

Appendix B - General Engineering

1. GENERAL DESIGN CONSIDERATIONS

The proposed project is composed of the design of an in-lake sediment retention basin that will capture silt and increase the amount of aquatic wetlands. Three sites named 1, 2, and 3 were proposed from the initial investigation of aerial imagery and were determined by topography to minimize the length of the structure. A fourth site named 1A was recommended to the project team by the sponsor based on the concern of access and the need for a reduced amount of real estate acquisition.

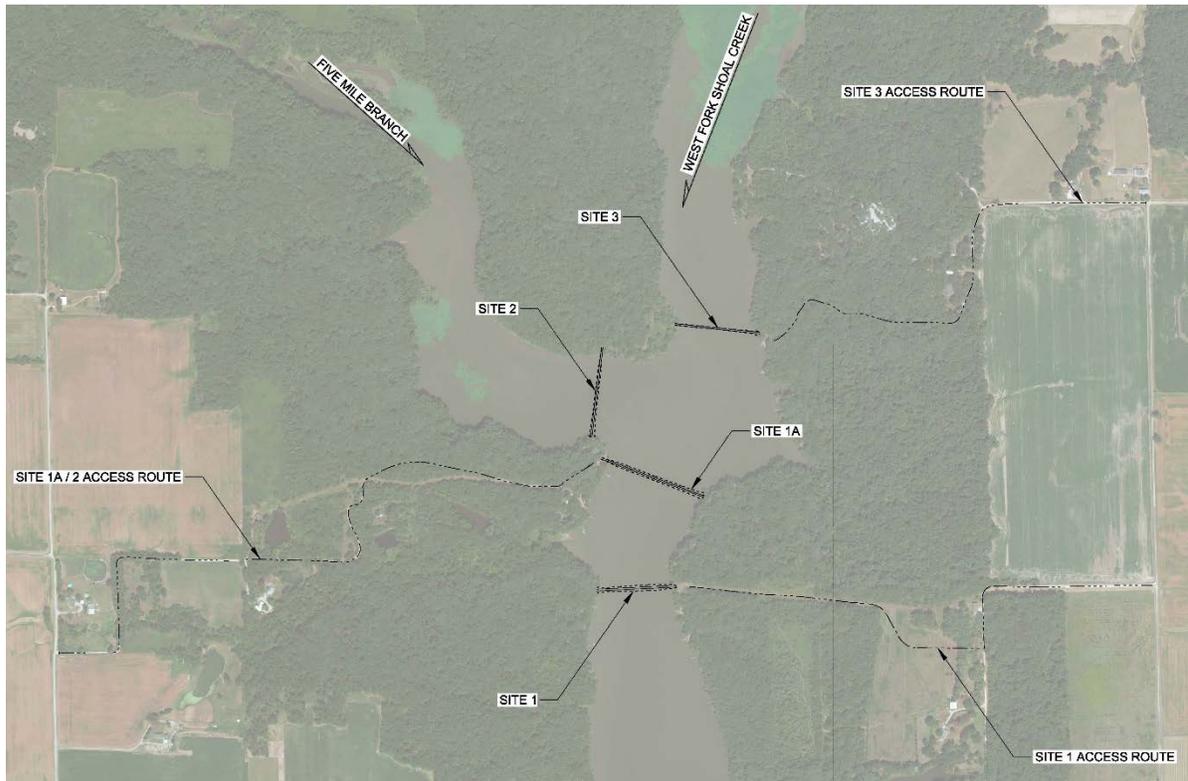


Figure 1: Site Locations



Figure 2: Site 1 Bankline



Figure 3: Site 1A Bankline

2. CONSTRUCTABILITY CONSIDERATIONS

2.1 Construction Access

The shoreline of the upper portion of Lake Lou Yaeger remains undeveloped with the exception of various camp sites with docks that are most only accessible by boat. The area is densely vegetated and the terrain near the lake is uneven. One of the major goals of the project was to minimize the impact to the existing ecosystem and existing cleared areas were explored for site access.

2.1.1 Site 1 Access

The proposed access to site 1 uses an existing road, a pasture, and a clearing in the vegetation for an electric line. The existing road is named Privacy Lane which is a privately owned gravel road that connects 3 residences to County Road 650 East. It is assumed that Privacy Lane will require improvement to sustain the transport of construction equipment and improvement upon completion of construction to restore the road to existing conditions. The remaining segment of access road will require the construction of a temporary gravel road across a pasture and existing clearing for an electric line that is an overhead line and turns into a buried line approximately 700 feet east of the lake. The access road will require grading to meet the maximum slopes allowed for construction equipment in EM 385-1-1 Section 4 and will also require a culvert to allow for drainage through a gulley during rain events. The width of the haul route is constrained by the terrain, vegetation and the powerline. The contractor will have room to construct turnouts or wider sections of haul route to allow for 2 way traffic passage but a full 2 way haul route would require the removal of long stretches of vegetation which will be avoided. The contractor will also need a method of communication between vehicles or a control plan to coordinate traffic through constrained areas. The access road will also require a temporary construction easement for approximately 1.3 acres of land



Figure 4: Site 1 Access Route

2.1.2 Sites 1A & 2 Access

The proposed access to sites 1A and 2 uses an existing road. The existing road is named Cemetery Lane which is a gravel road that connects 2 residences and a several of the lakes west bank camping sites to East 5th Road. Cemetery Lane is partially located on private land and the sponsor's property. It is assumed that the entire length of Cemetery Lane will require improvement to sustain the transport of construction equipment and improvement upon completion of construction to restore the road to existing conditions. At some locations the access road would require to allow for the passage of large construction equipment. The access road will also require a permanent construction easement for approximately 1.4 acres of land.



Figure 5: Sites 1A&2 Access Route

2.1.3 Site 3 Access

The proposed access to sites 3 uses an existing road and path to a boat ramp on the lake shoreline. The existing road is named North 18th Avenue which is a gravel road that connects several residences to County Road 650 East. North 18th Avenue is located on private land. It is assumed that the entire length of North 18th Avenue will require improvement to sustain the transport of construction equipment and improvement upon completion of construction to restore the road to existing conditions. The remaining segment of access road will require the construction of a temporary gravel road through an existing path through the wood line. A site visit to determine the condition of the road and path was not conducted because site 3 was eliminated from consideration prior to a site visit being completed.

2.2 Rock Berm Design Considerations

The results from the average flow velocity data calculated from steady-flow hydraulic modeling was used to determine the design average flow velocity. A wide range of flow

rates moving through the lake were modeled. The selected design velocity was 10 feet per second. This is an average flow velocity was used for initial riprap sizing. However, unsteady-flow hydraulic modeling of a flood event is recommended to better determine the flow velocities at the in-lake berm. It is recommended that unsteady-flow hydraulic modeling of a significant flood event entering the lake be developed for the case in which the lake elevation is at the level of the annual winter drawdown. This case may result in the highest likely flow velocity at the in-lake berm.

The product delivery team referenced EM 1110-2-1601, “Hydraulic Design of Flood Control Channels” for designing the in-lake berm riprap. It was assumed that this scenario would also develop turbulent flows within the in-lake berm.

The proposed riprap gradation selected by the product delivery team was a 1000 pound top size gradation. The riprap meets gradation requirements of LMVD, “Report on Standardization of Riprap Gradation,” revised March 1989. Gradation of riprap material is as follows:

1000-Pound Top Size Riprap

<u>Percent Lighter by Weight</u>	<u>Limits of Stone Weight, lb.</u>
100	1000-400
50	430-200
15	210-60

Given the assumption that the lake bottom is comprised of soft sediments, a bedding filter layer was not designed. The product delivery team expects that during placement of the required riprap quantities that a filter layer would be lost into the soft lake bottom. This would make the filter layer ineffective. Furthermore, it was assumed that 50% of the riprap volume placed for the in-lake berm would be lost or settle into the lake bottom during construction.

The proposed design for the in-lake berm is to have a 10 foot wide crown and 1V:3H slopes. The 10 foot crown was selected to allow for the construction of the berm in wet conditions. It is assumed that the contractor will dump the required large stone with a smaller choke stone on top starting on one side of the lake and working across until the in-lake berm is complete. For quantity analysis it was assumed that up to 50% of the stone could settle into the lake bed during the construction of the berm. Therefore this additional material was factored into the quantities that were used to determine the cost estimate of the structure.

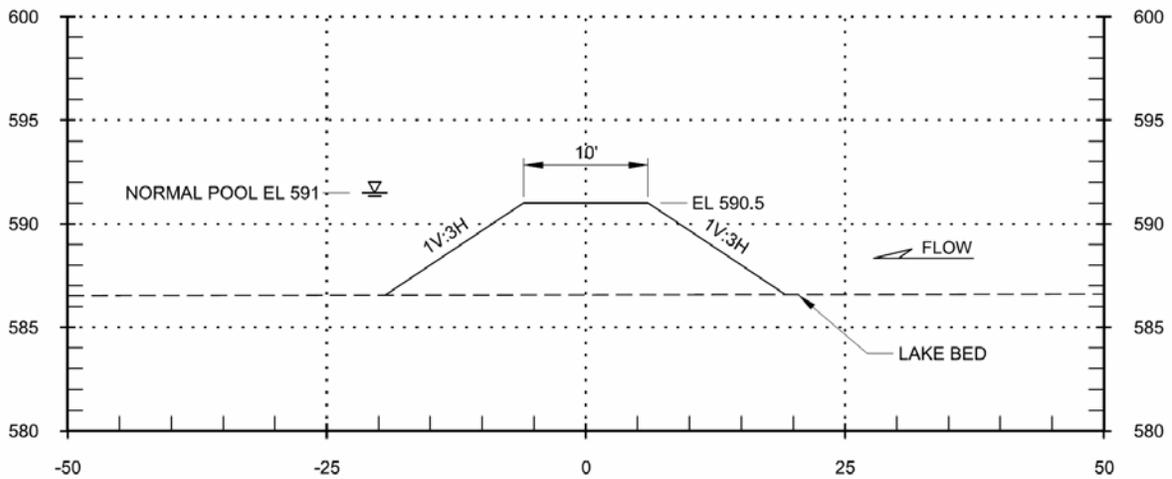


Figure 6: Typical Section

The top elevation of the in-lake berm is designed to be elevation 590.5 NAVD 88 based on hydraulic consideration. The elevation 591 NAVD 88 is 0.5 feet below the spillway elevation of the dam. The structure ties into the bank at elevation 596 NAVD 88 with a 1V:10H slope to keep the structure from being flanked during a high water event as shown in the figure below.

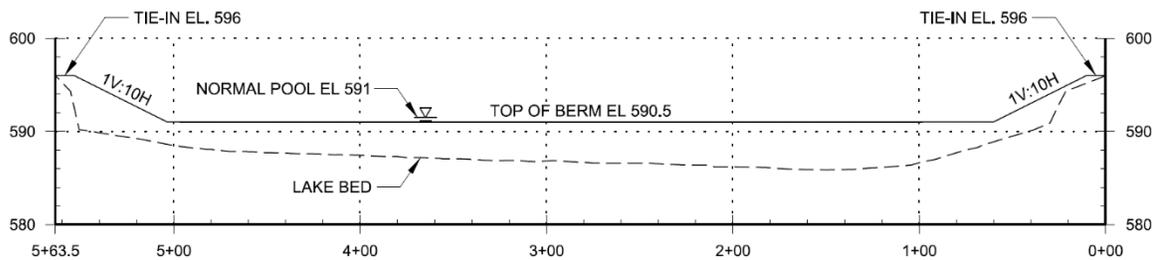


Figure 7: Site 1 Profile

2.3 Bankline Revetment

The bankline revetment was designed using ASCE Manuals and Reports on Engineering Practice No. 124: Inland Navigation Channel Training Works. The rock berm tie-in was similar to a dike bankhead and the bank paving option was more favorable than a root tie-in examples shown in Chapter 5. To determine the amount of downstream revetment the report suggests using the bank height multiplied by 3 for average conditions. The bank height of 8 feet was assumed to be the bottom of revetment key-in to the top of the structure tie-in. This

resulted in 24 feet which was rounded up to 25 feet of downstream paving. The report recommended the upstream paving not exceed the bank height therefore the 8 feet was rounded up to 10 feet. The revetment typical section is shown in the figure below.

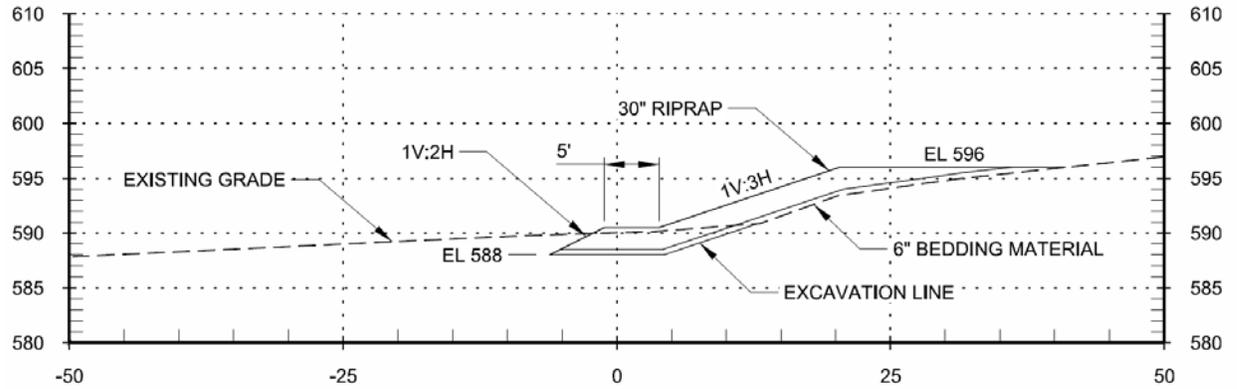


Figure 8: Revetment Typical Section

GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 1 TEMPORARY ACCESS ROAD OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY 1.3 ACRES
2. UTILITY LOCATIONS ARE APPROXIMATE



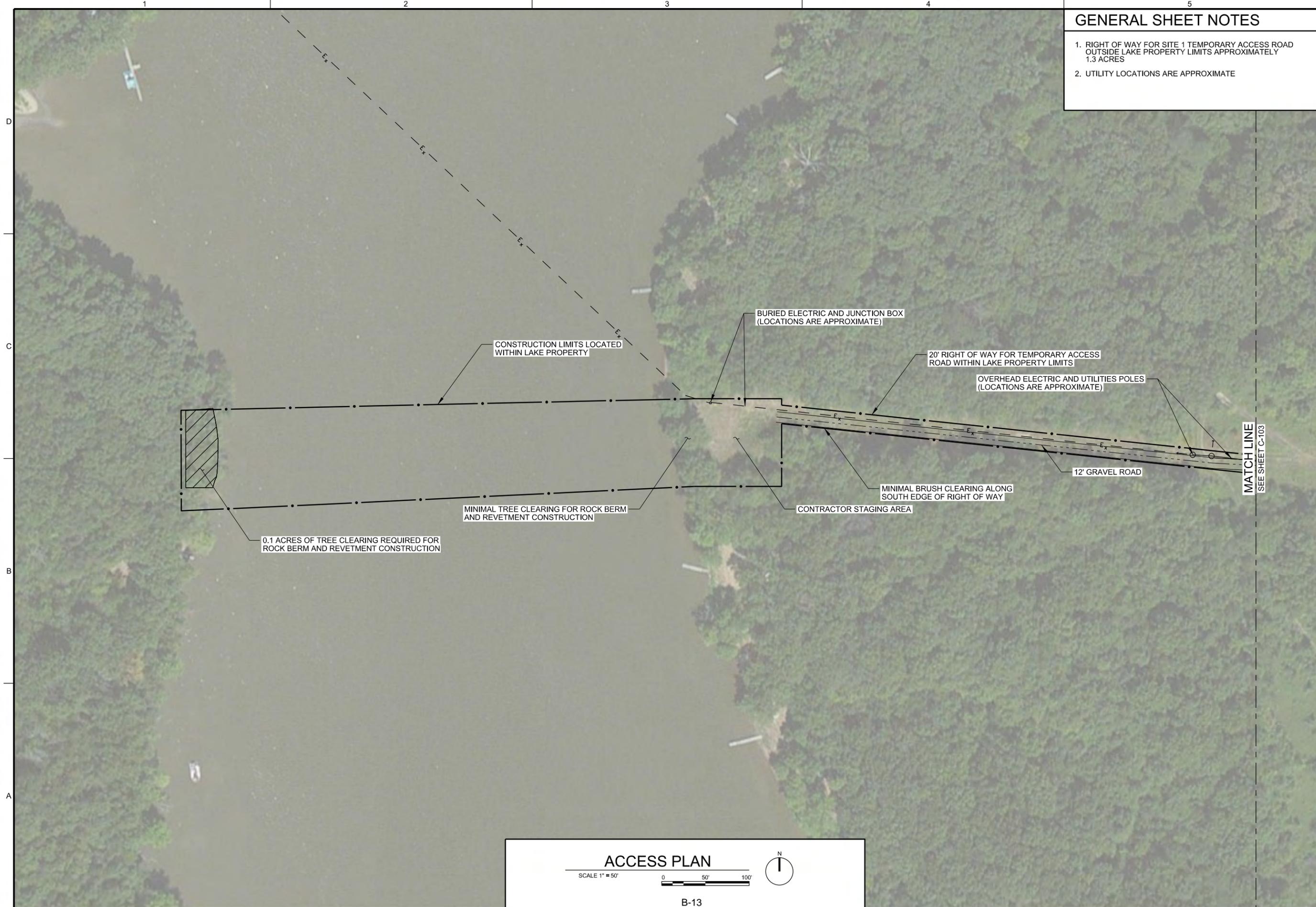
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LITCHFIELD, ILLINOIS

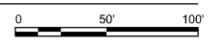
SITE 1 ACCESS PLAN
SHEET 1 OF 3

PLATE
C-102



ACCESS PLAN

SCALE 1" = 50'



B-13

GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 1 TEMPORARY ACCESS ROAD OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY 1.3 ACRES
2. UTILITY LOCATIONS ARE APPROXIMATE



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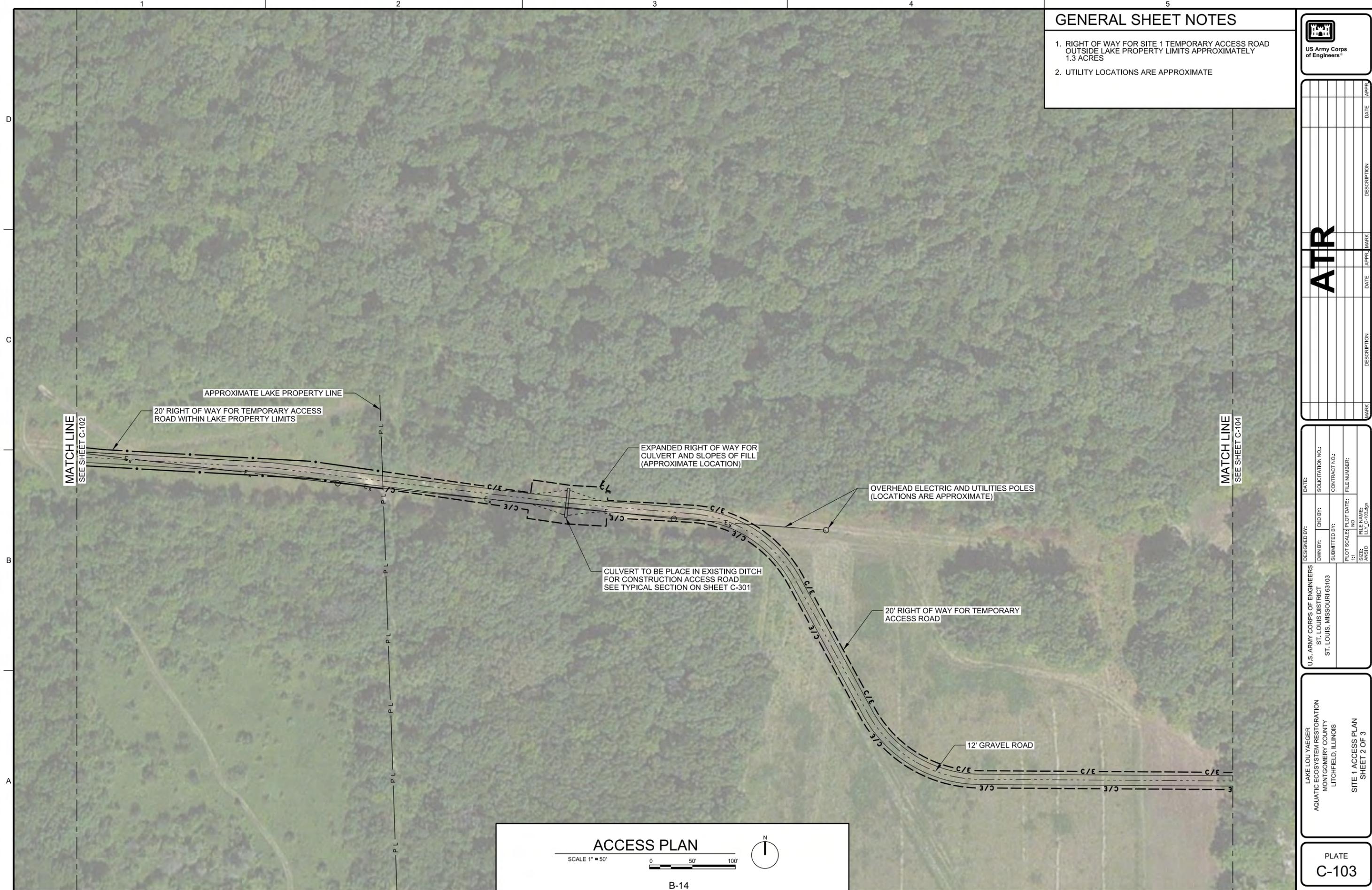
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SITE 1 ACCESS PLAN
SHEET 2 OF 3

PLATE
C-103



ACCESS PLAN

SCALE 1" = 50'

0 50' 100'

B-14



GENERAL SHEET NOTES

1. ALL ELEVATIONS ARE IN NORTH AMERICAN VERTICAL DATUM (N.A.V.D. 88)

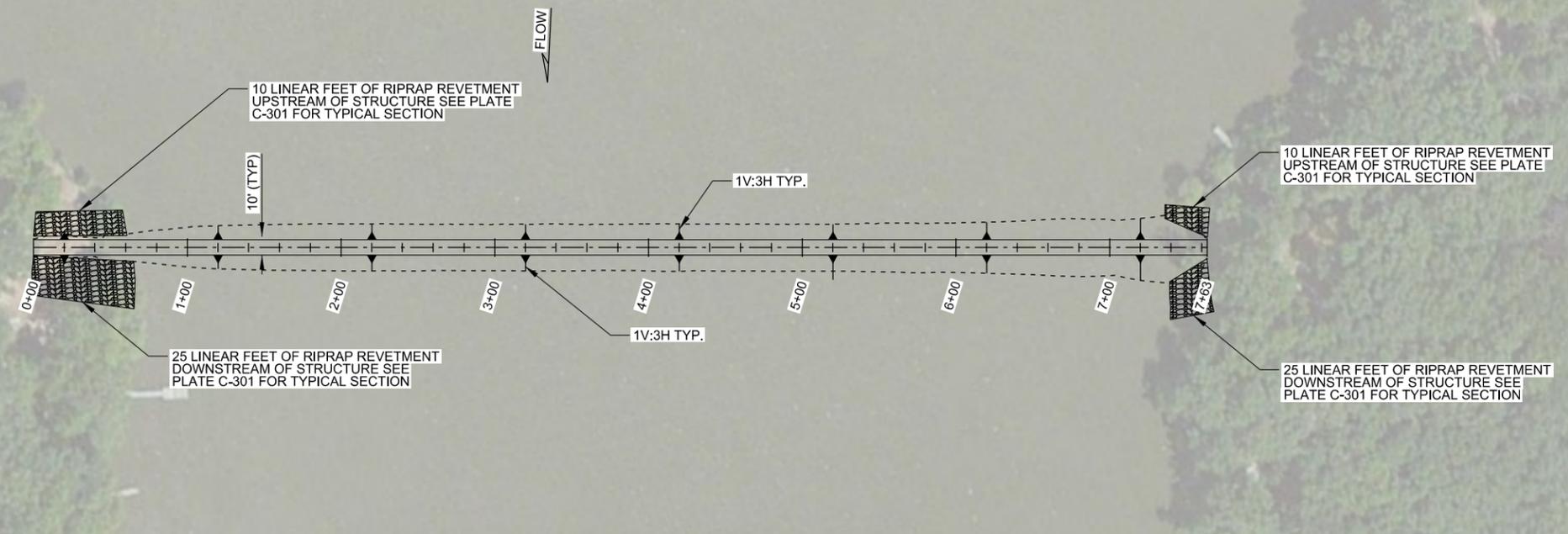


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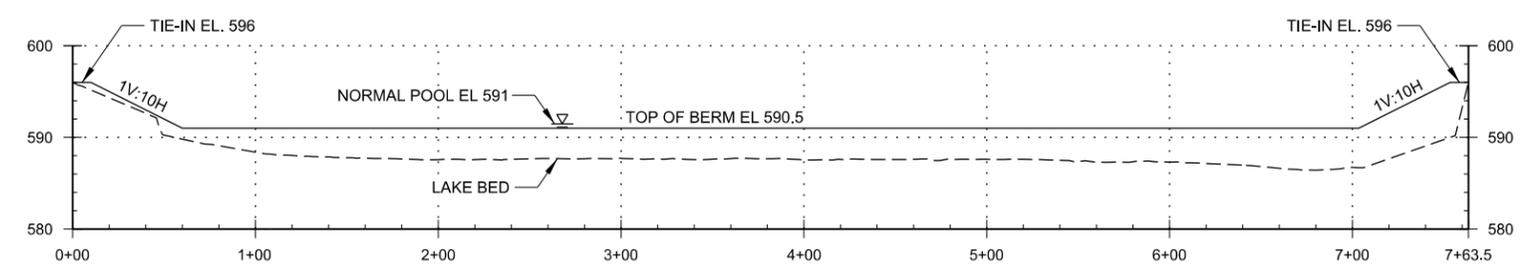
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SITE 1A PLAN AND PROFILE

PLATE
C-105



ROCK BERM PLAN
SCALE 1" = 50'



ROCK BERM PROFILE
HORIZ. SCALE 1" = 50' VERT. SCALE 1" = 10'

GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 1A TEMPORARY ACCESS ROAD
OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY
1.5 ACRES



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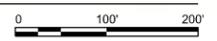
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SITE 1A ACCESS PLAN
SHEET 1 OF 2

PLATE
C-106



ACCESS PLAN

SCALE 1" = 100'



B-17

GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 1A TEMPORARY ACCESS ROAD OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY 1.5 ACRES
2. UTILITY LOCATIONS ARE APPROXIMATE



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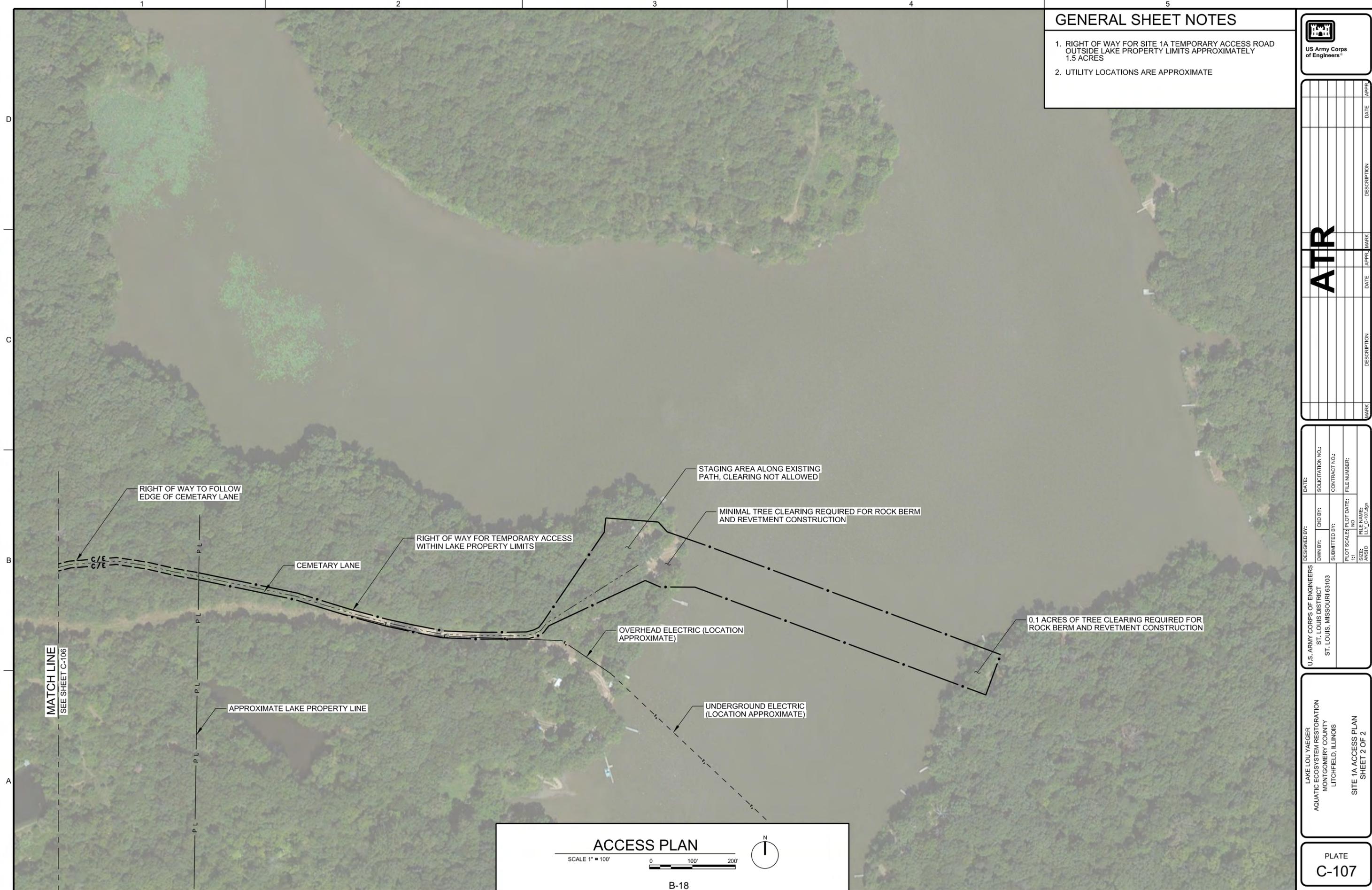
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 SITE 1A ACCESS PLAN
 SHEET 2 OF 2

PLATE
C-107

ACCESS PLAN

SCALE 1" = 100'

B-18



GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 2 TEMPORARY ACCESS ROAD
OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY
1.5 ACRES



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SITE 2 ACCESS PLAN
SHEET 1 OF 2

PLATE
C-109

ACCESS PLAN

SCALE 1" = 100'

0 100' 200'

N

B-19



GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 2 TEMPORARY ACCESS ROAD OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY 1.5 ACRES
2. UTILITY LOCATIONS ARE APPROXIMATE



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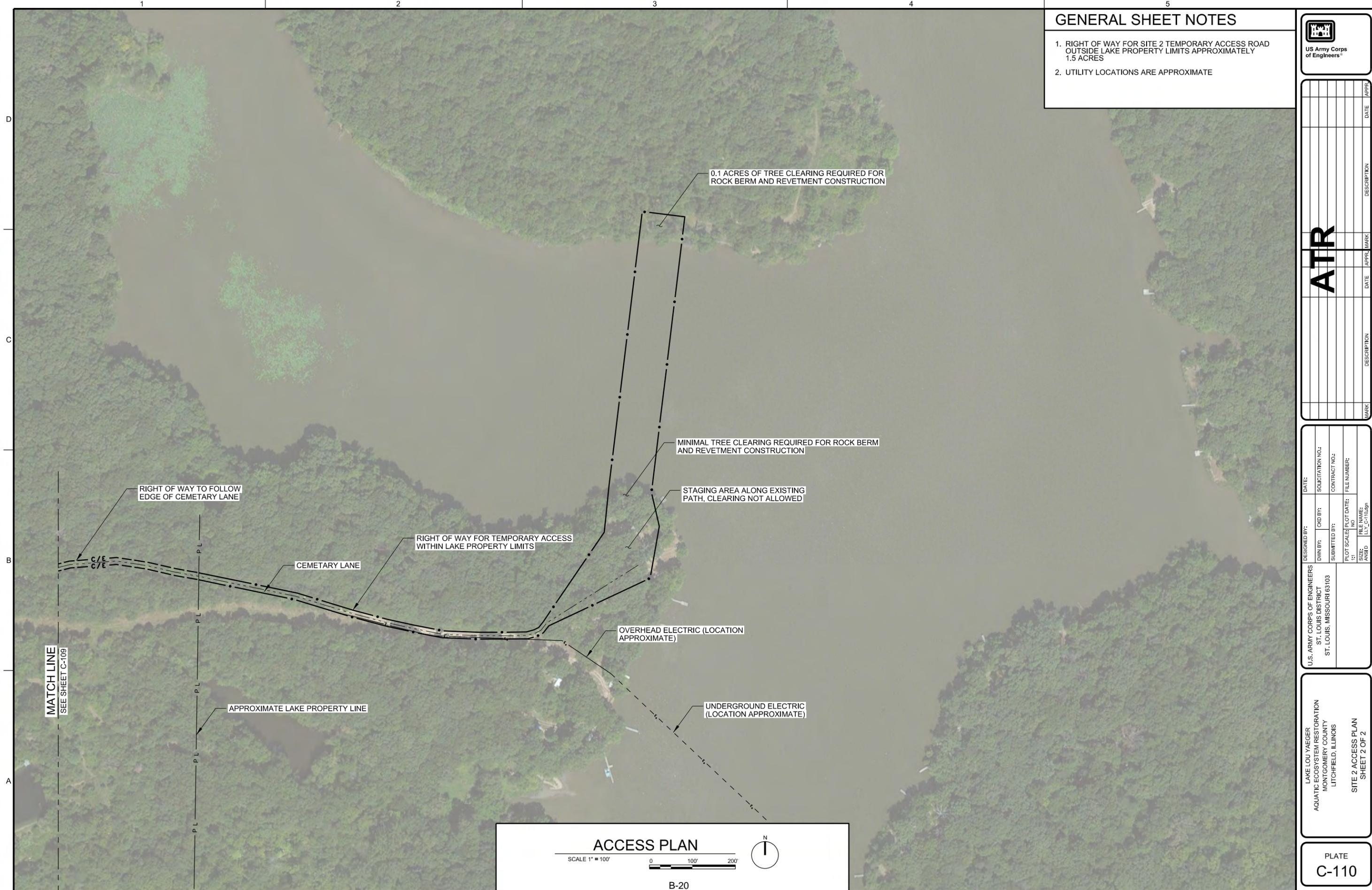
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SITE 2 ACCESS PLAN
SHEET 2 OF 2

PLATE
C-110

ACCESS PLAN

SCALE 1" = 100'

B-20



GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 3 TEMPORARY ACCESS ROAD
OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY
1.4 ACRES



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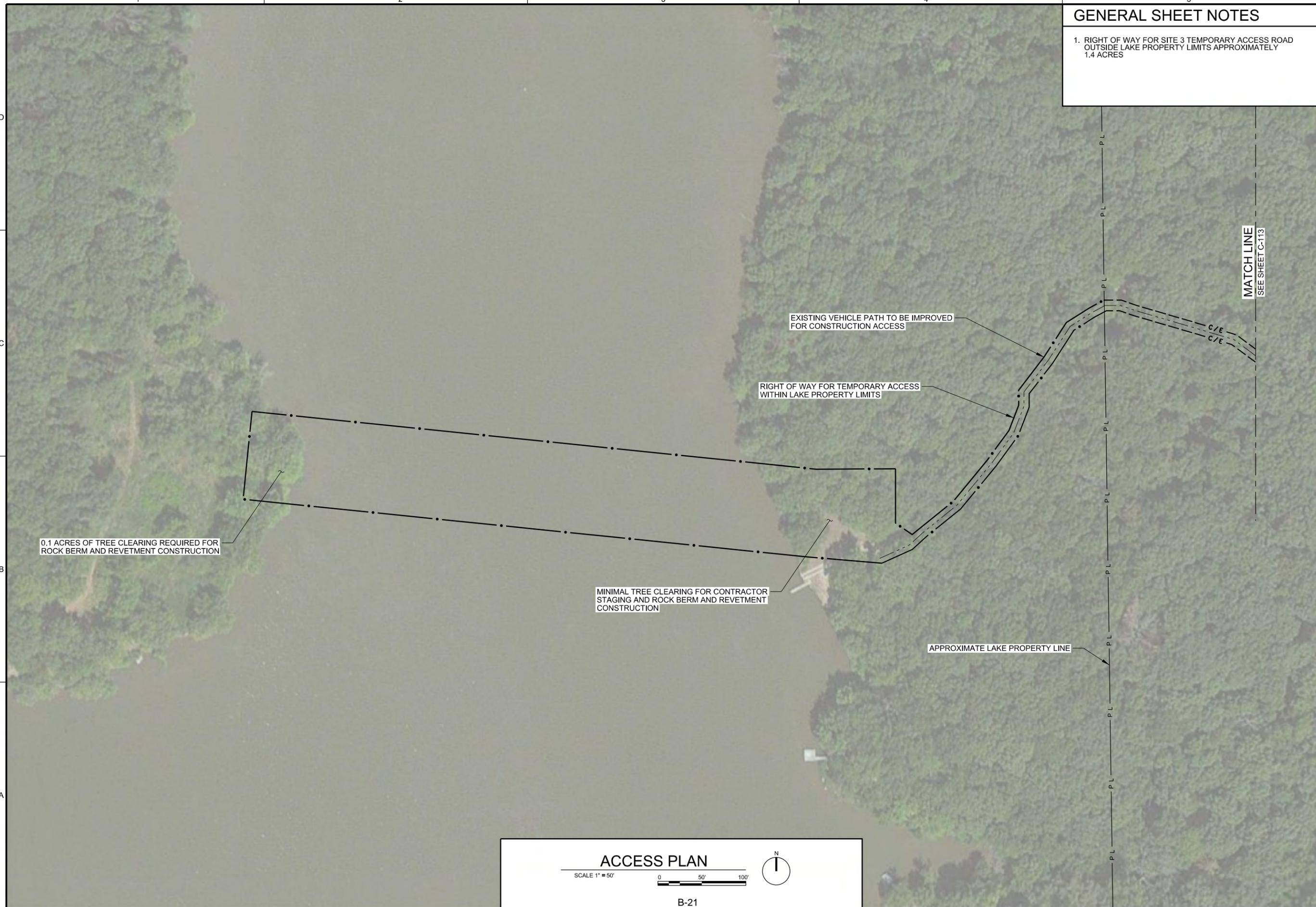
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SITE 3 ACCESS PLAN
SHEET 1 OF 3

PLATE
C-112

ACCESS PLAN

SCALE 1" = 50'

B-21



0.1 ACRES OF TREE CLEARING REQUIRED FOR
ROCK BERM AND REVETMENT CONSTRUCTION

MINIMAL TREE CLEARING FOR CONTRACTOR
STAGING AND ROCK BERM AND REVETMENT
CONSTRUCTION

RIGHT OF WAY FOR TEMPORARY ACCESS
WITHIN LAKE PROPERTY LIMITS

EXISTING VEHICLE PATH TO BE IMPROVED
FOR CONSTRUCTION ACCESS

APPROXIMATE LAKE PROPERTY LINE

MATCH LINE
SEE SHEET C-113

GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 3 TEMPORARY ACCESS ROAD
OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY
1.4 ACRES



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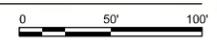
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SITE 3 ACCESS PLAN
SHEET 2 OF 3

PLATE
C-113



ACCESS PLAN

SCALE 1" = 50'



GENERAL SHEET NOTES

1. RIGHT OF WAY FOR SITE 3 TEMPORARY ACCESS ROAD
OUTSIDE LAKE PROPERTY LIMITS APPROXIMATELY
1.4 ACRES



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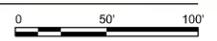
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SITE 3 ACCESS PLAN
SHEET 3 OF 3

PLATE
C-114



ACCESS PLAN

SCALE 1" = 50'



B-23

GENERAL SHEET NOTES

1. ELEVATIONS ARE IN NORTH AMERICAN VERTICAL DATUM (N.A.V.D. 88)



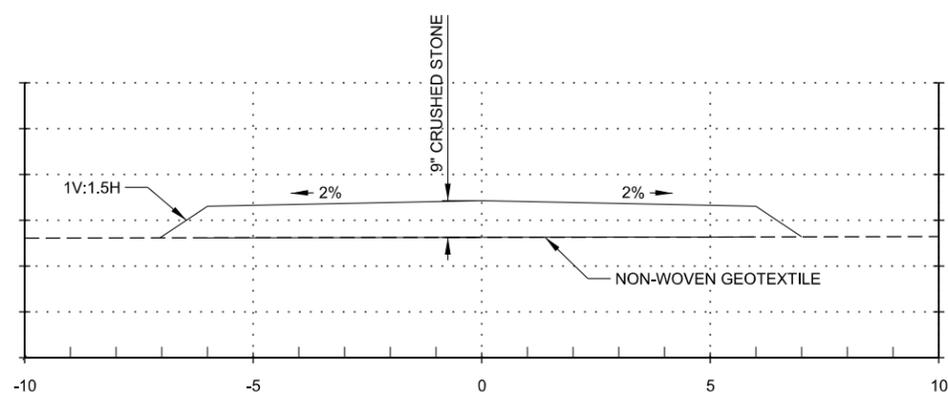
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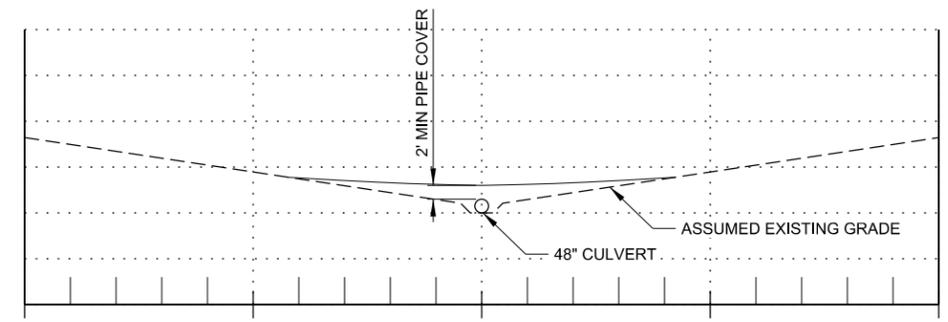
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TYPICAL SECTIONS

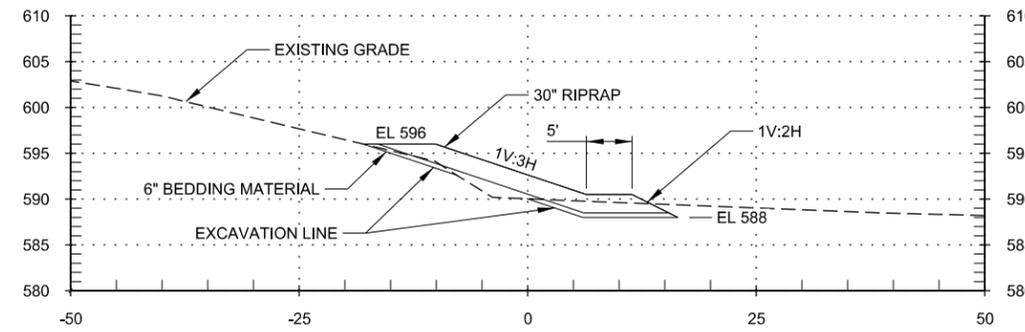
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C-301



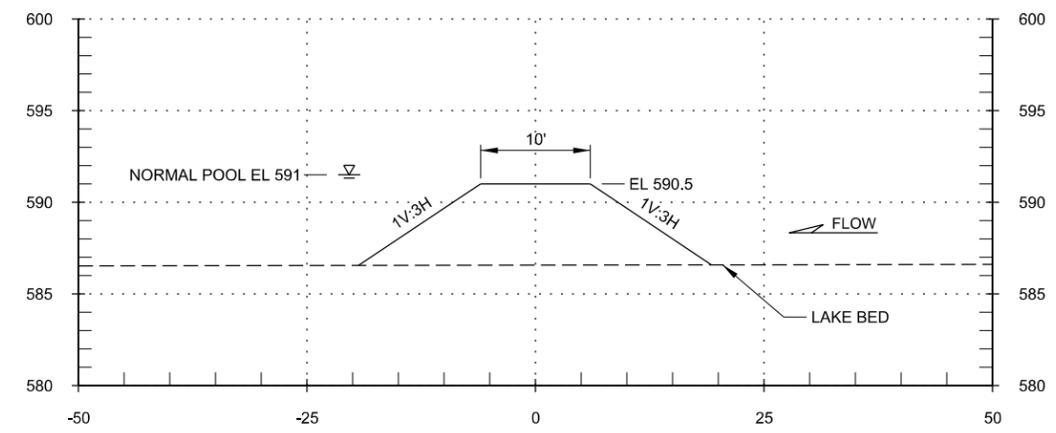
B3 ACCESS ROAD TYPICAL SECTION
SCALE NTS



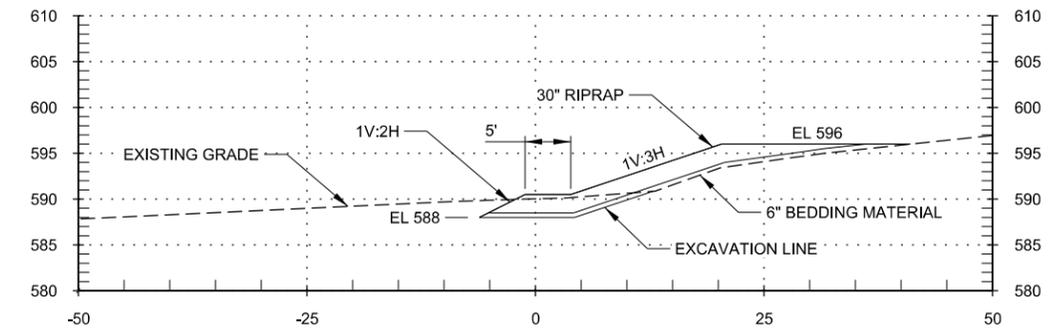
B3 ACCESS ROAD DITCH CROSSING
SCALE NTS



C2 WEST BANK REVETMENT
SCALE 1" = 10'



C3 ROCK BERM SECTION
HORIZ. SCALE 1" = 10' VERT. SCALE 1" = 5'



C4 EAST BANK REVETMENT
SCALE 1" = 10'