D05 AQUATIC INSTRUMENT SYSTEM (AIS)
SITE CHARACTERIZATION REPORT

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See Configuration Management System for approval history

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	9/02/2015	ECO-01904	Initial Release
B	02/04/2016	ECO-03542	Added Round Lake
C	07/20/2016	ECO-04032	Added Little Rock Lake

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1. DESCRIPTION

1.1. Purpose

Information collected and described here is used to inform the site design activities for the NEON project Aquatic Instrument System (AIS). This report includes information gathered by the Aquatic (AQU)and Environmental, Health, & Safety (EHS) teams. The purpose of this report is for the science team to outline what is desired at each site within a domain in order to obtain the best scientific data possible to help answer NEON's Grand Challenge Questions; therefore, this is not a design document, but a report that is an input to the design process.

This report takes precedence over other documents and reports that may repeat the information contained herein.

The Appendices include summary tables for the convenience of the multiple audiences of this report; some of the information in the tables is repeated from the body of this report while other information is exclusive to the summary tables.

1.2. Scope

AQU site characterization information presented in this document is for the D05 aquatic site locations: Crampton Lake (core) and Little Rock Lake (relocatable). Issues and concerns for each site that need further review are also addressed in this document according to our best knowledge. Unless otherwise noted, the information contained herein takes precedence over the same information repeated elsewhere; thereby, this document contains the official change-controlled information pertinent to these sites.

Disclaimer: All latitude and longitude coordinates are subject to the variation inherent in our GPS equipment and the conditions at the site. Some of the Aquatic sites are in narrow canyons with limited satellite coverage; resulting in coordinates that are not accurate to within 50 cm.

2. RELATED DOCUMENTS AND ACRONYMS

2.1. Applicable Documents

AD[01]	
AD[02]	
AD[03]	
AD[04]	

2.2. Reference Documents

RD[01]	NEON.NPR.000008 NEON Acronym List
RD[02]	NEON.NPR.000243 NEON Glossary of Terms
RD[03]	[Reference to photos]
RD[04]	[Reference to map(s)]

3. D05 AIS SITE CHARACTERIZATION REPORT

3.1.0 Crampton Lake

The Crampton Lake site is a lake site and the core for D5. Crampton Lake is a 25 ha, oligotrophic lake with a maximum depth of 19.7 m and a mean depth of 5 m. It is a low Chlorophyll lake, 3.81 ug L^{-1}. It does stratify and has a strong thermocline around 7 m. The lake goes anoxic (< 2 mg L^{-1}) at the bottom in the summer months. The lake is located in a region of primarily hardwood and mixed forests and some coniferous forests. Significant wetland coverage is present. The landscape is a pitted sandy outwash plain as evidenced by cobbly sediments. The general slope into the lake is 30 to 45^{o} (120-135^{o} bank angle).

3.1.1 Aquatic Auxiliary and Aquatic Portal Locations for Construction

The initial estimated locations for the Aquatic Auxiliary Portal and the Aquatic Portal, which are coincident, are illustrated in Figure 1, with lat-long coordinates presented in Tables 1 and 2.

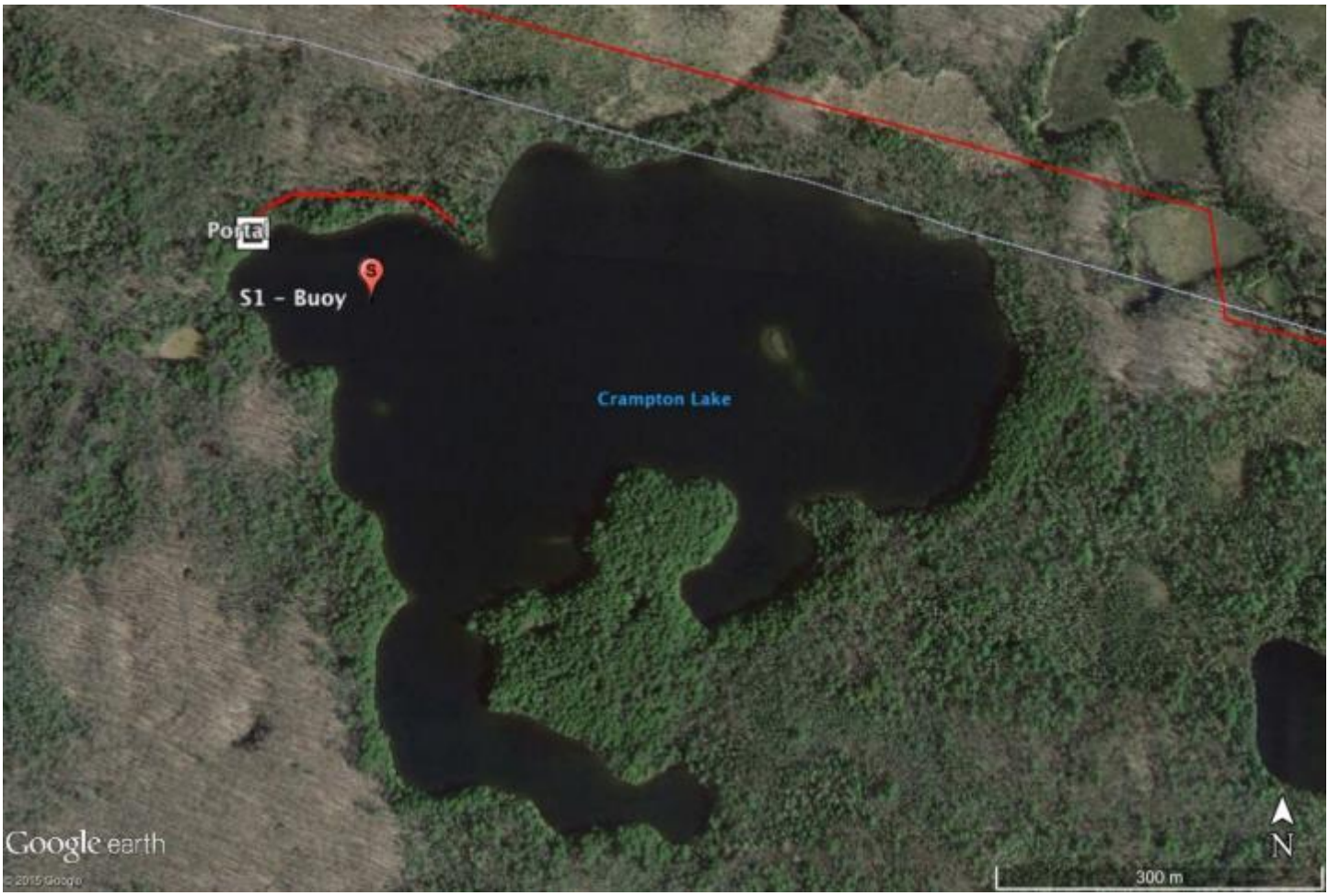

Figure 1 A Google-Earth-Derived Image of Aquatic Auxiliary Portal and Aquatic Portal for D05 Crampton Lake

Table 1 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	46.211199	-89.478420

Table 2 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	46.211199	-89.475420

3.1.2 Sensor Locations for Construction

AQU, with support from EHS, has the GPS coordinates presented in Tables 3 and 4 for S1 (buoy), S2 (NA), pressure sensor, micromet station, camera, staff gauge and inlet/outlet locations; graphically illustrated in Figure 2. Many aquatic sites are in narrow canyons or covered by dense canopy, which reduces satellite availability. In these situations, AQU will provide a description of the location and an approximate GPS location (e.g., not accurate to within <1m). This description will suffice for the planning stages, but sites will likely need to be physically marked prior to construction.

These coordinates are to be used for the input to the AIS design:

Table 3 Sensor 1 Location

Sensor	Latitude	Longitude
S1	46.210592	-89.476862

Table 4 Micromet & Inlet/Outlet Locations

Sensor	Latitude	Longitude
Micromet	46.211287	-89.475723
FDP – Met	46.211315	-89.475816
Camera	46.211202	-89.475790
Staff Gauge	46.211194	-89.475904
Outlet	46.211028	-89.469083
FDP-Outlet	46.211145	-89.469123
Inlet	46.210670	-89.478566
FDP-Inlet	46.210765	-89.478692

Figure 2 Kmz File of D05 Crampton Lake Denoting Locations of S1, Inlet, Outlet, Met Station, Camera and Staff Gauge, as well as associated field device posts (FDP). A path needed to access the met station is given in red.

Crampton Lake has a boat launch next to an existing dock which is shown in Figure 3. This dock is currently too narrow to support a trailer wide enough to deploy the buoy. Therefore either the boat launch will need to be widened or a separate deployment strategy will need to be pursued. This responsibility and decision will be made by SI&V with consult from SCI and FOPS.

Figure 3 Photo of lake access at D05 Crampton Lake

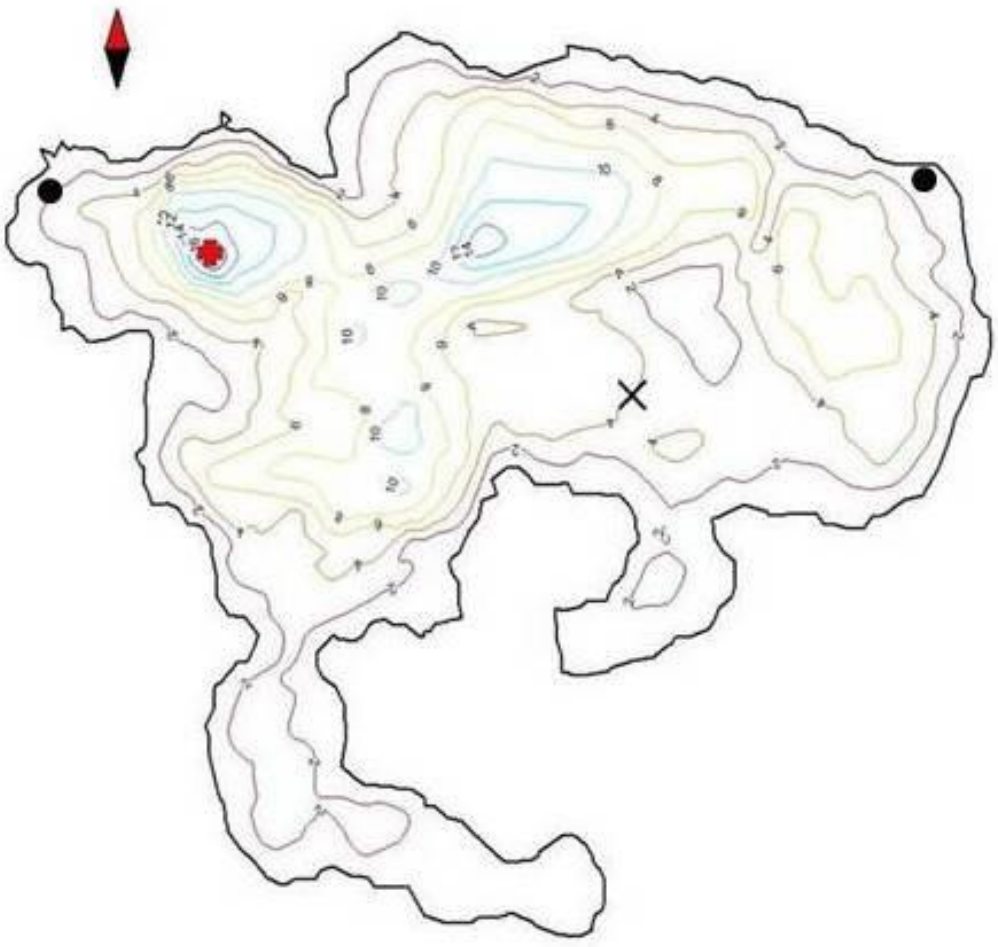

Figure 4 Bathymetric map (in meters) of D05 Crampton Lake showing the locations of the inlet and outlet (black circles) as well as the buoy location (red cross).

Figure 5 Photo of Bank Angle and Vegetation at D05 Crampton Lake

3.1.3 Groundwater Wells

Groundwater well locations are shown Figure 6 with the coordinates provided in Table 5 below. The groundwater observation wells network at the site will consist of 8 wells installed using a rotary auger rig. Topography at the site is dominated by forested rolling hills surrounding the lake. The wells will be installed at varying positions along the rolling hills, thus the required drilling depth will vary with total depths between 25-50 feet below ground surface. Access to the west side of the lake will be via the existing path and along the eastern side of the site will require navigating the rig either through the forest (avoiding wetlands) or over the lake (during winter months) to reach the well locations. Rig access to the well locations is anticipated to be easy and minimally damaging along the west side of the lake, and may be somewhat challenging to access the wells at the east end of the lake. One issue for drilling the wells is the presence of glacial erratics which were observed during the visit. These will be hard to detect from the surface using geophysical methods due to their size and may pose an issue if one is encountered during the drilling activities.

Figure 6 Initial Groundwater Well Locations Based on EMS kmz File at D05 Crampton Lake

Table 5 Name and location of groundwater wells at D05 Crampton Lake.

Well ID	Latitude	Longitude
D05-CRAM-OW-01	46.212221	-89.480013
D05-CRAM-OW-02	46.211454	-89.478354
D05-CRAM-OW-03	46.210758	-89.479414
D05-CRAM-OW-04	46.211675	-89.475811
D05-CRAM-OW-05	46.209430	-89.477861
D05-CRAM-OW-06	46.210959	-89.468673
D05-CRAM-OW-07	46.210732	-89.467955
D05-CRAM-OW-08	46.210325	-89.468352

3.1.4 Riparian Vegetation Cover

During 2010-2011 site visits, the following plant density and type were observed by the AQU team:

Figure 7 The Riparian Canopy at D05 Crampton Lake divided into trees (a, background), shrub/scrub (b) and aquatic littoral vegetation (a, foreground).

The primary vegetation types can be divided into the following three categories:

a. Trees

Primarily hardwood (white pine, red alder) and mixed forests and some coniferous forests (white and black spruce).

b. Shrubs/Scrub

Leatherleaf, young birch, sedges

c. Aquatic Littoral Vegetation

Macrophytes, predominantly pickerel weed (*Pontederia coradata*), water lilies, bur-reeds (*Sparganium spp*.) and pipewort (*Eriocaulon aquaticum*).

3.1.5 Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

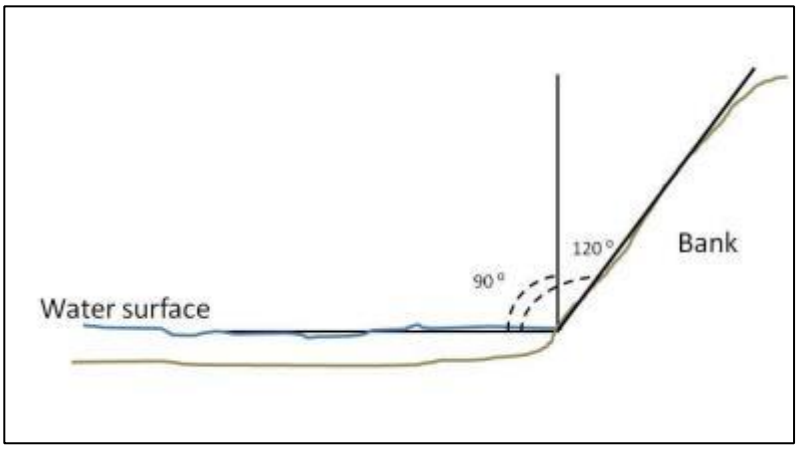

Figure 8 How Bank Angle is measured

During 2011 site visits, AQU observed the following bank conditions at S1 and S2:

Table 6 Bank Conditions at D05 Crampton Lake in 2011

Morphology Type	Lake Wide
Average bank angle	120 to 135 ^{o}
Bankful length	654 m
Bankful width	798 m
Lake Area	25 ha
Substrate composition	Sand, gravel and cobbles

3.1.6 Site Photos

The following photos of are representative of the site.

Figure 9 Typical substrates in D05 Crampton Lake are mostly sandy.

Figure 10 Typical substrates in shallow littoral zones of D05 Crampton Lake are mostly cobble.

Figure 11 Typical littoral zone emergent and floating vegetation in D05 Crampton Lake

Figure 12 Site access road/pathway in D05 Crampton Lake

Figure 13 Island in D05 Crampton Lake

Figure 14 Typical large woody debris in littoral areas in D05 Crampton Lake

3.1.7 Site Access Needs

An unimproved access pathway will be needed from the portal to the met station on the northern peninsula. An length of approximately 18m of the trail may require excavation of approximately 1m we the trail path transverses a steep slope approaching the met station location. This area is illustrated in yellow on the map in Figure 15.

No further boardwalks, stairs, or ladders are needed at D05 Crampton Lake for Science purposes.

Figure 15 Map of Access Pathway needed from boat launch and portal area to met station and camera. The portion of the trail in yellow may require excavation to address safety concerns due to the ground slope.

Table 7 Lat, Long, and distance of access pathway.

Pathway	Latitude	Longitude
Start of Pathway	46.211199	-89.478420
End of Pathway	46.211315	-89.475816
Distance	234 m	

3.1.8 Communications at the Site

The local communications company is Alphacom.
- See table in Appendix C for additional IT info

3.1.9 Power at the Site

The local power utility company is WE energy. Bill Howard 906-779-2472

3.1.10 Site Science Construction Constraints and Limitations

Site-specific issues to consider at D05 Crampton Lake are:

- UNDERC is a working facility use by the University of Notre Dame. Researchers from a multitude of institutions work at this lake throughout the year.

Driving and access constraints for D05 Crampton Lake are:

- A key to access the site lake is required to get through the gate.

3.1.11 Other Issues

No other science issues are identified at this time.

3.2.0 Little Rock Lake

The Little Rock Lake site is a lake site and the relocatable for D05. Little Rock Lake is a 16 ha, mesotrophic lake with a maximum depth of 10 meters. It does stratify and has a known thermocline that varies by season, approximately 8 meters deep on rough average. The lake likely goes anoxic (< 2 mg L^{-1}) at the bottom in most summer months. The lake is located in a region of primarily hardwood and mixed forests and some coniferous forests. Bed sediments at Little Rock Lake are 70% sand, 10% gravel, 15% rock, and 5% muck according to Wisconsin DNR (http://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=1862100). Observations on site show that the near-shore environment will be better suited for infrastructure installation than deeper locations due to the presence of greater amounts of cobble, gravel, and sand. The general slope into the lake is 50 to 60^{o}.

3.2.1 Aquatic Auxiliary and Aquatic Portal Locations for Construction

The initial estimated locations for the Aquatic Auxiliary Portal and the Aquatic Portal, which are coincident, are illustrated in Figure 1, with lat-long coordinates presented in Tables 8 and 9**.** Final location for the Aquatic Portal will be determined by FCC. The location presented here is proposed following informal discussions with FCC and will need to be finalized once Little Rock Lake is approved for NEON development.

Figure 16 A Google-Earth-Derived Image of Aquatic Auxiliary Portal and Aquatic Portal for D05 Little Rock Lake

Table 8 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	46.000756°	-89.703831°

Table 9 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	46.000756°	-89.703831°

3.2.2 Sensor Locations for Construction

AQU, with support from EHS, has the GPS coordinates presented in Tables 10 and 11 for S1 (buoy), pressure sensor, micromet station, camera, staff gauge and inlet/outlet locations; graphically illustrated in Figures 17 and 18. Many aquatic sites are in narrow canyons or covered by dense canopy, which reduces satellite availability. In these situations, AQU will provide a description of the location and an approximate GPS location (e.g., not accurate to within <1m). This description will suffice for the planning stages, but sites will likely need to be physically marked prior to construction.

The near-shore substrate at D05 Little Rock Lake is soft in the center, deeper sections of the lake, but more firm closer to the shore. The inlet and outlet infrastructure will be placed in the firm substrate closer to the shore. This will also conform to the shallow depth requirement for the infrastructure.

The riparian vegetation along the shores of Little Rock Lake can be thick. However, there are often openings in the understory suitable for Southern exposure for solar panels. The final location of the FDP-Outlet and FDP-Inlet should be placed to allow for good sun exposure. This is shown in pictures, Figures 23 through 26.

These coordinates are to be used for the input to the AIS design:

Table 10 Sensor 1 Location

Sensor	Latitude	Longitude
S1	45.998269°	-89.704767°

Table 11 Micromet & Inlet/Outlet Locations

Sensor	Latitude	Longitude
Micromet	46.000872°	-89.704089°
FDP – Met	46.000875°	-89.704017°
Camera	46.000767°	-89.704091°
Staff Gauge	46.000622°	-89.704192°
Outlet	46.000606°	-89.704064°
FDP-Outlet	46.000794°	-89.703972°
Inlet	45.995178°	-89.706478°
FDP-Inlet	45.995233°	-89.706617°

Figure 17 Kmz File of D05 Little Rock Lake Denoting Locations of S1, Outlet, Met Station, Camera and Staff Gauge, as well as associated field device posts (FDP).

Figure 18 Satellite images of D05 Little Rock lake Denoting Locations of Inlet and associated field device post (FDP).

3.2.3 Boat Access

Little Rock Lake has two boat launches. One of the boat launches is on the Eastern basin of the lake, with good vehicle, boat, and trailer access. The other is on the Northern point of the lake, accessible via ATV trail. The access on the Northern point is recommended for NEON infrastructure and regular maintenance access. The Eastern basin access is proposed for requested access for the installation and seasonal removal of the buoy, as trailer access is possible without ramp improvement. Some minor improvements (removal of down trees from trail and met station clearance) may be needed on the Northern point access.

Figure 19 Photos of lake access at D05 Little Rock Lake. Top: Eastern Basin boat access. Bottom: Northern point boat access.

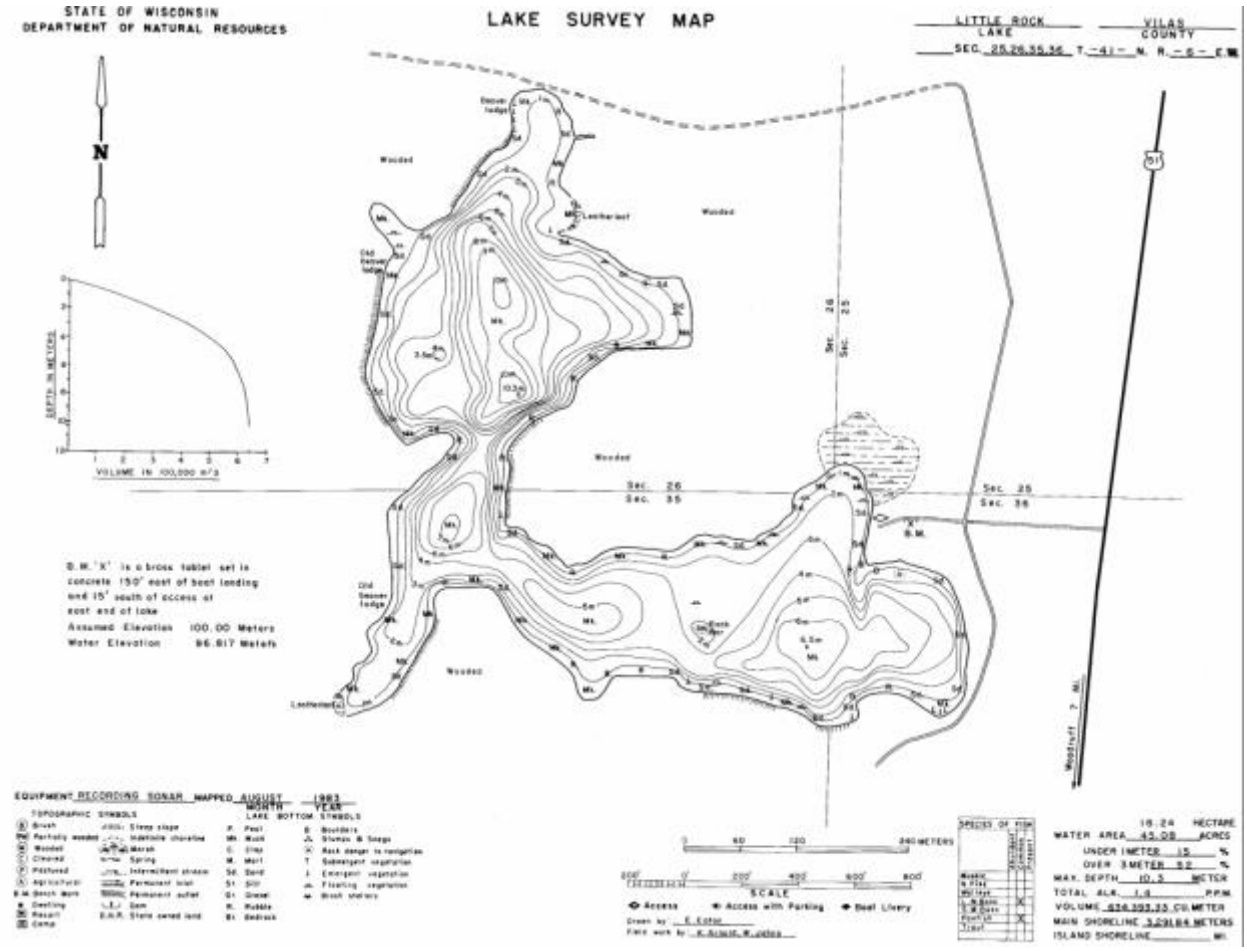

Figure 20 Bathymetric map (in meters) of D05 Little Rock Lake showing the locations of the inlet and as well as the buoy location.

Figure 20 Photo of Bank Angle and Vegetation at D05 Little Rock Lake

3.2.4 Groundwater Wells

Groundwater well locations are shown Figure 21 with the coordinates provided in Table 12 below. The groundwater observation wells network at the site will consist of 8 wells installed using a rotary auger rig. Topography at the site is dominated by forested rolling hills surrounding the lake. The wells will be installed at varying positions along the rolling hills, thus the required drilling depth will vary with total depths between 25-50 feet below ground surface. Access to the north side of the lake will be via the existing path and along the south side of the site will require navigating the rig through the forest to reach the well locations. Rig access to the well locations is anticipated to be easy and minimally damaging along the north side of the lake, and may be somewhat challenging to access the wells at the south end of the lake. One issue for drilling the wells is the presence of glacial erratics which were observed during the visit. These will be hard to detect from the surface using geophysical methods due to their size and may pose an issue if one is encountered during the drilling activities.

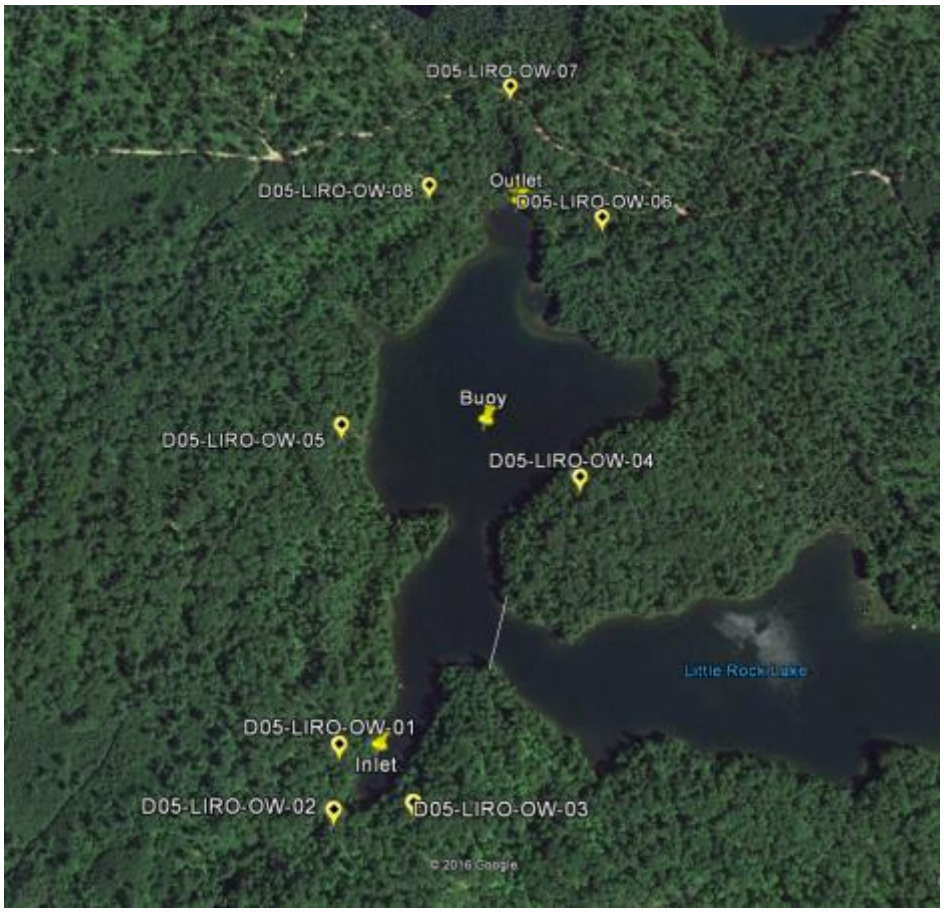

Figure 21 Initial Groundwater Well Locations Based on EMS kmz File at D05 Little Rock Lake.

Table 12 Name and location of groundwater wells at D05 Little Rock Lake.

Well ID	Latitude	Longitude
D05-LIRO-OW-01	45.995107°	-89.706966°
D05-LIRO-OW-02	45.994523°	-89.707067°
D05-LIRO-OW-03	45.994544°	-89.706006°
D05-LIRO-OW-04	45.997511°	-89.703463°
D05-LIRO-OW-05	45.998183°	-89.706781°
D05-LIRO-OW-06	46.000263°	-89.702808°
D05-LIRO-OW-07	46.001821°	-89.704029°
D05-LIRO-OW-08	46.000715°	-89.705350°

3.2.5 Riparian Vegetation Cover

During 2016 site visits, the following plant density and type were observed by the AQU team:

a)

b)

Figure 22 The Riparian Canopy at D05 Little Rock Lake divided into trees (a, background), shrub/scrub (b) and aquatic littoral vegetation (a, foreground).

The primary vegetation types can be divided into the following three categories:

d. Trees

Primarily hardwood (white pine, speckled alder (*Alnus incana rugosa*) and mixed forests and some coniferous forests (white and black spruce).

e. Shrubs/Scrub

f. Aquatic Littoral Vegetation

3.2.6 Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream or lake, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

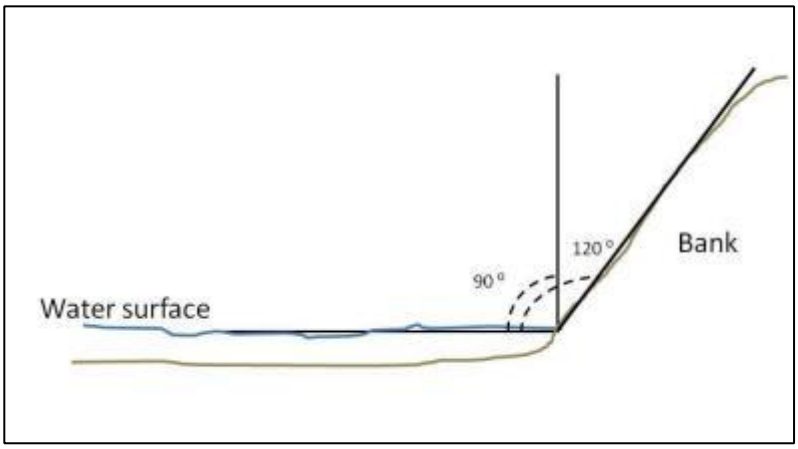

Figure 22 How Bank Angle is measured

During 2011 site visits, AQU observed the following bank conditions.

Table 13 Bank Conditions at D05 Little Rock Lake In 2016

Morphology Type	Lake Wide
Average bank angle	120 to 130 °
Lake Area	16 ha
Substrate composition	Sand, gravel, rock and muck.

3.2.7 Site Photos

The following photos of are representative of the site.

Figure 23 D05 Little Rock Lake substrate

Figure 24 Proposed access at Northern point. NEON is requesting some understory vegetation be removed for clearance for Aquatic Meteorological station, designated with the yellow circle.

Figure 25 Canopy at the proposed Met Station location.

Figure 26 D05 Little Rock Lake includes some rocks

3.2.8 Site Access Needs

Access considerations for D05 Little Rock Lake will be different for different Aquatic Portal and Met Station locations. As of spring 2016, the Met Station and Aquatic Portal are planned for the north shore near the less-accessed boat launch. A secondary boat launch is available on the East side of the lake, which is recommended for the seasonal installation and removal of the buoy. The North access launch may require minor alterations to the riparian vegetation. It is likely that the requirements for the secondary precipitation gauge will need to be waived. If the location is changed for permitting reasons, an unimproved pathway may be required.

No further boardwalks, stairs, or ladders are needed at D05 Little Rock Lake for Science purposes.

3.2.9 Communications at the Site

3.2.10 Power at the Site

Electric power in the Little Rock Lake area is provided by Wisconsin Public Services (WPS), Green Bay, Wisconsin.

Highway Route 51 runs north/south by Little Rock Lake, approximately 0.15 miles from the eastern basin boat access point. A buried WPS power line runs on the west side (the lake side) of Rt. 51. Preliminary conversations with WPS indicate NEON would be able to tie into the line.

Power could be brought from the WPS buried line to either the eastern basin (~1000 ft) or the northern basin (~2000 ft)., or both, depending on need and cost.

The suggested power-run is shown in Figure 27, below.

Figure 27 The suggested power run at D05 Little Rock Lake, shown in red.

3.2.11 Other Issues

No other science issues are identified at this time.

3 APPENDIX A. FCC SUMMARY TABLES FOR AIS SITE COMPONENTS AT D05

3.2 Crampton Lake FCC Summary Table

Site Component	**Latitude**	**Longitude**	**Units**
Stream, Lake, or River	Lake		Description
Aquatic Auxiliary Power Portal location	46.211199	-89.478420	Lat, Long in degrees
Aquatic Portal location			m away from bank, direction
Pathway needed? What is length?	Yes, unimproved pathway, 234 m		Yes/no, description w/ length
Pathway start location	46.211199	-89.478420	Lat, Long in degrees
Pathway end location	46.211315	-89.475816	Lat, Long in degrees
Stairs or ladder needed?	No		Yes/no, description
Stairs top location	Site1-StairsTopLat	Site1-StairsTopLong	Lat, Long in degrees
Stairs length	Site2-StairsLength		Meters
Ladder top location	Site1-LadderTopLat	Site1-LadderTopLong	Lat, Long in degrees
Ladder length	Site1-LadderLength		Meters
Boardwalk needed? What is length?	No		Yes/no, description w/ length
Shall stairs, boardwalk be installed during construction?	No		Yes/no, description
Fencing needs			Description
Site management			Description
Any additional site specific information			Description

3.3 Round Lake FCC Summary Table

Site Component	Latitude	Longitude	Units
Stream, Lake, or River	Lake		Description
Aquatic Auxiliary Power Portal location	45.518267°	-89.567595°	Lat, Long in degrees
Aquatic Portal location	45.518270°	-89.567578°	m away from bank, direction
Pathway needed? What is length?	No		Yes/no, description w/ length
Pathway start location			Lat, Long in degrees
Pathway end location			Lat, Long in degrees
Stairs or ladder needed?	No		Yes/no, description
Stairs top location			Lat, Long in degrees
Stairs length			Meters
Ladder top location			Lat, Long in degrees
Ladder length			Meters
Boardwalk needed? What is length?	No		Yes/no, description w/ length
Shall stairs, boardwalk be installed during construction?	No		Yes/no, description
Fencing needs	None		Description
Site management			Description
Any additional site specific information			Description

5. APPENDIX B. EHS SUMMARY TABLES FOR AIS SITE COMPONENTS AT D05

5.1. Crampton Lake EHS Summary Table

Site Component	Latitude	Longitude	Units
Sensor 1 (S1) location	46.210592	-89.476862	Lat, Long in degrees
Micromet	46.211287	-89.475723	Lat, Long in degrees
FDP – Met	46.211315	-89.475816	Lat, Long in degrees
Camera	46.211202	-89.475790	Lat, Long in degrees
Staff Gauge	46.211194	-89.475904	Lat, Long in degrees
Outlet	46.211028	-89.469083	Lat, Long in degrees
FDP-Outlet	46.211145	-89.469123	Lat, Long in degrees
Inlet	46.210670	-89.469123	Lat, Long in degrees
FDP-Inlet	46.210765	-89.478692	Lat, Long in degrees
Aquatic Auxiliary Power Portal location	46.211199	-89.478420	Lat, Long in degrees
Aquatic Portal location	46.211199	-89.478420	Lat, Long in degrees

5.2. Round Lake EHS Summary Table

Site Component	Latitude	Longitude	Units
Sensor 1 (S1) location	45.516872°	-89.567511°	Lat, Long in degrees
Micromet	45.518273°	-89.567410°	Lat, Long in degrees
FDP – Met	45.518270°	-89.567554°	Lat, Long in degrees
Camera	45.518004°	-89.567578°	Lat, Long in degrees
Staff Gauge	45.517795°	-89.567750°	Lat, Long in degrees
Outlet	45.516881°	-89.569431°	Lat, Long in degrees
FDP-Outlet	45.516911°	-89.569617°	Lat, Long in degrees
Inlet	45.515936°	-89.565975°	Lat, Long in degrees
FDP-Inlet	45.515894°	-89.565742°	Lat, Long in degrees
Aquatic Auxiliary Power Portal location	45.518267°	-89.567595°	Lat, Long in degrees
Aquatic Portal location	45.518270°	-89.567578°	Lat, Long in degrees

6. APPENDIX C. IT SUMMARY TABLES FOR AIS SITE COMPONENTS AT D05

6.1. Crampton Lake IT Summary Table

Site Component	Latitude	Longitude	Units
REQUIRED			
Aquatic Auxiliary Power Portal location	46.211199	-89.478420	Lat, Long in degrees
Aquatic Portal location	46.211199	-89.478420	Lat, Long in degrees
DESIRED			
Cell tower visible from site			Yes/no
Cell phone signal at site			Yes/no, which carrier?
Strength of cell phone signal			Description
Facility on property			Yes/no
Internet connectivity at facility			Yes/no, description
Phone number at facility location			Area code & first 3 needed

Site Component	Latitude	Longitude	Units
REQUIRED			
Aquatic Auxiliary Power Portal location	45.518267°	-89.567595°	Lat, Long in degrees
Aquatic Portal location	45.518270°	-89.567578°	Lat, Long in degrees
DESIRED			
Cell tower visible from site			Yes/no
Cell phone signal at site			Yes/no, which carrier?
Strength of cell phone signal			Description
Facility on property			Yes/no
Internet connectivity at facility			Yes/no, description

Phone number at facility location		Area code & first 3 needed

Round Lake IT Summary Table

7. Appendix D. Round Lake

The Round Lake site is a lake site and the relocatable for D5. Round Lake is a 6 ha, mesotrophic lake with a maximum depth of 4.5 meters It does stratify and has an unknown thermocline. The lake likely goes anoxic (< 2 mg L^{-1}) at the bottom in the summer months. The lake is located in a region of primarily hardwood and mixed forests and some coniferous forests. Bed sediments at Round Lake are 65% sand, 15% gravel, 0% rock, and 20% muck according to Wisconsin DNR (http://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=1014500). The general slope into the lake is 50 to 60^{o} (120-130^{o} bank angle on the south side and 170^{o} on the north side).

7.1.1. Aquatic Auxiliary and Aquatic Portal Locations for Construction

The initial estimated locations for the Aquatic Auxiliary Portal and the Aquatic Portal, which are coincident, are illustrated in Figure 1, with lat-long coordinates presented in Tables 8 and 9**.** Final location for the Aquatic Portal will be determined by FCC. The location presented here is proposed following informal discussions with FCC and will need to be finalized once Round Lake is approved for NEON development.

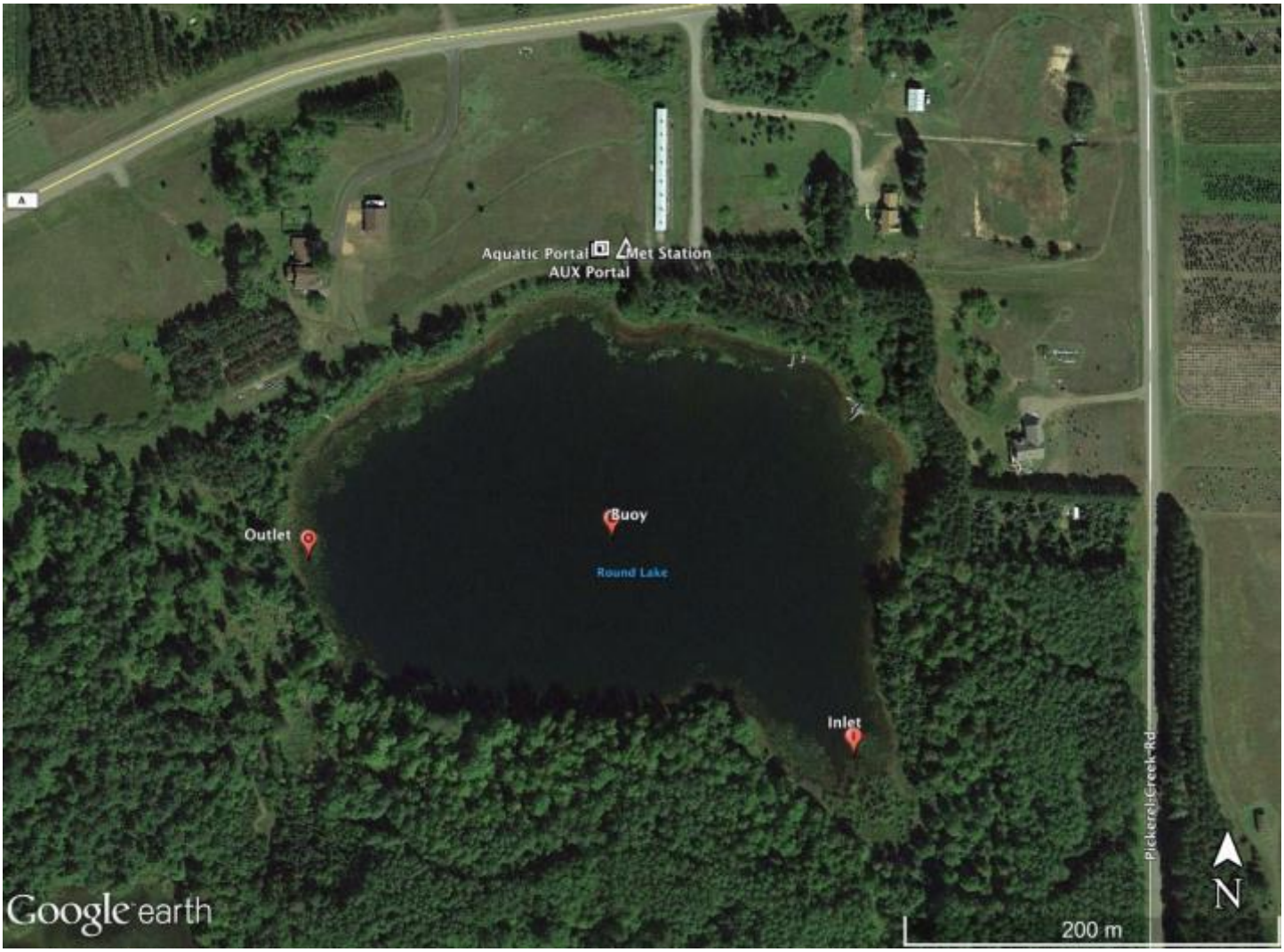

Figure 16 A Google-Earth-Derived Image of Aquatic Auxiliary Portal and Aquatic Portal for D05 Round Lake

Table 8 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	45.518267°	-89.567595°

Table 9 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	45.518270°	-89.567578°

7.1.2. Sensor Locations for Construction

AQU, with support from EHS, has the GPS coordinates presented in Tables 10 and 11 for S1 (buoy), pressure sensor, micromet station, camera, staff gauge and inlet/outlet locations; graphically illustrated in Figure 17. Many aquatic sites are in narrow canyons or covered by dense canopy, which reduces satellite availability. In these situations, AQU will provide a description of the location and an approximate GPS location (e.g., not accurate to within <1m). This description will suffice for the planning stages, but sites will likely need to be physically marked prior to construction.

Round Lake has forested shores and will require the field device posts to be placed using the solution developed for Suggs Lake in D03. This solution involves placing the solar panel on lake-based infrastructure and a battery and radio on the nearby shore.

These coordinates are to be used for the input to the AIS design:

Table 10 Sensor 1 Location

Sensor	Latitude	Longitude
S1	45.516872°	-89.567511°

Table 11 Micromet & Inlet/Outlet Locations

Sensor	Latitude	Longitude
Micromet	45.518273°	-89.567410°
FDP – Met	45.518270°	-89.567554°
Camera	45.518004°	-89.567578°
Staff Gauge	45.517795°	-89.567750°
Outlet	45.516881°	-89.5694301°
FDP-Outlet	45.516911°	-89.569617°
Inlet	45.515936°	-89.565975°
FDP-Inlet	45.515894°	-89.565742°

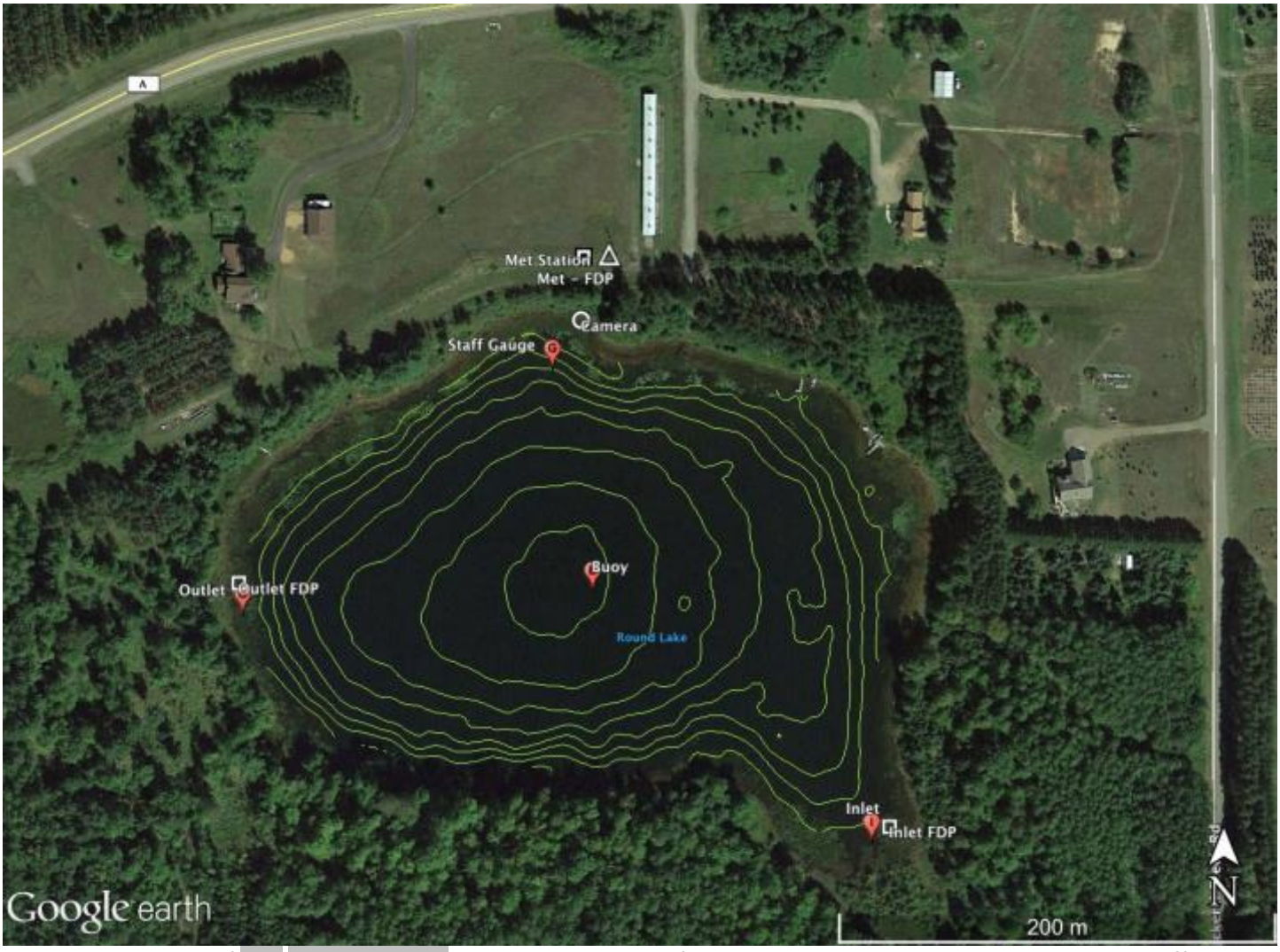

Figure 17 Kmz File of D05 Crampton Lake Denoting Locations of S1, Inlet, Outlet, Met Station, Camera and Staff Gauge, as well as associated field device posts (FDP).

Round Lake has a public boat launch and access which are shown in Figure 18. This access is sufficient for the buoy and trailer.

Figure 18 Photo of lake access at D05 Round Lake

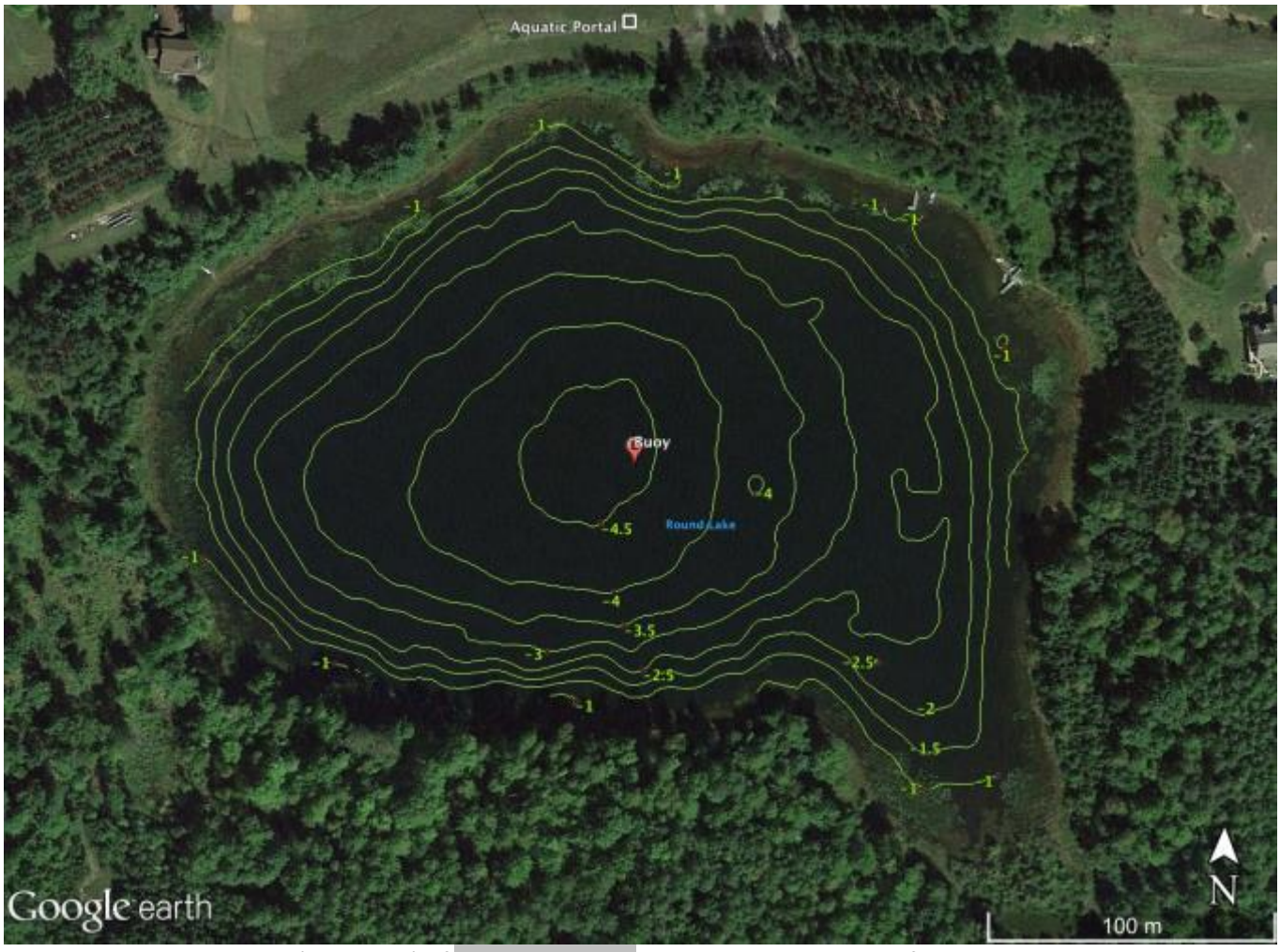

Figure 19 Bathymetric map (in meters) of D05 Round Lake showing the locations of the inlet and as well as the buoy location.

Figure 20 Photo of Bank Angle and Vegetation at D05 Round Lake

7.1.3. Groundwater Wells

Groundwater well locations are shown Figure 21 with the coordinates provided in Table 12 below.

Figure 21 Initial Groundwater Well Locations Based on EMS kmz File at D05 Round Lake

Table 12 Name and location of groundwater wells at **D05 Round Lake.**

Well ID	Latitude	Longitude
D05-ROLA-OW-01	45.517276°	-89.569812°
D05-ROLA-OW-02	45.517075°	-89.570386°
D05-ROLA-OW-03	45.516562°	-89.569781°
D05-ROLA-OW-04	45.516024°	-89.569291°
D05-ROLA-OW-05	45.515545°	-89.566258°
D05-ROLA-OW-06	45.515229°	-89.565178°
D05-ROLA-OW-07	45.515644°	-89.565311°
D05-ROLA-OW-08	45.517967°	-89.566643°

7.1.4. Riparian Vegetation Cover

During 2015 site visits, the following plant density and type were observed by the AQU team:

a)

b)

Figure 21 The Riparian Canopy at D05 Round Lake divided into trees (a, background), shrub/scrub (b) and aquatic littoral vegetation (a, foreground).

The primary vegetation types can be divided into the following three categories:

g. Trees

Primarily hardwood (white pine, red alder) and mixed forests and some coniferous forests (white and black spruce).

h. Shrubs/Scrub

i. Aquatic Littoral Vegetation

7.1.5. Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

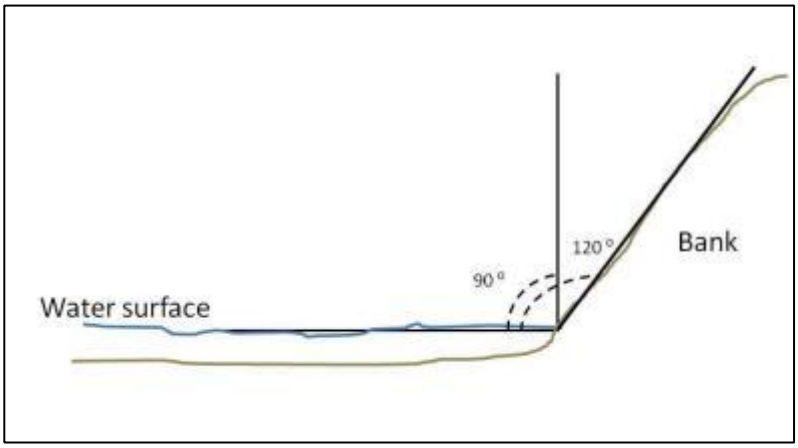

Figure 22 How Bank Angle is measured

During 2011 site visits, AQU observed the following bank conditions.

Table 13 Bank Conditions at D05 Round Lake In 2015

Morphology Type	Lake Wide
Average bank angle	North side: 170 ° South side: 120 to 130 °
Bankful length	223 m
Bankful width	314 m
Lake Area	6 ha
Substrate composition	Sand, gravel and muck.

7.1.6. Site Photos

The following photos of are representative of the site.

Figure 23 Typical aquatic vegetation in shallow areas of D05 Round Lake

Figure 24 Typical riparian vegetation at D05 Round Lake

Figure 25 Looking from the boat ramp at the south shore of D05 Round Lake

Figure 26 Looking from south shore towards north shore of D05 Round Lake

7.1.7. Site Access Needs

Access considerations for D05 Round Lake will be different for different Aquatic Portal and Met Station locations. As of December 2015, the Met Station and Aquatic Portal are planned for the north shore near the public access boat launch. This will not require additional access. If the location is changed for permitting reasons, an unimproved pathway may be required.

No further boardwalks, stairs, or ladders are needed at D05 Round Lake for Science purposes.

7.1.8. Communications at the Site

The local communications company is Wisconsin Publica Service (WPS).

7.1.9. Power at the Site

The local power utility company is WPS. 877-444-0888. Site Science Construction Constraints and Limitations
Site-specific issues to consider at D05 Round Lake are:

- The Met Station and Aquatic Portal are located on private land. The location best represents the weather conditions that affect the surface of the lake. Other locations on the south side of the lake would be unrepresentative of the conditions on the lake.

Driving and access constraints for D05 Round Lake are:

- Not applicable. Access to the lake is public.

7.1.10. Other Issues

No other science issues are identified at this time.