

STATE OF LOUISIANA
OFFICE OF CONSERVATION
BATON ROUGE, LOUISIANA

ORDER NO. IMD 2024-03

Order requiring the expedited construction of a containment berm
around the Sulphur Mines Salt Dome, Calcasieu Parish, Louisiana.

Pursuant to La. R.S. 30:1 *et seq.* and LAC 43, Parts XVII and XIX, this office has authority to issue permits for the drilling of oil and gas wells and the creation, development, and operation of solution-mined salt caverns. On September 20, 2023, the Commissioner of Conservation (“Commissioner”) issued Declaration of Emergency No. 2023-1 for an Area of Concern (“AOC”) encompassing a portion of the Sulphur Mines Salt Dome in the Sulphur Mines Field, Calcasieu Parish, Louisiana. On or about June 9, 2024, the pressure in the cavern (Cavern Code 10-01-06) associated with Brine Well No. 7B (Serial No. 67270) (“Cavern 7B”) of the Sulphur Mines Salt Dome sharply decreased, necessitating increased injection of brine into the cavern by Westlake US 2, LLC (W1039) (“Westlake”), the operator of record for the cavern. In anticipation of eventual subsidence due to a continued trend of decreasing pressure and to protect the health and safety of the public and the environment, the Commissioner hereby issues the following Order to all operators in the Area of Interest (“AOI”) defined in Order No. EMERG 970-1.

FINDINGS


THE COMMISSIONER OF CONSERVATION FINDS AS FOLLOWS:

1. The Commissioner issued Declaration of Emergency No. 2023-1 on September 20, 2023, pursuant to the authority granted under La. Const. art. IX, § 1; La. R.S. 36:351; La. R.S. 36:358(C); La. R.S. 36:359(B)(1); La. R.S. 30:1 *et seq.*, and particularly La. R.S. 30:4(A), La. R.S. 30:4(M), and La. R.S. 30:6.1; and LAC 43:XVII, Chs. 3 and 33.
2. The Louisiana Department of Energy and Natural Resources, Office of Conservation previously received evidence from operators, confirmed by agents and staff of this office, that ground deformation and subsidence threatened to occur imminently within the AOC defined in Order No. EMERG 970-1.
3. Following the issuance of Declaration of Emergency No. 2023-1 and Order No. EMERG 970-1, Westlake increased the rate of injection in Cavern 7B of the Sulphur Mines Salt Dome, and the pressure of the cavern stabilized for a time.
4. Based upon reports submitted to the Office of Conservation’s Injection and Mining Division on June 9, 2024, the pressure in Cavern 7B sharply decreased, necessitating increased injection of brine into the cavern by Westlake to maintain a safe pressure level.
5. Continuously increasing the rate of injection of brine into Cavern 7B is not sustainable in the long term. Accordingly, a subsidence event is highly likely in the short-to-medium term.
6. Given the urgent need to address the imminent subsidence event, the construction of a berm around the Sulphur Mines Salt Dome is necessary to contain and prevent the spread of hydrocarbons, brine, and other substances potentially harmful to human health and the environment.

ORDERS

NOW, THEREFORE, IT IS ORDERED THAT:

1. Westlake shall submit applications requesting expedited processing for all necessary federal, state, and local permits to construct the containment berm more fully detailed and shown in the April 19, 2024 Sulphur Brine Field Containment Levee Plan attached to this Order ("Levee Plan"). To the extent necessary and feasible, the Office of Conservation shall assist Westlake in obtaining all necessary permits as soon as reasonably possible.
2. As soon as practicable, Westlake shall complete construction of the containment berm detailed and shown in the Levee Plan and in accordance with the conditions of the referenced permits.
3. All operators within the AOI other than Westlake shall cooperate with Westlake to the end that the containment berm detailed and shown in the Levee Plan shall be constructed as quickly and safely as reasonably possible. Such cooperation shall include granting Westlake access to roads and other land so that Westlake may construct the containment berm.
4. If any operator fails or refuses to comply fully and timely with any provision of this Order, such operator shall be subject to civil penalties or other appropriate regulatory sanctions provided by law, including, but not limited to, those under La. R.S. 30:18.
5. This Order shall remain in effect until rescinded or supplemented by the Commissioner.
6. This Order shall be effective on and after June 12, 2024.


BENJAMIN C. BIENVENU
COMMISSIONER OF CONSERVATION

Sulphur Brine Field

Containment Levee Plan

Submitted by:

Westlake



Prepared by:



*1907 Ruth Street
Sulphur, Louisiana 70665
(337) 583-4662
Fax (337) 583-1836*

ReCon Engineering Project No. 23261173

Revision 2

April 19, 2024



TABLE OF CONTENTS

TABLE OF CONTENTS	i
1.0 Background	1
2.0 Introduction	1
3.0 Site Information	2
4.0 Levee System Plan	2
4.1 Impact Zone	2
4.2 Levee System Layout.....	3
4.3 Receiving Streams	3
4.4 Top Elevation of Levee System	4
4.5 Levee Configuration	5
4.6 Levee System Construction Materials	5
4.7 Levee System Engineering and Construction	6
5.0 Water Control and Treatment Plan	7
5.1 Water Level Control	7
5.2 Water Treatment	7

APPENDIX

Levee System Plan Diagrams	9
SK-APP1-01.02	Levee System Cover Sheet
SK-APP1-02.02	Levee System - Site Plan
SK-APP1-03.02	Levee System - Levee System Plan
SK-APP1-04.02	Levee System – Weir Structure and Pump Plans
SK-APP1-05.02	Pump Station 1 & 2 - Enlarged Plan
SK-APP1-06.01	Proposed Water Treatment Station – Enlarged Plan
SK-APP1-07.02	Levee System – Levee and Weir Structure Details
SK-APP1-08.02	Salt Lake High Bank Levee - Profile
SK-APP1-09.02	Dome and Well Levee – Profiles
SK-APP1-10.01	Levee System – Fill Schematic
NOAA Atlas 14, Vol. 9, Ver. 2	Precipitation Frequency Estimates..... 19

1.0 BACKGROUND

Order 3.i. of the Third Supplement to Compliance Order No. IMD 2022-027 issued by the State of Louisiana Department of Natural Resources Office of Conservation requires Westlake US 2, LLC (Westlake) to submit “a plan to construct a containment system around the potential affected area at the surface.”

Westlake and its contractors prepared the plan described herein in response to the above-described order. Westlake’s compliance with that order is not an admission that such a system is needed currently or a commitment to construct the described structures and improvements. Westlake reserves the right to challenge any order requiring construction of a containment system and to change the components of this proposal based on changes in circumstances occurring after its submission.

Westlake proposes the following components:

- Engineered earthen levees constructed with low permeability compacted clay soils surrounding the possible impact site (see Figure 1). These levees will be constructed by improving the levee surrounding the existing reservoir commonly referred to as Salt Lake. Additional levees will be installed east of PPG 7 and around all active and dormant Westlake well sites. The additional levees will be referred to herein as the “Well Levee” and “Dome Levee”.
- Four major weir drainage structures will allow transfer of water from one side of the containment levee to the other. Two structures will include three 36-inch diameter drainpipes and two will include two 36-inch diameter drainpipes that run through the levees. Each pipe will have valves which can be manually opened or closed to allow water transfer to the outside of the levee.
- Two smaller single 36-inch diameter drainpipe weir structures are planned for the east side Well Levee and one near the southwest corner of Salt Lake. The Well Levee weir will drain to Central Pond.
- Two pump stations will be constructed within the levee system to remove and/or utilize containment water following an event. Two electric pumps and one diesel pump are proposed for each station. One pump will be the primary pump and the others will be installed spares for redundancy.

2.0 INTRODUCTION

This plan describes the basis of the levee system layout, drainage structures, levee elevation, materials of construction, water treatment and control, etc.:

- Anticipated impact zone;
- Levee location;
- Current runoff receiving streams;
- Elevation of levee system;
- Levee system configuration
- Levee construction materials;

- Levee system engineering and construction;
- Water Level Control;
- Water Treatment

Each of these items is addressed in greater detail in the sections that follow in this Levee System Plan.

3.0 SITE INFORMATION

The majority of the brine field site in question is currently owned by Sulphur Dome, LLC and Westlake. Westlake also leases property to mine brine that is used in the Chlor-Alkali process at the Westlake South facility. Other landowners that may be impacted by the levee construction are Brimstone History Society, Apollo Lake Charles, Bell Mineral LLC, Julia B Est. Pollock, Keith Hobgood, and LOLC LLC according to public records gathered from Calcasieu Parish Police Jury.

The soils at the site are identified as Guyton, Judice, and Morey by USDA Soil Survey and fall into the Hydraulic Soil Groups C or D. These soils typically have land slopes in the 0 to 1% range and rarely flood. Vegetation consists of grass, naturally growing trees, and ponds. A large portion of the containment system will surround the existing Salt Lake.

4.0 LEVEE SYSTEM PLAN

The initial levee system plan submitted by Westlake has been revised based on comments noted during the January 30, 2024 meeting with State of Louisiana Department of Energy and Natural Resources (DENR), land owners, and operators held at the Sulphur Brine Field and March 15th, 2024 teleconference meeting with DENR officials.

A recommendation was made during the January 30th meeting to determine if the high bank line of the Salt Lake could be used as the main confining structure in combination with another structure/levee to confine Brine Wells 6 and 7 located on the east side of the pond. Following the meeting, using the high bank line of the Salt Lake as the main confining structure/levee was investigated and found to be favorable. As such, the levee configuration was revised to reflect the utilization of the Salt Lake bank in combination with a Well Levee to manage water discharge from the site following an event.

During the March 15th meeting, DENR requested the entire salt dome be contained with the upmost caution for the wellbeing of the public. As such Revision 2 reflects these requested changes with preliminary details of the additional weirs, pumping station, and infrastructure.

4.1 IMPACT ZONE

The impact zone was identified in the Lonquist "Surface Expression Impact Zone Estimate" document updated November 2, 2023. See Figure 4 page 6 of 41 of indicated document. The initial impact zone has been identified to have a diameter of 678 feet with the epicenter located 488 feet due west of Well 7B. The final impact zone is indicated to have a diameter of 1841 feet. See following Figure 1 and drawings SK-APP1-02.02 through SK-APP1-03.02 that indicated both impact zones in the Appendix.

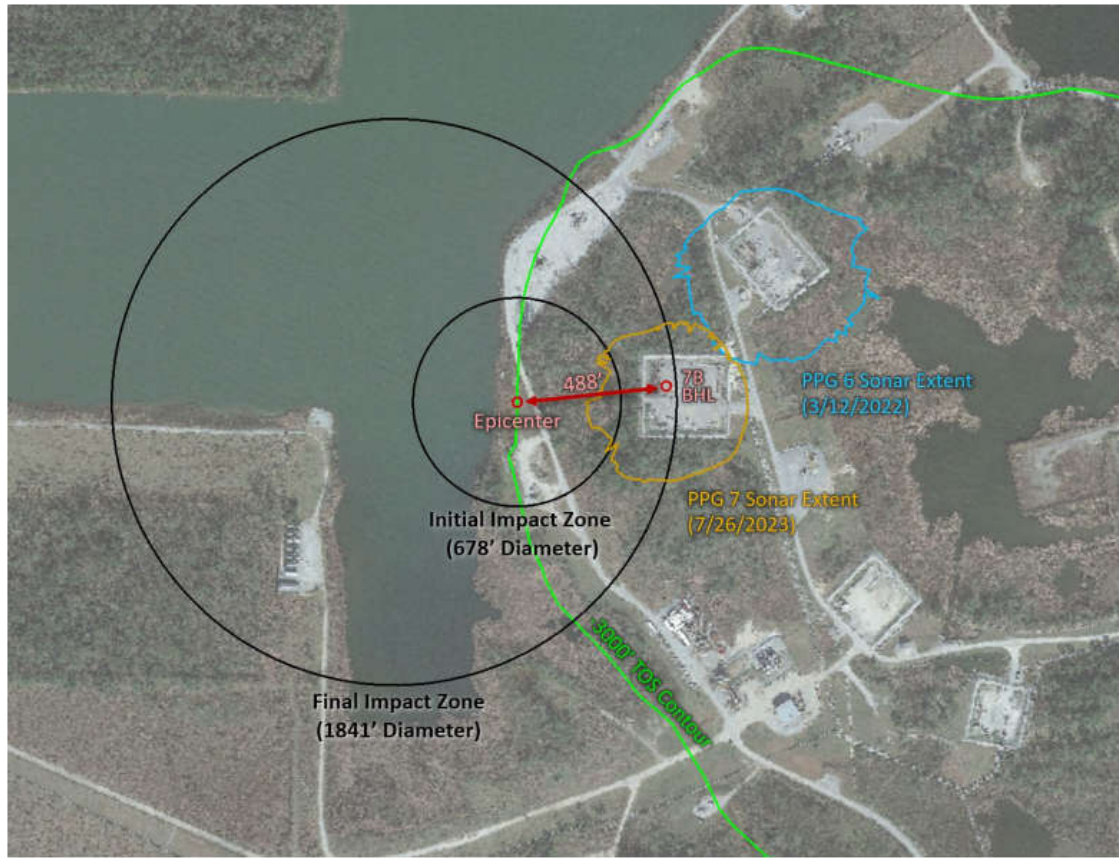


Figure 1 – Impact Zone Diagram (Obtained from Lonquist document dated 11/2/2023)

4.2 LEVEE SYSTEM LAYOUT

Using the indicated impact zones as the starting point, the levee was positioned along the high bank line of Salt Lake. Slight adjustments were made at the southwest side of Salt Lake due to a lower elevation of the high bank line. Preliminary investigations of the elevations along Salt Lake bank yielded a typical elevation near 14.0 feet with the water elevation at 11.0 feet MSL. In addition to the Salt Lake levee, a Well levee was routed around Well No. 7, and a Dome levee encompasses all known well sites to complete the Levee System. The proposed levee layout incorporates an approximate 313 acres for the Salt Lake, and 166 acres within the Dome Levee.

4.3 RECEIVING STREAMS

Two stormwater receiving streams have been identified at the Brine Field site as shown in Figure 2. One is the Bayou Choupique drainage lateral located on the south side of the property. It receives stormwater runoff that originates from the west side of the property. The other receiving stream is Bayou D'Inde drainage lateral that enters the east side of the property at about the midpoint of the facility and receives stormwater from the east side of the property.

Three weir drainage structures are planned around the Salt Lake Levee. Weir Structure 1 located on the West side and Weir Structure 2 in the Southwest corner will both discharge to

the Bayou Choupique drainage lateral. The third weir structure (Weir Structure 3) will be located on the east side of Salt Lake at a current drainage culvert that is located about mid-way along the Northeast Pond's east bank. This culvert currently discharges runoff to the ponds located east of the Brine site and then to a Bayou D'Inde drainage ditch.

A fourth drainage weir (Weir Structure 4) will be located in the Well Levee. This drainage structure will drain runoff collected between the existing Salt Lake high bank and Well Levee around the No.7 Brine Well pad and discharge to Central Pond. Weir Structures 5 and 6 located on the Southeast corner of the Dome Levee will discharge directly into the Bayou D'Inde Drainage Lateral.

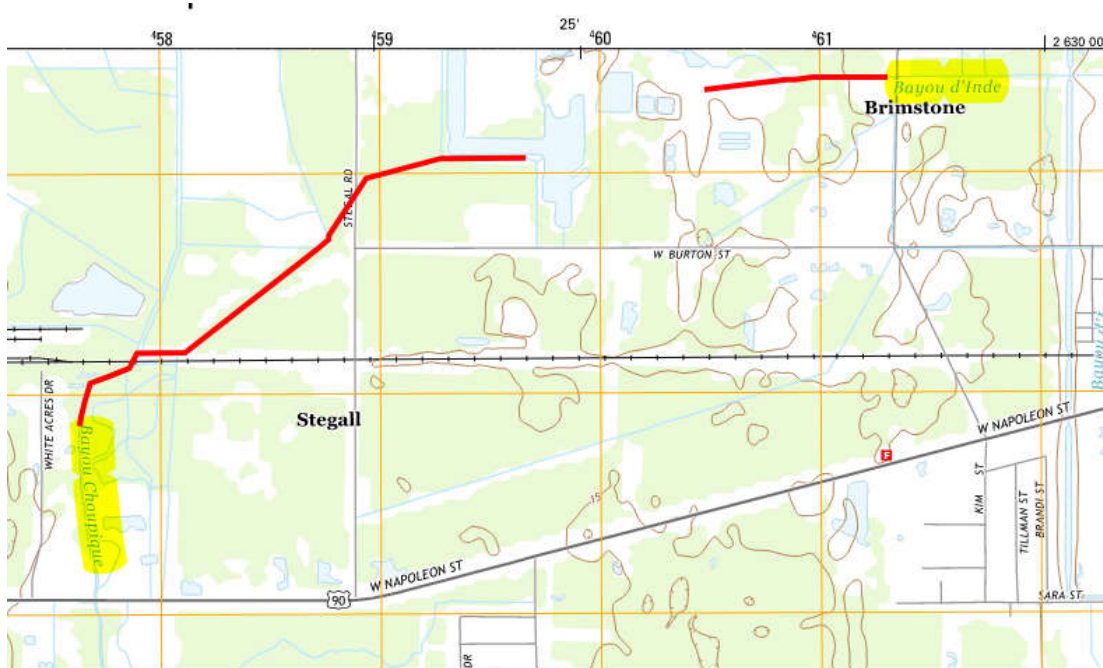


Figure 2 – Topographic Map Indicating Two Receiving Streams

4.4 TOP ELEVATION OF LEVEE SYSTEM

The water elevation in Salt Lake fluctuates depending on the amount of rainfall, but typically ranges from 11 to 12 feet MSL. The ground level varies across the site from 8 to 17 feet averaging between 12 and 13 feet. The high bank line around Salt Lake is typically around 14.0 feet (MSL).

The Sulphur Dome site is located outside of FEMA indicated flood zones and is designated Zone X, which indicates the site is not in a flood zone.

Based on the typical high bank line elevation around Salt Lake of 14.0 feet, the top of levee was set at a minimum elevation of 14.5 feet. This elevation would allow 3.5 feet of freeboard above Salt Lake's normal water surface elevation of 11.0 feet.

Several rainfall frequency estimates were considered to determine potential water level amounts at times the weirs are closed. It was determined that maintaining 3.5 feet of freeboard should not overtop the levee for most rainfall events. Example: A 500 Year storm event having

a 60-day duration would produce 40.6 inches of rainfall, which is less than the 42 inches of freeboard. Rainfall amounts were obtained from NOAA Atlas 14 Volume 9 Version 2. Information is included in Appendix, page 21.

4.5 LEVEE CONFIGURATION

The top of the levee will be set at approximately 3.5 feet above the Salt Lake surface elevation of 11.0 feet. The levee top will be the access road for the containment system and will be 14 to 16 feet wide to provide mobility for vehicles and equipment. The top will be surfaced with crushed aggregate placed on top of a geotextile fabric. Side slopes of the fill material will be 2 on 1. The total base width of the levee will vary depending on the existing ground elevations but can approach a width of 40 feet. See levee detail in appendix drawing SK-APP1-07.02.

4.6 LEVEE SYSTEM CONSTRUCTION MATERIALS

Clay soil material has been selected as the main levee construction material due to its low permeability properties and reliability over long durations. The following table includes the preliminary materials and quantities for the construction of the Levee System.

Major Construction Materials and Supplies

ITEM	APPROXIMATE QUANTITY
Clay Soil Material	16,650 cubic yards
Geotextile Fabric	15,000 feet at 10 feet wide
Aggregate	4,500 cubic yards
Weir Structures	4 major and 2 minor (6 total)
Grass Seeding	50 acres
Pump Station 2000 gpm	1 Unit
Pump Station 1000 gpm	1 Unit
Cable Tray and Power Feed	5700 feet
12" Dia. HDPE Pipe	3350 feet
10" Dia. HDPE Pipe	2350 feet

4.7 LEVEE SYSTEM ENGINEERING AND CONSTRUCTION

The outlined levee system on drawing SK-APP1-02.02 will be designed and installed proactively to contain the potential release of hydrocarbons and brackish water into the downstream drainage laterals. New drainage ditches around the perimeter of the Salt Lake will be constructed diverting current surface drainage outside directly to Bayou Choupique.

Four weirs are planned to control the Salt Lake level at 11 feet; providing the necessary freeboard for the potential No.7 expression. These locations will be equipped with salinity monitors and lighting for routine monitoring of the containment structure's stormwater discharge. The Salt Lake and Dome pump structures and foundations (Pump Station 1 and 2) as shown on drawing SK-APP1-05.02 will be installed with the levee system.

Final engineering and design will begin after DENR approval of the levee system outlined in this document and drawings. Engineering duration is dependent upon geotechnical information of the area soils as well as an area drainage/topography survey. Geotechnical results will impact levee design determining the required materials of construction while the area drainage survey will aid in defining culvert, weir, and pumping station locations. Proactive efforts are being made to expediate the receipt of the necessary geotechnical and survey data. Contacts and details are being prepared currently for these activities to begin work within the middle of 2024.

The following preliminary construction durations are highly dependent on weather conditions. As information becomes available during detail design, construction activities will be evaluated for opportunities to work concurrently to expedite construction reducing overall project duration. A total duration of approximately 13 months is estimated with project completion by Q3 2025. Installation of the levee system is estimated with the following durations:

- Engineering and Design – Complete in Q4 2024
 - Survey – efforts started Q1 2024, estimated completion end of Q2 2024
 - Geotechnical – levee areas prioritized estimated completion end of Q2 2024 remaining areas to follow Q3 2024
 - Evaluate and design based on survey and geotechnical data Q3-Q4 2024
 - Submit deliverables for construction Q4 2024
- Permitting
 - USACE Wetlands Permit
 - DEQ Stormwater Discharge Permit
 - Landowner permissions
- Clearing and Drainage – Start end of Q2 beginning of Q3 (Estimated duration 5 months)
 - Clearing to begin once proper permits/permissions obtained
 - Drainage improvements to follow upon receipt of topography data
- Weir Installation – Start early Q4 2024 (Estimated duration 6 months)
 - Weir locations to be finalized with topography data
- Levee System – Start late Q4 2024 (Estimated duration 6 months)
 - The Southern and Eastern sides of the containment will be prioritized due to the proximity to residential areas.
 - Weir locations to be determined prior to beginning levee construction
- Pump Stations – Start early Q1 2025 (Duration 7 months)
 - Infrastructure construction
- Water Treatment Area Development – Start mid Q1 2025 (Duration 1 month)

5.0 WATER CONTROL AND TREATMENT PLAN

In the event of a surface expression of the No.7B Brine Well all surface water at the expression site should be contained to prevent offsite freshwater contamination. Preliminary engineering and design development will be performed for the pumps and water treatment equipment during the levee system engineering and design. Additional details of the proposed water control and treatment are as follows.

5.1 WATER LEVEL CONTROL

Microseismic and subsidence monitoring serve as early indicators of the potential onset of a No.7 surface expression. All levee weir structures are to be closed following any indication of anomalous seismicity or subsidence to prevent the release of any contaminants or brackish water. After seismic and subsidence has ceased, and it is deemed safe to assess damage the following will be implemented.

Inspection of the levees, weirs and pump structures will be performed, and plans established for repairs and/or modifications will be implemented as deemed necessary. Efforts to minimize environmental impacts will be implemented. This will include the capture of surface hydrocarbons and water sampling to determine the appropriate water treatment equipment.

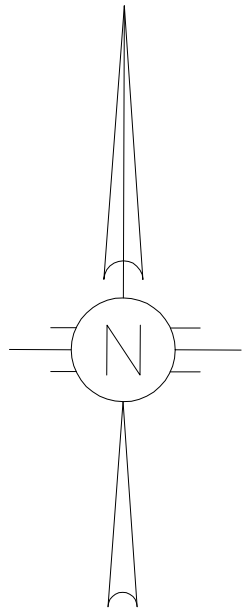
Temporary water treatment equipment and pumps will be utilized to treat and maintain the water levels inside the containment levees until such time as a permanent solution can be installed. A combination of water treatment for solution brine mining and surface drainage discharge will be utilized. To discharge in the bayous the water will need to be treated for hydrocarbons, sludge, and salinity levels. If used for brine mining the water will need to be treated so that it has no negative effects on chlorine manufacturing equipment.

5.2 WATER TREATMENT

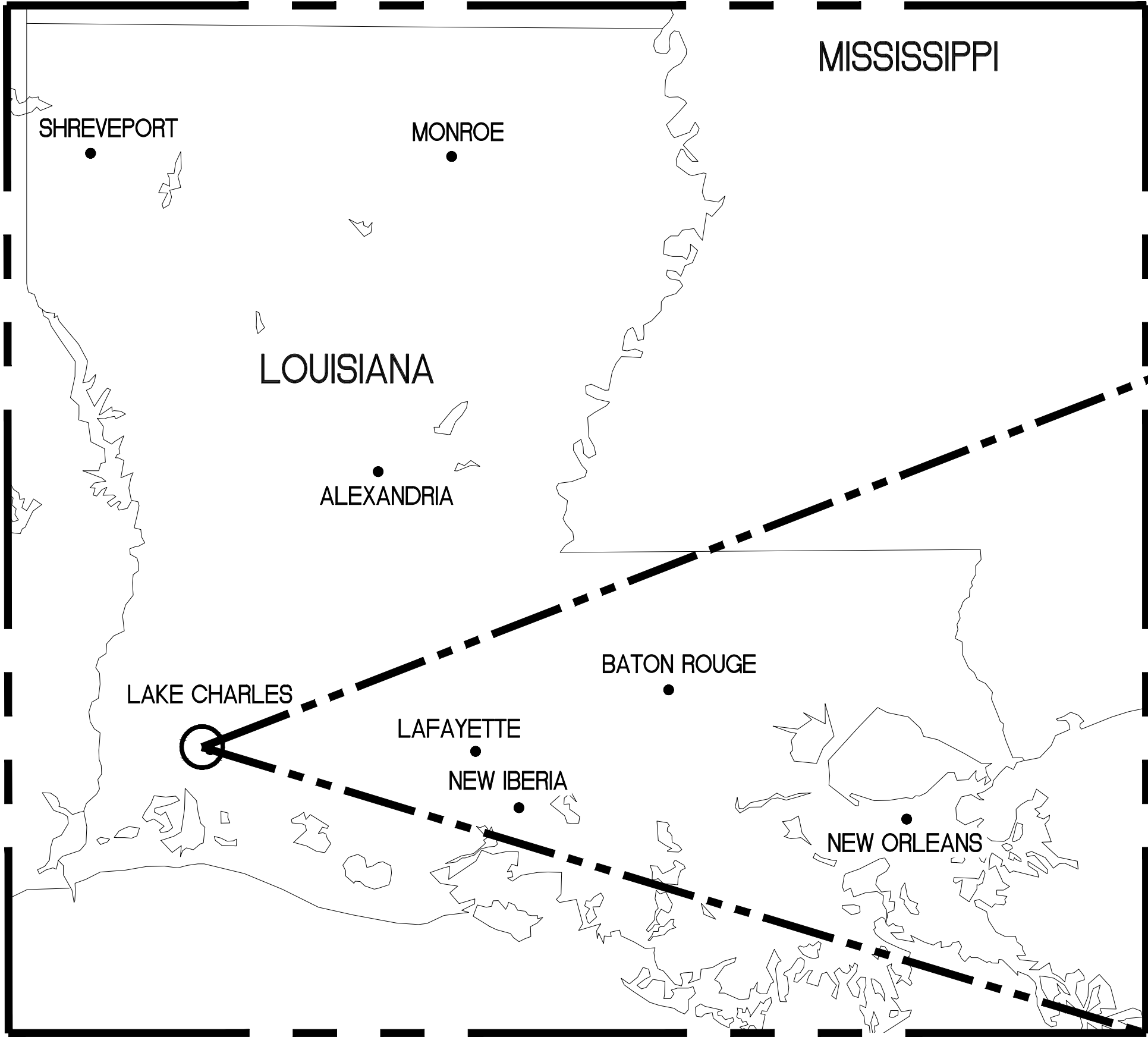
Future requirements for long-term water treatment and usage plans will be designed and developed. Water samples will be acquired at the appropriate surface expression location(s) to determine treatment needs. Westlake will work with knowledgeable water treatment experts to determine the appropriate treatment process(es) as outlined in the "Sulphur Brine Field Alternate Water Source" document submitted to the Louisiana Department of Natural Resources Office of Conservation in response to Order 5.a of the Third Supplement to Compliance Order No. IMD 2005-027. Preliminary calculations show the need to treat approximately 3,000 gpm based on containment size and sizeable rainfall events. Treatment equipment will be designed for a combination of on-site solution mining use as well as discharge to the local drainage system if required. Site infrastructure will be evaluated for potential future needs along with preliminary layouts of temporary and/or permanent process equipment locations.

APPENDIX

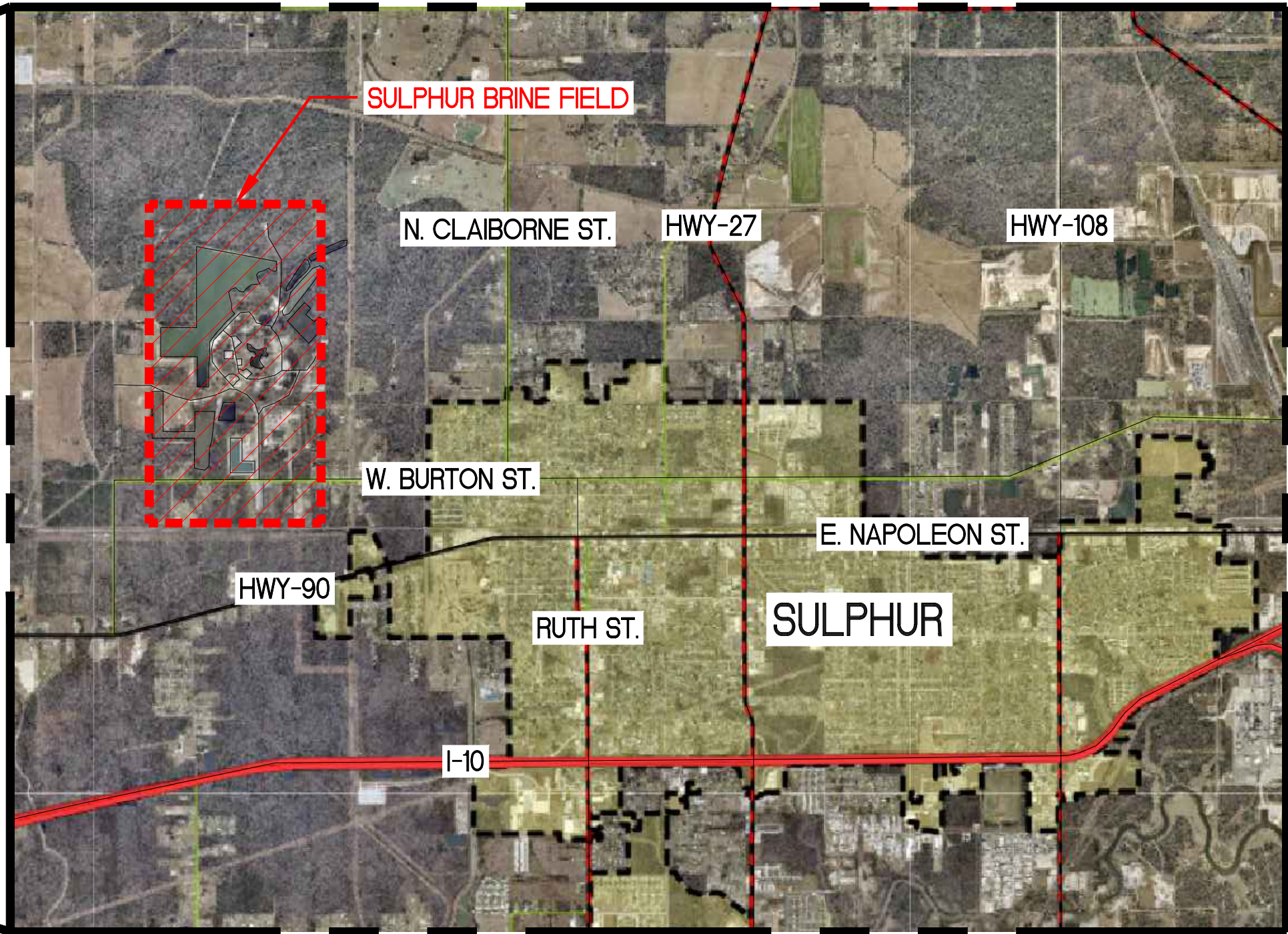
WESTLAKE US2, LLC
CALCASIEU PARISH, LOUISIANA
SULPHUR BRINE FIELD
LEVEE SYSTEM REV. 2 (APRIL 19, 2024)



REVISIONS	
ISSUED:	
FOR: RECORD	
BULLETIN NO.:	



STATE MAP
SCALE: N.T.S.



VICINITY MAP
SCALE: N.T.S.

SHEET INDEX:	
SK-APP1-01	COVER SHEET
SK-APP1-02	SITE PLAN
SK-APP1-03	LEVEE SYSTEM PLAN
SK-APP1-04	WEIR STRUCTURE AND PUMP PLANS
SK-APP1-05	PUMP STATION 1 & 2 ENLARGED PLAN
SK-APP1-06	WATER TREATMENT STATION ENLARGED PLAN
SK-APP1-07	DETAILS
SK-APP1-08	SALT LAKE HIGH BANK LEVEE PROFILE
SK-APP1-09	DOME AND WELL LEVEE PROFILES
SK-APP1-10	LEVEE SYSTEM FILL SCHEMATIC



ReCON Management • Engineering Inspection	PLOTTED:
	4/19/2024 11:09 AM
	JOB NO: 23261173
	SULPHUR, LA FILE: SK-APP1-01.DWG

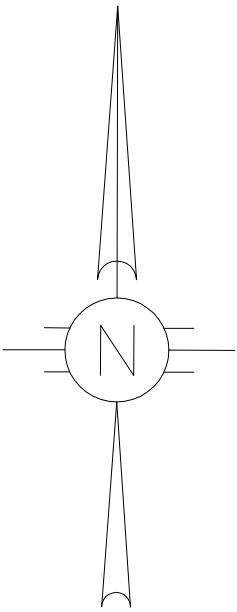
Westlake		North American Chlor-Alkali & Derivatives™ Lake Charles South Complex 1300 PPG Drive, Westlake, LA 70669	
SULPHUR BRINE FIELD		CIVIL	
LEVEE SYSTEM			
COVER SHEET			
DRAWN BY	B. WHITTINGTON	DATE	4/2024
CHECKED BY		DATE	
APPROVED BY		DATE	
DWG.	SK-APP1-01.02		

DATE: 4/2024

ISSUE FOR RECORD



LEVEE SYSTEM SITE PLAN
SCALE: N.T.S.



REVISIONS

ISSUED: _____
FOR: RECORD _____
BULLETIN NO.: _____

NOTES:

1. LEVEE SYSTEM TO BE BUILT SURROUNDING EXTERIOR SALT LAKE, CENTRAL POND, AND BRINE WELLS OPERATING AREA.
2. SIX DRAINAGE WEIRS ARE TO BE CONSTRUCTED AROUND THE SALT LAKE. THEY WILL BE LOCATED ON THE WEST SIDE, SOUTHWEST SIDE, NORTHEAST SIDE, SOUTHEAST SIDE, EAST SIDE OF WELL LEVEE, AND THE EAST SIDE OF DOME LEVEE.
3. PUMPS WILL BE INSTALLED SOUTH OF THE SALT LAKE AND THE EAST SIDE OF DOME LEVEE.

LEGEND:

- SALT LAKE, DOME, AND WELL LEVEES
- IMPACT ZONE ESTIMATE
- FROM LONQUIST REPORT DATED NOVEMBER 2, 2023
- DRAINAGE DITCHES
- WATER PIPE
- CABLE TRAY
- PUMP STRUCTURES



ReCON
Management • Engineering
Inspection
JOB NO. 23261173
SULPHUR, LA. FILE SK-APP1-02.DWG
APPROVED: _____

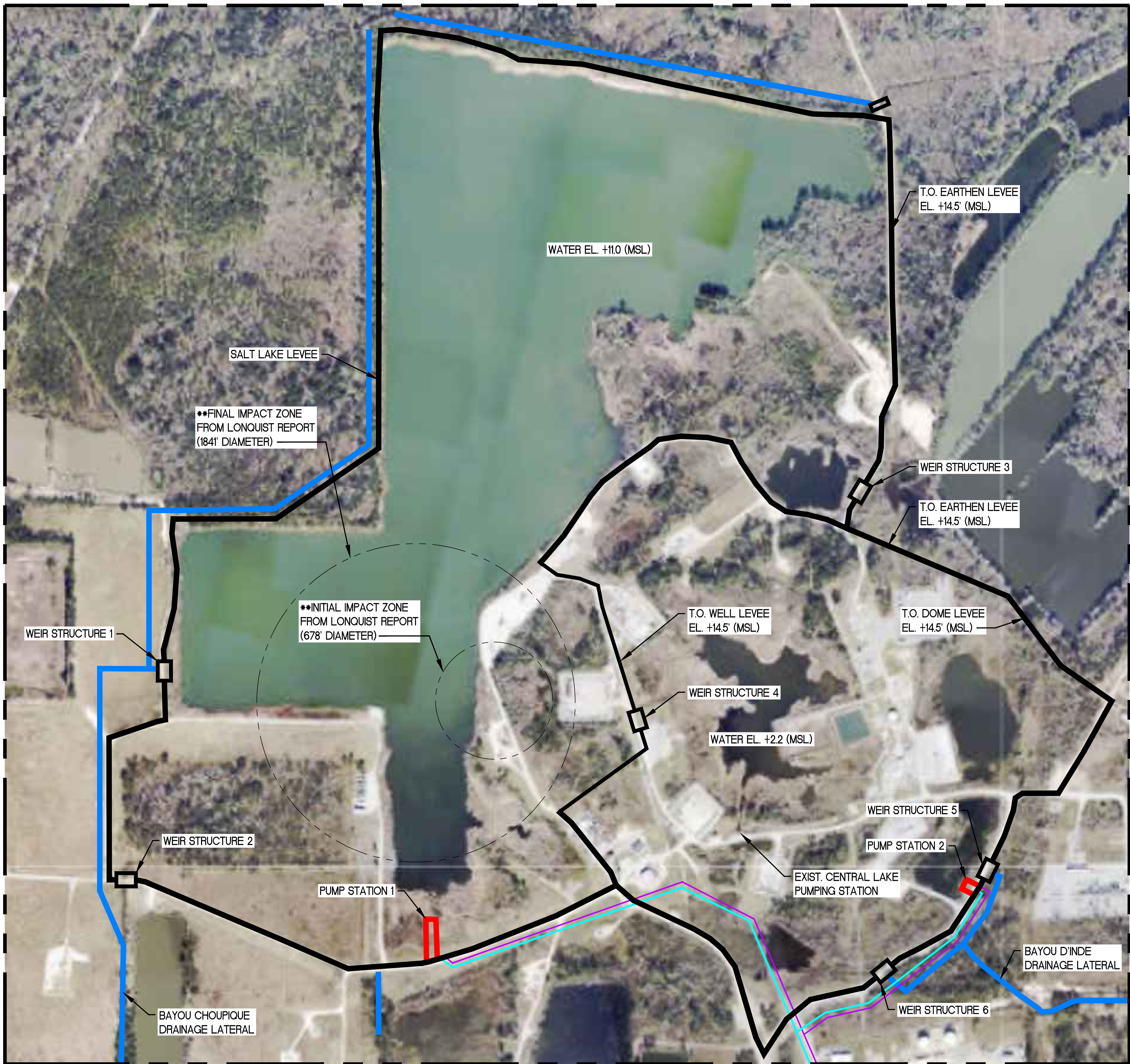
Westlake
North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD CIVIL
LEVEE SYSTEM
SITE PLAN

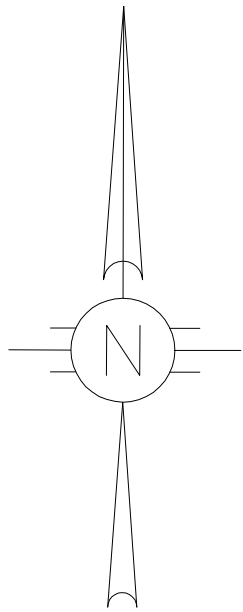
DRAWN BY B. WHITTINGTON DATE 4/2024 SCALE AS SHOWN
CHECKED BY _____ DATE _____ CHARGE _____
APPROVED BY _____ DATE _____ SHEET 2 OF 10

DWG. SK-APP1-02.02

ISSUE FOR RECORD



LEVEE SYSTEM PLAN
SCALE: 1" = 300'



REVISIONS	
ISSUED:	
FOR: RECORD	
BULLETIN NO.:	

NOTES:

- SIX WEIR STRUCTURES ARE TO BE CONSTRUCTED TO CONTROL POND WATER ELEVATION FOR RAINFALL EVENTS.
- STRUCTURES 1 & 2 DISCHARGE TO BAYOU CHOUPIQUE. WEIR STRUCTURES 3, 4, 5, & 6 DISCHARGE TO BAYOU D'INDE.

LEVEE SYSTEM NOTES:

APPROX. AREA WITHIN SALT LAKE LEVEE: 313 ACRES
APPROX. LENGTH OF SALT LAKE LEVEE: 17,479'
APPROX. LENGTH OF WELL LEVEE: 1,932'
APPROX. AREA OF DOME LEVEE: 166.3 ACRES
APPROX. LENGTH OF DOME LEVEE: 6,322'
APPROX. AREA TO BE CLEARED FOR LEVEE: 6.5 ACRES

LEGEND:

- SALT LAKE, DOME, AND WELL LEVEES
- IMPACT ZONE ESTIMATE
- ** FROM LONQUIST REPORT DATED NOVEMBER 2, 2023
- DRAINAGE DITCHES
- WATER PIPE
- CABLE TRAY
- PUMP STRUCTURES

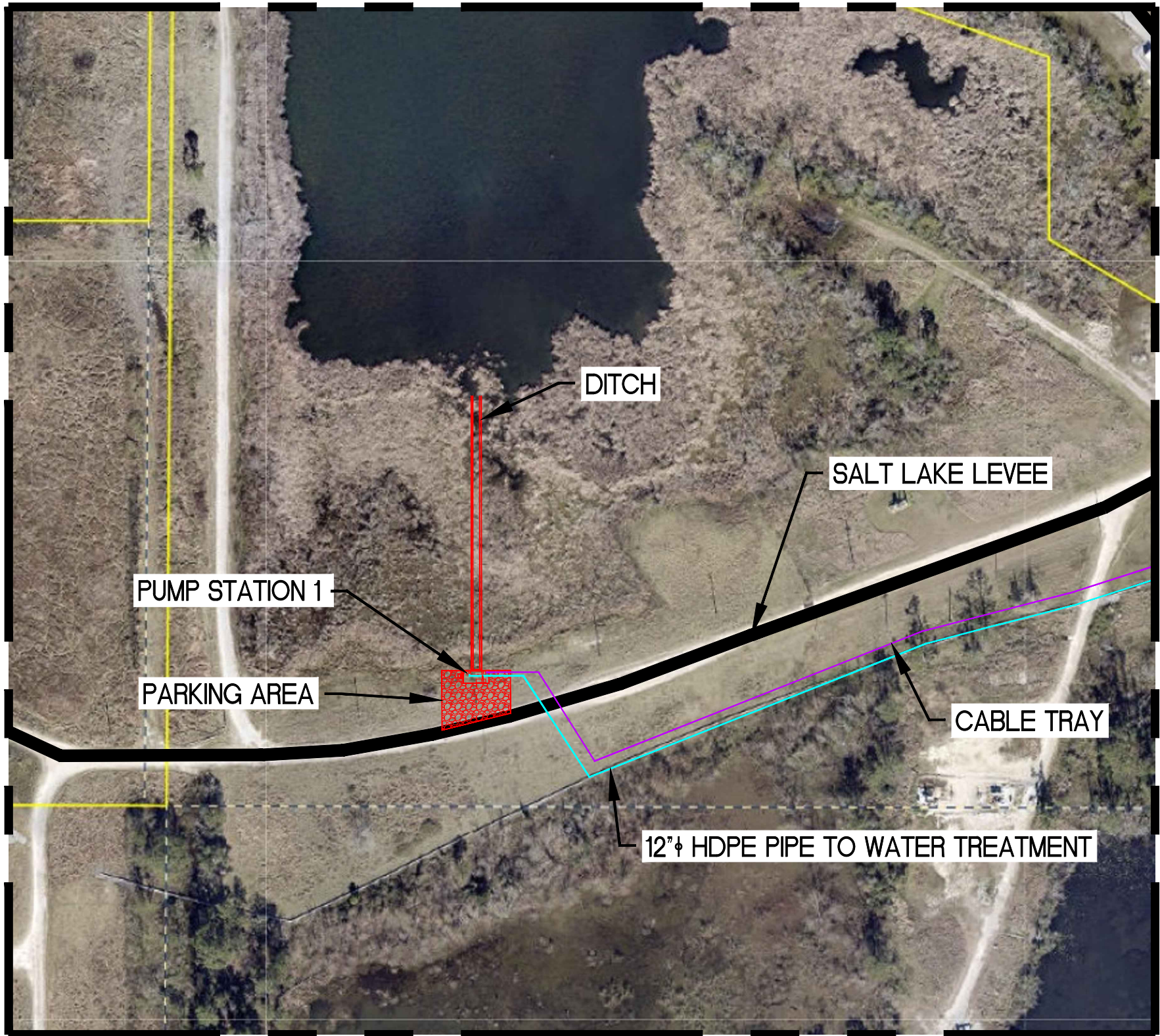


Westlake		North American Chlor-Alkali & Derivatives™ Lake Charles South Complex 1300 PPG Drive, Westlake, LA 70669	
SULPHUR BRINE FIELD		CIVIL	
LEVEE SYSTEM			
LEVEE SYSTEM PLAN			
DRAWN BY	B. WHITTINGTON	DATE	4/2024
CHECKED BY		DATE	
APPROVED BY		DATE	
DWG.		SK-APP1-03.02	

ISSUE FOR RECORD



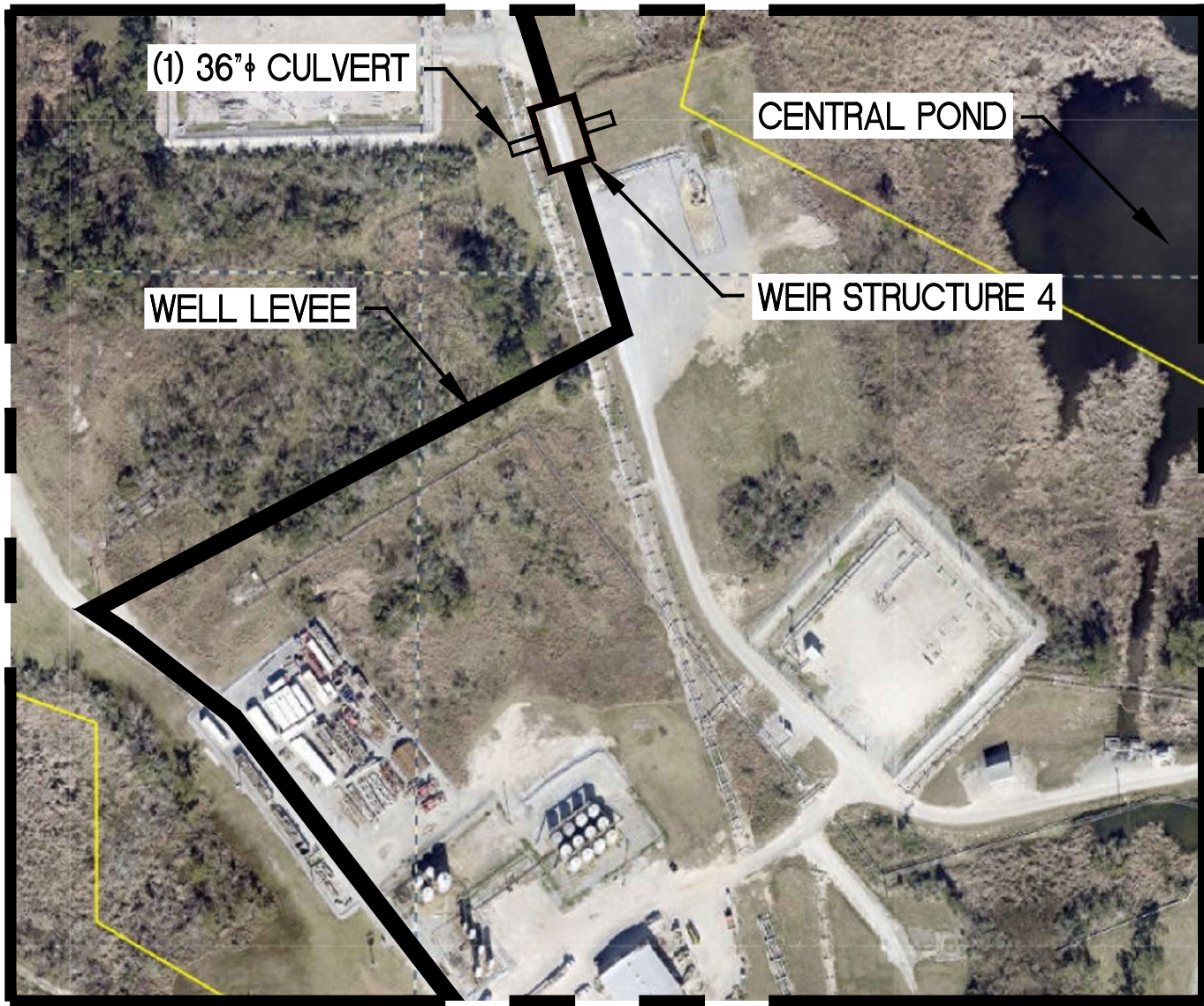
WEIR STRUCTURE 1 & 2
SCALE: 1" = 150'



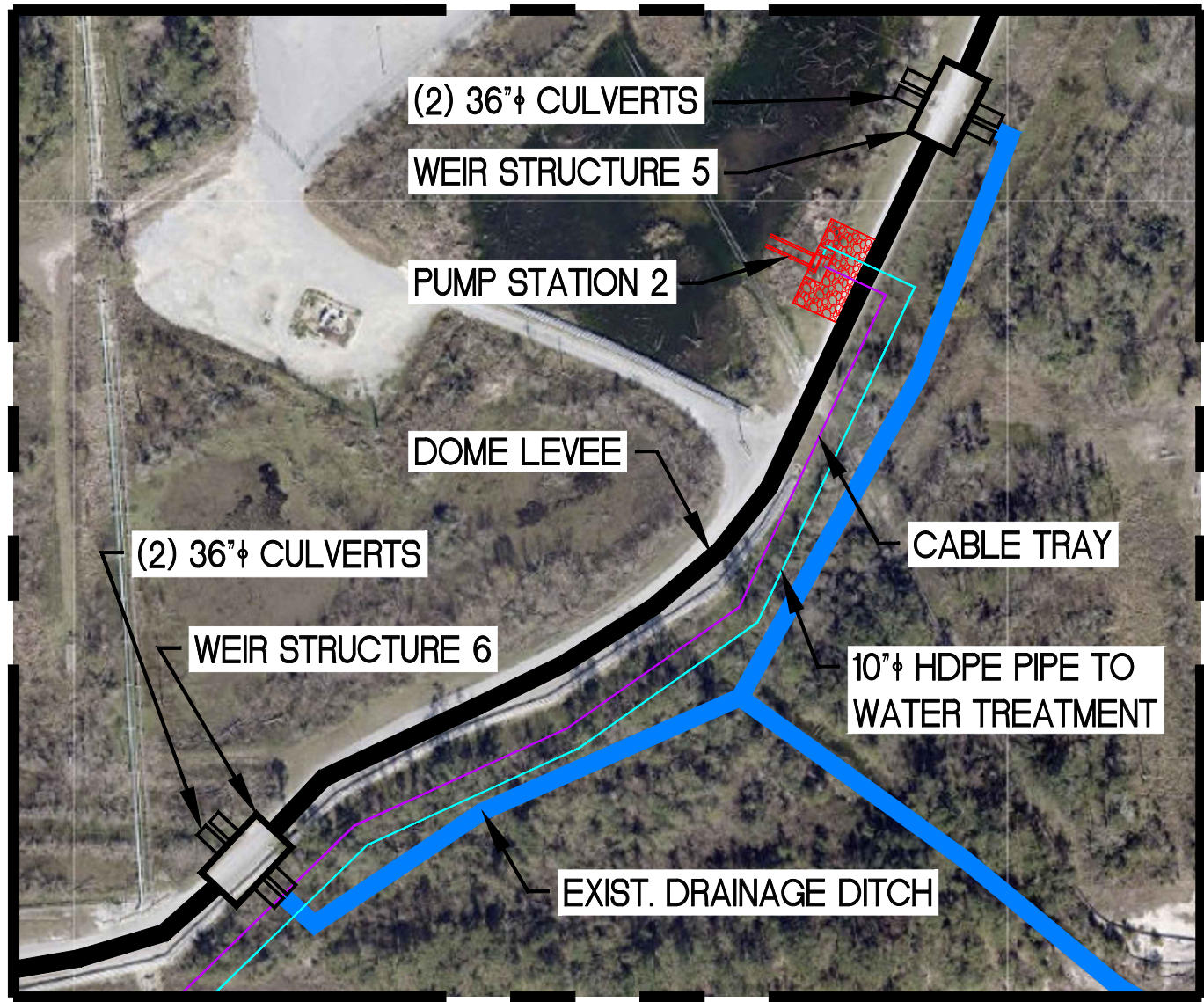
PUMP STATION 1
SCALE: 1" = 150'



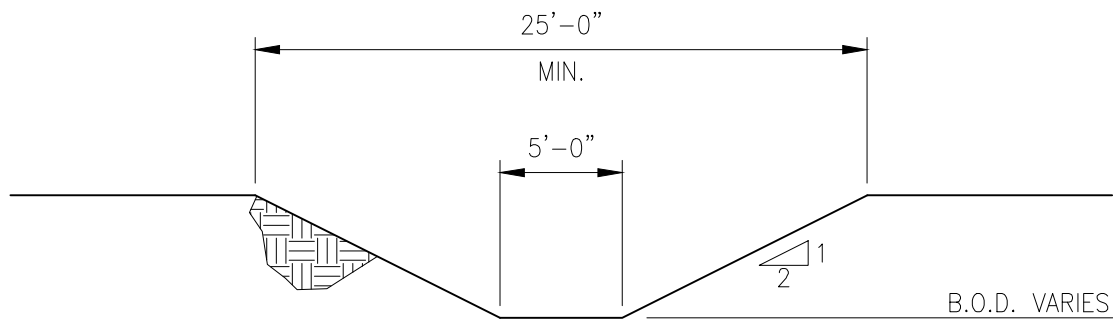
WEIR STRUCTURE 3
SCALE: 1" = 150'



WEIR STRUCTURE 4
SCALE: 1" = 150'



WEIR STRUCTURE 5, 6,
& PUMP STATION 2
SCALE: 1" = 150'



SECTION
DRAINAGE DITCH
SCALE: 1/8" = 1'-0"



RECON	PLOTTED: 4/19/2024 11:10 AM
Management • Engineering	
Inspection	JOB NO. 23261173
SULPHUR, LA.	FILESK-APP1-04.DWG
APPROVED:	

Westlake
North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD CIVIL

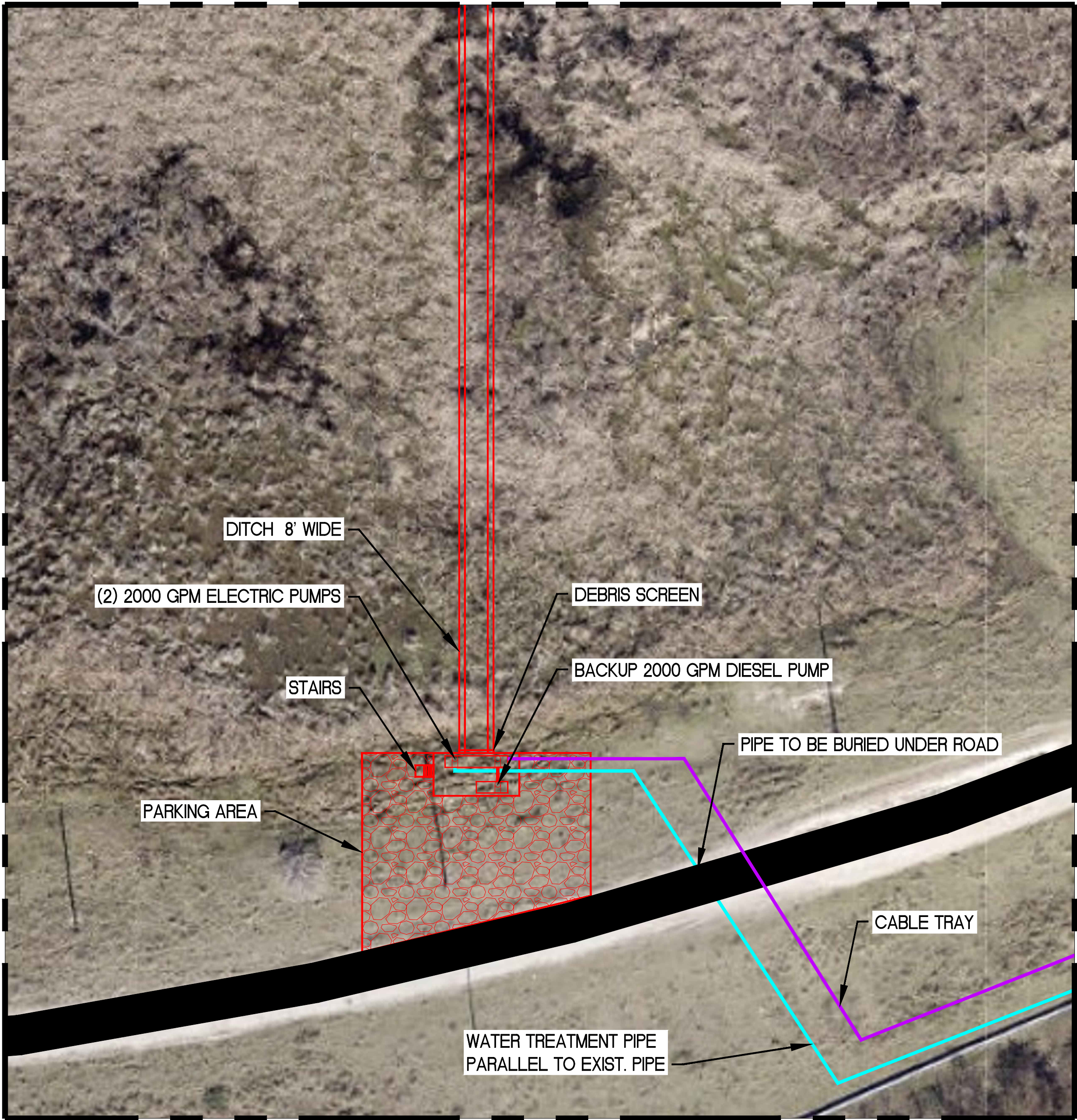
LEVEE SYSTEM

WEIR STRUCTURE AND PUMP PLANS

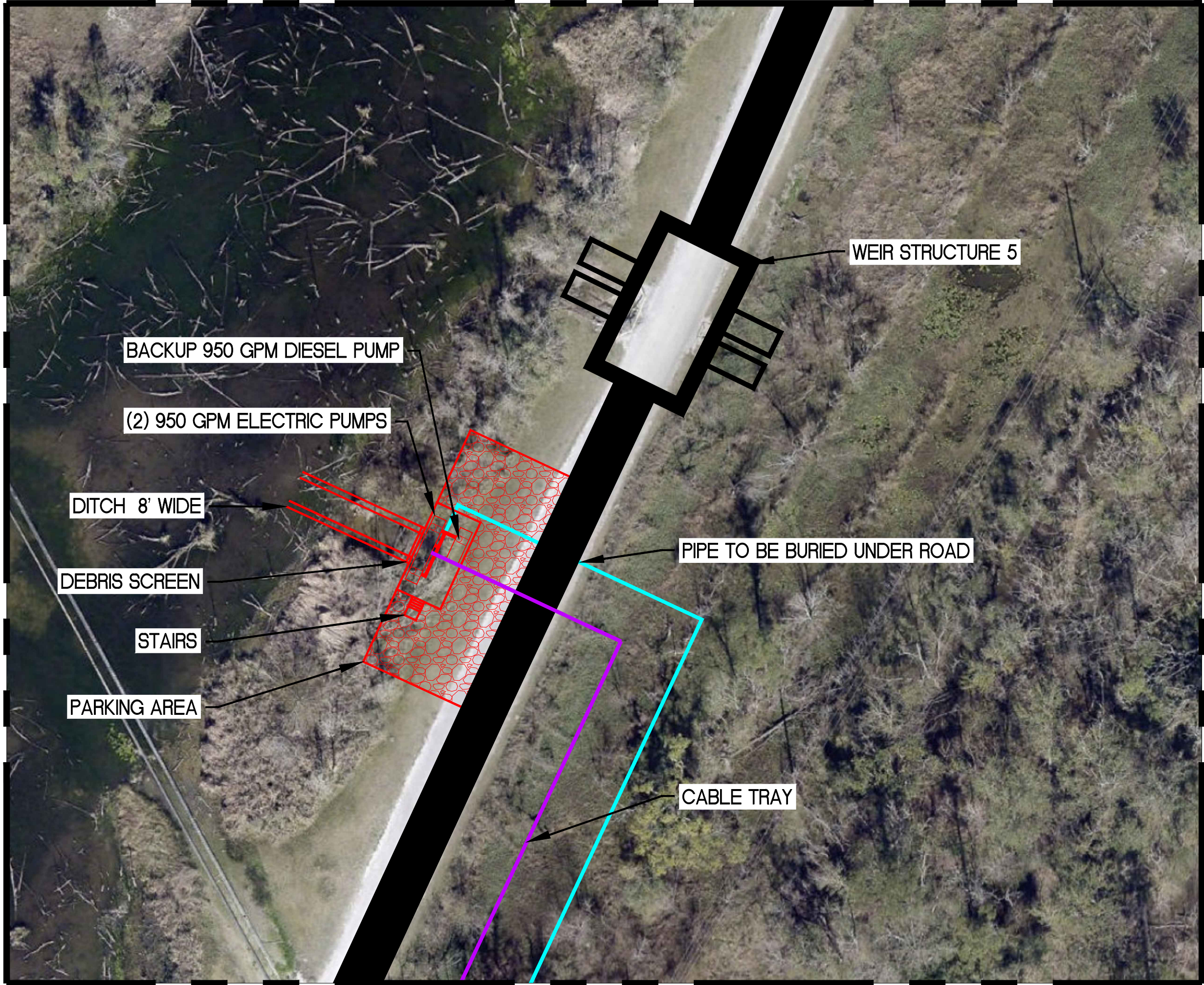
DRAWN BY B. WHITTINGTON DATE 4/2024 SCALE AS SHOWN
CHECKED BY DATE CHARGE
APPROVED BY DATE SHEET 4 OF 10

DWG. SK-APP1-04.02

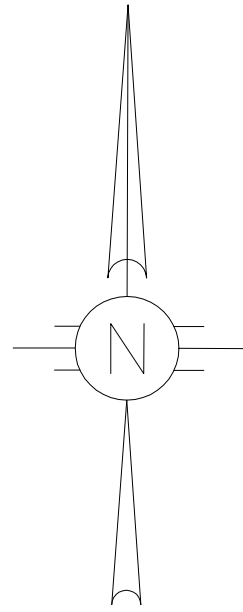
ISSUE FOR RECORD



PUMP STATION 1 ENLARGED PLAN
SCALE: 1" = 30'



PUMP STATION 2 ENLARGED PLAN
SCALE: 1" = 30'



REVISIONS	
ISSUED:	
FOR: RECORD	
BULLETIN NO.:	

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.



ReCON Management • Engineering Inspection	PLOTTED: 4/19/2024 11:10 AM
JOB NO. 23261173	
SULPHUR, LA	FILE: SK-APP1-05.DWG
APPROVED:	

Westlake North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD CIVIL
PUMP STATION 1 & 2
ENLARGED PLAN

DRAWN BY: B. WHITTINGTON DATE: 4/2024 SCALE: AS SHOWN
CHECKED BY: DATE: CHARGE:
APPROVED BY: DATE: SHEET 5 OF 10

DWG. SK-APP1-05.02

DATE: 4/2024
ISSUE FOR RECORD



CABLE TRAY

PIPE TO FOLLOW EXIST. PIPE RACK

WATER PIPE WILL LIE ON GROUND

EXIST. SWITCH GEAR BUILDING

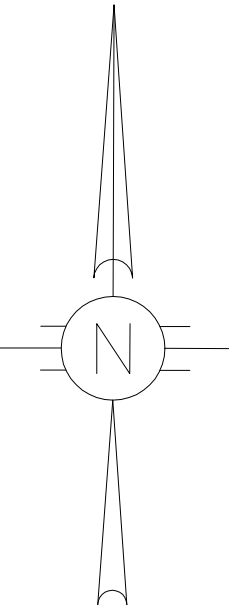
WATER TREATMENT AREA (2 ACRES)

WATER TREATMENT STATION ENLARGED PLAN
SCALE: 1" = 50'



DATE: 4/2024

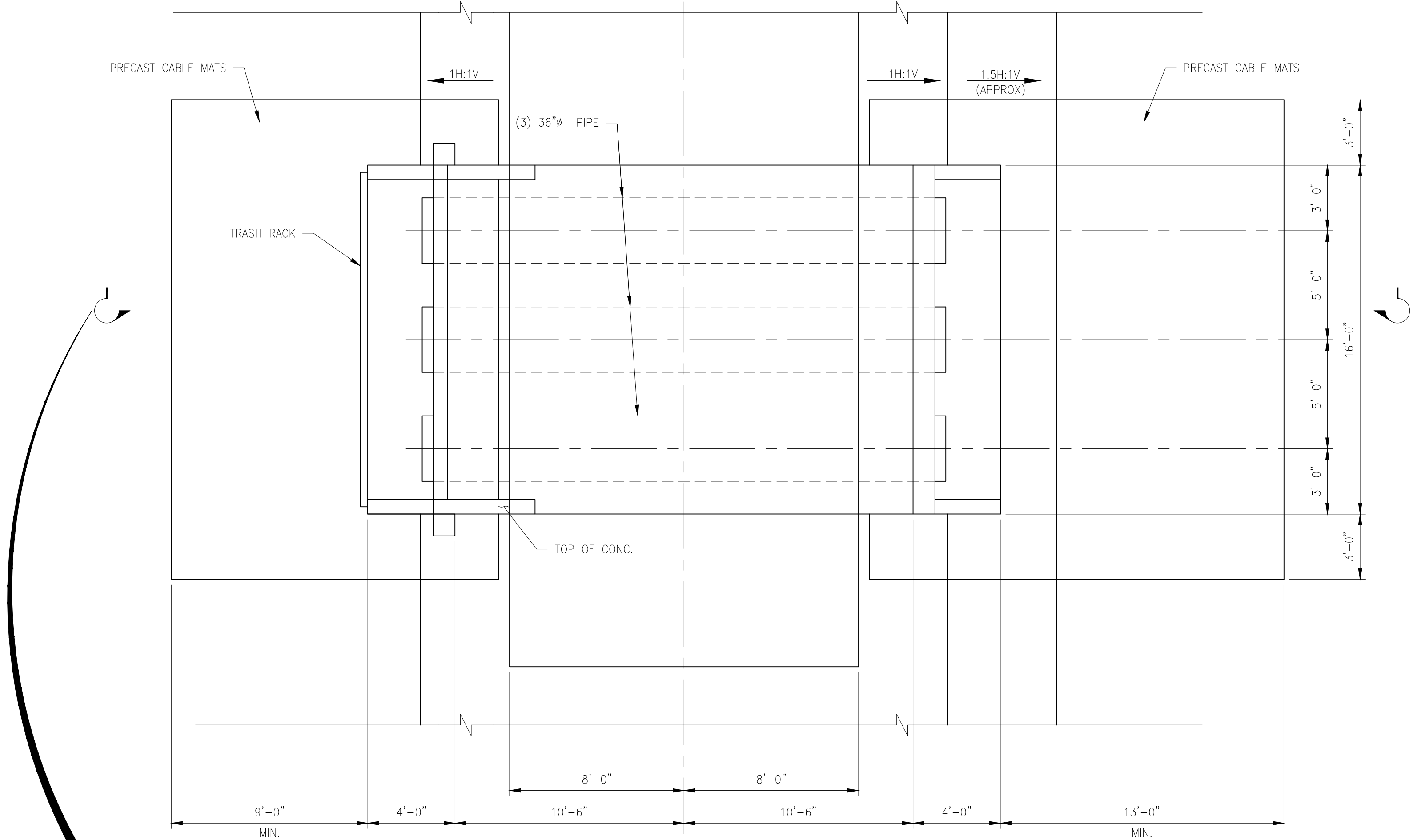
ISSUE FOR RECORD



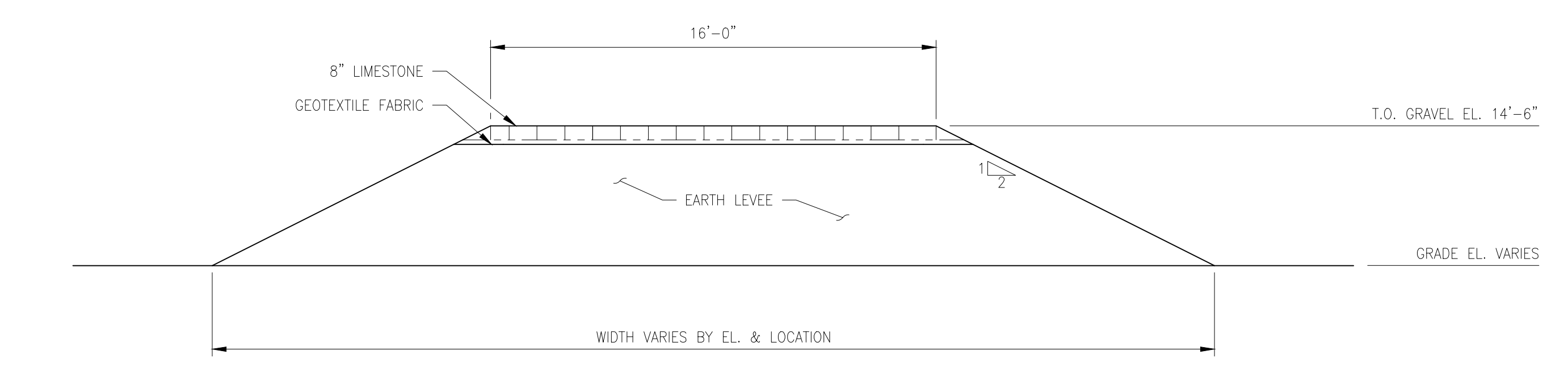
REVISIONS	
ISSUED:	
FOR: RECORD	
BULLETIN NO.:	

ReCON Management • Engineering Inspection	PLOTTED: 4/19/2024 11:10 AM
	JOB NO: 23261173
	SULPHUR, LA FILESK-APP1-06.DWG
APPROVED:	

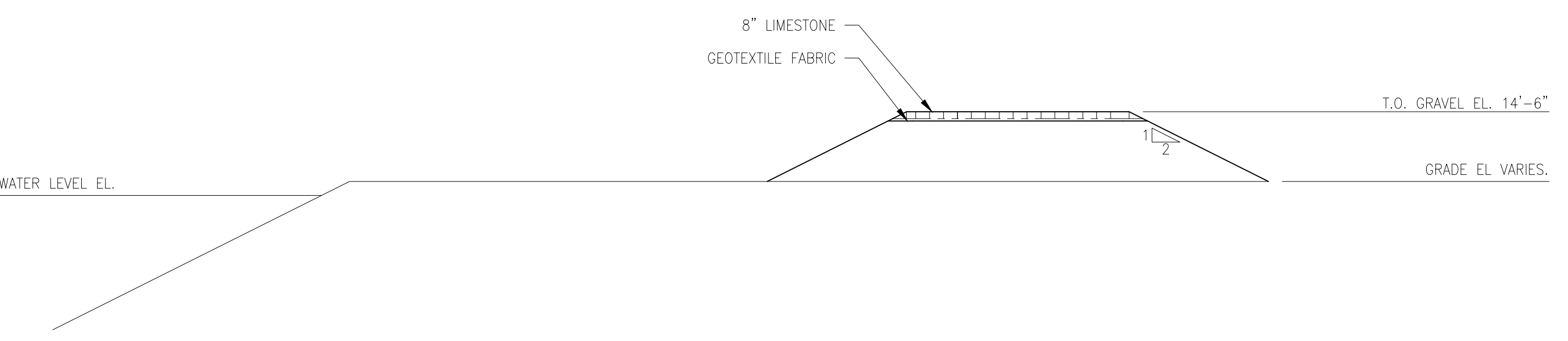
Westlake		North American Chlor-Alkali & Derivatives™ Lake Charles South Complex 1300 PPG Drive, Westlake, LA 70669	
SULPHUR BRINE FIELD		CIVIL	
PROPOSED WATER TREATMENT STATION			
ENLARGED PLAN			
DRAWN BY: B. WHITTINGTON	DATE: 4/2024	SCALE: AS SHOWN	
CHECKED BY:	DATE:	CHARGE:	
APPROVED BY:	DATE:	SHEET: 6	OF 10
DWG. SK-APP1-06.01			



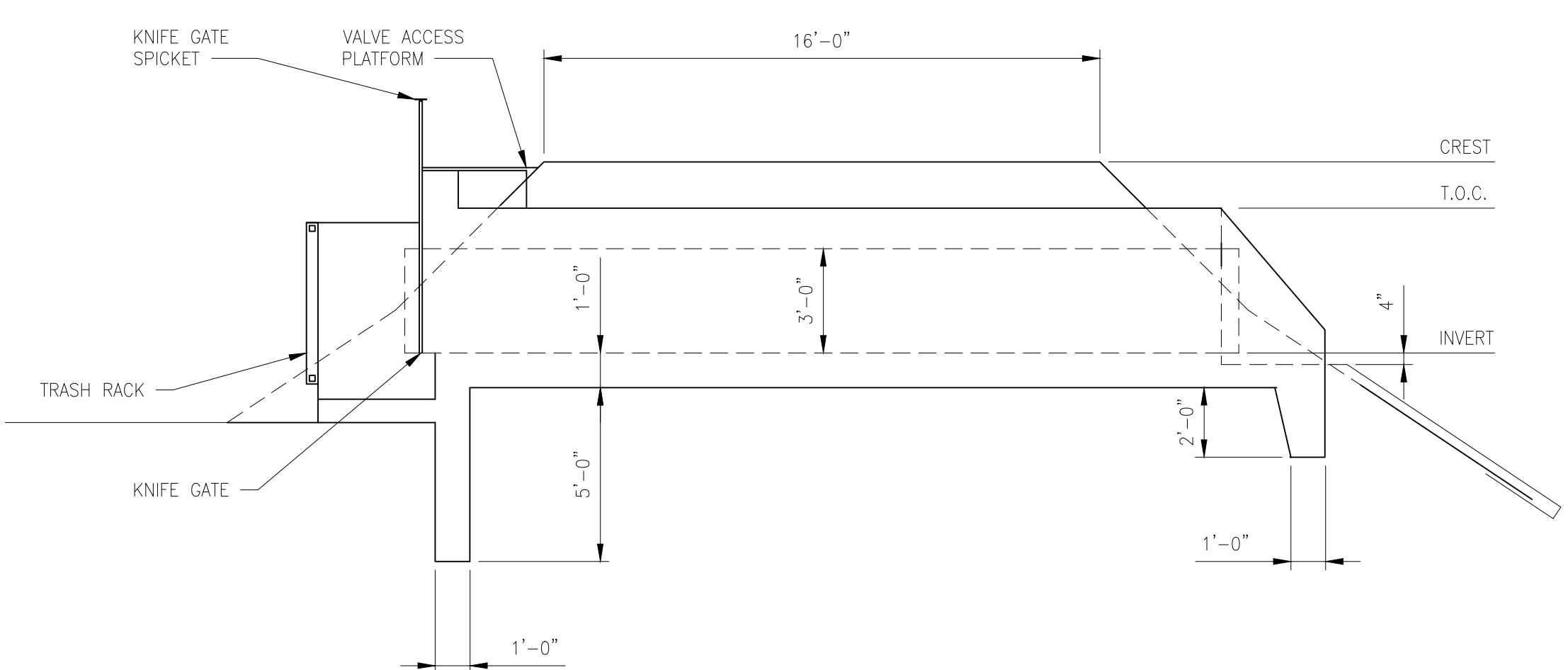
TYPICAL WEIR STRUCTURE PLAN
SCALE: 1/4" = 1'-0"



SECTION
TYPICAL LEVEE DETAIL
SCALE: 1/4" = 1'-0"



SECTION
TYPICAL LEVEE DETAIL
SCALE: 1/8" = 1'-0"



SECTION



ReCON
Management • Engineering
Inspection
SULPHUR, LA
JOB NO. 23261173
FILE SK-APP1-07.DWG
APPROVED:

Westlake
North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

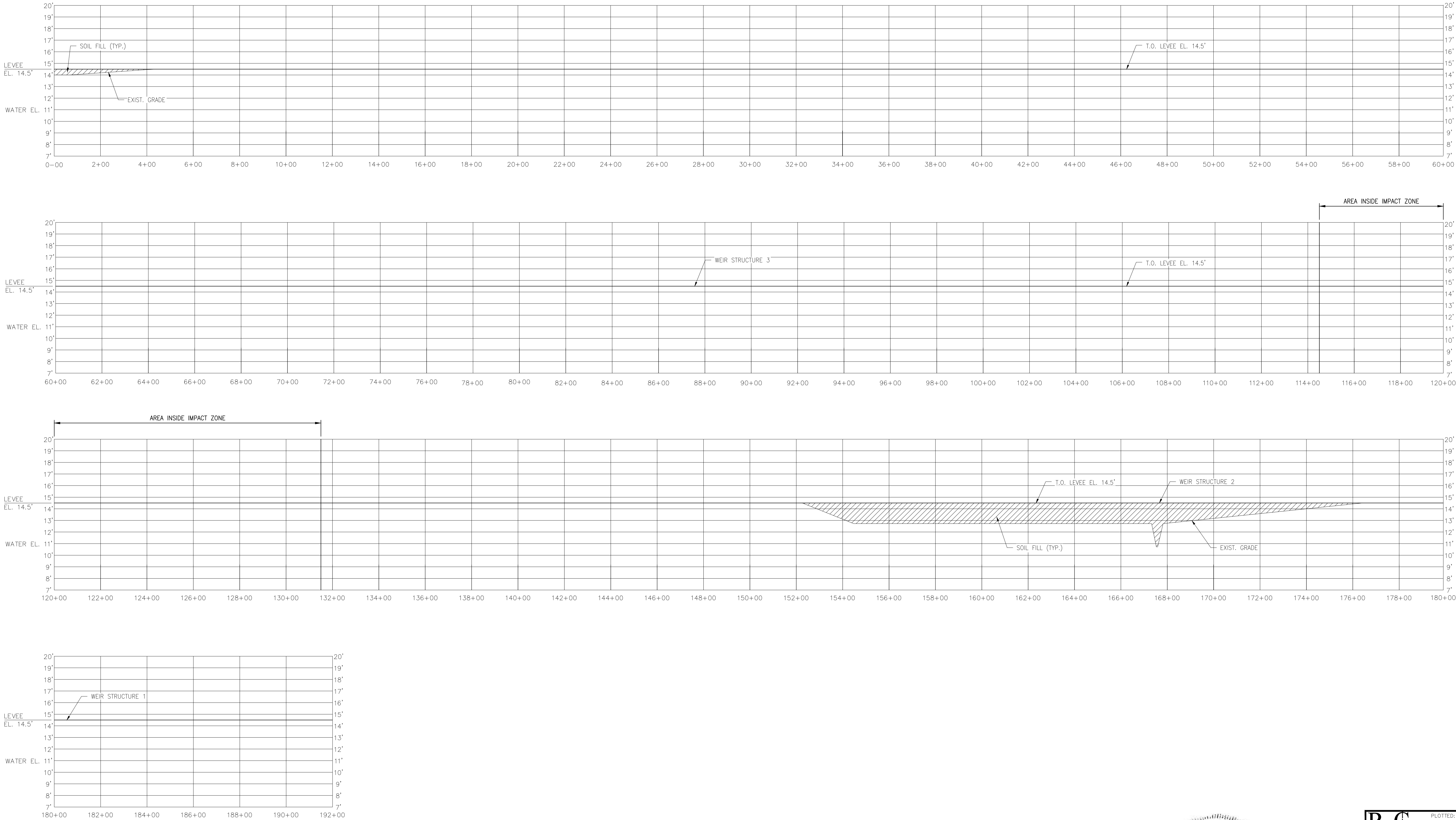
SULPHUR BRINE FIELD	CIVIL
LEVEE SYSTEM	
LEVEE AND WEIR STRUCTURE DETAILS	
DRAWN BY B.WHITTINGTON	DATE 4/2024
CHECKED BY	DATE
APPROVED BY	DATE
DWG.	SK-APP1-07.02

DATE: 4/2024
ISSUE FOR RECORD

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.

REVISIONS
ISSUED: 3/11/2024
FOR: RECORD
BULLETIN NO.:

REVISIONS



SALT LAKE LEVEE PROFILE

SCALE:
HORIZONTAL: 1" = 200'
VERTICAL: 1" = 4'



DATE: 04/2024

ISSUE FOR RECORD

ReCON Management • Engineering Inspection	PLOTTED: 4/19/2024 11:11 AM
	JOB NO.: _____
	SULPHUR, LA. FILE: SK-APP1-08.DWG
	APPROVED: _____

Westlake | North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

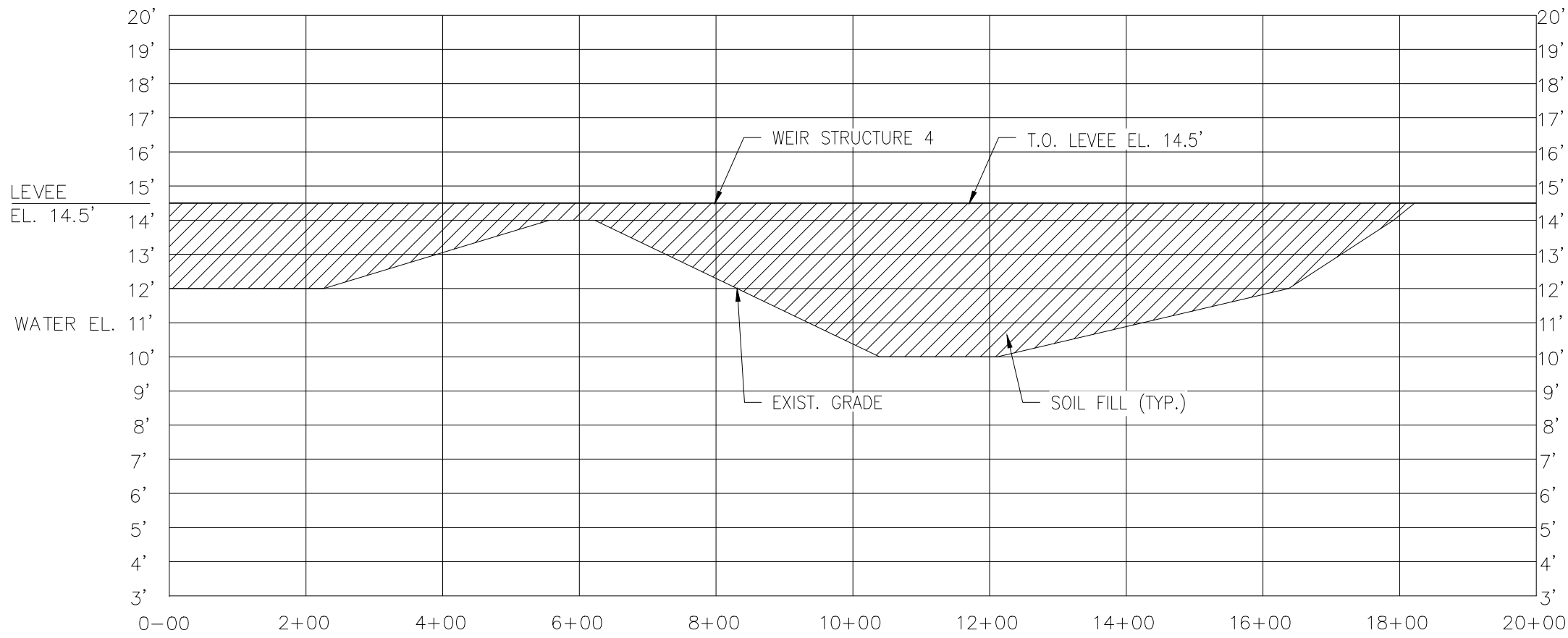
SULPHUR BRINE FIELD	CIVIL
SALT LAKE HIGH BANK LEVEE	
PROFILE	

DRAWN BY _____	DATE 4/2024	SCALE AS SHOWN
CHECKED BY _____	DATE _____	CHARGE _____
APPROVED BY _____	DATE _____	SHEET 8 OF 10

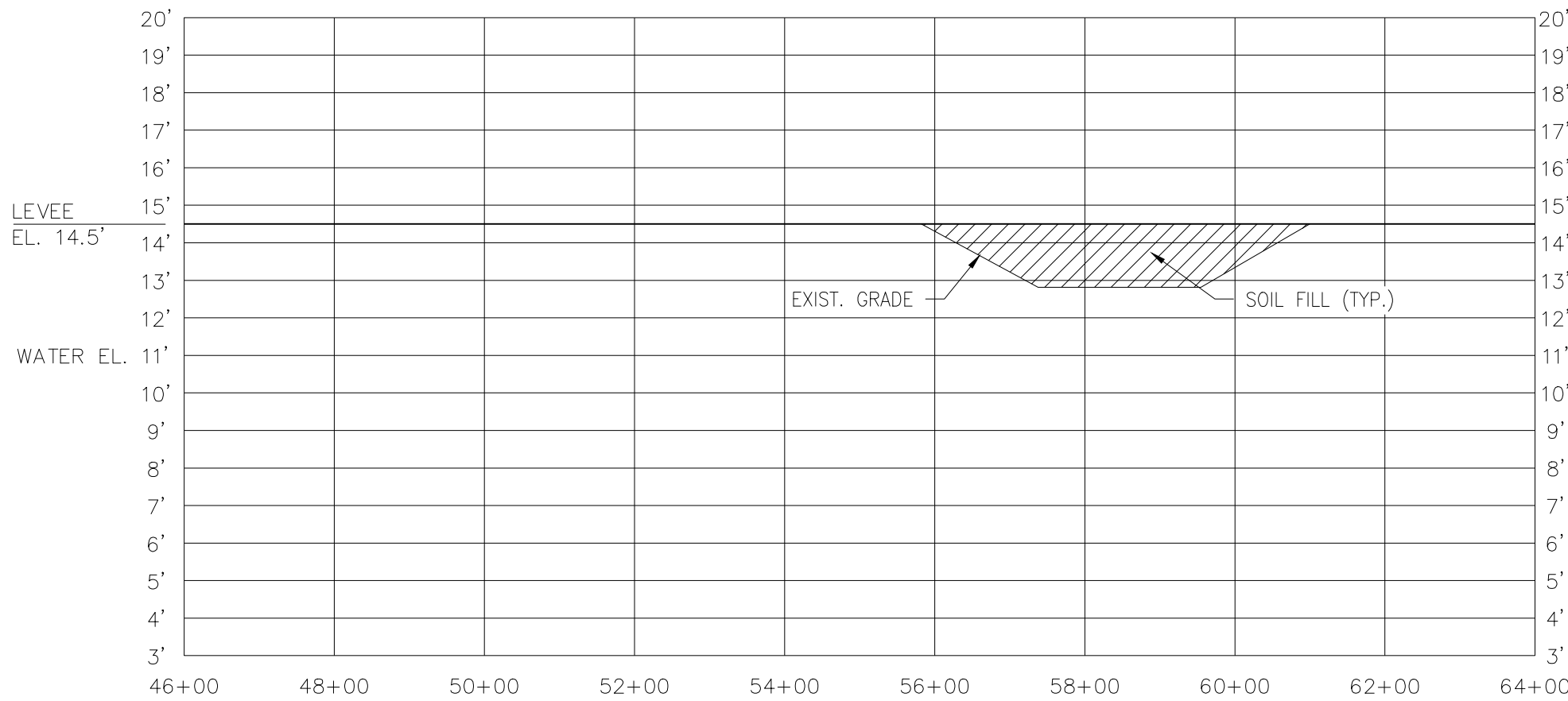
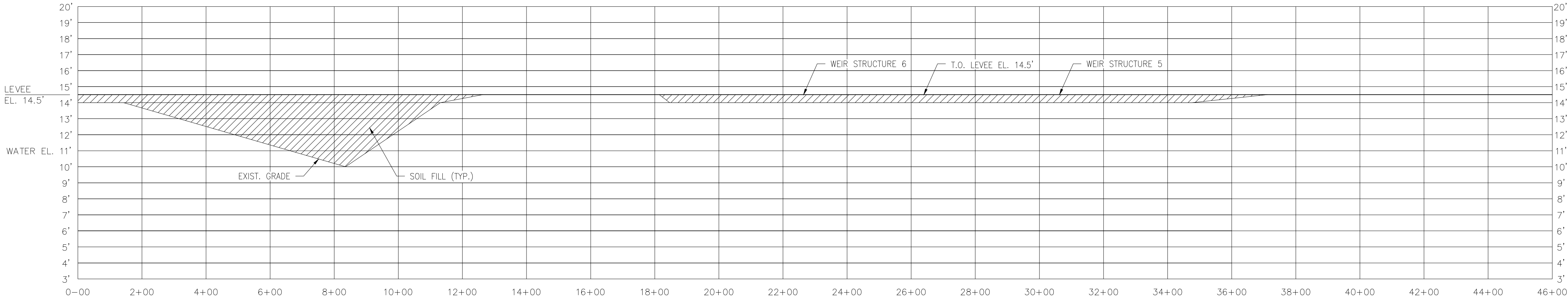
DWG. SK-APP1-08.02

FORM NO. 324-0503

REVISIONS



WELL LEVEE PROFILE



DOM LEVEE PROFILE

SCALE:
HORIZONTAL: 1" = 200'
VERTICAL: 1" = 4'

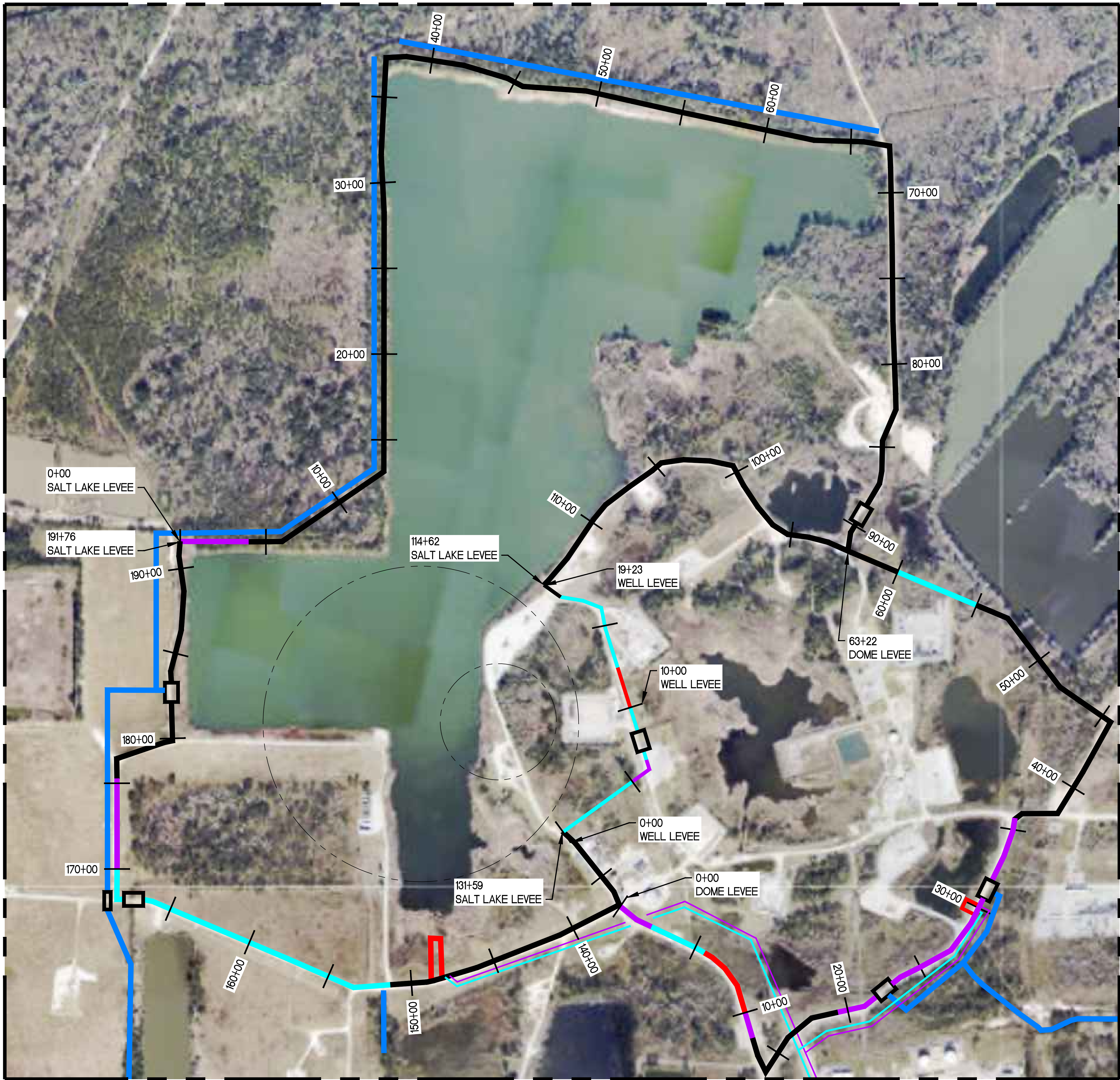
DATE: 4/2024

ISSUE FOR RECORD



ReCon Management • Engineering Inspection	PLOTTED: 4/19/2024 11:11 AM
	JOB NO.: _____
	SULPHUR, LA. FILE: SK-APP1-09.DWG
	APPROVED: _____

Westlake	North American Chlor-Alkali & Derivatives™ Lake Charles South Complex 1300 PPG Drive, Westlake, LA 70669
SULPHUR BRINE FIELD CIVIL	
DOME AND WELL LEVEE PROFILES	
DRAWN BY: _____ DATE: 4/2024 SCALE: AS SHOWN	
CHECKED BY: _____ DATE: _____ CHARGE: _____	
APPROVED BY: _____ DATE: _____ SHEET 9 OF 10	
DWG. SK-APP1-09.02	



LEVEE SYSTEM FILL SCHEMATIC
SCALE: 1" = 300'

LEVEE SYSTEM NOTES:

APPROX. AREA WITHIN SALT LAKE LEVEE: 293.8 ACRES
APPROX. LENGTH OF SALT LAKE LEVEE: 19,176'
APPROX. AREA OF WELL LEVEE: 19.3 ACRES
APPROX. LENGTH OF WELL LEVEE: 1,923'
APPROX. AREA OF DOME LEVEE: 166.3 ACRES
APPROX. LENGTH OF DOME LEVEE: 6,322'
APPROX. AREA TO BE CLEARED FOR LEVEE: 6.5 ACRES

LEGEND:

- LEVEES
- IMPACT ZONE ESTIMATE FROM LONQUIST
- STATIONS EVERY 500'
- 0-1' FILL
- 1'-3' FILL
- 3'-6' FILL



ReCON Management • Engineering Inspection	PLOTTED:
	4/19/2024 11:11 AM
	JOB NO: 23261173
	FILE: SK-APP1-10.DWG

Westlake North American
Chlor-Alkali & Derivatives™
Lake Charles South Complex
1300 PPG Drive, Westlake, LA 70669

SULPHUR BRINE FIELD CIVIL

LEVEE SYSTEM
FILL SCHEMATIC

DRAWN BY: _____ DATE: 4/2024 SCALE: AS SHOWN
CHECKED BY: _____ DATE: _____ CHARGE: _____
APPROVED BY: _____ DATE: _____ SHEET 10 OF 10

DWG. SK-APP1-10.01

ISSUE FOR RECORD

REVISIONS

ISSUED: CONST.
FOR: CONST.
BULLETIN NO.: CONST.

ALL PRINTS DATED BEFORE LAST REVISION ARE CANCELLED AND RECALLED.



NOAA Atlas 14, Volume 9, Version 2
Location name: Sulphur, Louisiana, USA*
Latitude: 30.2556°, Longitude: -93.413°
Elevation: 6 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.567 (0.456-0.716)	0.646 (0.519-0.817)	0.776 (0.621-0.983)	0.883 (0.703-1.12)	1.03 (0.792-1.35)	1.14 (0.860-1.52)	1.25 (0.913-1.72)	1.36 (0.957-1.93)	1.51 (1.02-2.20)	1.62 (1.07-2.41)
10-min	0.830 (0.667-1.05)	0.947 (0.760-1.20)	1.14 (0.909-1.44)	1.29 (1.03-1.65)	1.51 (1.16-1.98)	1.67 (1.26-2.23)	1.83 (1.34-2.51)	2.00 (1.40-2.82)	2.21 (1.50-3.22)	2.37 (1.57-3.52)
15-min	1.01 (0.814-1.28)	1.15 (0.927-1.46)	1.39 (1.11-1.76)	1.58 (1.26-2.01)	1.84 (1.41-2.41)	2.04 (1.54-2.72)	2.23 (1.63-3.06)	2.43 (1.71-3.44)	2.70 (1.82-3.93)	2.89 (1.91-4.30)
30-min	1.48 (1.19-1.86)	1.70 (1.36-2.15)	2.06 (1.65-2.61)	2.35 (1.87-3.00)	2.75 (2.12-3.61)	3.06 (2.30-4.08)	3.36 (2.45-4.61)	3.66 (2.57-5.17)	4.06 (2.74-5.91)	4.35 (2.88-6.47)
60-min	1.97 (1.58-2.49)	2.27 (1.82-2.86)	2.76 (2.21-3.50)	3.20 (2.54-4.07)	3.82 (2.96-5.06)	4.32 (3.27-5.80)	4.84 (3.54-6.68)	5.38 (3.79-7.65)	6.13 (4.16-8.98)	6.72 (4.44-9.98)
2-hr	2.47 (1.99-3.10)	2.83 (2.29-3.56)	3.47 (2.79-4.37)	4.04 (3.23-5.11)	4.88 (3.81-6.46)	5.58 (4.25-7.48)	6.31 (4.66-8.69)	7.10 (5.04-10.1)	8.21 (5.61-12.0)	9.09 (6.04-13.4)
3-hr	2.79 (2.26-3.49)	3.20 (2.59-4.01)	3.95 (3.18-4.95)	4.63 (3.72-5.84)	5.69 (4.48-7.54)	6.58 (5.05-8.83)	7.55 (5.60-10.4)	8.60 (6.14-12.2)	10.1 (6.96-14.8)	11.3 (7.57-16.7)
6-hr	3.38 (2.75-4.20)	3.89 (3.16-4.83)	4.85 (3.94-6.05)	5.78 (4.66-7.23)	7.23 (5.75-9.60)	8.49 (6.57-11.4)	9.88 (7.40-13.6)	11.4 (8.22-16.1)	13.7 (9.47-19.8)	15.5 (10.4-22.6)
12-hr	4.01 (3.28-4.94)	4.66 (3.81-5.75)	5.89 (4.80-7.29)	7.08 (5.74-8.80)	8.95 (7.16-11.8)	10.6 (8.23-14.1)	12.4 (9.32-16.9)	14.4 (10.4-20.2)	17.3 (12.1-24.9)	19.7 (13.3-28.5)
24-hr	4.69 (3.86-5.74)	5.48 (4.51-6.72)	6.98 (5.72-8.59)	8.41 (6.86-10.4)	10.7 (8.56-14.0)	12.6 (9.86-16.7)	14.7 (11.2-20.0)	17.1 (12.5-23.9)	20.5 (14.4-29.4)	23.3 (15.9-33.7)
2-day	5.43 (4.49-6.61)	6.35 (5.25-7.74)	8.07 (6.64-9.86)	9.69 (7.94-11.9)	12.2 (9.85-15.9)	14.4 (11.3-18.9)	16.7 (12.7-22.5)	19.3 (14.2-26.8)	23.1 (16.3-32.9)	26.2 (18.0-37.5)
3-day	5.89 (4.88-7.14)	6.89 (5.71-8.37)	8.74 (7.22-10.6)	10.5 (8.60-12.8)	13.1 (10.6-16.9)	15.4 (12.1-20.1)	17.8 (13.6-23.9)	20.5 (15.1-28.3)	24.4 (17.3-34.6)	27.6 (19.0-39.3)
4-day	6.24 (5.19-7.55)	7.31 (6.07-8.85)	9.25 (7.66-11.2)	11.1 (9.10-13.5)	13.8 (11.2-17.8)	16.1 (12.7-21.0)	18.7 (14.3-24.9)	21.4 (15.8-29.4)	25.4 (18.0-35.8)	28.6 (19.7-40.6)
7-day	7.15 (5.97-8.60)	8.32 (6.94-10.0)	10.4 (8.66-12.6)	12.3 (10.2-15.0)	15.2 (12.4-19.5)	17.7 (14.0-22.9)	20.4 (15.6-27.0)	23.2 (17.2-31.7)	27.3 (19.5-38.3)	30.7 (21.3-43.4)
10-day	8.00 (6.70-9.58)	9.22 (7.71-11.1)	11.4 (9.50-13.7)	13.4 (11.1-16.2)	16.3 (13.3-20.7)	18.8 (15.0-24.2)	21.5 (16.6-28.4)	24.4 (18.1-33.1)	28.5 (20.4-39.8)	31.8 (22.1-44.8)
20-day	10.5 (8.86-12.5)	11.9 (10.0-14.2)	14.3 (12.0-17.1)	16.3 (13.6-19.6)	19.3 (15.7-24.1)	21.7 (17.3-27.5)	24.2 (18.7-31.5)	26.9 (20.0-36.0)	30.5 (21.9-42.2)	33.4 (23.4-46.8)
30-day	12.6 (10.6-15.0)	14.2 (12.0-16.8)	16.8 (14.1-20.0)	19.0 (15.9-22.7)	22.0 (17.9-27.3)	24.4 (19.5-30.7)	26.9 (20.8-34.7)	29.4 (21.9-39.0)	32.7 (23.6-44.8)	35.3 (24.8-49.2)
45-day	15.2 (12.9-17.9)	17.1 (14.4-20.2)	20.1 (16.9-23.8)	22.5 (18.9-26.8)	25.9 (21.0-31.7)	28.4 (22.6-35.4)	30.9 (23.9-39.5)	33.3 (24.9-44.0)	36.5 (26.4-49.7)	38.9 (27.5-54.0)
60-day	17.4 (14.7-20.4)	19.5 (16.5-23.0)	23.0 (19.4-27.1)	25.7 (21.6-30.6)	29.4 (23.9-35.9)	32.1 (25.7-39.9)	34.8 (27.0-44.3)	37.4 (27.9-49.1)	40.6 (29.4-55.0)	43.0 (30.4-59.5)

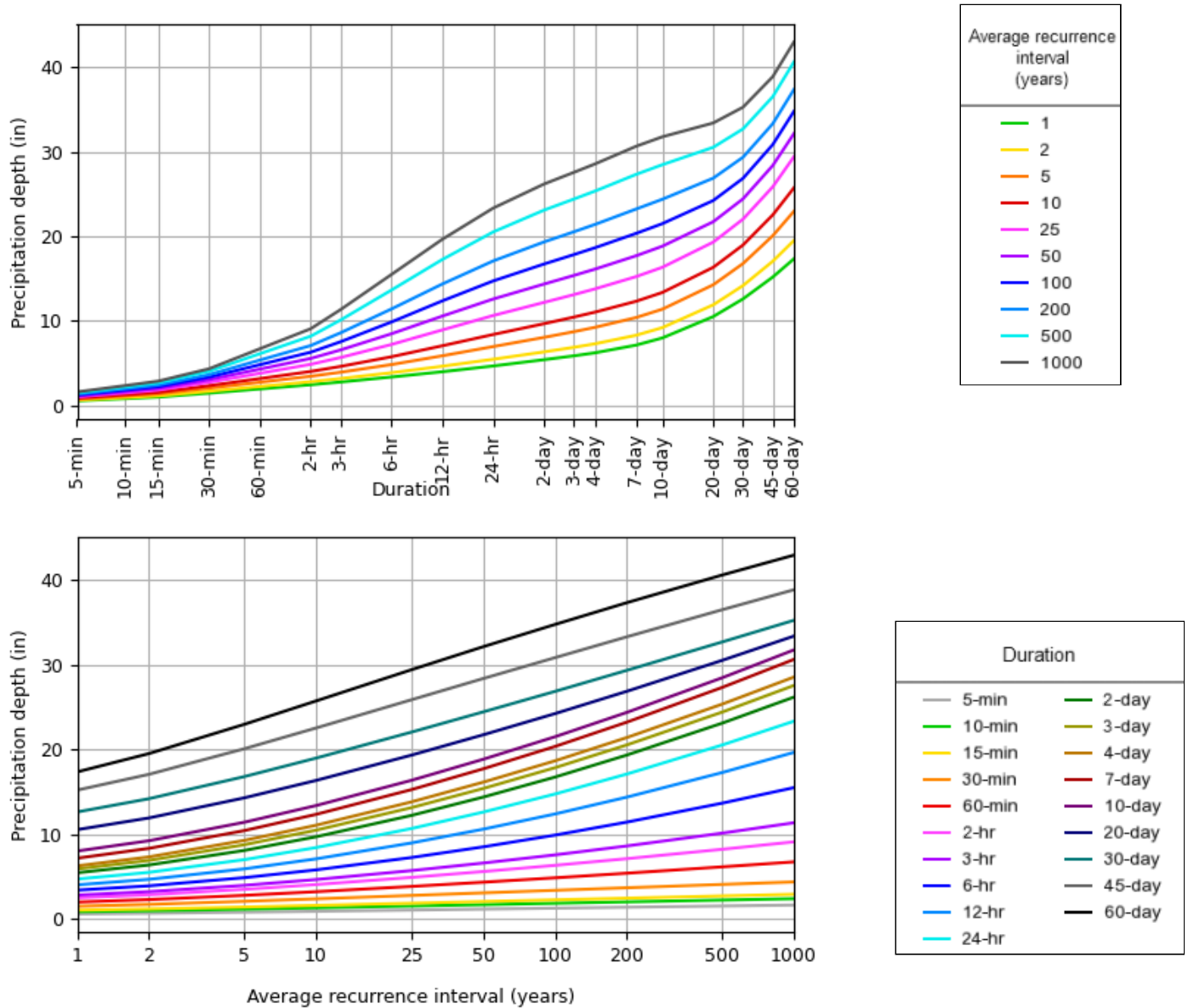
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

PDS-based depth-duration-frequency (DDF) curves

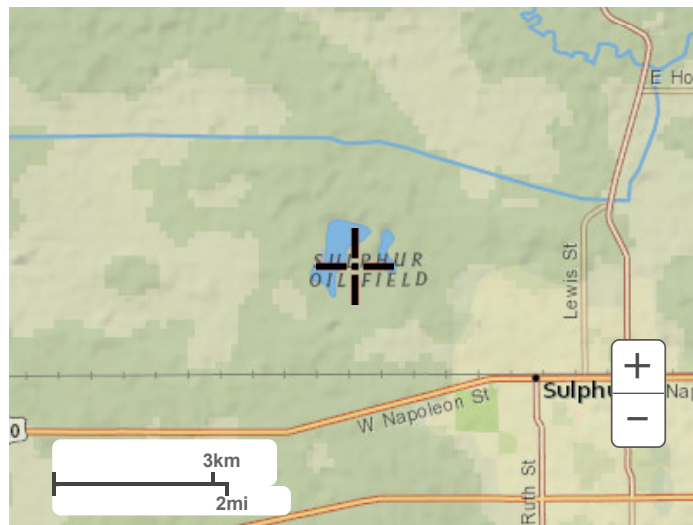
Latitude: 30.2556°, Longitude: -93.4130°

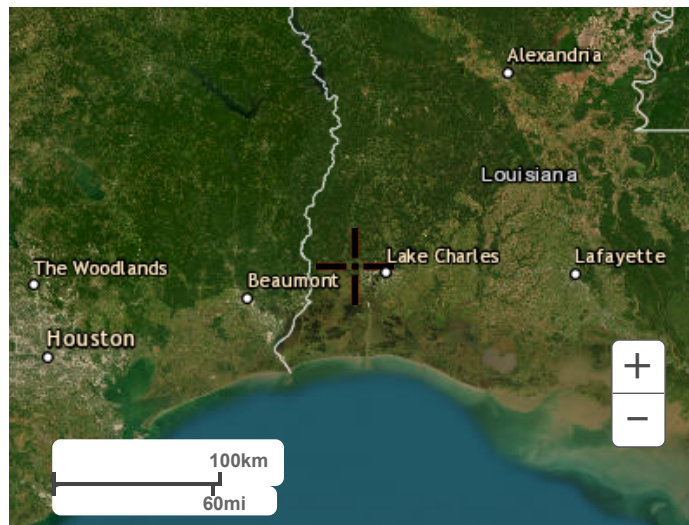


NOAA Atlas 14, Volume 9, Version 2

Created (GMT): Tue Feb 20 19:23:14 2024

[Back to Top](#)**Maps & aerals****Small scale terrain**

**Large scale terrain****Large scale map****Large scale aerial**



[Back to Top](#)

[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov
[Disclaimer](#)