080</td> <td>22,298</td> </tr> <tr> <td>4</td> <td>2.1</td> <td>8,001</td> <td>17,509</td> </tr> <tr> <td>5</td> <td>2.8</td> <td>548</td> <td>3,045</td> </tr> <tr> <td>6</td> <td>3.5</td> <td>2</td> <td>9</td> </tr> <tr> <td>7</td> <td>4.2</td> <td>-</td> <td>-</td> </tr> </tbody> </table>		Stage	Depth (m)	Volume (m ³)	Area (m ²)	1	0.0	58,973	29,901	2	0.7	39,257	26,447	3	1.4	22,080	22,298	4	2.1	8,001	17,509	5	2.8	548	3,045	6	3.5	2	9	7	4.2	-	-
Stage	Depth (m)	Volume (m ³)	Area (m ²)																														
1	0.0	58,973	29,901																														
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5	2.8	548	3,045																														
6	3.5	2	9																														
7	4.2	-	-																														

Figure 24 Pond 5 volumes

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PONDS 1 – 4 – TOP OF SLUDGE 3D PROFILE



A 3x vertical exaggeration has been applied to the 3D isometric drawing to highlight bottom features.


Ponds 1 and 2 exhibit shallower top sludge depths, while ponds 4 and 5 have deeper top sludge depths.

The average top of sludge depths for ponds 1, 2, 3 & 4 are, respectively, 0.29 m, 0.36 m, 1.0 m & 1.47 m.

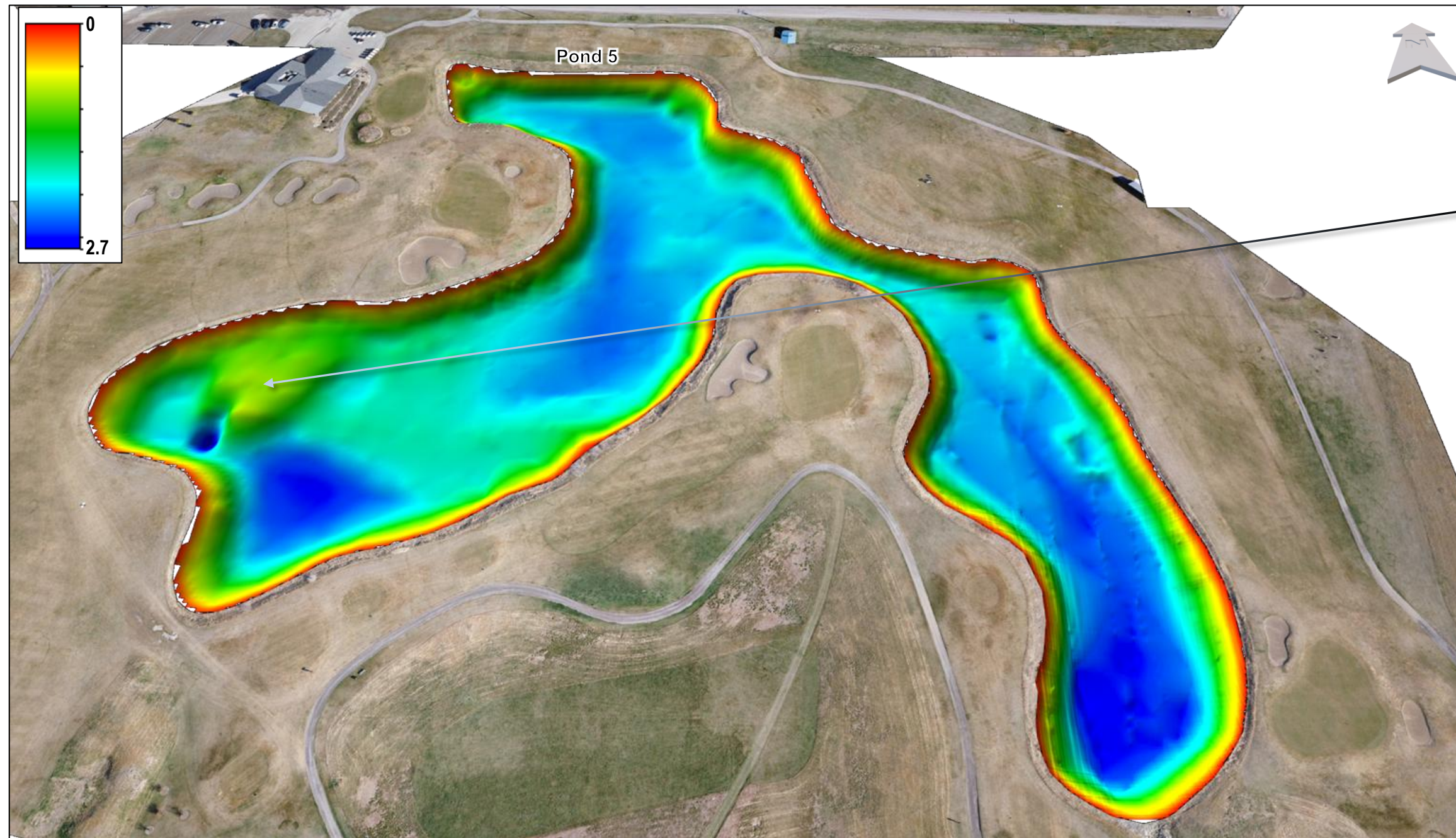
Figure 25 Ponds 1, 2, 3 & 4 top of sludge 3D isometric drawing – southeast to northwest

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POND 5 – TOP OF SLUDGE 3D PROFILE



A 3x vertical exaggeration has been applied to the 3D isometric drawing to highlight bottom features.


Sludge in Pond 4 is generally deep across the bottom, except for a shallow area in the western end.

The average top of sludge depths for Pond 5 is 1.97 m.

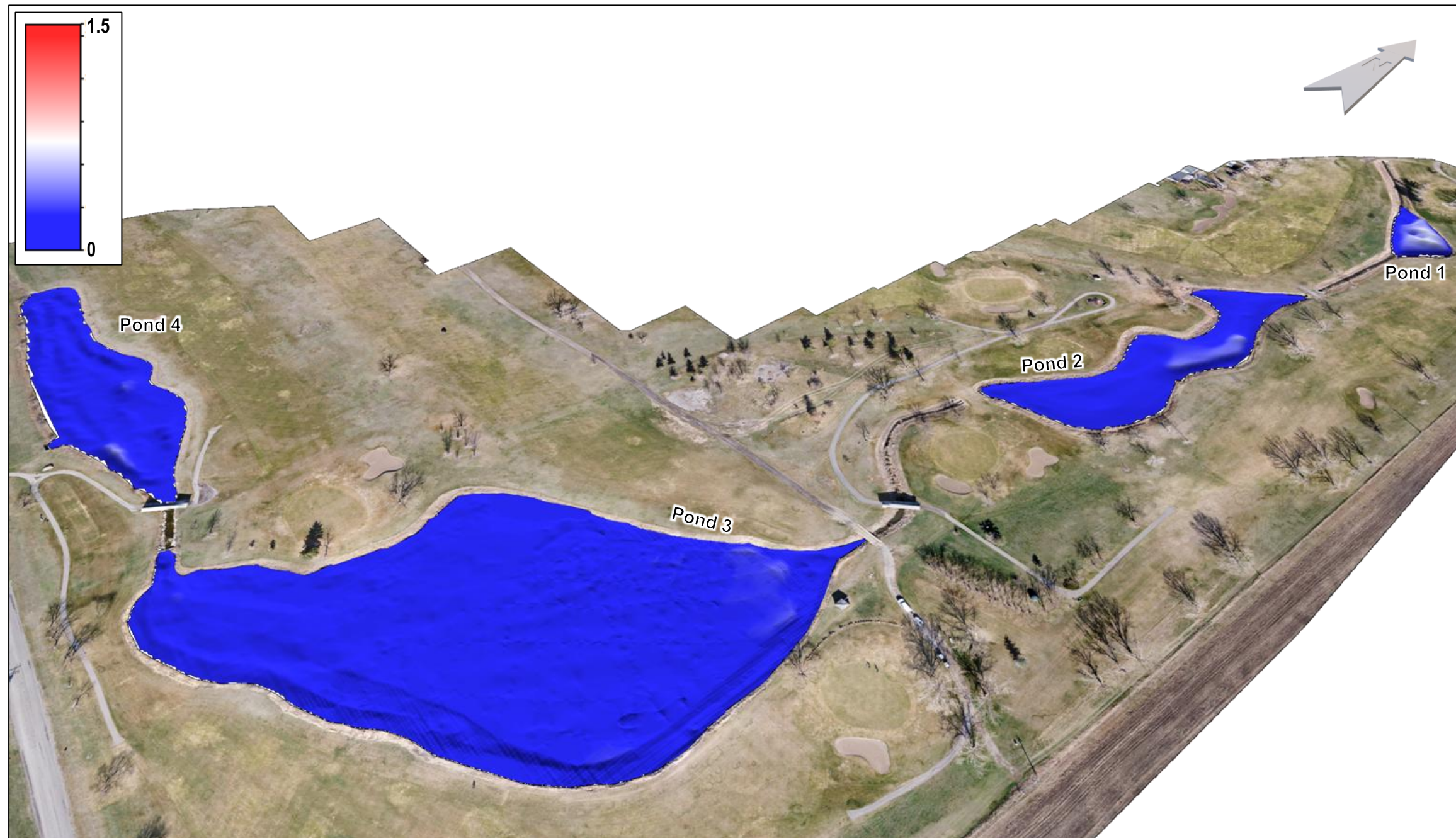
Figure 26 Pond 5 top of sludge 3D isometric drawing – south to north

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PONDS 1 – 4 – SLUDGE THICKNESS 3D PROFILE



A 3x vertical exaggeration has been applied to the 3D isometric drawing to highlight bottom features.


Sludge build-up is more significant in Pond 1.

The average sludge thickness for Ponds 1, 2, 3 & 4 are, respectively, 0.64 m, 0.28 m, 0.26 m & 0.15 m.

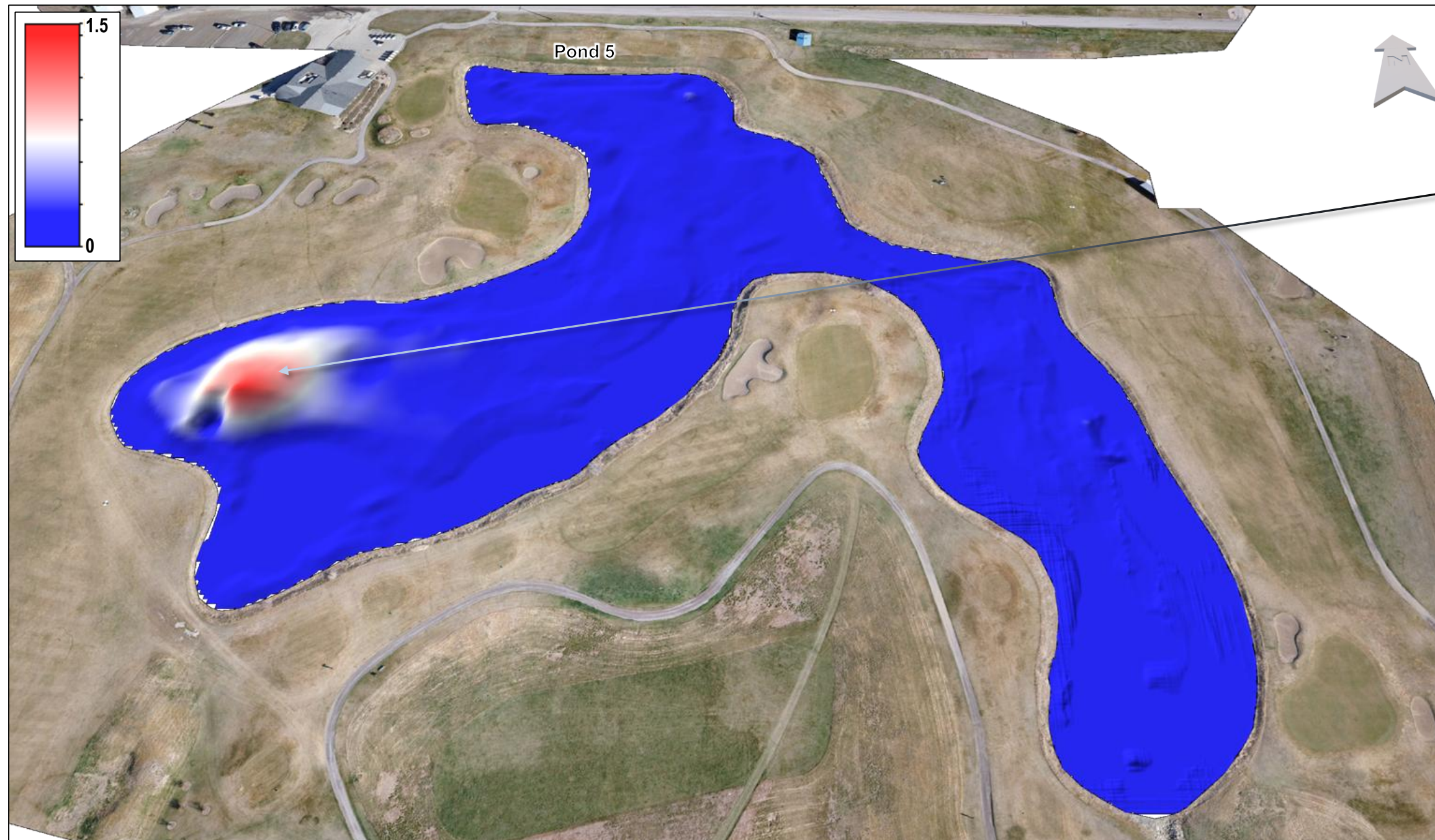
Figure 27 Ponds 1, 2, 3 & 4 top of sludge 3D isometric drawing – southeast to northwest

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POND 5 – SLUDGE THICKNESS 3D PROFILE



A 3x vertical exaggeration has been applied to the 3D isometric drawing to highlight bottom features.


Sludge accumulation in pond 5 occurs in the western end.

The average sludge thickness for Pond 5 is 0.20 m.

Figure 28 Pond 5 top of sludge 3D isometric drawing – south to north

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APPENDIX A – GLOSSARY

Bone dry tonnes (BDT): The in-situ sludge volume reduced to an ideal dry mass in metric tonnes (all moisture removed).

CGVD2013: Canadian Geodetic Vertical Datum of 2013

CGVD28: Canadian Geodetic Vertical Datum of 1928

Dredgeable area: The area of a lagoon or pond that is accessible to be cleaned by a floating dredge. Features that restrict dredge access include excessive shoreline vegetation (cattails), riprap, infrastructure, etc.

Dredgeable volume: The volume of sludge in the dredgeable area adjusted to account for the cutterhead guard and sludge-liner interface by raising the liner surface by 15 cm and by applying an offset from the shoreline of 3 m for Ponds 1, 2, 3, 4 & 5.

Echogram: A visualization of acoustic returns displayed as a vertical cross section (elevation view) or ‘slice’ of the entire water column (waterline down to sludge) that shows the bottom profile and basic underwater features.

Floating crust: A layer of material (made up of biosolids and synthetic debris) which is less dense and therefore floats on the surface of the effluent and forms a crust.

Freeboard: Distance from the surveyed Pond water elevation to the Pond level of capacity or overflow.

In-situ sludge density: The calculated density of the in-situ sludge.

Sludge accumulation: The amount of sludge (in depth or volume) that accumulates over a period of time.

Sludge blanket thickness: The amount of sludge that has accumulated on the bottom of the pond.


Sludge volume: The in-situ sludge volume that exists between the liner and the top of the sludge surface.

Top of sludge depths: The vertical measurement from the water surface down to the top of the sludge layer.

Top of sludge elevations: The elevations mapped at the top of the sludge layer. By tracking these elevations overtime sludge accumulation can be accurately monitored or dredging progress can be assessed even with varying pond levels.

Water volume / hydraulic capacity: Volume of water/effluent in the pond at the time of survey. This value represents the hydraulic capacity on top of the settled sludge blanket.

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APPENDIX B – A NOTE ON VOLUME CALCULATIONS

This Sludge Survey Report has been prepared by Hydrasurvey Ltd. (“HS”) for the Town of Claresholm (herein referred to as the “Client”). It is intended to provide the Client with an estimate of sludge quantity and pond hydraulic capacity.


This report is based on data and information obtained by measuring pond depths with the Single Beam Echosounder, or Infrared Sludge Interface Detector and verified using manual checks. Estimated sludge volumes and dry tonne amounts are calculated using software that creates interpolations between the sounding lines measured in the field.

The Client recognizes and acknowledges that estimated sludge volumes will vary from actual sludge volumes and that this report should be used only as a general guideline for planning maintenance desludging or dredging and should not be assumed to be an exact quantification of sludge volume. HS shall not be liable for any damages resulting from any difference between estimated sludge volumes and actual sludge volumes.

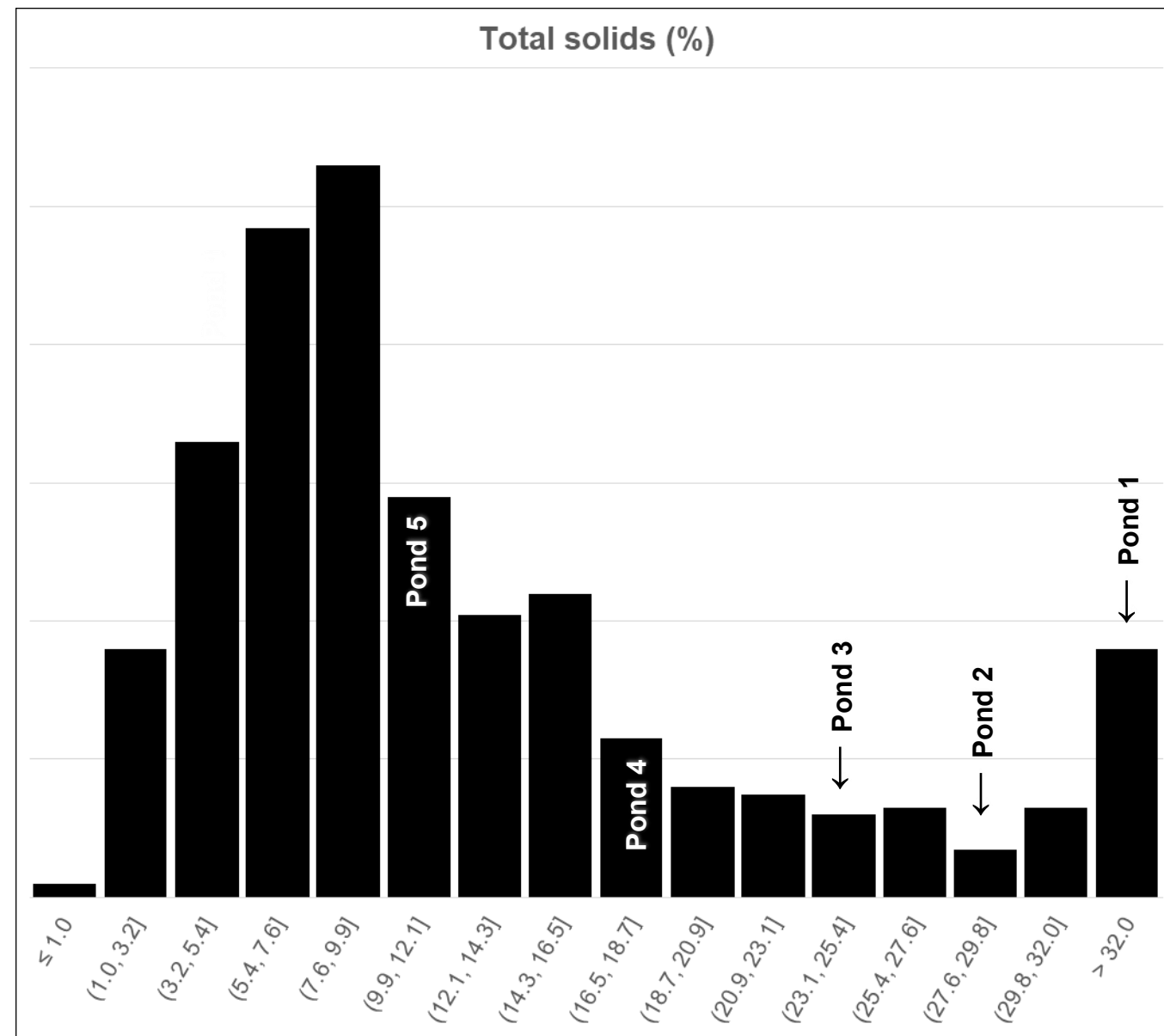
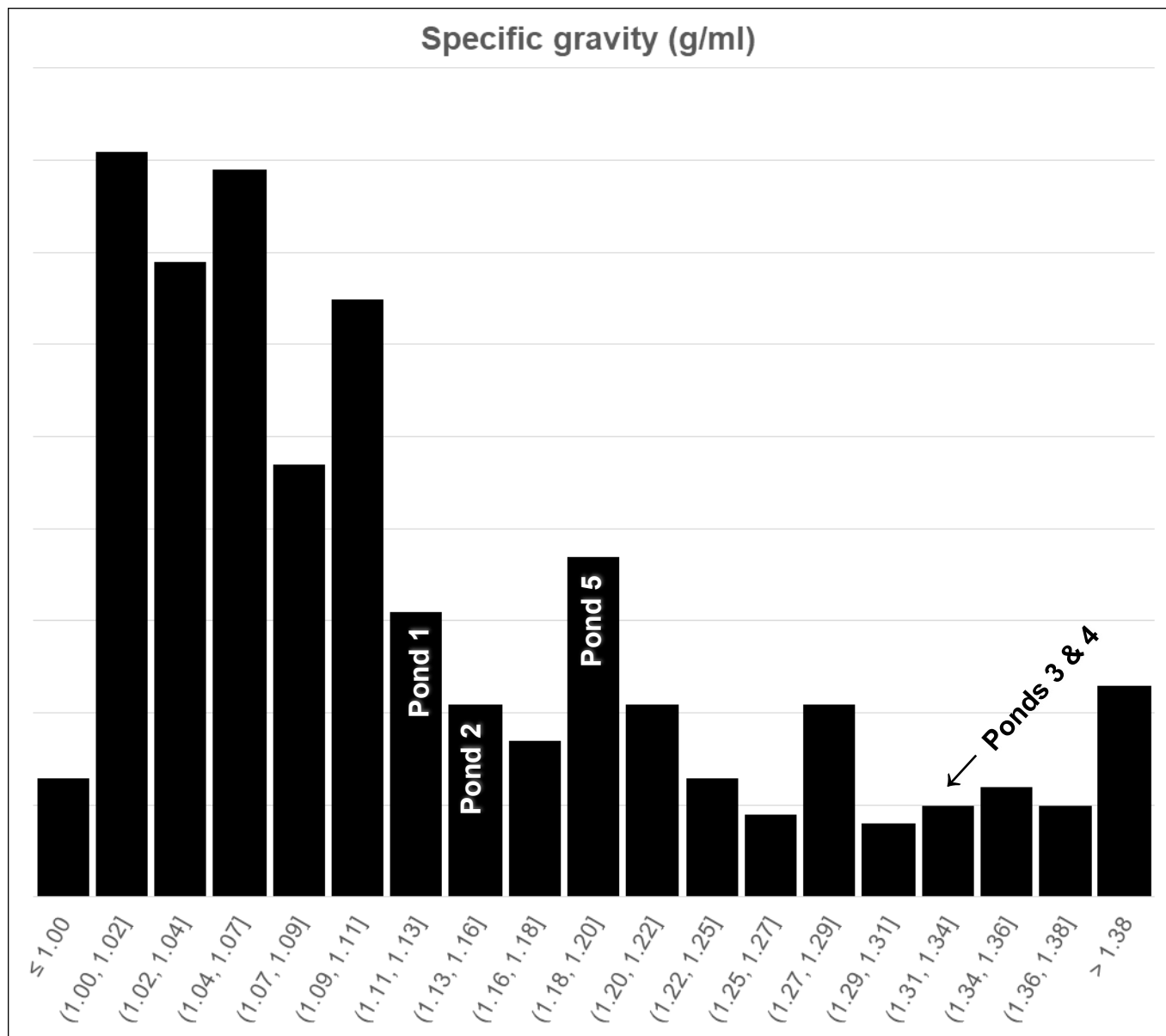
Furthermore, the liability of HS to the Client and to all third parties shall be limited to injury or loss caused by the negligent acts, errors or omissions of HS. Notwithstanding the foregoing, the total aggregate liability of HS shall not exceed the lesser of the actual damages incurred, or the total fee of HS for services rendered on this project.

The Client agrees to defend, indemnify, and hold harmless HS, its affiliates, officers, directors, employees, and agents from any and all liabilities, in excess of the limits of HS’ entire liability set out above, incurred by HS or any other party, in connection with the services provided. Such indemnity shall include the costs of the time spent and expenses incurred by HS and its affiliates in connection with the defence of any claims.

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	Name	Date		
Prepared by:	RM	29-04-2025		
Reviewed by:	AA	16-05-2025		
Revised by:	RM	12-06-2025		
			Project Title	Claresholm, AB Stormwater Pond Sludge Surveys 2025 Report
			Project Number	25001
Unless otherwise specified all dimensions are in meters			Revision	1
			Sheet	29 OF 32

APPENDIX C – CLARESHOLM, AB STORMWATER POND SLUDGE SAMPLE TEST RESULTS AND COMPARISON WITH HYDRASURVEY'S DATABASE



Histogram of sludge sample test results for Specific Gravity (g/ml) and Total Solids (%)

This is not a legal survey document
 Matrix depths and elevations are interpolated from field measurements
 Depths are relative to water level at the time of the survey.
 Infrastructure shown on drawings is approximate.
 Survey data collected between 21 & 25/04/2025.
 Report any discrepancies in this report to Hydrasurvey Ltd.
 Do not modify or use this report for purposes other than which it is intended
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	Name	Date		
Prepared by:	RM	29-04-2025		
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Project Title			Clareholm, AB Stormwater Pond Sludge Surveys 2025 Report	
Project Number			25001	
Revision			1	
Sheet			30	OF 32

Unless otherwise specified all dimensions are in meters

ANALYTICAL REPORT

Client: Hydrasurvey Ltd.
 4030 8 Street SE
 Calgary T2G 3A7

Attention: Andrew Ambrocichuk

KaizenLAB JOB #:	344440
DATE RECEIVED:	28-Apr-2025
DATE REPORTED:	05-May-2025
PROJECT ID:	25001 Claresholm, AB Stormwater Pond Surveys 12 N
LOCATION:	Claresholm, AB

KaizenLAB Sample #: 344440_001 **Sample ID:** 25001- Claresholm - Pond 1
Date Sampled: 25-Apr-2025 14:00 **Matrix:** SLUDGE

Parameter Description	Units	Result	Detection Limit
Specific Gravity (Dry)	g/mL	1.13	
Volatile and Total Solids (gravimetric) in soil			
Total and Volatile Solids in Soil			
Total Solids	%	35.1	0.1
Volatile Solids	%	3.9	0.1

KaizenLAB Sample #: 344440_002 **Sample ID:** 25001 - Claresholm - Pond 2
Date Sampled: 24-Apr-2025 18:00 **Matrix:** SLUDGE

Parameter Description	Units	Result	Detection Limit
Specific Gravity (Dry)	g/mL	1.15	
Volatile and Total Solids (gravimetric) in soil			
Total and Volatile Solids in Soil			
Total Solids	%	29.0	0.1
Volatile Solids	%	3.2	0.1

KaizenLAB Sample #: 344440_003 **Sample ID:** 25001 - Claresholm - Pond 3
Date Sampled: 23-Apr-2025 15:30 **Matrix:** SLUDGE

Parameter Description	Units	Result	Detection Limit
Specific Gravity (Dry)	g/mL	1.32	
Volatile and Total Solids (gravimetric) in soil			
Total and Volatile Solids in Soil			
Total Solids	%	24.7	0.1
Volatile Solids	%	2.9	0.1

KaizenLAB Sample #: 344440_004 **Sample ID:** 25001 - Claresholm - Pond 4
Date Sampled: 23-Apr-2025 17:30 **Matrix:** SLUDGE

Parameter Description	Units	Result	Detection Limit
Specific Gravity (Dry)	g/mL	1.31	
Volatile and Total Solids (gravimetric) in soil			
Total and Volatile Solids in Soil			
Total Solids	%	17.8	0.1
Volatile Solids	%	2.0	0.1

KaizenLAB Sample #: 344440_005 **Sample ID:** 25001 - Claresholm - Pond 5
Date Sampled: 22-Apr-2025 18:00 **Matrix:** SLUDGE

Parameter Description	Units	Result	Detection Limit
Specific Gravity (Dry)	g/mL	1.20	
Volatile and Total Solids (gravimetric) in soil			
Total and Volatile Solids in Soil			
Total Solids	%	11.5	0.1
Volatile Solids	%	1.6	0.1

Test Methodologies

Specific Gravity / Bulk Density in Soil/Sludge (Non-Accredited): Modified from Soil Sampling & Methods of Analysis, M.R. Carter, 2008 and Directive 050 of the Alberta Energy Regulator, August 2019
 Total and Volatile Solids in Soil (Non-Accredited): Modified from SM 2540 B and E

Final Review by:



Christina Daguio
 Client Services Administrator

Note: The results in this report relate only to the items tested and as received. Information is available for any items in 7.8.2.1 of ISO/IEC 17025:2017 that cannot be put on a test report. The report shall not be reproduced except in full without written approval of KaizenLAB. The validity of results may be affected if the information is provided by the customer.

Test methodologies are accredited in accordance with ISO/IEC 17025 via CALA, unless otherwise specified in the description of the methods.

*This analyte is not accredited, even though analyzed by an accredited methodology.