



**Natural
Resource
Technology**
AN OBG COMPANY



Fountain Lake Restoration Project

Rich Weber, NRT – WEDA Midwest Conference, March 8-10, 2017





AGENDA

Project History

Lake Modeling

Dredging Plan

Upland Sediment Placement Site

Agency Permitting and Public
Coordination

Project Status



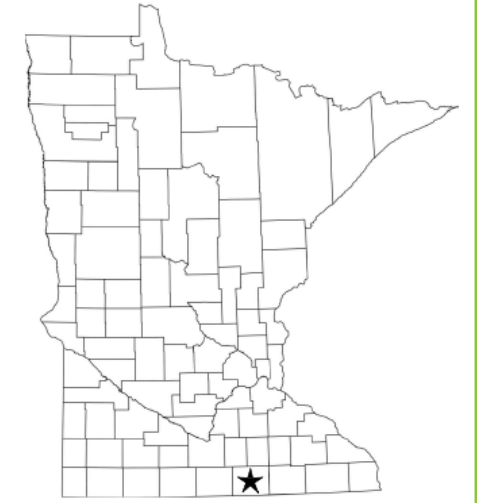
Shell Rock River Watershed District (SRRWD)

Established in 2003, governed by a Board of Managers, and accountable to the MN Board of Water and Soil Resources

Watershed covers 246 square miles in Freeborn County including 11 shallow lakes

Guided by a Water Management Plan to conserve and restore water resources

Funds come from property tax, 0.5% local sales tax (since 2005), and grants (\$7.5M for dredging appropriated from MN General Fund in 2014)

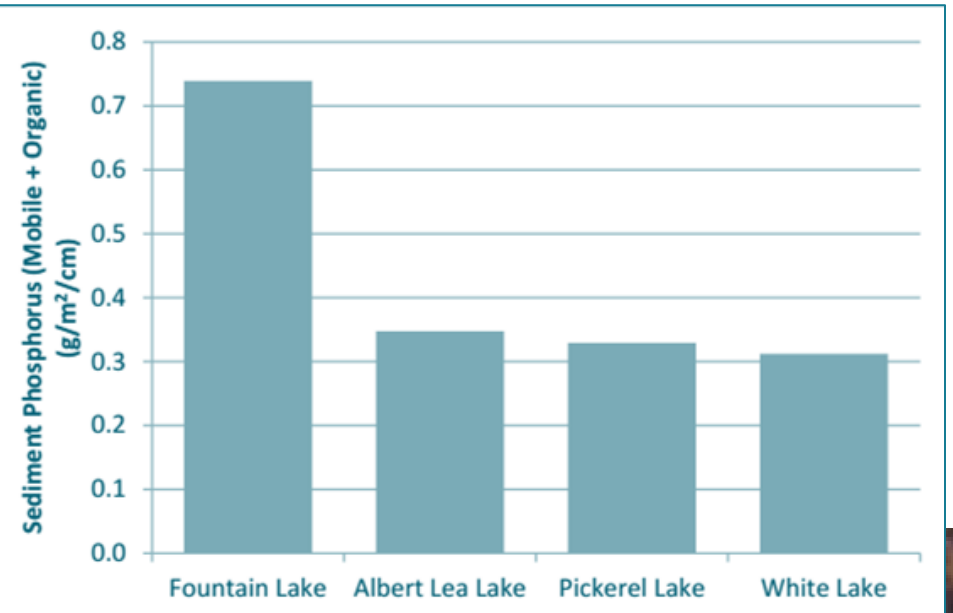


MINNESOTA

“SRRWD Mission is to implement reasonable and necessary improvements to the water-related and other natural resources of the district.”



Locate
Albert Lea



Fountain Lake Restoration Project

GOAL 1 Improve Lake Water Quality

Dredge accumulated
sediment

Reduce nutrient loads
to downstream
waterbodies

GOAL 2 Enhance Aquatic Habitat

Increase water depth
and clarity for
improved fish habitat

GOAL 3 Improved Recreational Opportunities

Improve water
clarity for improved
swimming

Increase water depth
for improved boating



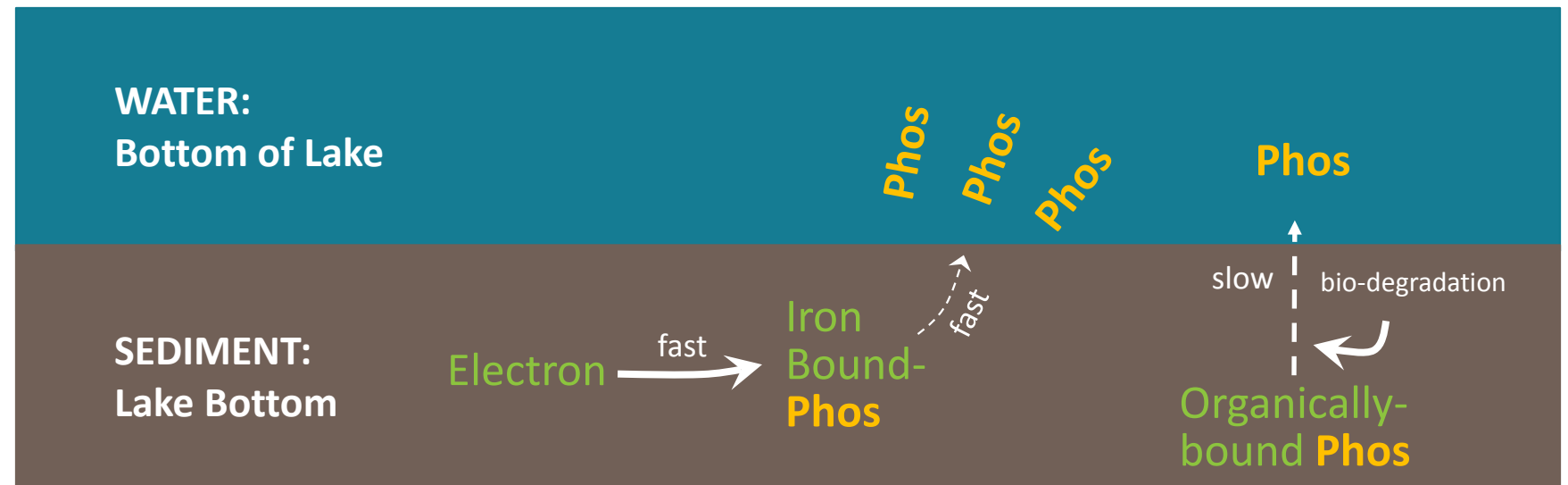
Phosphorous Loading

Mobile phosphorus (iron-bound)

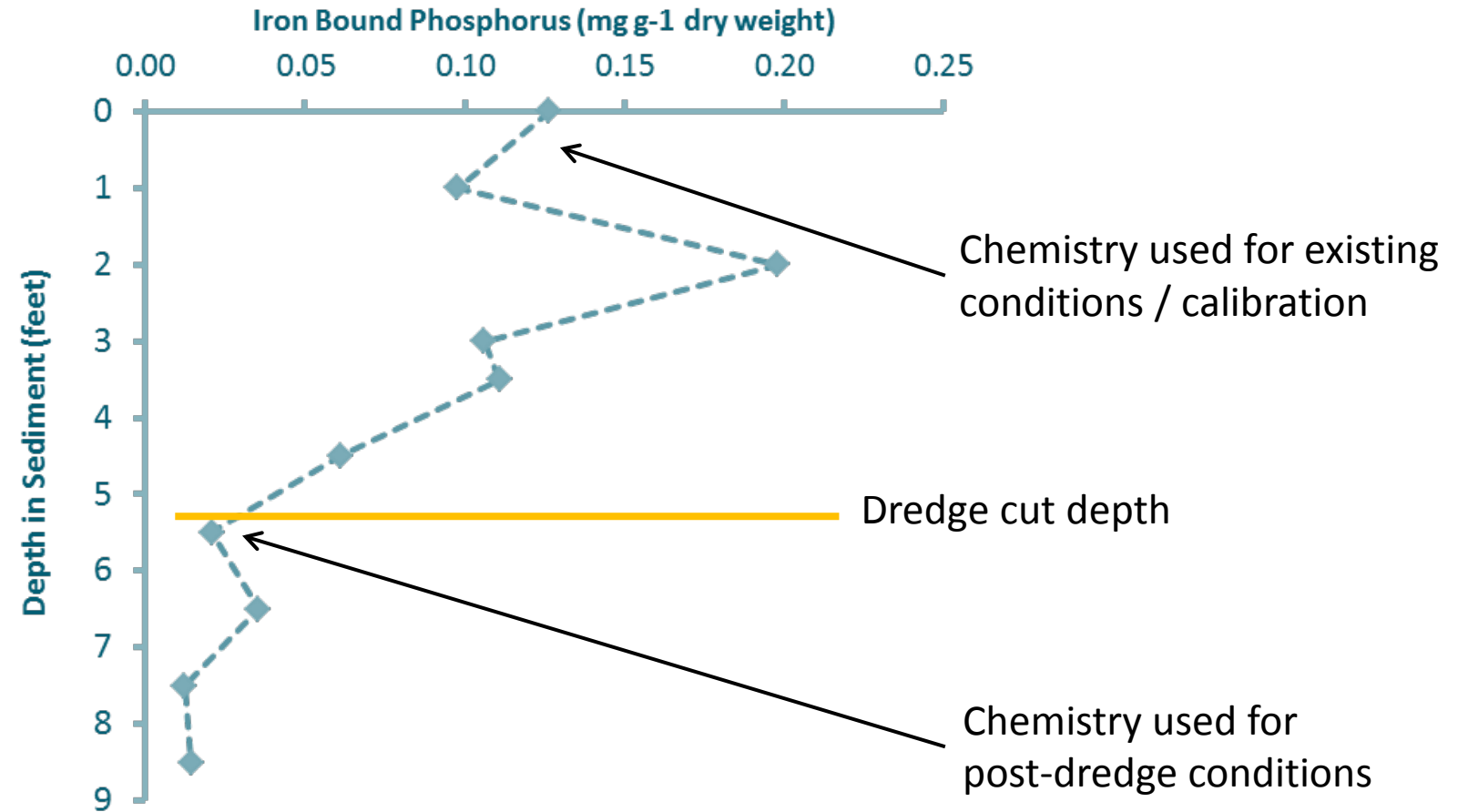
- Loosely bound and redox sensitive
- Released under anaerobic conditions
- **Primary source for internal loading**

Organically-bound phosphorus

- Released during biodegradation of organic phosphorus in sediment
- **Secondary source for internal loading**



Dredge Design – Sediment Chemistry



Lake Modeling – Dredge Benefits

Physical, chemical, and biological Lake processes are interrelated and complex

A hydrodynamic and ecological model is needed to **integrate and predict** potential water quality effects of dredging

With dredging/deepening of Fountain Lake: Increased lake volume, change in stratification, and new sediments with new chemistry exposed to water column

Provides a technical basis for Lake restoration planning

Lake Modeling – Delft 3D

Calibrate hydrodynamics and sediment transport

Calibrate water quality model – solids, nutrients, phytoplankton, DO, temperature

Use model to estimate effects of dredging – mobile and organic phosphorus concentrations; greater lake volume and depth



Modeled Effects of Dredging

Changes to bathymetry result in increased periods of thermal stratification

Increased periods of thermal stratification results in less mixing of the water column

Reductions in average and maximum summer total phosphorus concentrations

Reductions in the frequency and magnitude of phytoplankton blooms (chlorophyll a)

Increased average and maximum summer water clarity (Secchi disk depths)



Dredging Plan

Based on sediment phosphorus chemistry

Modified for constructability

Dredging ~50% of Lake surface area

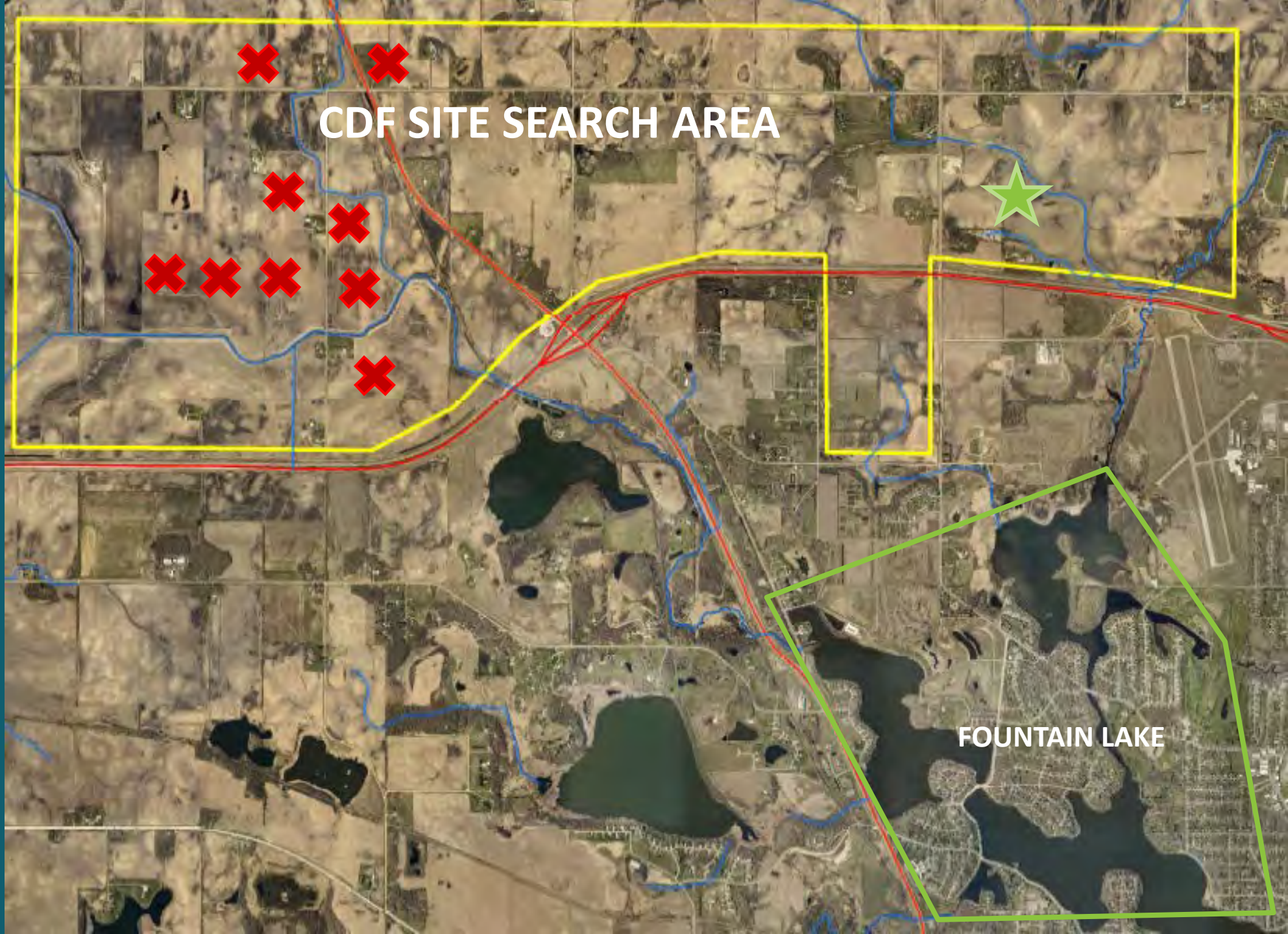
Total project volume of approximately
1.2 million CY

Average dredge cut ~3 ft

Design in permit review and subject to change



Sediment Placement Site



Sediment Placement Site

*Evaluated 9 parcels over 6 months in mid-2015 –
all were removed from consideration*

Presence of buried utilities

Unfavorable terrain

Difficult dredge pipeline route logistics

Unwilling landowners

Proximity of residences (high hazard dam classification)



Sediment Placement Site

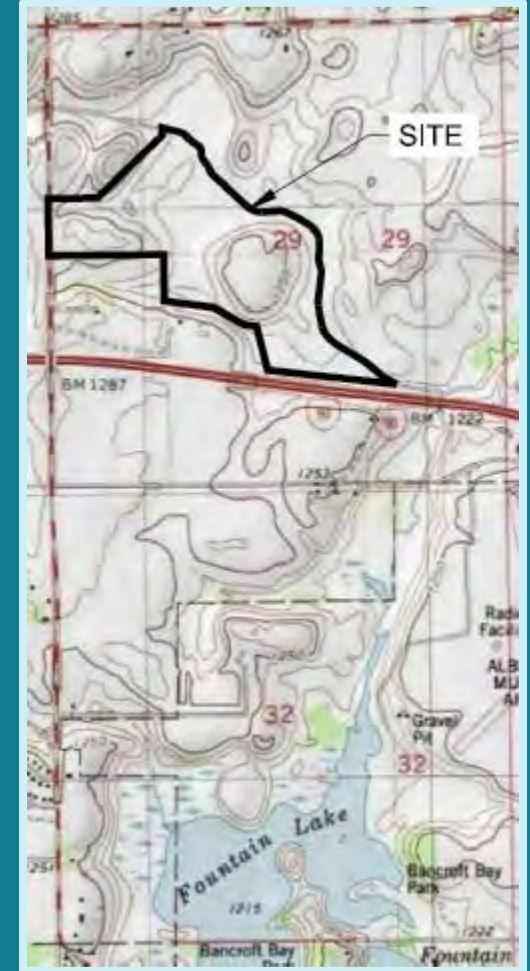
Located suitable site in late 2015 with interested and cooperative landowner

Within 3 miles of farthest dredge area in Fountain Lake

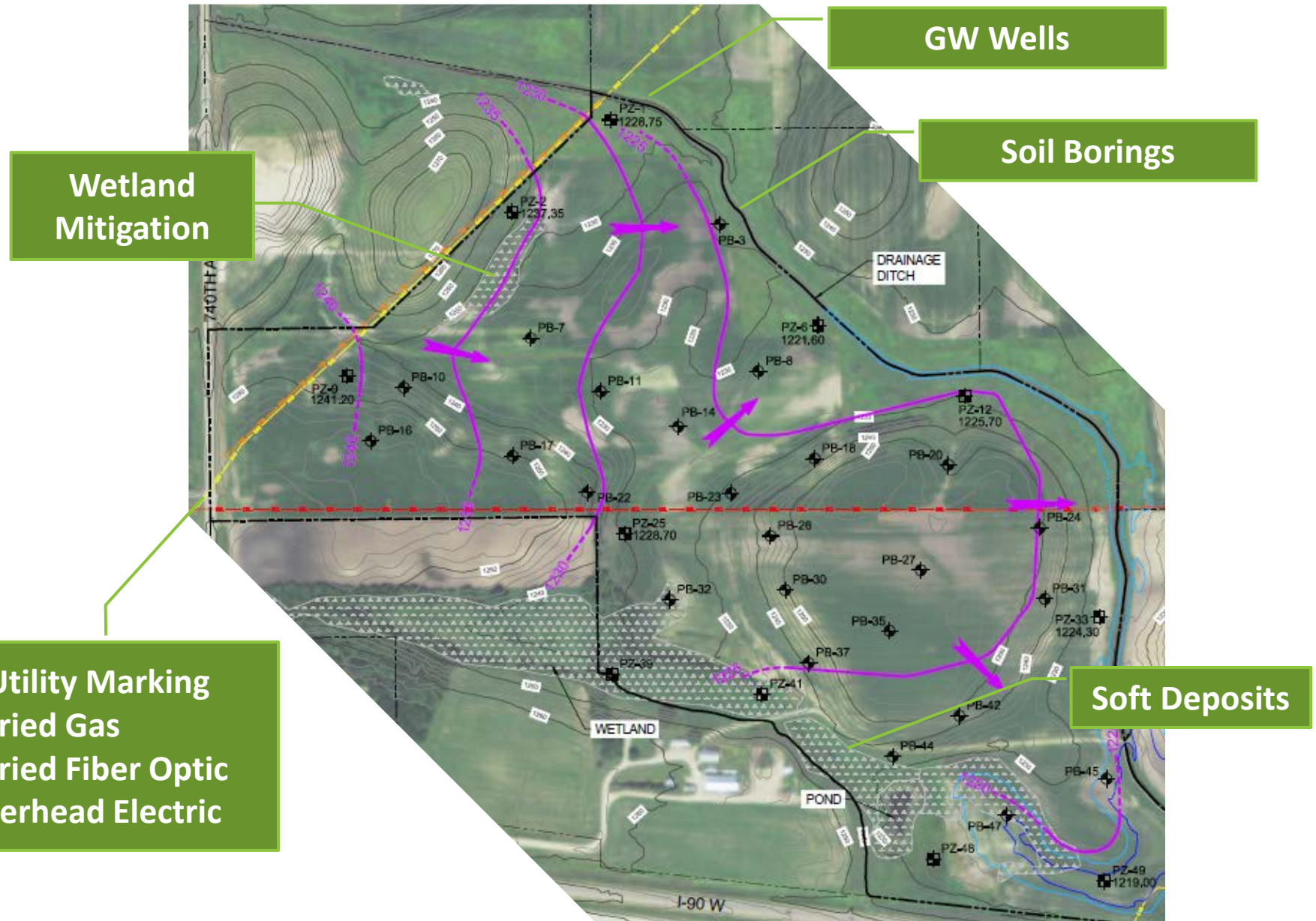
Located along existing drainage features for gravity flow of return water to Fountain Lake

Usable topography and low hazard for dam permitting

Willing landowner



Site Investigation



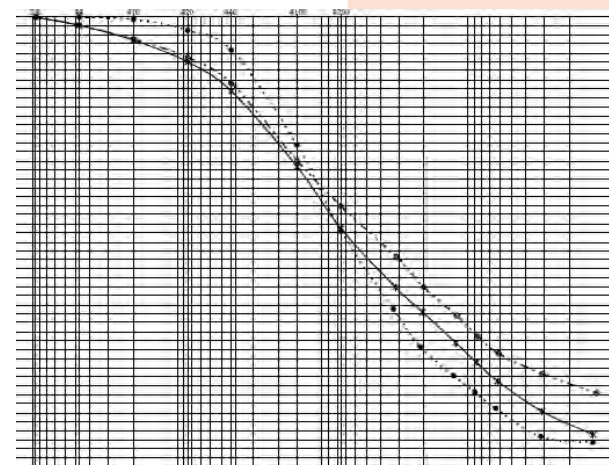
Geotechnical Testing

INDEX TESTS

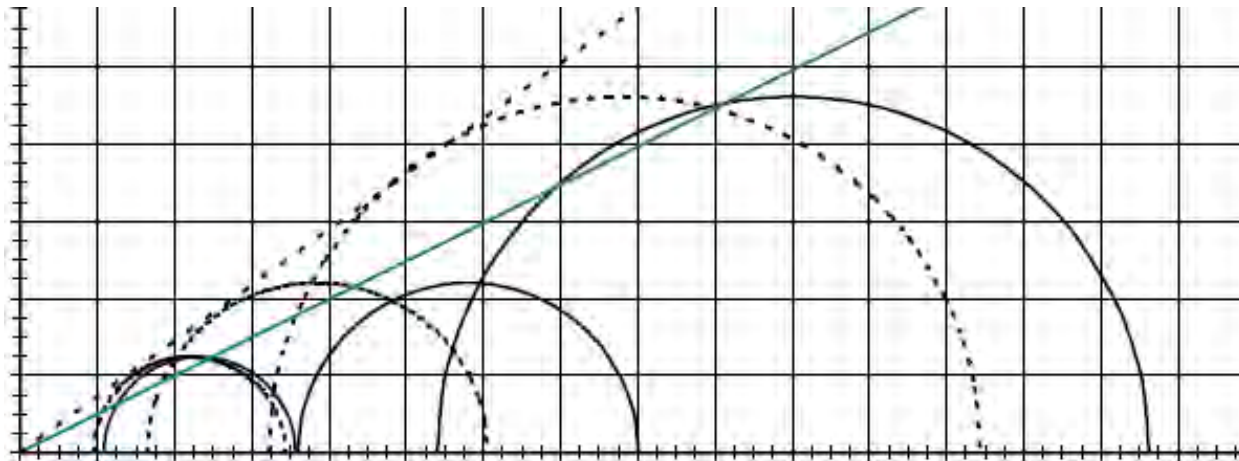
Moisture, Grain Size
Atterberg Limits
Loss-on-Ignition
Moisture-Density

STRENGTH TESTS

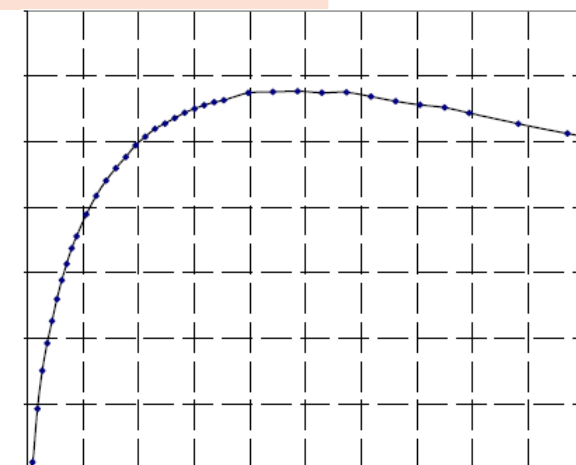
Unconfined Compression
Direct Shear
Triaxial Shear (UU & CU)
CONSOLIDATION TESTS



Grain Size Distribution



Triaxial Shear: CU with Pore Pressure



Unconfined Compression



CDF Design

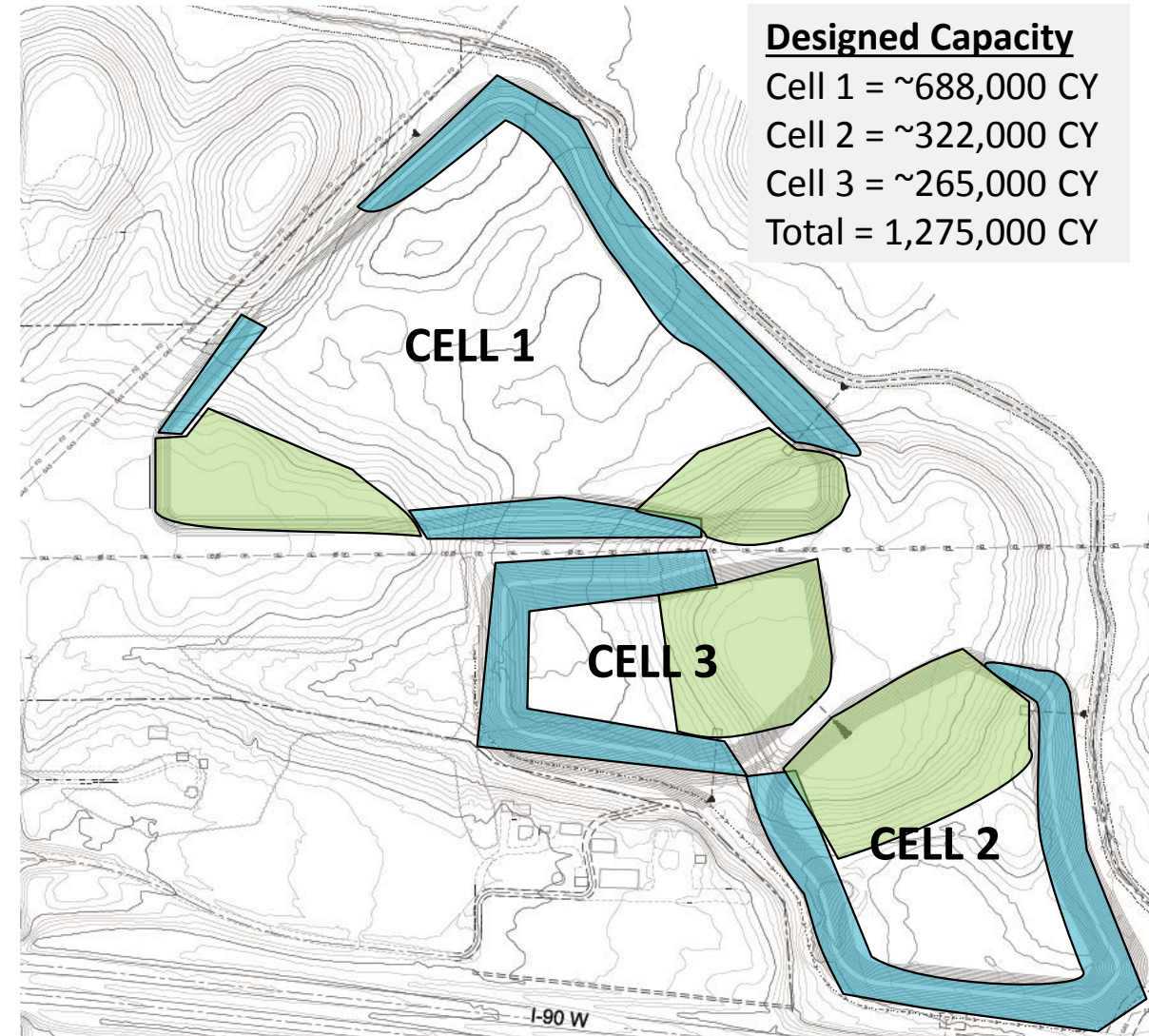
3-Cell system for phased permitting and construction

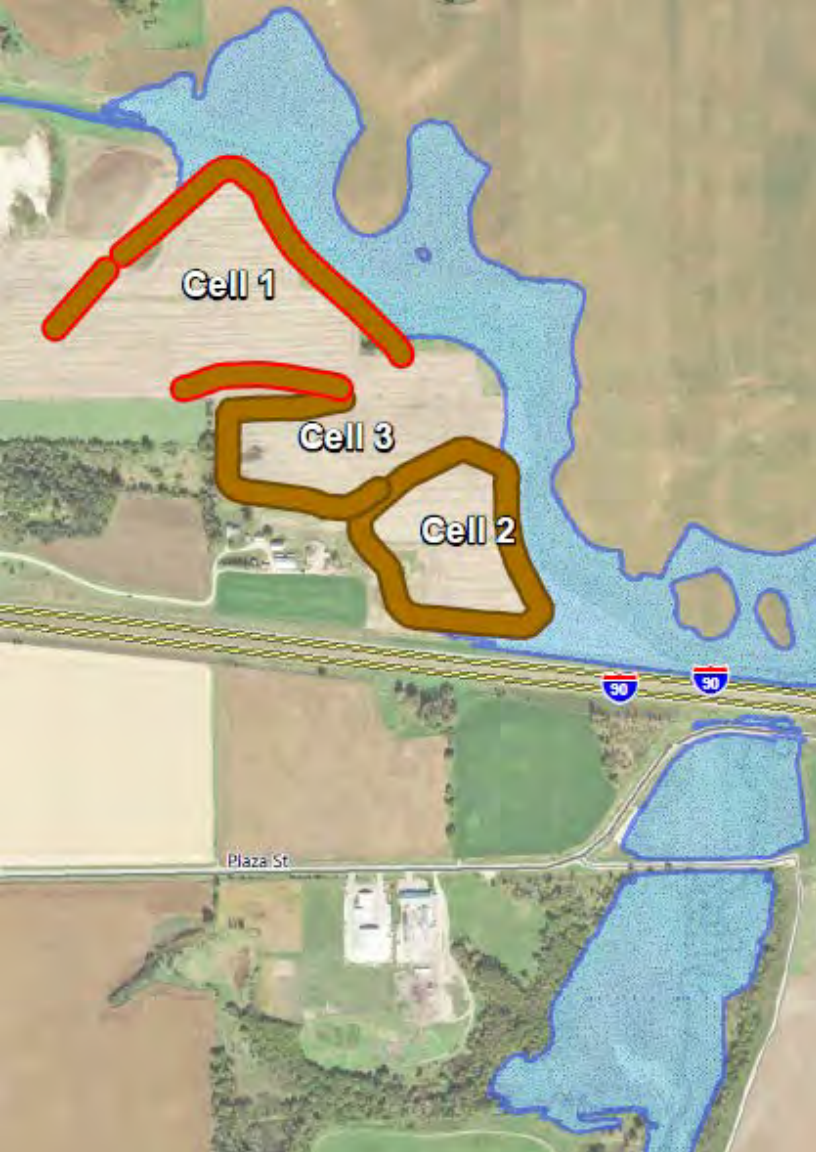
Configuration restricted by utilities, drainage ditch, and property lines

Make use of existing topography

Construct berms in low elevation

Tie into existing higher elevation





*Inundation Study Map; performed and prepared by
Barr Engineering*

Dam Safety

CDF regulated as a dam due to height of embankments and liquid storage capacity

Extensive permit submittal and review process

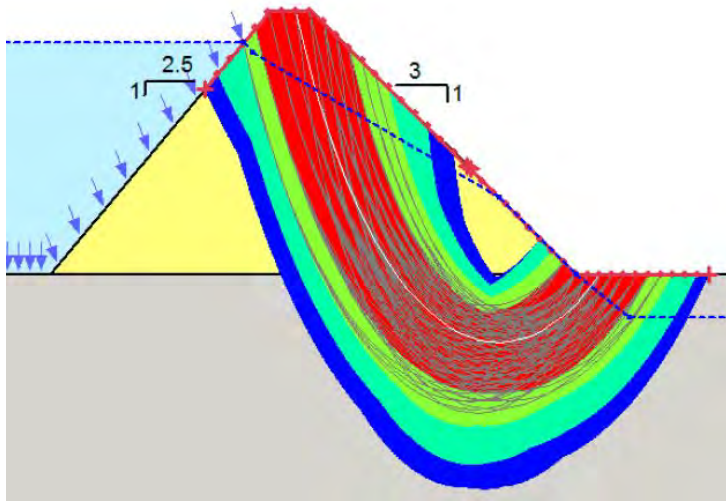
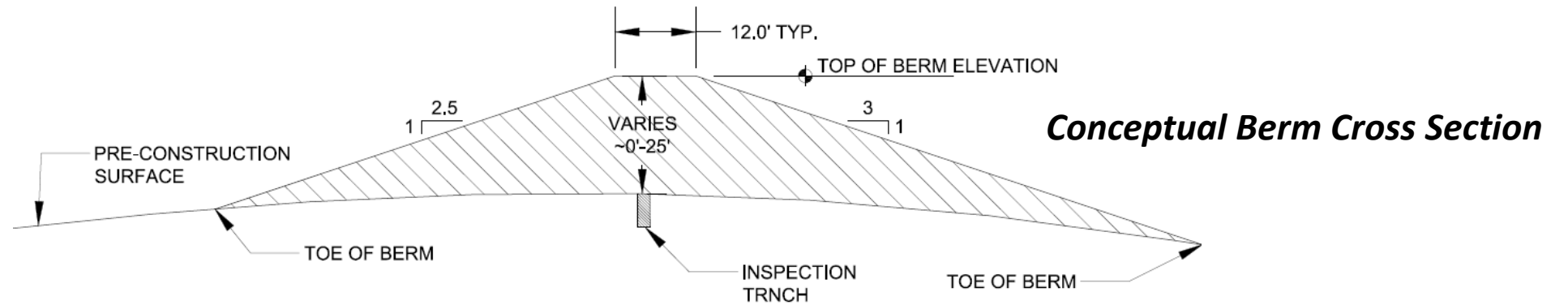
Dam Breach Inundation Study

Inspection, Operation, and Maintenance Plan

Emergency Action Plan



CDF Design



Design and Analysis

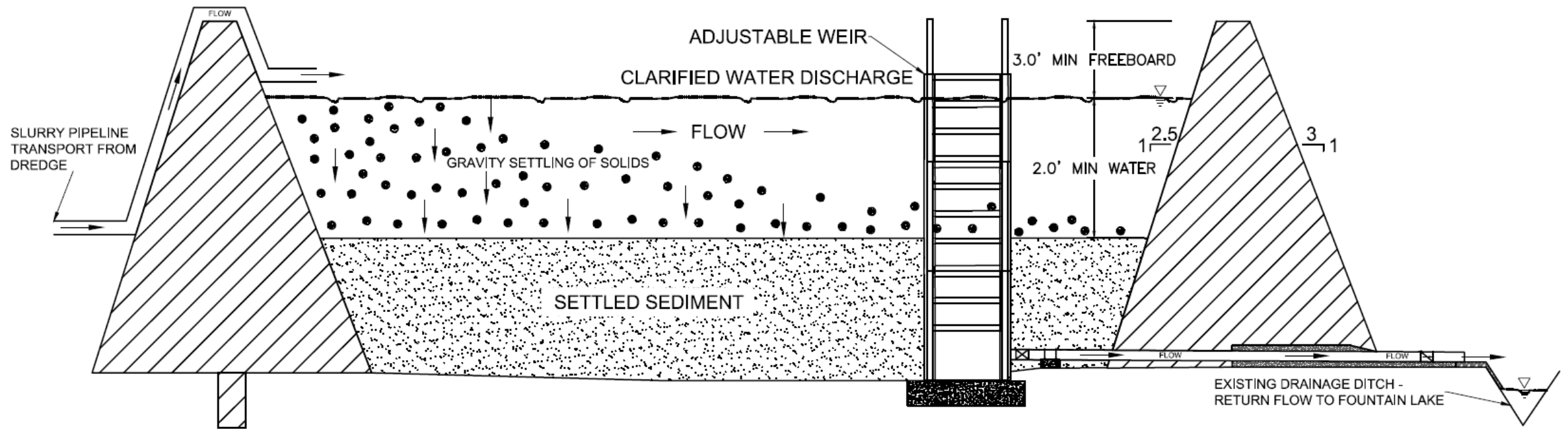
Slope stability assessment

Seepage assessment

Consolidation assessment



CDF Process Flow Diagram





CDF Weir Box Riser

U.S. Army Corps of Engineers design

Controls discharge of CDF supernatant

Weir boards are added to the box riser structure to increase ponded water within CDF

Surrounding dock and gangway float and rise along box riser structure as water rises

Provides easy safe access to weir from perimeter berm

*Box Riser Weir design and pictures courtesy of
USACE Jacksonville District*



CDF Weir Box Riser

Weir overflow water flows out the base of the box riser structure via HDPE pipe through perimeter berm

Equipped with emergency flap gate to stop flow

Concrete foundation sized to prevent flotation



Box Riser Weir design and pictures courtesy of USACE Jacksonville District





Agency and Public Coordination

MN Environmental Quality Board:

Environmental Assessment Worksheet, public comment, and decision → negative declaration

MN Board of Water and Soil Resources Project Plan review

MN Department of Natural Resources Project Plan review

SRRWD public hearings and Board workshops

Public outreach – e.g., booth at County fair



Permitting Agencies

MN Department of Natural Resources	Freeborn County
Dam Safety Permit (CDF)	Conditional Land Use Permit
Public Waters Work Permit (dredging)	Wetland Conservation Act
Water Appropriations Permit (dredging)	ROW Work Permit (Dredge pipeline route)
MN Pollution Control Agency	MN Department of Transportation
Notification to Manage Dredged Material	ROW Work Permit (Dredge pipeline route)
Section 401 CWA Water Quality Certification	City of Albert Lea
Construction Stormwater (NPDES)	Access Agreements
U.S. Army Corps of Engineers	Private Citizens
Section 404 CWA CDF Discharge	Access Agreements (Dredge pipeline route)
Federal Aviation Administration	
Aeronautical Hazard Determination	



Project Status

CDF Cell 1 construction is under contract with construction planned from April to August 2017

Dredging design of entire lake is complete and pending Agency review of permits

Dredge Contract 1 bid release expected May 2017; dredging to begin August or September 2017

CDF Cells 2 and 3 construction, and Dredge Contract 2, in future years



Contractor Notice

www.questcdn.com Project No. 4897968

Project Description:

This **Pre-Solicitation Notice** is being issued by the Shell Rock River Watershed District (SRRWD) to inform interested/potential contractors of the District's intent to issue a Request for Bid Package, anticipated by May 15, 2017.

PROJECT INFORMATION: This project involves hydraulic dredging up to approximately 635,000 cubic yards of sediment from Edgewater Bay, Fountain Lake, located in Albert Lea, MN. Project requirements include preparation and submission of work plans, survey control, site layout, bathymetric survey(s), hydraulic dredging and pipeline transport to CDF Cell No. 1, and operation and maintenance of CDF Cell No. 1. CDF Cell No. 1 will be constructed by others and made available for use by August 15, 2017. Potential bidders must be a responsible contractor as defined in Minn. Stat. § 16C.285 to qualify for bid submission.

Owner:

Shell Rock River Watershed District



ACKNOWLEDGEMENTS

Shell Rock River Watershed District

Natural Resource Technology, Inc., an OBG Company

Barr Engineering

Peterson, Kolker, Haedt & Benda, Ltd.

Jones, Haugh & Smith, Inc.

WSB & Associates, Inc.





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Questions?

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