Emergency Action Plan:
Reid Gardner Station, Mesa Ponds M5 and M7

Revision 04

February 2025

Pond Name	National Inventory of Dam Number	Nevada State Identification Number
Mesa Pond M5	NV10779	J-652
Mesa Pond M7	NV10780	J-652

Document Control No: ___ of ____

DO NOT DUPLICATE

Certification and Change Record

This section contains the written certification by a qualified professional engineer required by §257.73(a)(3)(iv) of the U.S. Environmental Protection Agency's Coal Combustion Residual (CCR) Rule. This Emergency Action Plan (EAP) for Ponds M5 and M7, existing coal combustion residual surface impoundments at Reid Gardner Station (Station), meets the requirements of §257.73(a)(3) of the CCR Rule.

Digitally signed by Nathan Betts
Date: 2025.03.11 18:16:34 -07'00'

It is recommended that the entire EAP be redistributed to all parties periodically. Updates to the notification flowchart, with names and numbers updated, review logs, record of training and participants, etc. should be revised periodically. Updated pages should be provided to each EAP holder, and follow-up confirmation is recommended to verify that pages have been replaced.

Document History and Status

Revision	Date	Description	Review
Original	April 14, 2017	Initial Plan	Nathan Betts, PE /CH2M
1	April 28, 2017	Removed Initial Hazard Potential Classification Assessment from Appendix A, and re-lettered Appendixes. Added document control no. label on cover. Added revision number to footer.	Nathan Betts, PE /CH2M
2	June 19, 2018	Updated notification procedures, equipment, and personnel to reflect operational changes	Nathan Betts, PE /Jacobs
3	April 16, 2021	Updated status of Station facilities following decommissioning and demolition of generating units 1-4; updated contact information, responsibilities, and notification procedures; updated equipment, added Initial Hazard Potential Classification Assessment (inundation modeling files) as Appendix D, and added a new Figure 4-1 for the Station Location and Vicinity Map, renumbered the original Figures 4-1 and 4-2 to Figures 4-2 and 4-3 respectively.	Scott Dethloff, PE/Jacobs
4	February 2025	Updated notification procedure, contact information, responsibilities, and current operational status.	Nathan Betts, PE /Jacobs

Contents

Appendixes

Tables

Figures

1. Summary of Emergency Action Plan Responsibilities

A summary of Emergency Action Plan (EAP) responsibilities during and before an emergency is provided in Table 1-1 and EAP responsibilities for specific positions is provided in Table 1-2. All responsibilities are described in greater detail in Section 6.

Table 1-1. Summary of EAP Emergency Responsibilities

Entity	Responsibilities
NV Energy	**During an Emergency** 1. Detect and evaluate emergency conditions and classify the emergency level (Section 5 and Table 5-1). 2. Follow notification flowchart (Section 2 and Figure 2-1). 3. Mitigate with corrective action. 4. Monitor the M5/M7 ponds and provide timely status updates. 5. Terminate emergency when resolved. **Prior to an Emergency** 1. Disseminate EAP to stakeholders. Dissemination to local emergency responders is recommended. 2. Provide for EAP training. An annual frequency is recommended. 3. Perform periodic exercises, drills and testing for the EAP. At minimum, an annual face-to-face meeting or exercise with local emergency responders is required. 4. Perform periodic review of the EAP to ensure contact information is correct and operational changes are reflected, an annual review is suggested. 5. Based on periodic reviews, update the EAP as needed. Additional items that could trigger an update include lessons learned from the exercises, drills, and testing, and whenever there is a change in conditions that would substantially affect the EAP. 6. Flesh out these and other responsibilities. Require and take proactive steps to ensure compliance with all EAP requirements and verifications
Clark County Emergency Dispatch (911)	1. Receive emergency call from NV Energy. 2. Notify and mobilize Clark County emergency responders. 3. Coordinate initial two-way communication with NV Energy for status reports.
Clark County Police, Fire and Rescue, and Emergency Services	1. Receive notification from Clark County Emergency Dispatch [911]. The dispatch will determine the appropriate first responders based on the situation. 2. Establish communication and coordinate directly with NV Energy. 3. Receive status updates. 4. Notify the public within the inundation limits. 5. Evacuate within the inundation limits, if required. Implement their own emergency response plan per their standard operating procedures. 6. Assist NV Energy, as necessary.

Table 1-2. Summary of NV Energy Responsibilities by Position

Entity	Responsibilities
Operations Manager Todd Robison	1. Determine emergency level. 2. Initiate notification procedures. 3. Initiate evacuation protocol if appropriate 4. Contact Clark County Emergency Dispatch (911). 5. Overall responsibility for the implementation of this EAP and for assigning an incident commander when in doubt . 6. Assign an engineer or retain an informed outside consultant as a dam-safety engineer. That engineer must be experienced in dam design and dam safety and be available for consultation and expert opinion prior to and during dam-safety emergencies. 7. Optionally participate as part of the technical team to provide periodic dam inspections in advance of an emergency, and assist in evaluation, classification and suggesting response actions when the EAP is activated or under consideration for activation. 8. If not available during an emergency, the Production Manager or EAP Coordinator will assume these responsibilities.
Incident Commander (per Sect. 6.2.2)	1. Has the authority to take and direct all emergency actions described in this EAP. 2. Selected per Section 6.2.2 based on who is available. 3. Title may be transferred but must at all times be filled and clearly designated during an emergency.
Regional Director Don Hopper	1. Notify the Corporate Public Information Office for potential failures and imminent failure emergencies. 2. Responsible for overseeing and confirming that the EAP responsibilities of the EAP coordinator, operations manager and dam-safety engineer have been adequately completed each year, consistent with this EAP and EAP objectives.
EAP Coordinator Michael Rojo	1. Act for the Operations Manager in his absence. 2. Provide and coordinate assistance to the incident commander and corporate officials during an emergency, serving as a deputy. 3. Responsible for organizing follow-up meetings and completing follow-up reports after the termination of an event. 4. Ensure that the provisions of the EAP are fulfilled, including preparedness, notification contact updates and other EAP requirements. 5. Coordinate and provide for training, EAP exercises/tests, an EAP update, and other EAP revisions, as needed (enlisting in-house or consultant dam-safety EAP experts, as needed). 6. Answer general questions pertaining to the EAP.
Dam Safety Engineer Alex Fitzjerrells	1. Be available for consultation and expert opinion prior to and during dam-safety emergencies. 2. Participate as part of the technical team to provide periodic dam inspections in advance of an emergency, and assist in evaluation, classification and suggesting response actions when the EAP is activated or under consideration for activation. 3. Provide input regarding the timing of EAP termination and post-event follow-up.
Corp. Security	1. Respond to suspicious persons.

2. Emergency Level and Notifications

The notification procedure is listed below, and the flowchart shown on Figure 2-1 summarizes who is to be notified by whom, and in what priority, based on the three potential emergency levels.

2.1 Step 1: Emergency Level Determination

Determine the Emergency Level: Non-Failure , Potential Failure, or Imminent Failure. The guidance for determining the emergence level is provided in Table 2-1.

Table 2-1. Emergency Level Determining Guidance

Risk	Emergency Level Determination Guidance	Emergency Level		
		Non-Failure	Potential Failure	Imminent Failure
Flooding	Not considered a likely event for M5/M7 ponds because of the location on Mesa and away from low-lying areas. Closure has also been initiated per 40 CFR §257.101(a)(1) and there is approximately 3 feet of solids in the ponds.	•		
Erosion	Incised areas close to the ponds	•		
Overtopping of top of the ponds	Water level is above maximum operational level, but more than 12 inches below the pond embankment	•		
	Water level within 12 inches of pond embankment		•	
	Erosion of embankment area by large overtopping waves			•
	Water level at or nearly at top of dam; water overtopping top of dam, with or without erosion			•
Seepage	New seepage area on or around the M5/M7 Ponds	•		
	New seepage area with cloudy discharge or increasing flow rate		•	
	Rapid flow rate increase with cloudy discharge from an existing seepage area			•
	New, small sand boil, whirlpool, rapid settlement, or sinkhole	•		
	Enlarging sand boil, whirlpool, settlement, or sinkhole – imminent failure if rapid		•	•
Embankment cracking	New cracks in the embankment, greater than 0.25-inch-wide, without seepage	•		
	Cracks in the embankment with seepage		•	
Embankment movement	Evidence of embankment slope movement (sliding, slumping, rotation, settlement)	•		
	Sudden or rapidly progressing slides of the embankment slopes			•

Table 2-1. Emergency Level Determining Guidance

		Emergency Level		
Risk	**Emergency Level Determination Guidance**	**Non-Failure**	**Potential Failure**	**Imminent Failure**
Earthquake	Earthquake felt at ponds M5/M7 or with Magnitude 4.0 reported within 30 miles	•		
	Earthquake resulting in visible damage to the M5/M7 Ponds		•	
	Earthquake resulting in uncontrolled release of water from the M5/M7 Ponds			•
Security threat	Demonstration or public protest that raises security threat levels	•		
	Verified bomb threat that, if carried out, could result in damage to the M5/M7 ponds		•	
	Detonated bomb that has resulted in damage to the M5/M7 Ponds			•
Sabotage/ vandalism	Damage to the M5/M7 Ponds with no impact ponds function	•		
	Modification of M5/M7 Ponds that could adversely impact function	•		
	Damage to M5/M7 Ponds that has resulted in seepage flow		•	
	Damage to M5/M7 Ponds that has resulted in uncontrolled water release			•

Notes:

2.2 Notification Procedure

The notification procedure is described below. The notification flowchart shown on Figure 2-1 below, summarizes who is to be notified by whom, and in what priority, based on the three potential emergency levels. A breach inundation map is included in Section 8. Classification of emergency levels is summarized in Table 2-1 above.

2.3 Notification Procedure

1) ***Emergency Level*** **–** Correctly classify the emergency level to ensure proper notification and messaging. Emergency levels are defined here and described in more detail in Section 5 and Table 2-1.

   – **Imminent Failure:** Failure is imminent or has occurred. For example, rapidly increasing seepage erosion, overtopping or an embankment breach.

   – **Potential Failure:** A dam failure condition may be slowly developing, but failure can be delayed or averted with a timely response; failure is not imminent. For example, a significant earthquake, acts of sabotage or terrorism, water surface elevation within 12 inches of the dam embankment crest, or failure of wastewater pipelines.

- **Non-Failure:** Will not, by itself, lead to flooding. For example, water surface elevation above the maximum operational level, new seepage or leakage to monitor, security threats, or malfunction of a wastewater valve.

2) ***Message*** **–** Contact the personnel listed on the notification flowchart, Figure 2-1, in accordance with the emergency level. Contact using the applicable sample message listed in Section 2.3.1.
3) ***Escalation*** **–** If the emergency level escalates, immediately notify personnel required only for higher emergency levels, per the notification flowchart on Figure 2-1.
4) ***De-escalation*** **–** If the emergency level de-escalates, provide an update to all previously contacted personnel, per the notification flowchart, before switching communications to personnel required only for lower-level emergencies.
5) ***Emergency Termination*** **–** See Section 5.5.

Table 2-2. EAP Distribution List

Reid Gardner Station 501 Wally Kay Way, Moapa, Nevada 89025 **Total number of copies distributed: 1 0**			
Department/Division	**Location**	**Number of Copies**	**Document Control Number**
NV Energy	501 Wally Kay Way, Moapa, Nevada 89025	3	1, 2, 3
Clark County Public Works Emergency Management Coordinator	500 Grand Central Parkway Las Vegas NV 89155-4000	1	4
Nevada Department of Public Safety Emergency Management	555 Wright Way Carson City, NV 89711	1	5
Dept of Conservation and Natural Resources – Division of Water Resources	901 South Stewart Street Suite 2002 Carson City, NV 89701-5250	2	6, 7
Moapa Valley Fire District Fire Chief	P.O. Box 578 Logandale, NV 89021	1	8
Clark County Fire Department Office of Emergency Management and Homeland Security	575 E. Flamingo Road Las Vegas, NV 89119	1	9
Las Vegas Metropolitan Police Department Southern Nevada Counter – Terrorism Center	400 S. Martin Luther King Blvd. Las Vegas, NV 89106	1	10

2.3.1 Sample Messages

Below is a sample of the language which should be used when reporting an imminent failure, a potential failure, or non-failure event

2.3.1.1 Sample Message for Imminent Failure (to Emergency Response Agency)

My name is __________. I am the ________ at the NV Energy Reid Gardner Station in Moapa, Nevada. A dam at our Station called Mesa Ponds M5/M7 is failing [about to fail or has failed]. I am initiating the Emergency Action Plan. This is NOT a drill or a test. This is a dam failure emergency. We recommend that you initiate immediate warnings and evacuation along the Muddy River corridor between Reid Gardner Station and downstream to Interstate Highway 15 (approximately 4.5 miles).

Please refer to your copy of the Emergency Action Plan to see sample inundation maps. If you do not have a copy of the EAP, we can provide one. I can provide details from those maps about locations where people may be at risk and estimate potential flood wave arrival times and depths. [Share information from EAP inundation maps.]

The problem at the dam is __________ [explain with a few simple words].

I can provide a status update in roughly ____ minutes at this number. If you have follow-up questions, please call _______ at _______ [give contact and number].

2.3.1.2 Sample Message for Potential Failure (to Emergency Response Agency)

My name is __________. I am the _________ at the NV Energy Reid Gardner Station in Moapa, Nevada. There is a serious situation here at one of our dams, but no immediate danger of a dam failure. I am initiating the Emergency Action Plan. This is NOT a drill or a test.

The problem at the dam is __________ [explain with a few simple words]. Please refer to your copy of the Emergency Action Plan to see sample inundation maps. If you do not have a copy of the EAP, we can provide one.

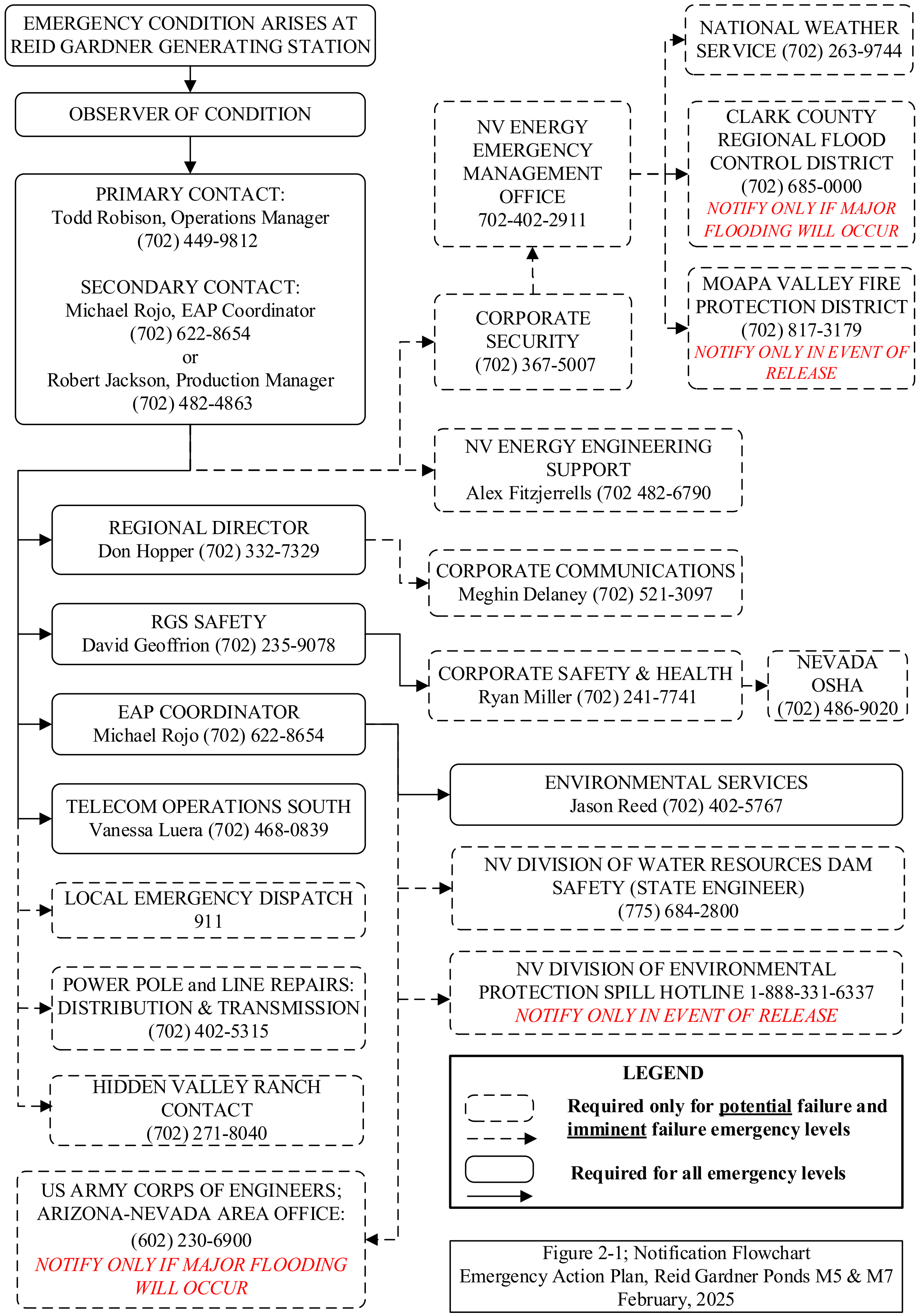
I will provide a status update when available. If you have follow-up questions, please call _______ at _______ [give contact and number].

2.3.1.3 Sample Message for Non-Failure Event (Internal Only)

My name is __________. I am the _________ at the NV Energy Reid Gardner Station in Moapa, Nevada. There is an unusual condition at one of our dams, but no immediate danger of a dam failure. I am initiating the Emergency Action Plan. This is NOT a drill or a test.

The problem at the dam is __________ [explain with a few simple words]. Please refer to your copy of the Emergency Action Plan. If you do not have a copy of the EAP, we can provide one.

Figure 2-1. Notification Flowchart Emergency Action Plan, Ponds M5 & M7



3. Statement of Purpose

3.1 Purpose

This EAP defines responsibilities and provides procedures designed to identify unusual and unlikely conditions that may endanger NV Energy Mesa Ponds M5 or M7 at the Station in time to take actions to mitigate the problem and notify the appropriate emergency management officials of possible, impending, or actual failure of a pond. The EAP may also be used to provide notification when the potential for major flooding downstream of the facility is present. This EAP was written to meet the requirements of the Nevada Administrative Code 535.320[1] and Section 257.73 of the U.S. Environmental Protection Agency's Coal Combustion Residual (CCR) Rule.

The Mesa Ponds are regulated as dams by the Nevada Division of Water Resources' Dam Safety Program (i.e., the State Engineer). The EAP provides for the following prior to, during and after a dam emergency:

- **Responsibilities** for preparedness, emergency action and post-emergency assessment
- **Notification Flowchart** (Figure 2-1) for emergency communication/coordination
- **Project Description** containing a site description and key information about the dam
- **EAP Response Process** (detect, evaluate, notify, mitigate, terminate, follow-up)
- **Preparedness** prior to an emergency
- **Inundation Maps** (Figures 8-1 and 8-2) to illustrate potential dam failure inundation limits
- **Supplemental Materials** that may be useful prior to or during an emergency

The general objective is to reduce the risk of death, injury, property damage, ecological damage and contamination due to flooding or an unlikely dam failure emergency.

3.2 Scope

With careful planning and proper training prior to an emergency, loss of life, property damage and economic and environmental impacts can be reduced. The intent of this EAP is to train and assist personnel in the appropriate preparation and response to a flooding or dam-safety emergency at the M5/M7 Ponds located on the Mesa. As such, it does not cover other facilities, nor does it directly cover related safety topics, such as site security, public access and safety, and response to medical emergencies. The EAP is an important training tool and plan for unusual and emergency dam conditions, and applies to all personnel, contractors and others who may be on-site or have responsibilities during an emergency.

[1] Nevada Administrative Code 535.320 refers to *FEMA 64*, which presents Federal Emergency Management Agency's (FEMA) standardized guidelines and template for EAPs for dams. The full title for FEMA 64 is *Federal Guidelines for Dam Safety, Emergency Action Planning for Dams* (July 2013).

4. Project Description

4.1 Current Condition

The Mesa ponds were taken out of service in April 2021 when piping carrying waste process water from the former generating facility was disconnected and air-gapped preventing any additional influent from entering the ponds. Closure of the ponds was initiated per 40 CFR §257.101(a)(1). Currently there is approximately 3 feet of solids in each the two ponds.

4.2 Location of Mesa Ponds

Provided below are Location of the Station, directions of access to the Mesa Ponds from both Las Vegas to the west and Mesquite to the East, and the legal description and coordinates of the ponds are provided below.

4.2.1 RGS Site Location

The Station is approximately 45 miles northeast of Las Vegas within the Moapa Valley, a large and relatively flat-bottomed valley occupied by the Muddy River, a spring-fed perennial stream. The river bisects the NV Energy property in a northwest to southeast orientation. Ponds M5 and M7 are about a mile south of the Station on a mesa overlooking the valley. The latitude and longitude of the plant area is 36° 39'22" N and 114° 38'03" W. Figures 4-1, 4-2, and 4-3 show the location and vicinity of the Station and the Mesa Ponds.

4.2.2 Mesa Ponds Access

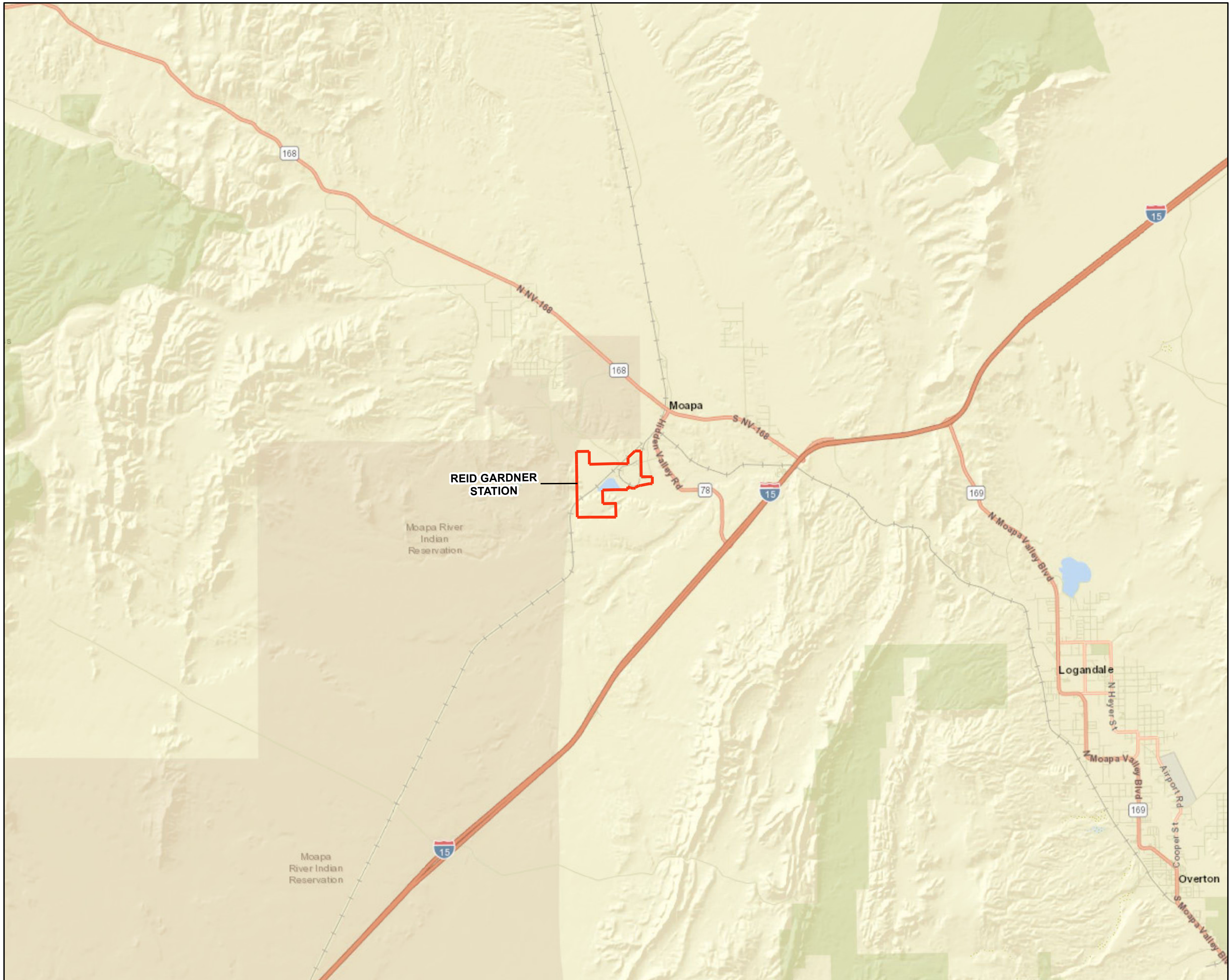
Primary Route: From Las Vegas Interstate 15 (I-15), take the Hidden Valley Road Exit (Exit 88). Head north on Hidden Valley Road for approximately 2.5 miles. Turn left onto Wally Kay Way and travel for approximately 1 mile to the Station. Meet up with NV Energy personnel at the warehouse to proceed approximately 1 mile to the south to reach the Mesa Ponds.

Alternate Route: From Las Vegas I-15, take U.S. Route 93 toward Ely (Exit 64) and head north. Turn right to head east on State Road 168 (SR-168) at Coyote Springs. Travel on SR-168 for approximately 21 miles. Turn right onto Hidden Valley Road and travel for approximately 1 mile to Wally Kay Way. Take a right onto Wally Kay Way and continue to the Station. Meet up with NV Energy personnel at the warehouse to proceed approximately 1 mile to the south to reach the Mesa Ponds.

Primary Route: From Mesquite I-15, take the Glendale Moapa Exit (Exit 91). Head north on SR-168 for approximately 3.0 miles. Turn left onto Hidden Valley Road and travel for approximately 1 mile to Wally Kay Way. Take a right onto Wally Kay Way and continue to the Station. Meet up with NV Energy personnel at the warehouse to proceed approximately 1 mile to the south to reach the Mesa Ponds.

4.2.3 Mesa Ponds Location and Coordinates

The M5/M7 Ponds are located within the southeast quarter of Section 8. The facility is in Township 15 South, Range 66 East, Mount Diablo Baseline and Meridian in Clark County, Nevada. The latitude and longitude of the ponds are 36° 38'32" N and 114° 37'50" W.



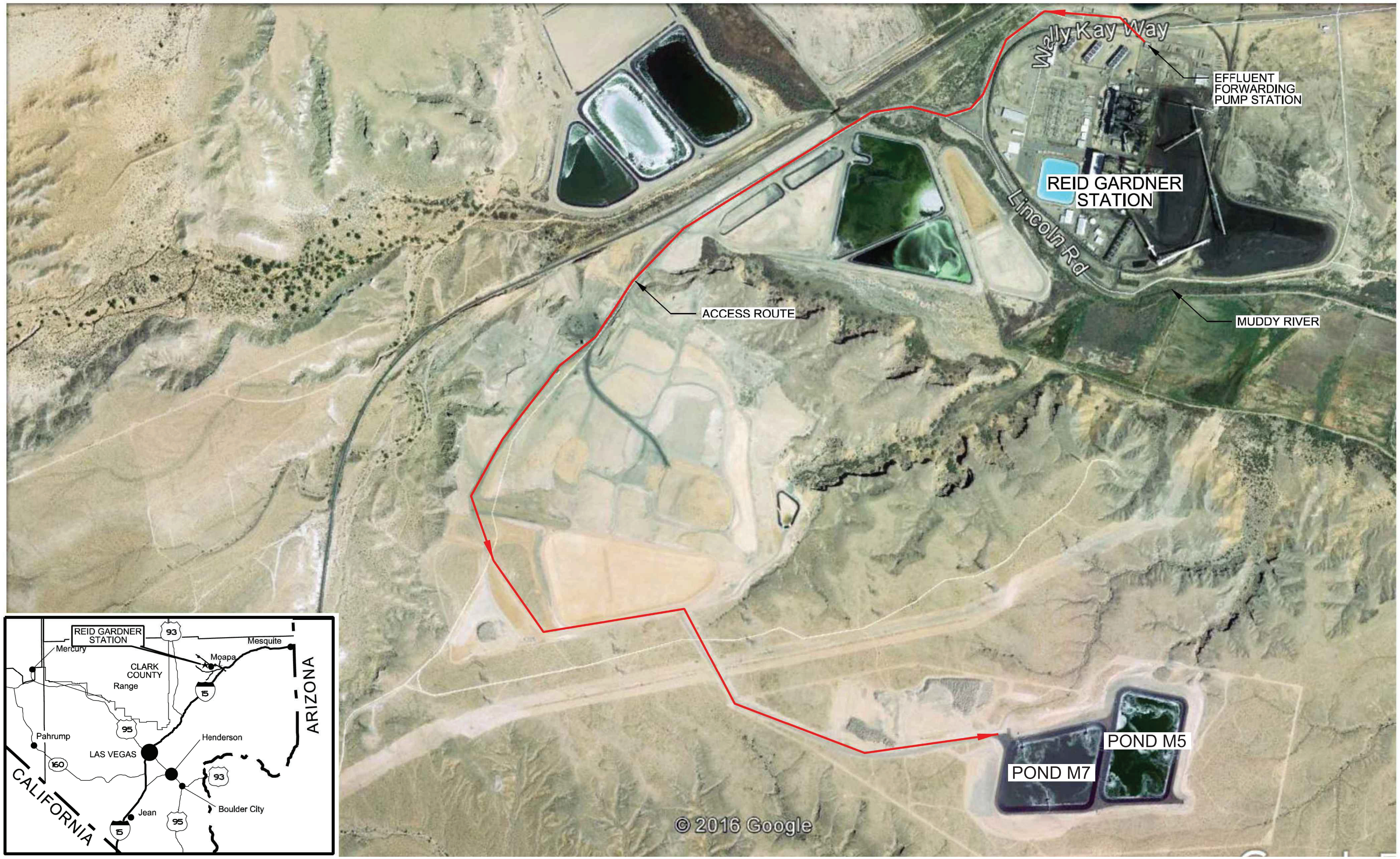
LEGEND
Approximate Property Boundary

N
0 1 2
1 in = 2 miles

Figure 4-1. Reid Gardner Station Location and Vicinity Map
Emergency Action Plan, Reid Gardner Station
Moapa, Nevada

\\DC1VS01\GISPROJ\N\NVENERGY\NVE01907_REID GARDNER\MAPS\REPORT\EAP_2021\FIGURE4-1_RGS_EAP_LOCVIC.MXD HILLK3 4/13/2021 6:01:34 PM

Jacobs



LEGEND

Access Route

Figure 4-2. Mesa Ponds Location and Vicinity Map
Mesa Ponds M5 and M7
Emergency Action Plan, Reid Gardner Station

Jacobs

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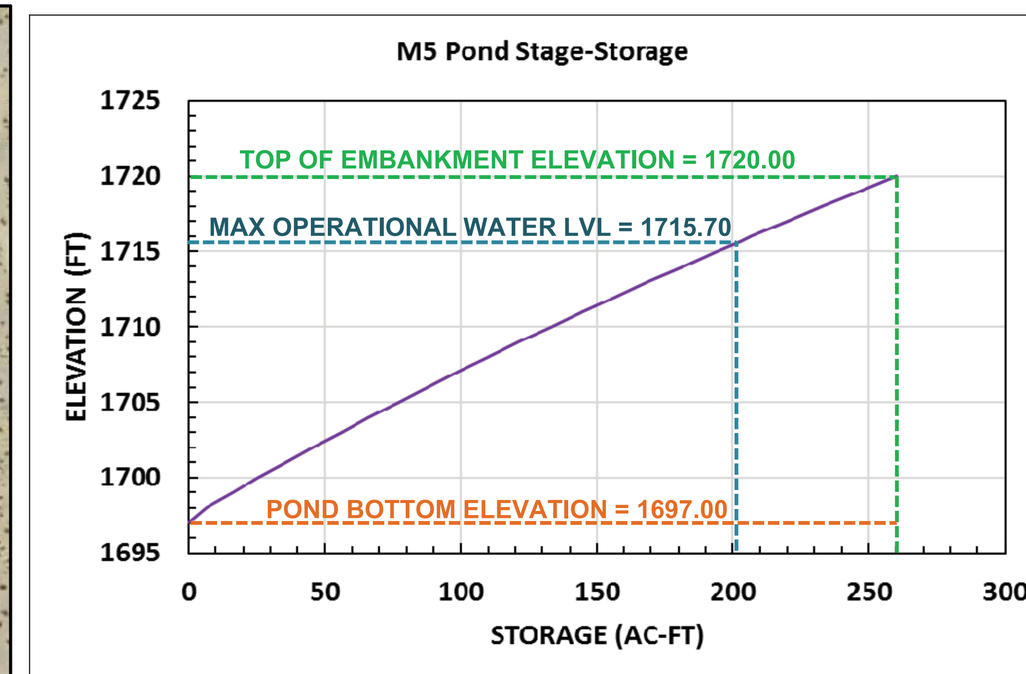
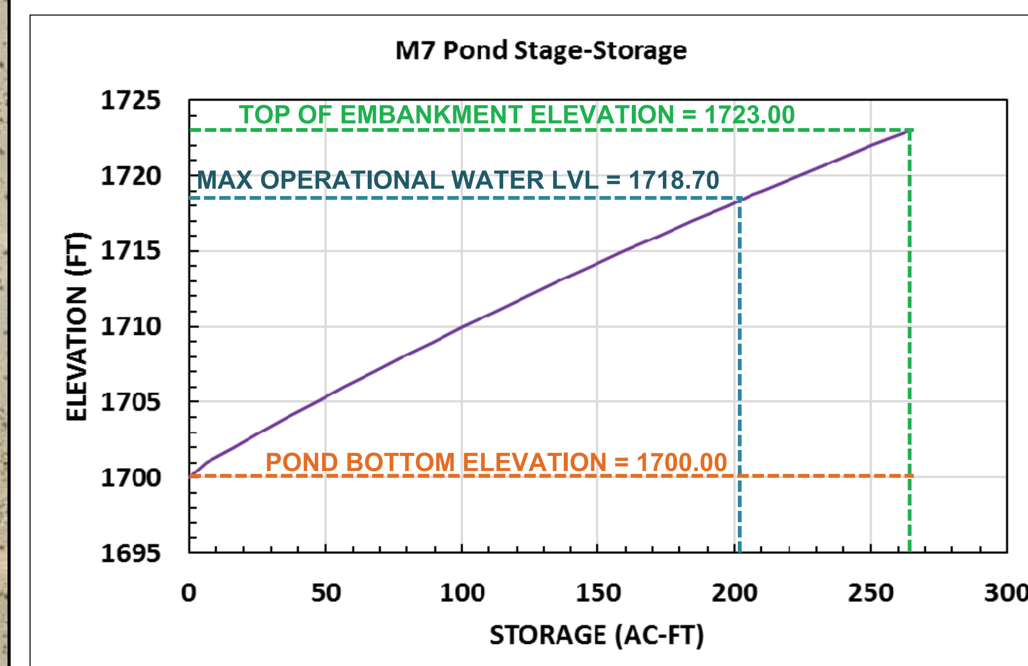




Note: all elevations reference NAVD 1988 vertical datum

LEGEND

- Effluent Discharge Pipeline
- Effluent Pipeline Valve Station
- Mixer
- Observation Point
- Pond Effluent Discharge Point

FES0519201436LAS

Figure 4-3. Dam Facilities Map
Mesa Ponds M5 and M7
Emergency Action Plan, Reid Gardner Station

Jacobs

4.3 Pond Information Summary

Table 4-1 presents the design information summary for the Mesa Ponds M5 and M7. The pond information was taken from the record drawings for the Mesa Evaporation Ponds (Appendix B). Figure 4-3 shows the facility features and storage curves of the Mesa Ponds. The ponds are lined with two layers of high-density polyethylene (HDPE) geomembrane with an interstitial leak detection and collection system.

Table 4-1. Location and Design Information Summary

<table>
<tr><th colspan="4">Name of Dam: Mesa Ponds M5 and M7</th></tr>
<tr><td colspan="4">Location of Embankments: (Township, Range, Section): T 15S, R 66E, Section 8</td></tr>
<tr><td colspan="4">Name of Stream or Drainage: Not Applicable – The dams are designed to prevent inflow from drainages.</td></tr>
<tr><th colspan="4">Name of Dam: Mesa Pond M5</th></tr>
<tr><td>State: Nevada</td><td colspan="2">County: Clark</td><td>Jurisdiction: Clark County</td></tr>
<tr><td>National ID: NV10779</td><td colspan="2">State ID: J-652 (for M5 and M7)</td><td>HAZARD RATINGS:
High (per CCR Rule)
Significant (per State Permit)</td></tr>
<tr><td colspan="4">Type of Embankment (Earthfill, Concrete, etc.): Earthfill</td></tr>
<tr><td colspan="2">Top of Embankment Elevation: 1,720.0 feet</td><td colspan="2">Height of embankment: 23 feet</td></tr>
<tr><td colspan="2">Length of embankment: 1,360 feet</td><td>Thickness at top: 20 feet</td><td>Thickness at bottom: 160 feet</td></tr>
<tr><td colspan="2">Operational Water Surface Elevation: 1,715.7 feet</td><td>Freeboard: 4.3 feet</td><td>Maximum Storage: 260 acre-feet</td></tr>
<tr><th colspan="4">Name of Dam: Mesa Pond M7</th></tr>
<tr><td>State: Nevada</td><td colspan="2">County: Clark</td><td>Jurisdiction: Clark County</td></tr>
<tr><td>National ID: NV10780</td><td colspan="2">State ID: J-652 (for M5 and M7)</td><td>HAZARD RATINGS:
High (per CCR Rule)
Significant (per State Permit)</td></tr>
<tr><td colspan="4">Type of Embankment (Earthfill, Concrete, etc.): Earthfill</td></tr>
<tr><td colspan="2">Top of Embankment Elevation: 1,723.0 feet</td><td colspan="2">Height of embankment: 23 feet</td></tr>
<tr><td colspan="2">Length of embankment: 920 feet</td><td>Thickness at top: 20 feet</td><td>Thickness at bottom: 130 feet</td></tr>
<tr><td colspan="2">Operational Water Surface Elevation: 1,718.7 feet</td><td>Freeboard: 4.3 feet</td><td>Maximum Storage: 265 acre-feet</td></tr>
</table>

4.4 Pond Piping and Operation

The Mesa Ponds were used to evaporate stormwater and legacy process wastewater from the Station's power generation plant and have been out of service since April 2021.

Wastewater was fed to the M ponds from an 8-inch diameter HDPE pipeline running from the effluent forwarding pump station at the former generating station to a valve Station located at the northwest corner of Pond M7 (Figure 4-3).The valve Station routes flow into one of three HDPE underground pipes for discharge into the ponds. One pipe discharges into Pond M5, one into Pond M7, and the third is capped and does not discharge. This third pipe was installed for a third proposed mesa pond that has not been built. The pipes discharging into Ponds M5 and M7 are open-ended, to reduce the pressure of the water in pipes buried in the embankments. As of April 2021, the pipeline leading to the M ponds was disconnected by removing sections of the line at both the station end and the ponds end, preventing any additional wastewater from entering the two ponds.

Within the ponds, HDPE markers are welded to the HDPE geomembranes to mark the maximum operational water level, and staff gauges are installed on one bridge in each pond. These markers and gauges are visually inspected to assess water depth. The maximum operational water levels for Ponds M5 and M7 are 1,715.70 and 1,718.70 feet above mean sea level, respectively (Figure 4-3). Vertical datum is the North American Vertical Datum of 1988. As of January 2025, less than 4 feet of water and pond solids exists in each Pond. Removal of pond solids and the geomembrane liner system is scheduled to occur by the first quarter of 2026.

4.5 Geotechnical Information

The earthen pond embankments were designed and constructed as a balanced cut and fill with no embankment zoning. The geotechnical evaluation of the site was performed by Converse Consultants and detailed earthwork specifications were developed by CH2M HILL Engineers, Inc (CH2M). The Converse Geotechnical Report describes the native soil as "predominantly silty to poorly graded sands that were occasionally partially cemented to cemented, intermingled with lean and fat clays and poorly graded gravel." The native soil was excavated then processed to produce earthfill by removing deleterious material and particles larger than 4-inches in diameter.

The embankments were constructed by excavating and placing the native soil with scrapers, spreading the soil into lifts using graders, removing deleterious material with graders or by hand, moisture conditioning and then compacting with loaded scrapers. The embankment soil was compacted to a minimum dry unit weight corresponding to 95 percent of the maximum dry unit weight determined in the laboratory by ASTM International Test Method 1557.

4.6 Description of Downstream Area

The area downstream of the Mesa Ponds is rural and includes the Muddy River, a few residences, barns, hay fields and cow pastures. Flow from a theoretical Ponds M5 or M7 dam breach would travel down steep cliffs and could make its way to the Muddy River approximately 4,000 feet from the ponds, and then flow generally along the Muddy River and its floodplain. Based on analysis, one of the downstream residences (a manufactured home) is inside the modeled inundation area. The analysis is found in the "Periodic (5 Year) Hazard Potential Classification Assessment, Ponds M5 and M7, Reid Gardner Station," created by Jacobs and dated October 11, 2021 (Appendix D).

5. EAP Response Process

The EAP uses a four-step process:

- Step 1: Detect, evaluate and classify an incident or emergency (Section 5.1).
- Step 2: Notify and communicate (Section 5.2).
- Step 3: Take emergency action (Sections 5.3).
- Step 4: Terminate and follow-up (including documentation) (Section 5.4).

5.1 Step 1: Emergency Detection, Evaluation and Classification

5.1.1 Detection

The M5 and M7 ponds are located on a mesa about a mile south of the Station, therefore, detection of an unusual or emergency condition at the dams may be initiated by direct observation. In terms of staffing, there are no permanent Station personnel present on-site nor are security personnel present. NV Energy personnel visit the site periodically to check the ponds and pipelines, typically once per week, usually during daytime hours. Water surface elevation, HDPE liner markers, and pipelines is visually observed.

If an emergency is detected, use guidance in this section to evaluate conditions at the dam and classify the emergency as one of three levels: **Imminent Failure**, **Potential Failure,** or **Non-Failure**.

5.1.2 Evaluation and Classification

During an emergency associated with the ponds at the Station, it is important to correctly evaluate and classify the conditions for accurate communication using the notification procedure. The three emergency classifications at the facility are described below and in Section 2 Table 2-1.

Imminent Failure

Failure is imminent or has already occurred. Due to lack of time or mitigation options, immediate downstream evacuation is warranted. Examples are listed below and in Section 2 Table 2-1.

- Rapid inflow to a pond cannot be controlled and will cause overtopping of the embankment. Resulting failure is likely.
- Uncontrolled seepage through, under or around the embankment is removing embankment material at an accelerating pace. Stop-gap granular fill cannot be placed in time to stop progressive internal erosion. Uncontrolled release of the reservoir is projected.

Potential Failure

Conditions are developing that could progress to a dam failure, but time is available for analyses, decisions and mitigating actions before the dam could fail. Although a failure may occur, predetermined actions may prevent or moderate failure. Examples are listed below and in Section 2 Table 2-1.

- Rising reservoir levels may yet be diverted.
- Transverse cracking of the embankment (from earthquake or incipient slope movement).
- A verified threat to use explosives to damage the dam.
- Seepage is slowly eroding the embankment toe, and staff are mobilizing to place granular fill at the point of discharge or have already placed inadequate fill.

Non-Failure

An unusual event at a dam that will not, by itself, lead to dam failure, but requires internal or external notifications. External notifications are only required if there is an immediate threat to the public. Examples are listed below and in Section 2 Table 2-1.

- Water surface elevation is above maximum operational level. The maximum operational water levels for Ponds M5 and M7 are 1,715.70 and 1,718.70 feet above mean sea level, respectively (Figure 4-3). Vertical datum is the North American Vertical Datum of 1988 (i.e., NAVD 88).
- New seepage or leakage through the dam requires increased monitoring and assessment.
- Unauthorized persons appear to be watching or surveilling the dam.
- Malfunction of water conveyance infrastructure.

5.2 Step 2: Notification and Communication

Use the notification flowchart and procedure in Section 2. As indicated in Section 2, the people notified, and the message delivered depend on the emergency level (Table 2-1). While the EAP notification flowchart must be updated whenever personnel or contact information changes, a current Emergency Response Phone List must also be posted locally in the warehouse and BESS offices.

5.2.1 Imminent Failure (or has already occurred)

If failure of the dam is imminent, the priority is to immediately initiate evacuations downstream of the dams. Engage notified dam-safety experts to complete dam evaluation and emergency classification in parallel, while notifications are completed. Update notifications when status is better understood.

5.2.2 Potential Failure

If a potential dam-safety emergency is detected early, there may be time to evaluate and mitigate concerns prior to completing *all* external notifications. Immediately engage notified dam-safety experts to allow for better evaluation, classification and appropriate action to avert failure or mitigate impacts, and to alert key supervisors and emergency responders to facilitate emergency preparation and coordination.

5.2.3 Non-Failure

If an unusual, non-failure condition is discovered at a dam, focus on engaging internal experts for evaluation, monitoring and response; or law enforcement if there is a security concern.

5.3 Step 3: Emergency Actions

During or after initial notifications, NV Energy must act to prevent or delay a dam failure, and to mitigate its impacts if failure cannot be avoided. While a dam failure emergency is unfolding, NV Energy is responsible for monitoring conditions at the dam and providing timely status updates internally and to external emergency responders, using the appropriate notification flowchart(s).

Pre-planned actions to some dam-safety emergencies are summarized in Tables 5-1 through 5-3. Responsibilities of specific personnel are described in Section 6. Pre-planned steps to be prepared are described in Section 7.

Table 5-1. Emergency Operations and Repair Actions for Imminent Failure Conditions

Indicators Requiring Action:	Mitigation and Control Actions to be taken:
Embankment or structural integrity appears to be uncontrollably deteriorating or a breach in the dam has occurred.	Follow notification and evacuation procedures outlined in Section 2 this EAP. Inspect and clear evacuation routes on and from the Station. Place traffic control devices to barricade entry into anticipated flood areas on the Station. Post site monitors where they can safely observe and monitor the dam. Monitors should not be stationed on the dam or within the projected dam failure floodplain. If additional site monitors are available and can be placed on high ground, consider aiding emergency responders by observing predicted areas of inundation (from a safe distance) to monitor flow, debris buildup and damage conditions. Initiate emergency evacuation of the downstream floodplain area indicated by corresponding inundation maps by notifying emergency responders via the notification flowchart in Section 2. Initiate evacuation of the Station if any portions are in the downstream floodplain area indicated by inundation maps.

Table 5-2. Emergency Operations and Repair Actions for Potential Failure Conditions

Indicators Requiring Action:	Mitigation and Control Actions to be Taken:
Water surface elevation is above maximum operation level in either pond, but more than 12 inches below the dam embankment crest.	Observer will notify the Operations Manager about developing emergency condition. Operations Manager will begin notification procedures in Section 2 of this EAP. Operations manager will begin notification procedures in Section 2 of this EAP. Operations manager may direct on-site personnel to transfer water from pond with developing emergency condition to the other pond. If water levels in the pond(s) reach the dam embankment crest or begin overtopping, proceed to Table 5-1.
Verified bomb threat to Mesa Ponds embankment.	Observer will notify Operations Manager who will begin notification procedures in Section 2 of this EAP.
Transverse cracking of embankment (from earthquake or incident slope movement).	Observer will notify Operations Manager who will begin notification procedures in Section 2 of this EAP. Notify dam safety engineer to develop recommendations for buttressing or other strengthening measures. Repair operations should only be undertaken if the embankment is deemed stable enough to support such activities. If repair operations are not successful or cannot be performed, proceed to Table 5-1.
Seepage is slowly eroding embankment and Station personnel have not started placing granular fill at the point of discharge or have not placed adequate fill.	Begin or continue repair operations only if embankment is deemed stable enough to support such activities. Operations Manager will begin notification procedures in Section 2 of this EAP. If repair operations are not successful, or cannot be performed, proceed to Table 5-1.

Table 5-3. Emergency Operations and Repair Actions for Non-Failure Conditions

Indicators Requiring Action:	Mitigation and Control Actions to be Taken:
New seepage detected in embankment.	Observer will notify Operations Manager to monitor seepage detection. Plant supervisor will begin notification procedures in Section 2 of this EAP. Operations Manager will designate a site monitor and send them to monitor the M Ponds. Site monitor will look for seepage in the embankment and communicate with the plant supervisor. If seepage is detected, arrange for notified dam-safety experts to observe site.
Unauthorized persons appear to be surveilling or watching the dam.	Observer will notify Operations Manager of possible trespassers at the M Ponds. Operations Manager will begin notification procedures in Section 2 of this EAP. Observer will not approach person(s) on their own.

5.4 Step 4: Termination and Follow-up (Including Documentation)

NV Energy is responsible for initiating the EAP and deciding when the emergency has passed, and activation of the EAP is officially terminated. Termination must be communicated to all previously contacted parties using the same notification flowchart in Section 2. After termination, follow-up EAP activations with post-event documentation and conduct supplemental evaluation of the EAP for its effectiveness and recommended improvements. The EAP evaluation can best be conducted in a post-event evaluation workshop to solicit input from those who were involved in the EAP activation, including those from external emergency responders.

Form templates are provided in Appendix C to document EAP activations. Complete these forms prior to terminating the EAP and as part of follow-up. The forms are:

- Emergency Response Event Log – used to document a timeline of events, actions and communications taken during the emergency.
- Event Termination Log – used to assess damage to the dam, Station, and downstream and justify termination of the dam-safety emergency.

The post-event EAP evaluation workshop can be documented in a brief report documenting when and where it was held, who participated, what the workshop outcomes were, who will update the EAP and when updates to the EAP will be completed. The report should be attached to future versions of the EAP in a new appendix.

6. Responsibilities Under the EAP

6.1 General Responsibilities

The EAP is a structured plan to help ensure appropriate emergency response. That plan includes preparedness (Section 7), pre-planned notifications (Section 2) and pre-planned actions (Section 5). Effective use of the EAP requires prior training and fulfillment of planned responsibilities. EAP responsibilities can be broadly described as follows. Assigned responsibilities by title, described in the subsections that follow, help ensure these broad responsibilities are fulfilled.

- Owner (NV Energy)
  - Appoint an EAP coordinator who will ensure EAP requirements are performed as required in the EAP
  - Provide for training and exercises. An annual face-to-face meeting or exercise with local emergency responders is required
  - Update and improve the EAP as required
  - Perform surveillance and monitoring
  - Detect incidents and activate the EAP
  - Evaluate and classify an incident. Ensure dam-safety experts are available (either on staff or have ability to retain an informed consultant available)
  - Notify emergency management authorities
  - Provide inundation maps and summarize downstream impacts
  - Provide supplemental (appended) information
  - Perform pre-planned response actions
  - Coordinate in advance any warnings or evacuations to be performed by owner
  - Monitor an incident and provide for staff safety and security
  - Terminate an activated EAP and follow-up
- Emergency Management Authorities
  - Issue public warnings
  - Perform any evacuations
  - Coordinate multiple emergency management agencies and their staff
- Dam-Safety Agencies
  - Provide technical support
  - Help with post-event assessment and information

6.2 Owner Responsibilities

The specific actions NV Energy personnel are to take after implementing the EAP notification procedures are described below. When time permits, consult supervisory personnel before any response actions are taken. Advice may be needed concerning predetermined remedial action to delay, moderate, or alleviate the severity of the emergency condition.

6.2.1 Notifications

Notification responsibilities and lines of communication are illustrated on the notification flowcharts in Section 2. If a link in the chain of communication is unavailable or unable to perform, the incident commander will assign an alternative person to fill that role.

6.2.2 Incident Commander

The incident commander is the senior official is who is available on-site. During normal work hours, the Operations Manager will typically begin serving as the incident commander until the role is transferred. At no point will the incident commander role be left unfilled. The incident commander title must be immediately adopted by an available staff member until transferred. The incident commander has the authority to take the necessary actions described in this EAP and direct emergency response actions.

If time permits, the incident commander should consult with an operations manager or the dam safety engineer and dam inspection team before initiating notifications; however, Imminent Failure notifications should be initiated immediately. If a link in the chain of communication is unavailable, the incident commander will assign an alternative person to fill that link. The incident commander is responsible to confirm and ensure that all notifications are completed and updated as required.

The incident commander will ensure that the full response process (Section 5) is implemented during the event, following event detection: event evaluation and classification, dam monitoring and status updates, notifications and communications, and emergency actions.

The incident commander is responsible for termination of the EAP when the event is fully resolved. For non-urgent conditions, this may take several days or possibly weeks.

The incident commander will also carry out any specific actions and duties listed in complementary NV Energy emergency response plans.

6.2.2.1 Transfer of Incident Commanders

When transferring the incident commander role and title from one person to another for whatever reason, a formal statement of the transfer must be made between the ex-commander and the commander-to-be (such as, “Are you assuming the role of incident commander?”).

The reply would be, “Yes, I am assuming the role of incident commander” or “I am taking over as incident commander.” This conversation or statement clarifies who is acting as incident commander and assuming incident commander responsibilities and that the acting incident commander is being relieved of his/her incident commander responsibilities and duties at that time.

There should be only one incident commander at a time for a given situation.

6.2.3 Operations Manager

The Operations Manager or person acting in that role will act as the incident commander until relieved by NV Energy management.

When time allows, the Operations Manager shall account for all personnel on-site who may be affected or assist during a dam-safety emergency. He or she will assist the incident commander, EAP coordinator and others with EAP responsibilities.

6.2.4 EAP Coordinator

The EAP coordinator is responsible for providing and coordinating assistance to the incident commander and corporate officials during an emergency, serving as a deputy. The EAP coordinator is responsible for organizing follow-up meetings and completing follow-up reports after the termination of an event.

The EAP coordinator will ensure that the provisions of the EAP are fulfilled, including preparedness, notification contact updates and other EAP requirements. The EAP coordinator will coordinate and provide for training, EAP exercises/tests, an EAP update, and other EAP revisions, as needed (enlisting in-house or consultant dam-safety EAP experts, as needed). The EAP coordinator will answer general questions pertaining to the EAP.

6.2.5 Dam-Safety Engineer

The operations manager will assign an internal dam-safety engineer or retain an informed outside consultant as a dam-safety engineer. That engineer must be experienced in dam design and dam safety and be available for consultation and expert opinion prior to and during dam-safety emergencies. The dam-safety engineer, and optionally the operations manager, will participate as part of the technical team to provide periodic dam inspections in advance of an emergency, and assist in evaluation, classification and suggesting response actions when the EAP is activated or under consideration for activation. The engineers will provide input regarding the timing of EAP termination and during post-event follow-up.

6.2.6 Regional Director

The regional director has overall responsibility for the implementation of this EAP and for assigning an incident commander when in doubt.

The regional director is responsible for overseeing and confirming that the EAP responsibilities of the EAP coordinator, operations manager and dam-safety engineer have been adequately completed each year, consistent with this EAP and EAP objectives.

6.2.7 Corporate Responsibilities

Although most emergencies will be handled at the plant level, there may be instances when the Corporate Emergency Response Plan may require activation. The decision to activate the Corporate Emergency Response Plan may only be made by a corporate officer. The decision to alert the corporate officer in charge of generation will be made by the operations manager or their designee.

6.2.8 Observer's Responsibilities

The observer can be anyone that notices a potential problem at the Mesa Ponds. In the event of an emergency, the observer should evaluate the situation and, if necessary, contact their station contact or the operations manager to initiate one of the emergency notification procedures.

Clear, concise communication of the situation is essential. All communications should be done in a calm manner so as not to unnecessarily alarm the recipient. However, communications should be done in a serious manner to demonstrate the reality of the situation. Example communications are provided in Section 2.3.1.

6.3 External Communications

The notification flowchart (Section 2) indicates notifications outside of NV Energy.

Do not communicate with the media (reporters). Reporters should be directed to the corporate public information officer, who is on the notification flowchart, and to the company emergency response authorities.

The corporate public information officer or his or her designated representative will be responsible for disseminating information to the media and the public on a periodic basis throughout the emergency.

If a flood warning needs to be issued, follow the notification flowchart to contact emergency dispatch.

6.4 Responsibility for Evacuation

The incident commander will determine whether evacuation is required for on-site personnel and Station property. In the event of evacuation, the incident commander will make sure that the Station's gates are closed and locked.

Evacuations of the public and property not owned by NV Energy will be the responsibility of emergency responders. Notifications will be made to the emergency responders in accordance with the notification flowchart (Figure 2-1) and Notification Procedures (Section 2).

6.5 Responsibility for Duration, Security, Termination and Follow-Up

The EAP coordinator or incident commander will monitor the emergency as described above and keep local and state authorities informed of the developing conditions from the time an emergency starts until the emergency has been terminated. Security shall be maintained by NV Energy personnel and any additional help coordinated by the incident commander.

Procedures for event termination are in Section 5.4 (Step 4). The incident commander is responsible for declaring that the emergency at the facility is terminated after state or local emergency management officials have terminated their disaster response activities. After termination of the EAP activation, a follow-up evaluation will be completed by all participants. The results of the evaluation will be documented in a written report.

7. Preparedness

7.1 Preparedness Overview

Preparedness actions are taken prior to EAP activation to pre-plan and enable actions during an emergency that may prevent, slow or mitigate a dam failure or other EAP event. The preparedness actions in this Plan include:

- Surveillance and monitoring
- Evaluation of detection and response timing
- Access to the site
- Response during periods of darkness
- Response during weekends and holidays
- Response during adverse weather
- Alternative systems of communication
- Emergency supplies and information
- Sources of earthen materials and earth-moving equipment to stall a breach
- Training and exercises

Preparedness actions involve the installation of equipment or the establishment of procedures for one or more of the following purposes:

- Preventing the development of emergency conditions, if possible, or warning of the development of emergency situations
- Facilitating the operation of the ponds to limit impacts in an emergency
- Minimizing the extent of damage resulting from emergency situations

7.2 Surveillance and Monitoring

Station personnel physically observe the Mesa Ponds to ensure the water surface elevation is at or below maximum operational level.

7.3 Evaluation of Detection and Response Timing

Training and/or drills may be used to evaluate detection and response timing. Drills may be enhanced by including simulated performance obstacles, such as loss of power, darkness, employees absent on vacation or holiday, and other hurdles to manage. Using lessons learned, revise the EAP to improve the likelihood of early detection and shorten the required response time, and to customize annual training modules. When participants are not informed of the drill in advance to improve realism, always clearly communicate that this is ONLY A DRILL and NOT AN ACTUAL EMERGENCY. Debrief participants at the end of the drill, and document results for inclusion in the EAP.

7.4 Access to the Site

Access to the Mesa Ponds from the Station involves leaving the Station at Lincoln Road and heading southwest on the Haul Road to the utility corridor. Head south across the utility corridor and continue to the Mesa Ponds. The utility corridor gates may be locked, keys are located in the warehouse on the key board, and are also available through the on-site personnel or operations manager. The access route from the Station to the Mesa Ponds can be found in Figure 4-1. Refer to Table 4-1 for directions to the Station.

Overton, Mesquite and Las Vegas have emergency medical services that could respond to the Station. These cities are approximately 20 (Overton), 40 (Mesquite), and 55 (Las Vegas) miles from the Station. It can be assumed that most emergency responders would be coming from Mesquite or Las Vegas as these are the largest metropolitan areas close to the facility.

7.5 Response during Periods of Darkness

In the event of an emergency incident during periods of darkness, the observer would contact the operations manager who would enact the emergency notification pertinent to the emergency level of the incident at the raw water ponds.

Exterior lighting at the Station and ponds is provided by NV Energy, while the electrical provider in the local area is Overton Power. Minimal lighting is provided at the Mesa Ponds. During a power failure, the operations manager will be notified and act as needed. NV Energy Transmission and Distribution Department staff or the Overton Power District would be contacted by the operations manager to repair damaged power poles or lines.

7.6 Response during Weekends and Holidays

The ponds are typically checked once a week by NV Energy personnel. In the event of an emergency incident during weekends or holidays, the observer would contact the operations manager who would initiate the notification procedure pertinent to the emergency level of the incident.

7.7 Response during Adverse Weather

Changes in the weather associated with fast-moving severe storms give little or no warning. In the event of impending severe weather, personnel will monitor the local emergency weather broadcast. The safety of on-site personnel and the integrity of plant equipment, in that order, will be the first concerns. The operations manager will be notified of any impending severe storms who will determine the appropriate action.

In the event of an emergency incident during periods of adverse weather, the observer would contact the operations manager. The plant supervisor would initiate the notification procedure pertinent the emergency level of the incident.

Table 7-1 lists emergency resources, including equipment to be used during periods of adverse weather.

7.8 Alternative Systems of Communication

Systems of communication available to personnel at the Station are limited to conventional telephone service and cellular phones.

7.9 Emergency Supplies and Information

7.9.1 Stockpiling Materials and Equipment

Emergency equipment that is available is listed in Table 7-1. Equipment is divided into that readily available and other equipment that is available but would likely require more time to deliver to the ponds. If extra equipment (not listed in Table 7-1), more personnel, specific materials, or additional expertise is needed for emergency response actions, the EAP coordinator should contact appropriate local contractors for these services.

The Station has no first responders during regular working hours. The area is served by the Moapa Valley Fire District, to be contacted via Clark County Emergency Dispatch (911).

Table 7-1. Available Emergency Equipment

Quantity	Description
1	One-ton, 4×4 pickup
1	Caterpillar 928 front-end loader
1	Caterpillar skid steer loader
1	Ranger rescue boat with 2-25 horsepower motors
2	All-terrain vehicles

7.9.2 Coordination of Information

Knowledge of current and forecasted streamflow and weather information may prove beneficial to emergency situation decisions made during emergencies. Sources of such information are described below.

The U.S. Geological Survey maintains a streamflow gage approximately 1 mile downstream of the Station on the Muddy River. The gage measures and records the stage of the river in feet. River flow in cubic feet per second can be estimated using the stage-discharge relationship. Stage can be obtained from the gage at any time. Note that the U.S. Geological Survey periodically modifies streamflow gage rating tables and, therefore, the rating should be replaced when appropriate.

Related information is available at the following web addresses:

http://waterdata.usgs.gov/nv/nwis/rt – U.S. Geological Survey Real-Time Water Data for Nevada

http://www.wrh.noaa.gov/vef/ – National Weather Service (Las Vegas, NV).

http://water.weather.gov/ahps2/index.php?wfo=vef – National Weather Service Advanced Hydrologic Prediction Service.

http://gustfront.ccrfcd.org/gagemap/gagemap.html- Local rain gauges

7.10 Training and Exercises

The EAP coordinator will arrange EAP training for applicable staff; and the training will occur annually. Part of the training may include an annual EAP exercise that includes evaluation of detection and response timing (Section 7.3). It is recommended that the annual meetings or exercises be documented. Additional details are provided in Appendix B.

8. Inundation Maps

8.1 Results of Dam Breach Analysis

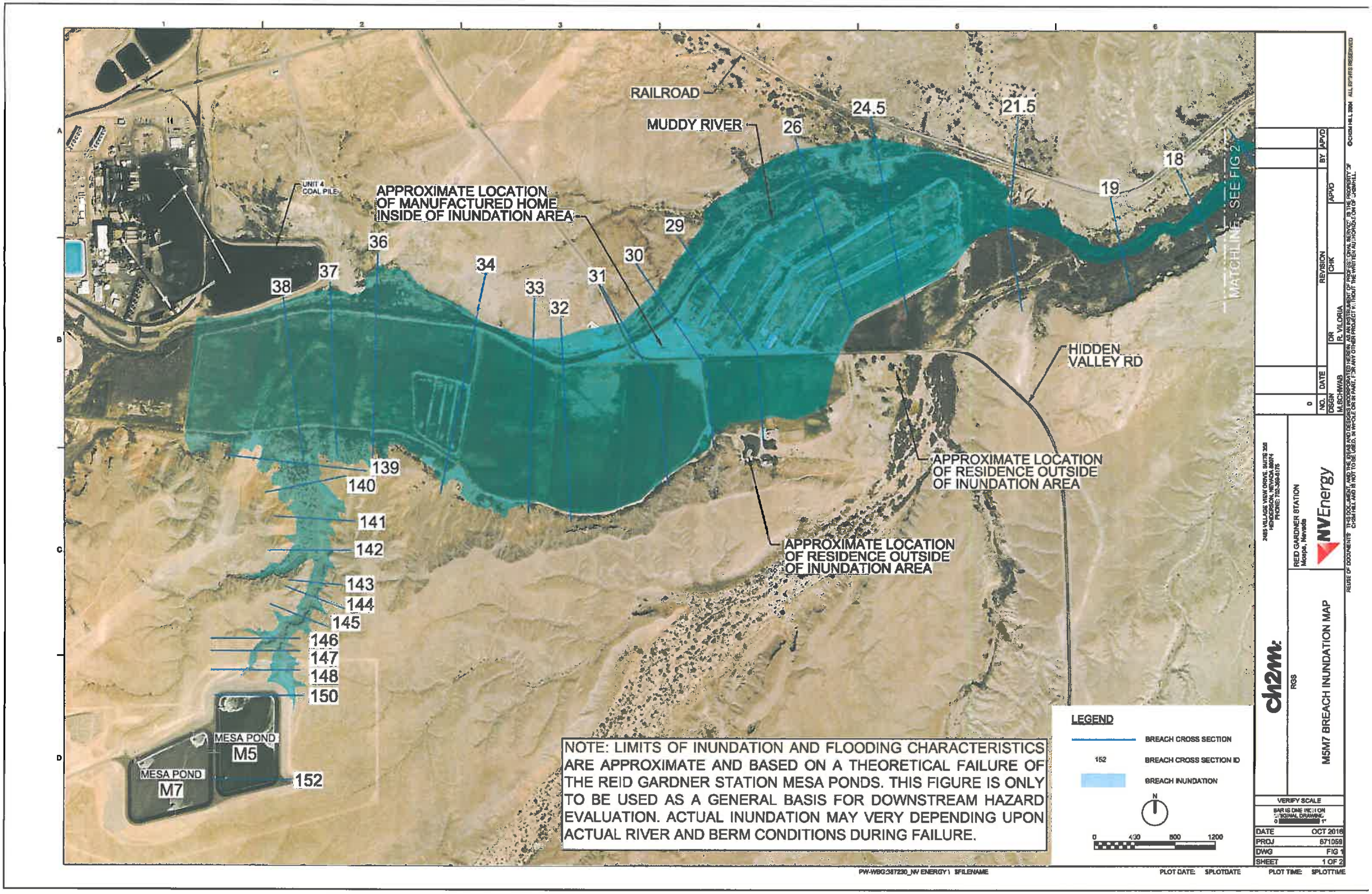
A "sunny day" full pool dam breach analysis was performed on the Mesa Pond. The following is a list of results from the analysis. The analysis is found in the "Periodic (5 Year) Hazard Potential Classification Assessment, Ponds M5 and M7, Reid Gardner Station," created by Jacobs and dated October 11, 2021 (Appendix D).

- The resulting water surface elevation of the Muddy River from a theoretical dam breach is less than the 100-year water surface elevation on the Muddy River.
- The leading edge of the flood wave will reach the private residence, near where Hidden Valley Road crosses the Muddy River, in approximately 0.60 hours after a dam breach of the Mesa Ponds.
- The maximum flow at the private residence is approximately 4,000 cubic feet per second.
- The flow from a theoretical dam breach of the Mesa Ponds will be contained in the Muddy River banks approximately 2.0 river miles from the Station.

8.2 Inundation Maps

Figure 8-1, M5M7 Breach Inundation Map, 1of2, and Figure 8-2, M5M7 Breach Inundation Map, 2of2, on the following pages show the inundation limits due to the "sunny day" failure scenario analyzed for Pond M5. The breach inundation modeling files used to generate the inundation map is located in Appendix D.

Limits of inundation and flooding characteristics shown on the map are approximate and based on the theoretical failure of the Mesa Ponds described above. This map is only to be used as a general basis for downstream hazard evaluation. Actual inundation and flood wave characteristics may vary depending upon actual river and berm conditions during failure.


RAILROAD
MUDDY RIVER
24.5
21.5
26
18
19
MATCHLINE - SEE FIG 2
UNIT 4 COAL PILE
APPROXIMATE LOCATION OF MANUFACTURED HOME INSIDE OF INUNDATION AREA
29
36
30
37
34
31
38
33
32
HIDDEN VALLEY RD
APPROXIMATE LOCATION OF RESIDENCE OUTSIDE OF INUNDATION AREA
139
140
141
142
APPROXIMATE LOCATION OF RESIDENCE OUTSIDE OF INUNDATION AREA
143
144
145
146
147
148
150
MESA POND M5
MESA POND M7
152
NOTE: LIMITS OF INUNDATION AND FLOODING CHARACTERISTICS ARE APPROXIMATE AND BASED ON A THEORETICAL FAILURE OF THE REID GARDNER STATION MESA PONDS. THIS FIGURE IS ONLY TO BE USED AS A GENERAL BASIS FOR DOWNSTREAM HAZARD EVALUATION. ACTUAL INUNDATION MAY VERY DEPENDING UPON ACTUAL RIVER AND BERM CONDITIONS DURING FAILURE.
LEGEND
BREACH CROSS SECTION
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N
0 400 800 1200
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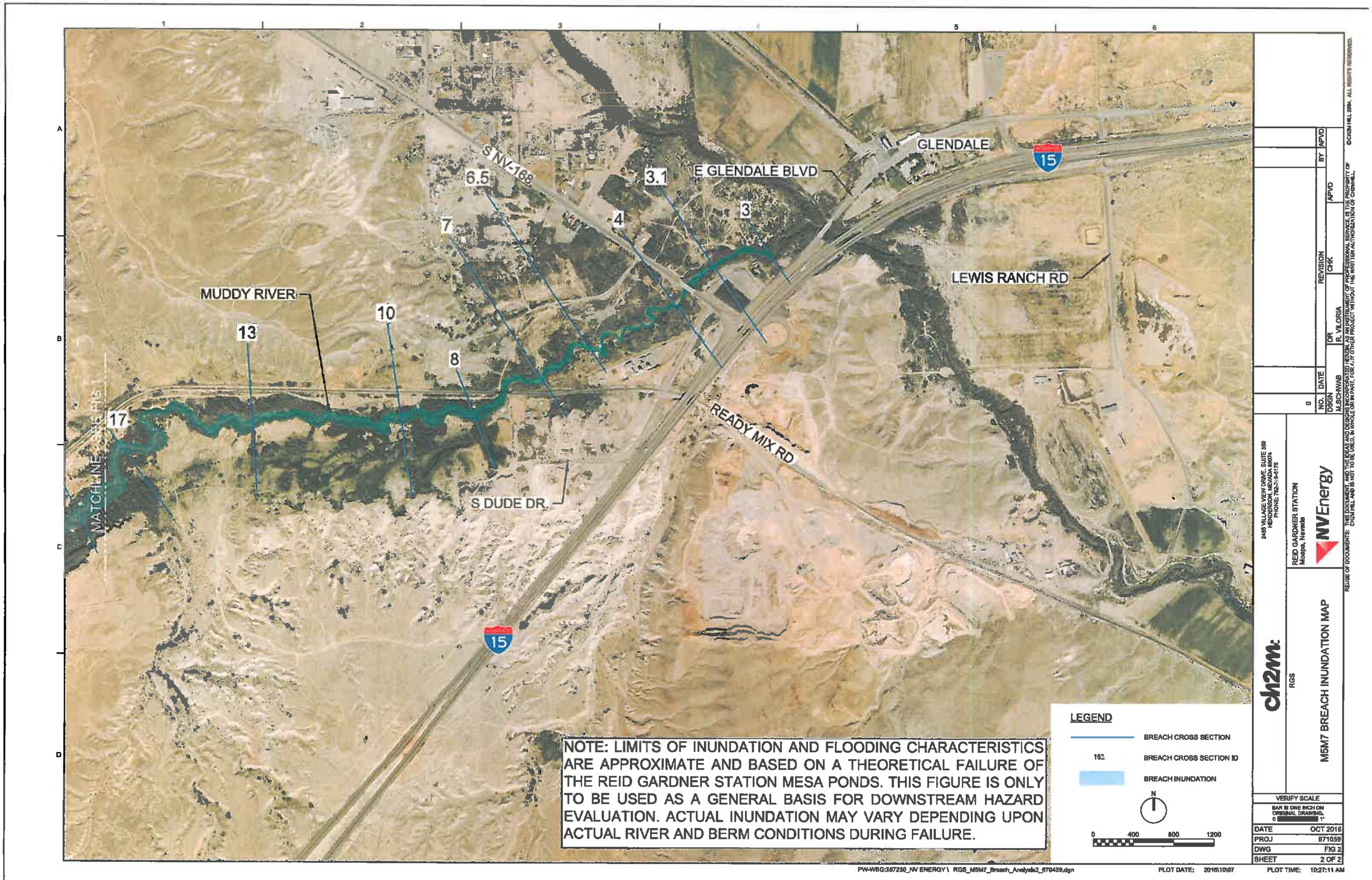
REID GARDNER STATION
Moapa, Nevada
M5M7 BREACH INUNDATION MAP
RGS
VERIFY SCALE
DATE OCT 2016
DWG FIG 1
SHEET 1 OF 2


GLENDALE
E GLENDALE BLVD
S NV-168
15
LEWIS RANCH RD
MUDDY RIVER
READY MIX RD
S DUDE DR.
MATCHLINE - SEE FIG 1
6.5
3.1
4
3
7
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17
NOTE: LIMITS OF INUNDATION AND FLOODING CHARACTERISTICS ARE APPROXIMATE AND BASED ON A THEORETICAL FAILURE OF THE REID GARDNER STATION MESA PONDS. THIS FIGURE IS ONLY TO BE USED AS A GENERAL BASIS FOR DOWNSTREAM HAZARD EVALUATION. ACTUAL INUNDATION MAY VARY DEPENDING UPON ACTUAL RIVER AND BERM CONDITIONS DURING FAILURE.
LEGEND
BREACH CROSS SECTION
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ch2m:
2485 VILLAGE VIEW DRIVE, SUITE 350
HENDERSON, NEVADA 89074
REID GARDNER STATION
Moapa, Nevada
NVEnergy
RGS
M5M7 BREACH INUNDATION MAP
NO. DATE REVISION BY APVD
DSGN M.SCHWAB
DR R. VILORIA
CHK
APVD
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
DATE OCT 2016
PROJ 671059
DWG FIG 2
SHEET 2 OF 2
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Appendix A
Plans for Training, Exercising, Updating and Posting the Plan

Appendix A. Plans for Training, Exercising, Updating and Posting the Plan

A.1 Training

EAP training is to take place for applicable employees periodically (annual is recommended).

Training for personnel should include a review of the EAP and the notification flowchart as well as overall emergency response training. Specific items to be covered include how to correctly respond to emergencies, emergency procedures, and the chain of command. Trained personnel should be familiar with the elements of this Plan, the availability of equipment, and their responsibilities and duties. Technically qualified personnel should be trained in problem detection and evaluation and appropriate remedial measures. A sufficient number of people should be trained to ensure adequate coverage of the positions listed in Sections 4 and 5, the notification flowchart, and the notification procedure.

Training is to be performed by the EAP coordinator or specialists arranged by the EAP coordinator as identified in Sections 6 and 7 of this Plan. Training for the EAP coordinator is available from the Federal Emergency Management Agency (FEMA) and the Nevada Division of Emergency Management at the addresses below:

FEMA
Region IX: Oakland
1111 Broadway., Suite 1200
Oakland, CA 94607
510.627.7220

Nevada Division of Emergency Management
2478 Fairview Drive
Carson City, NV 89701
775.687.0300

A.2 Exercising

Training should be performed at a frequency that ensures a state of readiness of personnel who are responsible to take action during an emergency situation. Testing should include a drill that simulates an emergency condition. Special procedures for nighttime, weekends and holidays, as outlined in Section 6, should be included. If possible, coordination and consultation with state and local emergency management officials and other organizations listed in the notification flowchart should be included in the drill and functional exercises. Participation by the affected state and local officials will enhance the effectiveness of the exercises. The exercises should be evaluated and the EAP should be revised to correct any deficiencies noted. The following subsections discuss the different types of exercises that could be conducted at the Station.

At a minimum, to meet the requirements of CCR Rule Section 257.73(a)(3)(i)(E), the annual exercise must include a face-to-face meeting or exercise with local emergency responders. It is recommended that the annual exercise required to satisfy the CCR Rule be documented.

A.2.1 Orientation Seminar

This exercise is an annual seminar that involves bringing together those with roles or interests in the EAP. The individuals and departments listed on the notification flowchart (Figure 2-1) would attend this seminar. A representative from each of the local and state emergency agencies and the neighboring property owners should be encouraged to attend. The EAP coordinator or their representative will lead the presentation and discuss the roles, responsibilities and procedures associated with the EAP. The orientation seminar can also be used to discuss and describe technical matters with involved, non-technical personnel.

A.2.2 Drill

A drill is the lowest level of exercise that involves an actual implementation of the EAP. A drill should test, develop and maintain skills in a single emergency response procedure. An example of a drill is an in-house exercise performed to verify the validity of telephone numbers and other means of communication.

A.2.3 Tabletop Exercise

The tabletop exercise is a higher-level exercise than a drill. The tabletop exercise involves a meeting of facility personnel, potentially with state and local emergency management officials, in a conference room environment. The format of the meeting should include a description of a simulated event and a discussion to evaluate the EAP response procedures. Recommendations should be made to revise the EAP to resolve concerns regarding coordination and responsibilities.

A.2.4 Functional Exercise

An outline of a functional drill exercise for the EAP is as follows:

- Operations manager and EAP coordinator meet in the warehouse.
- Operations manager initiates a **Test** notification procedure using the notification flowchart. It is imperative that all communications during the test clearly state that it is a test. An example communication would be:
  - My name is ___________ and I am the operations manager for the Reid Gardner Station in Moapa, Nevada. We are conducting a test of the Emergency Action Plan for the Mesa Ponds. Repeat, **THIS IS A TEST** and there is no actual emergency at the ponds. Please refer to your copy of the Emergency Action Plan and make any communications that are required. Be sure that your communications clearly identify that this is only a test.
- **Calls to emergency agencies should be made using numbers other than "911."**
- The EAP coordinator should take notes throughout the exercise. Notes should include start time, time required to reach each person on the notification flowcharts, problems and any other information that might prove useful.
- Subsequent to the exercise, the EAP coordinator should fill out the EAP Exercise Reporting Form. The form should include the following (a blank copy is included in Appendix C):
- Time required for completing notifications;
- Critique on notification procedure; and
- Verification that all persons notified had current copies of the EAP.

A.3 Updating

Evaluate the EAP, at a minimum every 5 years, to ensure accuracy per the CCR Rule Section 257.(a)(3)(ii). It is recommended that the EAP should be reviewed at least annually. Update the EAP as necessary to keep it current, incorporate lessons learned from the exercises and whenever there is a change in conditions that would substantially affect the EAP. The review and update should include:

- Names, titles, telephone numbers, etc. of operating personnel and personnel responsible for implementation of the EAP.
- Names and telephone numbers of contacts to be notified under the EAP (for example, state or local agencies, neighboring property owners, media, etc.).
- Changes in the ponds that could affect results of the embankment failure analysis (for example, changes in flood inundation areas, downstream developments, embankment heights, or in the reservoir).
- Changes in operation and/or maintenance of the ponds that could substantially affect the implementation of the EAP.

Any and all changes to the EAP must be distributed to all holders of the EAP listed in Table 2-2 (Section 2).

The EAP coordinator should ensure that each original copy of the EAP on the distribution list (Table 2-2, Section 2) is up to date after a revision is completed.

Updated or revised EAPs must be placed in the Station's operating record per CCR Rule Section 257.73(a)(3)(ii)(B). The EAP, and any amendment must be certified by a qualified professional engineer per CCR Rule Section 257.73(a)(3)(iv).

It is recommended that the entire EAP be reprinted and redistributed to all parties at least every 5 years.

Appendix B
Select Mesa Ponds M5 and M7 Record Drawings

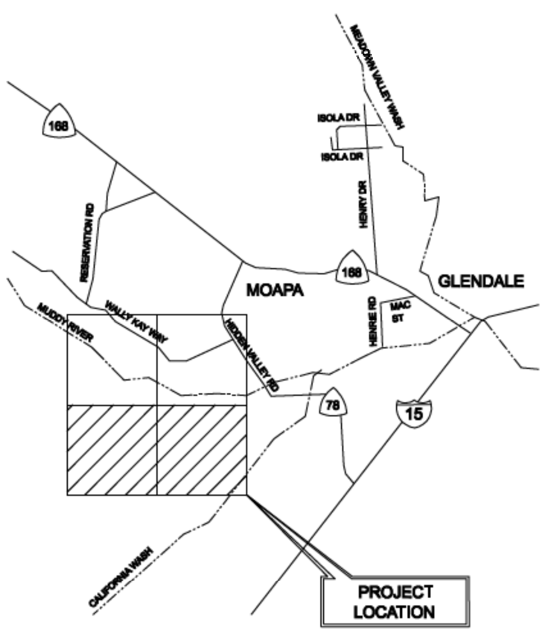
MOAPA, NEVADA

REID GARDNER STATION
WASTEWATER SYSTEM IMPROVEMENT PROJECTS
DRAWINGS FOR CONSTRUCTION OF
MESA EVAPORATION PONDS - M5 AND M7

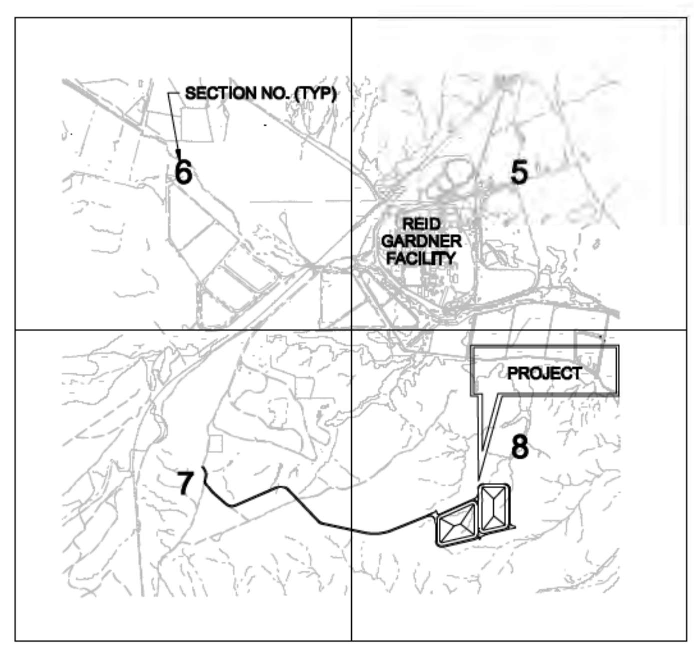
M5: RC171 WO# 9825650201

M7: RC171 WO# 9821855101

JULY 2011



VICINITY MAP



T. 15 S., R. 66E. M.D.M.

LOCATION MAP

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL   Date: July 2011

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS IN 2011. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

TITLE SHEET, VICINITY AND LOCATION MAPS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	G-1
SHEET	1 OF 147

RECORD DRAWING

DRAWING INDEX

SHEET OR PAGE NO.	DWG NO. OR SHT NO.	TITLE	INCLUDED WITH DAM IMPOUND APPLICATION	ENGINEER
		GENERAL DRAWINGS FOR SCHEDULE A AND B		
1	G-1	Title Sheet, Vicinity and Location Maps	Y	CH2M HILL
2	G-1A	Drawing Index	Y	CH2M HILL
3	G-2	Abbreviations, General Notes and Civil Legend	Y	CH2M HILL
4	G-3	Structural Notes	Y	CH2M HILL
5	G-4	Mechanical Legend	Y	CH2M HILL
6	G-5	Electrical Legend	Y	CH2M HILL
7	G-6	Instrumentation and Control Legend	Y	CH2M HILL
		SCHEDULE A DRAWINGS		
8	D-1	Elevation/Capacity and Elevation/Area Curves	Y	CH2M HILL
	D-2	Not Used		
9	D-3	General Layout Plan Pond M5	Y	CH2M HILL
10	D-4	General Layout Plan Pond M7	Y	CH2M HILL
	D-5	Not Used		
11	D-6	Berm Profile Pond M5	Y	CH2M HILL
12	D-7	Berm Profile Pond M7	Y	CH2M HILL
13	C-1	General Site Plan	Y	CH2M HILL
14	C-2	General Pond Site Plan	Y	CH2M HILL
15	C-3	Pond Site Plan - Area 1	Y	CH2M HILL
16	C-4	Pond Site Plan - Area 2	Y	CH2M HILL
17	C-5	Pond Site Plan - Area 3	Y	CH2M HILL
18	C-6	Pond Site Plan - Area 4	Y	CH2M HILL
19	C-7	Pond Site Plan - Area 5	Y	CH2M HILL
20	C-8	Pond Site Plan - Area 6	Y	CH2M HILL
21	C-9	Drainage Ditch Details	Y	CH2M HILL
22	C-10	Pond Sections	Y	CH2M HILL
	C-11	Not Used		
23	C-12	Pond Berm Typical Sections	Y	CH2M HILL
	C-13	Not Used		
	C-14	Not Used		
24	C-15	Pond M5 Liner Plan	Y	CH2M HILL
25	C-16	Pond M7 Liner Plan	Y	CH2M HILL
26	C-17	Leak Detection and Recovery System - Civil Details	Y	CH2M HILL
27	C-18	Leak Detection and Recovery System and Liner System Details	Y	CH2M HILL
28	C-19	Liner System Details	Y	CH2M HILL
		SCHEDULE B DRAWINGS		
29	C-20	Paved MEP Access Road		Forsgren Associates
30	C-21	Paved MEP Access Road		Forsgren Associates
31	C-22	Paved MEP Access Road		Forsgren Associates
32	C-23	Paved MEP Access Road	Y	Forsgren Associates
33	C-24	Civil Details	Y	Forsgren Associates
34	P-1	Effluent Discharge Pipeline - Site West		Forsgren Associates
35	P-2	Effluent Discharge Pipeline - Site East	Y	Forsgren Associates
36	P-3	Pond Berm Typical Sections	Y	Forsgren Associates
37	P-4	Discharge Pipeline Details	Y	Forsgren Associates
38	P-5	Effluent Discharge Pipelines - Sta 0+00 to 10+00	Y	Forsgren Associates
39	P-6	Effluent Discharge Pipelines - Sta 10+00 to 20+00	Y	Forsgren Associates
40	P-7	Effluent Discharge Pipelines - Sta 20+00 to 25+00	Y	Forsgren Associates
41	S-1	General Notes	Y	Forsgren Associates
42	S-2	Bridge Plan and Elevation	Y	Forsgren Associates
43	S-3	Foundation M5-2, M5-3	Y	Forsgren Associates
44	S-4	Foundation M7-1	Y	Forsgren Associates
45	S-5	Foundation M7-2, M7-3, M5-1	Y	Forsgren Associates
46	S-6	Column Details	Y	Forsgren Associates
47	S-6a	Column Details		Forsgren Associates
48	S-7	Pond M5 Pier/Platform Plan		Forsgren Associates
49	S-7A	Pond M7 Pier/Platform Plan		Forsgren Associates
50	S-8	Pier Cap M5-2, M5-3 Details		Forsgren Associates
51	S-8a	Pier Cap M5-2, M5-3 Details		Forsgren Associates
52	S-8b	Pier Cap M5-2, M5-3 Details		Forsgren Associates
53	S-9	Pier Cap M7-1 Details		Forsgren Associates
54	S-9a	Pier Cap M7-1 Details		Forsgren Associates
55	S-9b	Pier Cap M7-1 Details		Forsgren Associates
56	S-10	Pier Cap M7-2, M7-3, M5-1 Details		Forsgren Associates
57	S-10a	Pier Cap M7-2, M7-3, M5-1 Details		Forsgren Associates
58	S-10b	Pier Cap M7-2, M7-3, M5-1 Details		Forsgren Associates
59	S-11	Details	Y	Forsgren Associates
60	S-11A	Details	Y	Forsgren Associates
61	S-11B	Details	Y	Forsgren Associates
62	S-11C	Details	Y	Forsgren Associates
	S-11D	Not Used		
63	S-11E	Details		Forsgren Associates
64	S-12	Mixer Access Bridge #M7-3 Erection Layout		Solutions Inc / R&M Eng.
65	S-13	Mixer Access Bridge #M7-3 Splice Details		Solutions Inc / R&M Eng.
66	S-14	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
67	S-15	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
68	S-16	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
69	S-17	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
70	S-18	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
71	S-19	Mixer Access Bridge #M7-3 Plans, Sections & Details		Solutions Inc / R&M Eng.
72	S-20	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Erection Layout		Solutions Inc / R&M Eng.
73	S-21	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Splice Details		Solutions Inc / R&M Eng.
74	S-22	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
75	S-23	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
76	S-24	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
77	S-25	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
78	S-26	Mixer Access Bridge#M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
79	S-27	Mixer Access Bridge #M5-1,2,3 & M7-1,2 Plans, Sections & Details		Solutions Inc / R&M Eng.
80	S-28	Mixer Platforms General Steel Notes and Standard Details		Solutions Inc / R&M Eng.
81	S-29	Mixer Platforms Handrail Standards		Solutions Inc / R&M Eng.
82	S-30	Mixer Platform #M5-1 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
83	S-31	Mixer Platform #M5-1 Sections and Details		Solutions Inc / R&M Eng.
84	S-32	Mixer Platform #M5-1 Sections and Details		Solutions Inc / R&M Eng.
85	S-33	Mixer Platform #M5-1 Sections and Details		Solutions Inc / R&M Eng.
86	S-34	Mixer Platform #M5-2 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
87	S-35	Mixer Platform #M5-2 Sections and Details		Solutions Inc / R&M Eng.
88	S-36	Mixer Platform #M5-2 Sections and Details		Solutions Inc / R&M Eng.
89	S-37	Mixer Platform #M5-2 Sections and Details		Solutions Inc / R&M Eng.
90	S-38	Mixer Platform #M5-3 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
91	S-39	Mixer Platform #M5-3 Sections and Details		Solutions Inc / R&M Eng.
92	S-40	Mixer Platform #M5-3 Sections and Details		Solutions Inc / R&M Eng.
93	S-41	Mixer Platform #M5-3 Sections and Details		Solutions Inc / R&M Eng.
94	S-42	Mixer Platform #M7-1 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
95	S-43	Mixer Platform #M7-1 Sections and Details		Solutions Inc / R&M Eng.
96	S-44	Mixer Platform #M7-1 Sections and Details		Solutions Inc / R&M Eng.
97	S-45	Mixer Platform #M7-1 Sections and Details		Solutions Inc / R&M Eng.
98	S-46	Mixer Platform #M7-1 Sections and Details		Solutions Inc / R&M Eng.
99	S-47	Mixer Platform #M7-1 Sections and Details		Solutions Inc / R&M Eng.
100	S-48	Mixer Platform #M7-2 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
101	S-49	Mixer Platform #M7-2 Sections and Details		Solutions Inc / R&M Eng.
102	S-50	Mixer Platform #M7-2 Sections and Details		Solutions Inc / R&M Eng.
103	S-51	Mixer Platform #M7-2 Sections and Details		Solutions Inc / R&M Eng.
104	S-52	Mixer Platform #M7-2 Sections and Details		Solutions Inc / R&M Eng.
105	S-53	Mixer Platform #M7-3 Steel Framing and Grating Plan		Solutions Inc / R&M Eng.
106	S-54	Mixer Platform #M7-3 Sections and Details		Solutions Inc / R&M Eng.
107	S-55	Mixer Platform #M7-3 Sections and Details		Solutions Inc / R&M Eng.
108	S-56	Mixer Platform #M7-3 Sections and Details		Solutions Inc / R&M Eng.
109	S-57	Mixer Platforms Embedded Plate Sections and Details		Solutions Inc / R&M Eng.
110	S-58	General Arrangement Rising Post		Solutions Inc / OnPoint
111	S-59	GA Elevations M5-3 Rising Post		Solutions Inc / OnPoint
112	S-60	GA Elevations M5-1,2 & M7-1,2,3 Rising Post		Solutions Inc / OnPoint
113	S-61	Reserved		Solutions Inc / OnPoint
114	S-62	General Arrangement Mixer/Diffuser		Solutions Inc / OnPoint
115	S-63	Bill of Materials Headframe Assembly		Solutions Inc / OnPoint
116	S-64	Fabrication Detail Headframe Assembly		Solutions Inc / OnPoint
117	S-65	Fabrication Detail Headframe Parts 1		Solutions Inc / OnPoint
118	S-65a	Assembly Detail Headframe Parts		Solutions Inc / OnPoint
119	S-66	Fabrication Detail Headframe Parts 2		Solutions Inc / OnPoint
120	S-67	Fabrication Details Roller Mounts		Solutions Inc / OnPoint
121	S-68	Fabrication Details Aeration Feed Pipe		Solutions Inc / OnPoint
122	S-69	Fabrication Details Ratchet Assembly		Solutions Inc / OnPoint
123	S-70	Fabrication Details Diffuser Assembly		Solutions Inc / OnPoint
124	S-71	Fabrication Details Motor Mount		Solutions Inc / OnPoint
125	S-72	Installation Details Air Hose Assembly		Solutions Inc / OnPoint
126	S-73	installation Details Cable Support		Solutions Inc / OnPoint
127	S-74	Fabrication Details 32' Post M5-3		Solutions Inc / OnPoint
128	S-75	Fabrication Details 30' post M5-1,2 & M7-1,2,3		Solutions Inc / OnPoint
129	S-76	Fabrication Detail Post Attachments & Brackets		Solutions Inc / OnPoint
130	M-1	Leak Detection and Recovery System - Mechanical Details	Y	Forsgren Associates
131	M-2	Pond M7 Mechanical - Site Plan	Y	Forsgren Associates
132	M-3	Pond M5 Mechanical - Site Plan	Y	Forsgren Associates
133	M-4	Mixer Bridge and Platform - Mechanical Plan		Forsgren Associates
134	M-5	Mixer Bridge and Platform - Mechanical Sections		Forsgren Associates
135	M-6	Blower Pad	Y	CH2M HILL
136	E-0	Electrical Legend	Y	Forsgren Ass./TJK Eng.
137	E-1	Electrical Site Plan	Y	Forsgren Ass./TJK Eng.
138	E-2	One Line Diagram		Forsgren Ass./TJK Eng.
139	E-3	Electrical Details		Forsgren Ass./TJK Eng.
140	E-4	Electrical Details	Y	Forsgren Ass./TJK Eng.
141	E-5	Electrical Calculations		Forsgren Ass./TJK Eng.
142	E-6	Electrical Details		Forsgren Ass./TJK Eng.
143	E-7	Electrical Details		Forsgren Ass./TJK Eng.
144	E-8	Control Wiring Details		Forsgren Ass./TJK Eng.
145	E-9	Electrical Details	Y	Forsgren Ass./TJK Eng.
146	N-0	P&ID Legend		Forsgren Ass./TJK Eng.
147	N-1	P&ID		Forsgren Ass./TJK Eng.

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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RECORD DRAWING

REVISION: 0 | 07/14/11 | NKB | SWD

NO. DATE BY APVD

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NV Energy
REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821655101

DRAWING INDEX

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

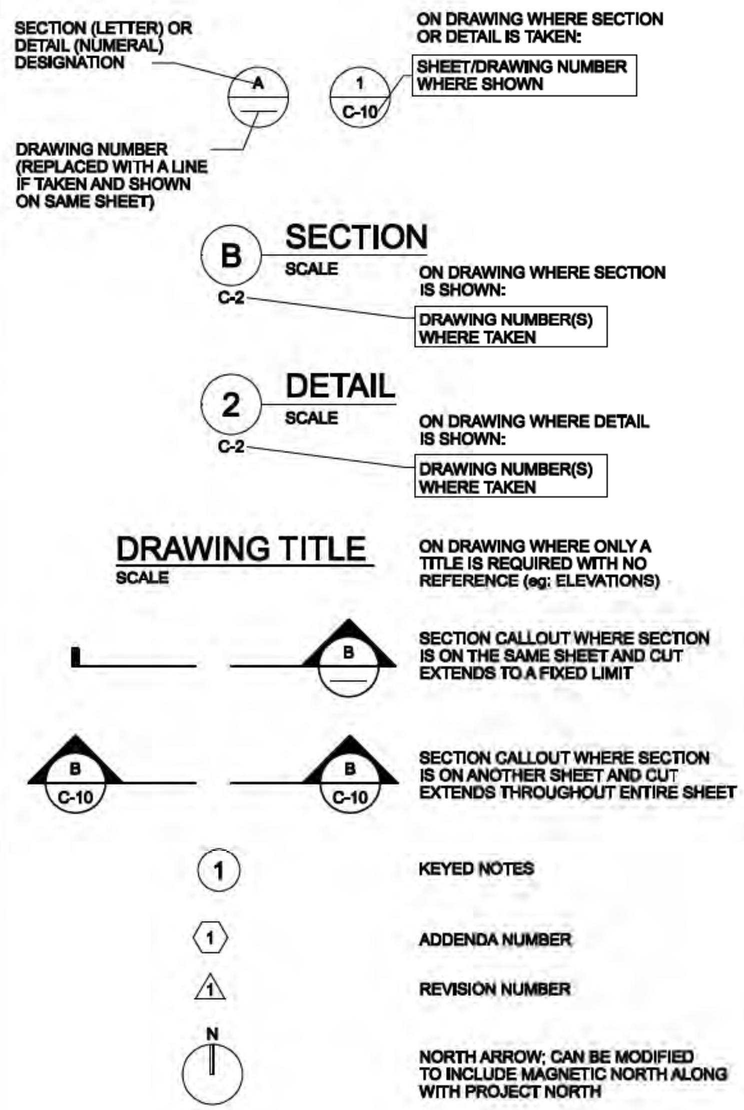
DATE JULY 2011
PROJ 401621
DWG G-1A
SHEET 2 OF 147

ABBREVIATIONS, CIVIL, STRUCTURAL, MECHANICAL

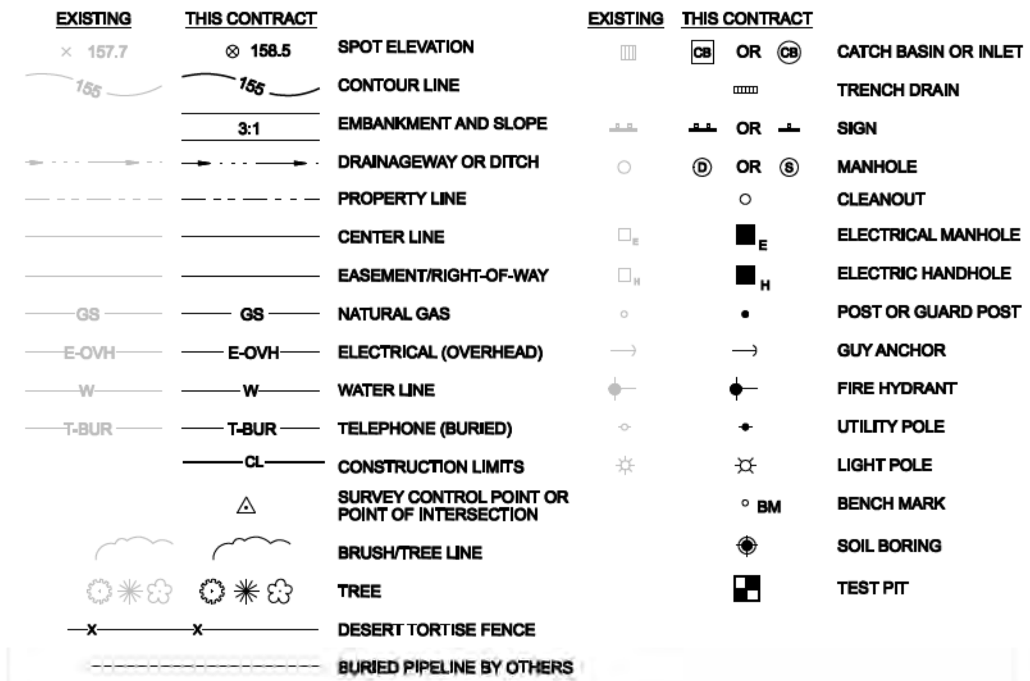
ABDN	ABANDON	OPNG	OPENING
ACP	ASPHAULT CONCRETE PAVEMENT	OPP	OPPOSITE
ADDTL	ADDITIONAL	P	PUMP
AI	INSTRUMENT AIR	PC	POINT OF CURVATURE
AL	ALUMINUM	PCV	PRESSURE CONTROL VALVE
ALT	ALTERNATE	PI	POINT OF INTERSECTION, PRESSURE INSTRUMENT
APPROX	APPROXIMATE	PJF	PREMOLDED JOINT FILLER
ARCH	ARCHITECTURAL	PL	PLATE, PROPERTY LINE
ARV	AIR RELEASE VALVE	PLCS	PLACES
AVRV	AIR VACUUM RELEASE VALVE	PMP	PEAK MAXIMUM PRECIPITATION
BLM	BUREAU OF LAND MANAGEMENT	POB	POINT OF BEGINNING
BM	BEAM, BENCHMARK	POE	POINT OF ENDING
BMP	BEST MANAGEMENT PRACTICE	POT	POTABLE
BOT	BOTTOM	PP	POWER POLE
BS	BOTH SURFACES	PRV	PRESSURE RELEASE VALVE
BVC	BEGINNING OF VERTICAL CURVE	PSDC	POND SOLIDS DISPOSAL CELL
CDN	COMPOSITE DRAINAGE NET	PT	PRESSURE TREATED
CFM	CUBIC FEET PER MINUTE	PT	POINT OF TANGENCY
CHKD	CHECKERED	PVC	POLYVINYL CHLORIDE, POINT OF VERTICAL CURVE
CJ	CONSTRUCTION, CONTROL JOINT	PVI	POINT OF VERTICAL INTERSECTION
CL	CENTERLINE	PVT	POINT OF VERTICAL TANGENCY
CLDI	CEMENT LINED DUCTILE IRON	PWP	POTABLE WATER LINE
CLR	CLEAR	R	RADIUS
CLSF	CONTROLLED LOW STRENGTH FILL	R/W	RIGHT OF WAY
CMP	CORRUGATED METAL PIPE	RD	ROAD
CMU	CONCRETE MASONRY UNIT	RDCR	REDUCER
CONC	CONCRETE	REINF	REINFORCING
CONN	CONNECTION	RGS	RIGID GALVANIZED STEEL
CONT	CONTINUED/ CONTINUATION/ CONTINUOUS	RGS	REID GARDNER STATION
COORD	COORDINATE	RT	RIGHT
CTRD	CENTERED	S	SLOPE
CWCS	CONTACT WATER COLLECTION SYSTEM	SCH	SCHEDULE
CWPS	CONTACT WATER POND SYSTEM	SF	SQUARE FEET
CY	CUBIC YARDS	SIM	SIMILAR
DCS	DISTRIBUTED CONTROL SYSTEM	SLLE	SOUTH LATERAL LANDFILL EXPANSION
DIA	DIAMETER	SST	STAINLESS STEEL
DIP	DUCTILE IRON PIPE	STA	STATION
DN	DRAINAGE NET	STD	STANDARD
DT	DESERT TORTOISE	SWPPP	STORMWATER POLLUTION PREVENTION PLAN
DWG	DRAWING	T&B	TOP AND BOTTOM
EA	EACH	TE	TREATED EFFLUENT
EE	EACH END	TEMP	TEMPORARY
EF	EACH FACE	TI	TREATED INFLUENT
EFPS	EFFLUENT FORWARDING PUMPING SYSTEM	TO	TOP OF
EL	ELEVATION	TOC	TOP OF CONCRETE, TOP OF CURB
ELLE	EAST LATERAL LANDFILL EXPANSION	TOF	TOP OF FOOTING
EQ	EQUAL	TOS	TOP OF SLAB
EQPT	EQUIPMENT	TOW	TOP OF WALL
EUH	ELECTRIC UNIT HEATER	TST	TOP OF STEEL
EW	EACH WAY	TYP	TYPICAL
EXST	EXISTING	UPRR	UNION PACIFIC RAILROAD
FD	FLOOR DRAIN	USFWS	U.S. FISH AND WILDLIFE SERVICE
FG	FINISHED GRADE	VERT	VERTICAL
FIN	FINISHED	VF	VENTILATION FAN
FIP	FACILITY IMPROVEMENT PROGRAM	W/	WITH
FT	FOOT OR FEET	WL	WATER LEVEL
FTG	FOOTING	WMU	WASTE MANAGEMENT UNIT
GALV	GALVANIZED	WS	WATER STOP
HAS	HEADED ANCHOR STUD	WWF	WELDED WIRE FABRIC
HDPE	HIGH DENSITY POLYETHYLENE		
HGL	HYDRAULIC GRADE LINE		
HORIZ	HORIZONTAL		
HP	HYDROGEN PEROXIDE		
HPS	HYDROGEN PEROXIDE STATION		
HPT	HIGH POINT		
HTP	HEAT PUMP AIR CONDITIONING UNIT		
IE	INVERT ELEVATION		
IN	INCH		
INV	INVERT		
JT	JOINT		
kVA	KILOVOLT-AMPERES		
LDRS	LEAK DETECTION AND RECOVERY SYSTEM		
LIT	LEVEL INDICATING TRANSMITTER		
LLS	LEAK LOCATION SYSTEM		
LPT	LOW POINT		
LT	LEFT		
MAX	MAXIMUM		
MEP	MESA EVAPORATION PONDS		
MH	MANHOLE, MOUNTING HEIGHT		
MIN	MINIMUM		
MJ	MECHANICAL JOINT		
MO	MASONRY OPENING		
N	NORTH, NEUTRAL		
NAC	NEVADA ADMINISTRATIVE CODE		
NDEP	NEVADA DIVISION ENVIRONMENTAL PROTECTION		
NDOW	NEVADA DEPARTMENT OF WILDLIFE		
NGVD	NATIONAL GEODETIC VERTICAL DATUM		
NIC	NOT IN CONTRACT		
NTS	NOT TO SCALE		
NVDOT	NEVADA DEPARTMENT OF TRANSPORTATION		
OC	ON CENTER		
OH	OVERHEAD		

NOTE: SOME ABBREVIATIONS MAY NOT BE USED ON THIS PROJECT.

SECTION / DETAIL DESIGNATIONS



CIVIL LEGEND



GENERAL SITE NOTES:

1. SOURCE OF TOPOGRAPHY SHOWN ON THE CIVIL PLANS PREPARED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED: 1-2-09. EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN ON THESE PLANS. VERIFY EXISTING CONDITIONS AND ADJUST WORK PLAN ACCORDINGLY PRIOR TO BEGINNING CONSTRUCTION.
2. EXISTING TOPOGRAPHY, STRUCTURES, AND SITE FEATURES ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE SHOWN HEAVY-LINED.
3. HORIZONTAL DATUM: NAD83 NEVADA SP EAST
4. VERTICAL DATUM: NAVD 1988
5. MAINTAIN, RELOCATE, OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER.
6. FOR LOCATION OF CONTROL POINT ON STRUCTURES, SEE STRUCTURAL DRAWINGS.
7. STAGING AREA SHALL BE FOR CONTRACTOR'S TRAILERS, EQUIPMENT AND ON-SITE STORAGE OF MATERIALS.
8. ALL PRIVATE CARS AND TRUCKS SHALL BE PARKED IN THE RGS NORTH CONSTRUCTION PARKING AREA. LOCATED NORTHWEST OF THE PLANT. CONTRACTOR SHALL PROVIDE SHUTTLES AS NECESSARY TO GET EMPLOYEES TO CONSTRUCTION SITE.
9. PROVIDE TEMPORARY FENCING AS NECESSARY TO MAINTAIN SECURITY AT ALL TIMES.
10. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN.
11. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.
12. CONTRACTOR WILL IMPLEMENT AND MAINTAIN EROSION CONTROL DEVICES WITHIN PROJECT LIMITS THROUGHOUT THE DURATION OF CONSTRUCTION.
13. CONTRACTOR SHALL TAKE ALL OTHER MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE. CONTRACTOR TO SUBMIT EROSION CONTROL PLAN. PER SPECIFICATIONS.
14. FILLS GREATER THAN 5 FEET IN HEIGHT PLACED ON NATIVE SLOPES STEEPER THAN 5:1 SHALL BE KEYED INTO THE PRE-EXISTING SLOPE WITH HORIZONTAL BENCHES. REFER TO THE SPECIFICATIONS FOR BENCHING REQUIREMENTS

GENERAL YARD PIPING AND UTILITIES NOTES:

1. EXISTING UNDERGROUND UTILITIES OBTAINED FROM AS-BUILTS AND FROM FIELD SURVEY. FIELD VERIFY DEPTH AND LOCATION PRIOR TO EXCAVATION. PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION.
2. EXISTING PIPING AND EQUIPMENT ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW EQUIPMENT IS SHOWN HEAVY-LINED. NEW PIPING IS SHOWN AS HEAVY, DASHED LINES.
3. UNLESS OTHERWISE SHOWN ALL PIPING SHALL HAVE A MINIMUM OF 3' COVER.
4. ALL PIPES SHALL HAVE A CONSTANT SLOPE BETWEEN INVERT ELEVATIONS UNLESS A FITTING IS SHOWN.
5. ALL NEW PIPES MUST BE PROPERLY FLUSHED AND, PRESSURE TESTED AS SPECIFIED.
6. FOR TYPICAL TRENCHING, SEE DWG P-3.
7. FLUSHING OF HDPE PIPELINE IS NOT REQUIRED.
8. ALL SECTIONS AND COMPONENTS OF THE EFFLUENT PIPING SYSTEM SHALL BE HYDROTESTED WITH CONSTRUCTION WATER PRIOR TO ACCEPTANCE.

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.

DATE	JULY 2011
PROJ	401621
DWG	G-2
SHEET	3 OF 147

DESIGN CRITERIA

1. APPLICABLE CODE: 2006 INTERNATIONAL BUILDING CODE (IBC), AS AMENDED BY THE STATE OF NEVADA AND ALL OTHER APPLICABLE LOCAL AGENCIES.

2. REFER TO THE DRAWINGS FOR ADDITIONAL AND SPECIFIC STRUCTURE LOADINGS AND REQUIREMENTS.

3. FLOOR LIVE LOADS:
   - ELECTRICAL AREA — 300 PSF
   - MECHANICAL AREA — 200 PSF
   - BRIDGE DECK AND MIXING PLATFORM — 75 PSF
   - BRIDGE DECK WHEEL LOAD — 750 LB WHEEL LOAD

4. WIND LOAD:
   - BASIC WIND SPEED (3-SECOND GUST) = 90 MPH
   - EXPOSURE = C
   - OCCUPANCY CATEGORY = I I
   - I = 1.0

5. SEISMIC LOAD:
   - MAPPED SPECTRAL RESPONSE ACCELERATIONS
     - S_S = 0.622 g
     - S_1 = 0.194 g
   - DESIGN SPECTRAL RESPONSE ACCELERATIONS
     - S_{DS} = 0.540 g
     - S_{D1} = 0.262 g
   - SITE CLASS = C
   - OCCUPANCY CATEGORY = I I
   - SEISMIC DESIGN CATEGORY = D
   - I = 1.0

6. SOIL DESIGN PARAMETERS:
   A. SEE SECTION "FOUNDATIONS" FOR GEOTECHNICAL REFERENCE MATERIALS.

GENERAL INFORMATION

1. FOR ABBREVIATIONS NOT LISTED, SEE ASME Y14.38 "ABBREVIATIONS AND ACRONYMS: PUBLICATION AS DISTRIBUTED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME).

2. DETAILING AND DIMENSIONS OF EXISTING STRUCTURES SHOWN ARE BASED ON AS-BUILT DESIGN DRAWINGS, AND DO NOT NECESSARILY REPRESENT THE AS-CONSTRUCTED CONDITIONS. THE CONTRACTOR SHALL FIELD VERIFY DIMENSIONS AND DETAILING OF THE EXISTING STRUCTURES PRIOR TO FABRICATION OF ADJACENT FRAMING OR CONNECTIONS OR SUPPORTS THAT ARE AFFECTED BY THE EXISTING STRUCTURE.

3. FOR NUMBER, TYPE, SIZE, ARRANGEMENT, AND/OR LOCATION OF EQUIPMENT PADS SEE OTHER DISCIPLINE DRAWINGS.

4. STRUCTURAL MEMBERS SHALL NOT BE CUT OR MODIFIED FOR PIPES, DUCTS, ETC, UNLESS SPECIFICALLY DETAILED OR APPROVED IN WRITING BY THE DESIGNER.

SPECIAL INSPECTION, OBSERVATIONS AND TESTING

1. SPECIAL INSPECTION (CONTRACTOR PROVIDED AND OWNER APPROVED) IS REQUIRED IN ACCORDANCE WITH IBC SECTIONS 109 AND 1704. CONTRACTOR'S DESIGN ENGINEER SHALL PROVIDE LIST OF ITEMS REQUIRING SPECIAL INSPECTION IN ACCORDANCE WITH IBC.

2. SPECIFIED CONCRETE TESTING DURING CONSTRUCTION WILL BE CONTRACTOR FURNISHED BY OWNER APPROVED INDEPENDANT TESTING AGENCY. SPECIFIED LABORATORY TEST MIXES. SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

FOUNDATIONS

1. REFER TO GEOTECHNICAL DATA REPORT "GEOTECHNICAL INVESTIGATION: MESA EVAPORATION PONDS" BY CONVERSE CONSULTANTS, DATED MAY 4, 2009. SOIL DESIGN PARAMETERS SHALL BE DETERMINED BASED ON SOIL DESCRIPTIONS AND INFORMATION CONTAINED IN GEOTECHNICAL DATA REPORT.

2. ALL FOUNDATION BEARING SURFACES SHALL BE OBSERVED BY A GEOTECHNICAL ENGINEER OR HIS DESIGNEE PRIOR TO PLACEMENT OF FORMING OR REINFORCING STEEL THE OBSERVATION SHALL VERIFY THAT THE ACTUAL EXPOSED SUBGRADE IS AS ANTICIPATED BY THE SITE SPECIFIC BORINGS, TEST PITS, TESTING AND DATA REPORTS.

FORMWORK, SHORING AND BRACING

1. CONTRACTOR IS RESPONSIBLE FOR ALL WORK RELATING TO CONSTRUCTION ERECTION METHODS, BRACING, SHORING, RIGGING, GUYS, SCAFFOLDING, FORMWORK, AND OTHER WORK AIDS REQUIRED TO SAFELY PERFORM THE WORK SHOWN.

2. TEMPORARY SHORING SHALL REMAIN IN PLACE UNTIL ELEVATED CONCRETE FLOOR OR SLABS HAVE REACHED 80 PERCENT OF THE 28 DAY DESIGN STRENGTH AS DETERMINED BY CYLINDER BREAKS.

CONCRETE REINFORCING

1. CLEARANCE FOR REINFORCEMENT BARS, UNLESS SHOWN OTHERWISE, SHALL BE:
   - WHEN PLACED ON GROUND: 3"
   - ALL OTHER CONCRETE SURFACES 2"

2. 90 DEGREE BENDS, UNLESS OTHERWISE SHOWN, SHALL BE ACI 318 STANDARD HOOKS.

3. REINFORCEMENT BENDS AND LAPS, UNLESS OTHERWISE NOTED, SHALL SATISFY THE FOLLOWING MINIMUM REQUIREMENTS:

CONCRETE DESIGN STRENGTH = 4,000 PSI ★★		GRADE 60 REINFORCING STEEL								
BAR SIZE		#3	#4	#5	#6	#7	#8	#9	#10	#11
LAP SPLICE LENGTH										
SPACING<6"	TOP BAR ★	1'-4"	2'-0"	3'-0"	4'-0"	5'-10"	6'-8"	7'-7"	8'-6"	9'-5"
	OTHER BAR	1'-4"	1'-7"	2'-4"	3'-1"	4'-6"	5'-2"	5'-10"	6'-7"	7'-3"
SPACING≥6"	TOP BAR ★	1'-4"	1'-6"	2'-0"	2'-5"	3'-6"	4'-0"	5'-0"	6'-2"	7'-5"
	OTHER BAR	1'-4"	1'-4"	1'-7"	1'-10"	2'-9"	3'-1"	3'-10"	4'-9"	5'-8"
EMBEDMENT LENGTH										
SPACING<6"	TOP BAR ★	1'-0"	1'-7"	2'-4"	3'-1"	4'-6"	5'-2"	5'-10"	6'-7"	7'-3"
	OTHER BAR	1'-0"	1'-3"	1'-9"	2'-5"	3'-6"	4'-0"	4'-6"	5'-1"	5'-7"
SPACING≥6"	TOP BAR ★	1'-0"	1'-3"	1'-7"	1'-10"	2'-9"	3'-1"	3'-10"	4'-9"	5'-8"
	OTHER BAR	1'-0"	1'-0"	1'-3"	1'-5"	2'-1"	2'-5"	3'-0"	3'-8"	4'-5"

★ TOP BARS SHALL BE DEFINED AS ANY HORIZONTAL BARS PLACED SUCH THAT MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW THE BAR IN ANY SINGLE POUR. HORIZONTAL WALL BARS ARE CONSIDERED TOP BARS.

★★ WHERE 3000 PSI CONCRETE IS USED, INCREASE ABOVE LENGTHS BY 16 PERCENT

CONCRETE

1. 28-DAY CAST-IN-PLACE CONCRETE STRENGTHS:
   - TYPICAL: 4500 PSI
   - PIPE AND CONDUIT ENCASEMENTS 3000 PSI

2. REINFORCING STEEL: ASTM A615, GRADE 60

3. FABRICATION AND PLACEMENT OF REINFORCING STEEL SHALL BE IN ACCORDANCE WITH CRSI MSP-1 "MANUAL OF STANDARD PRACTICE" AND ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE".

4. ROUGHEN AND CLEAN CONSTRUCTION JOINTS AS SPECIFIED PRIOR TO PLACING ADJACENT CONCRETE.

5. THE CONTRACTOR SHALL COORDINATE PLACEMENT OF OPENINGS, CURBS, DOWELS, SLEEVES, CONDUITS, BOLTS AND INSERTS PRIOR TO PLACEMENT OF CONCRETE.

6. NO ALUMINUM CONDUIT OR PRODUCTS CONTAINING ALUMINUM OR ANY OTHER MATERIAL INJURIOUS TO THE CONCRETE SHALL BE EMBEDDED IN THE CONCRETE.

WELDING

1. WELDS SHALL CONFORM TO AMERICAN WELDING SOCIETY (AWS), LATEST EDITION:
   - D1.1, STRUCTURAL WELDING CODE – STEEL
   - D1.3, STRUCTURAL WELDING CODE – SHEET STEEL
   - D1.4, STRUCTURAL WELDING CODE – REINFORCING STEEL
   - D1.6, STRUCTURAL WELDING CODE – STAINLESS STEEL

2. REPAIR WELDS FOUND DEFECTIVE IN ACCORDANCE WITH AWS D1.1 SECTION 5.26.

3. USE INTERMITTENT WELDS AT FIELD WELDS OF EMBED PLATES AND ANGLES TO AVOID SPALLING OR CRACKING OF THE EXISTING CONCRETE.

4. BUTT JOINT WELDS SHALL BE COMPLETE JOINT PENETRATION (CJP) UNLESS INDICATED OTHERWISE.

STRUCTURAL STEEL AND METAL FABRICATIONS

1. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING:
   - W-SHAPES — A992
   - MISCELLANEOUS SHAPES INCLUDING ANGLES, CHANNELS, PLATES, ETC. — A36
   - SQUARE OR RECTANGULAR STEEL TUBING — A500, GRADE B
   - STEEL PIPE — A53, GRADE B

2. STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN CONFORMANCE WITH THE AISC MANUAL OF CONSTRUCTION, CURRENT EDITION, AND CURRENT OSHA STANDARDS.

3. BOLTS SHALL BE HIGH STRENGTH BOLTS CONFORMING TO THE FOLLOWING EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE:
   - UNLESS SHOWN OTHERWISE — A325-N, GALVANIZED
   - SLIP CRITICAL — A325-SC, GALVANIZED
   - ANCHOR BOLTS (AB)
     - STAINLESS STEEL — F593, AISI TYPE 316, CONDITION CW
     - GALVANIZED STEEL — F1554, GR 36 / A153
   - MACHINE BOLTS (MB) — A307, GALVANIZED

4. ITEMS TO BE EMBEDDED IN CONCRETE SHALL BE CLEAN AND FREE OF OIL, DIRT AND PAINT.

5. NO HOLES OTHER THAN THOSE SPECIFICALLY DETAILED SHALL BE ALLOWED THROUGH STRUCTURAL STEEL MEMBERS. NO CUTTING OR BURNING OF STRUCTURAL STEEL IS PERMITTED WITHOUT THE APPROVAL OF THE ENGINEER.

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	04/16/10	ISSUED FOR CONSTRUCTION	CB	SWD

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NV Energy

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9525650201 M7: RC171 WO# 9821855101

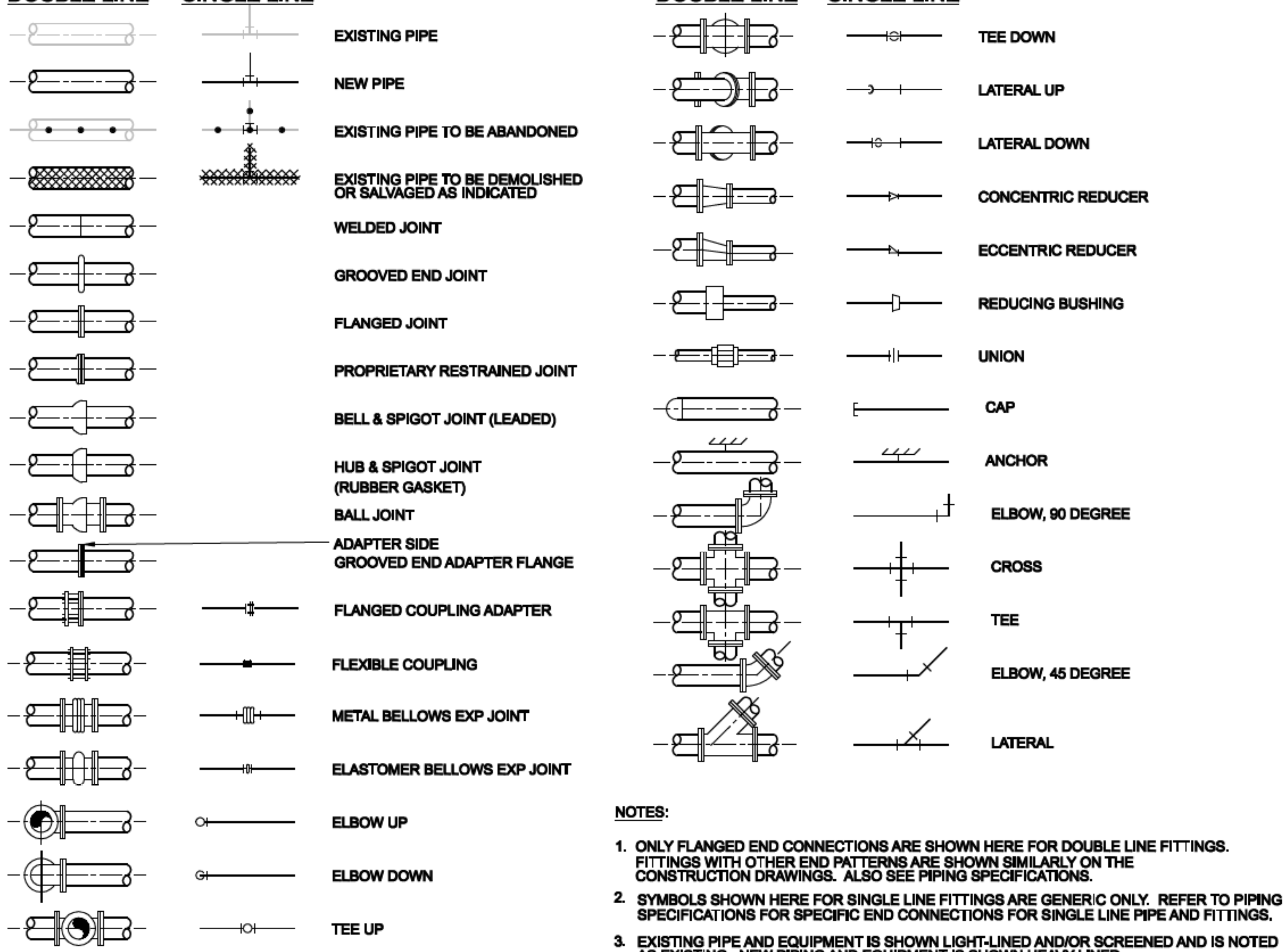
STRUCTURAL NOTES

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	G-3
SHEET	4 OF 147

RECORD DRAWING

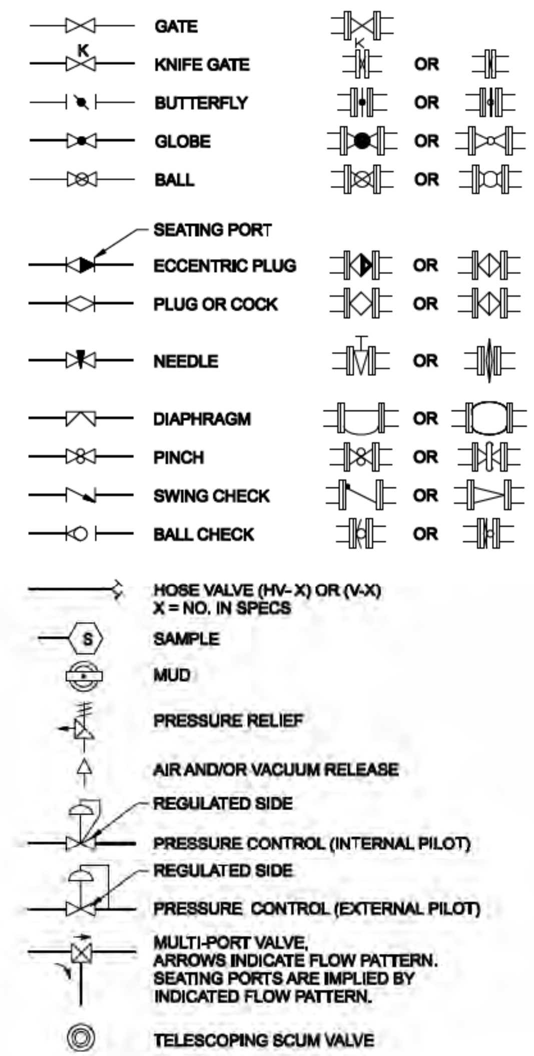
PIPE AND FITTING SYMBOLS



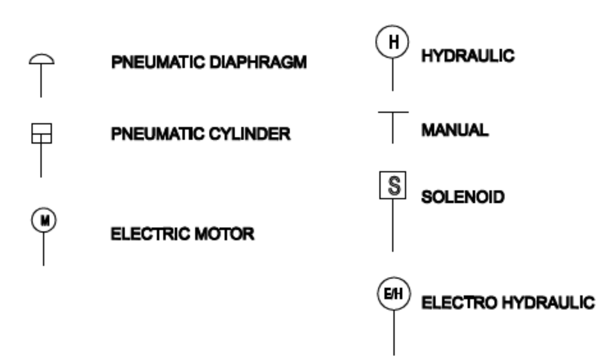
NOTES:

1. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS. FITTINGS WITH OTHER END PATTERNS ARE SHOWN SIMILARLY ON THE CONSTRUCTION DRAWINGS. ALSO SEE PIPING SPECIFICATIONS.
2. SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
3. EXISTING PIPE AND EQUIPMENT IS SHOWN LIGHT-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN HEAVY-LINED.

VALVE SYMBOLS



ACTUATOR SYMBOLS



MECHANICAL NOTES

GENERIC PIPING NOTES

1. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
2. SIZE OF FITTINGS SHOWN ON DRAWINGS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
3. IF SHOWN, LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS IS ONLY APPROXIMATE. CONTRACTOR SHALL DESIGN SUPPORTS.
4. ALL JOINTS SHALL BE WATERTIGHT.
5. ALL FLEXIBLE CONNECTORS AND COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST PROTECTION, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED.
6. SYMBOLS AND LEGENDS SHOWN SHALL BE FOLLOWED THROUGHOUT THE DRAWINGS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS PIPING COMPONENTS ARE NECESSARILY USED IN THE PROJECT.
7. ALL BURIED PIPING SPECIFIED TO BE PRESSURE TESTED, EXCEPT FLANGED, WELDED, BUTT-FUSED, OR SCREWED PIPING, SHALL BE PROVIDED WITH THRUST PROTECTION AS SPECIFIED, UNLESS OTHERWISE NOTED.
8. IF SHOWN, NUMBER AND LOCATION OF UNIONS ON DRAWINGS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
9. WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE, UNLESS OTHERWISE SPECIFIED. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE SHALL BE JOINED TO THE COUPLING ADAPTER.

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MESA EVAPORATION PONDS M5, AND M7
M5: RC171 WO# 9825850201 M7: RC171 WO# 9821855101

MECHANICAL LEGEND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	G-4
SHEET	5 OF 147

RECORD DRAWING

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
	NEW EQUIPMENT, WIRING AND TEXT
	EXISTING OR OWNER FURNISHED AND CONTRACTOR INSTALLED EQUIPMENT, WIRING AND TEXT IS SHOWN WITH SCREENED LINES
	EXISTING EQUIPMENT, CONDUIT AND WIRING TO BE REMOVED
OR	CONNECTION POINT TO DEVICES UNDER THIS CONTRACT AND SPECIFIED IN DIVISIONS OTHER THAN 16. WIRING, RACEWAYS AND CONNECTIONS SHALL BE PROVIDED UNDER THIS CONTRACT AS SPECIFIED UNDER DIVISION 16.
MCC-A	MAJOR ELECTRICAL COMPONENT OR DEVICE - NAME OR IDENTIFYING SYMBOL AS SHOWN.
	BRANCH CIRCUIT PANELBOARD
UH1	UNIT HEATER NO.1 SEE SCHEDULE
TEL	TELEPHONE TERMINAL CABINET
	TERMINAL JUNCTION BOX
5	MOTOR, SQUIRREL CAGE INDUCTION - HORSEPOWER INDICATED
	LUMINAIRE
	LUMINAIRE AND POLE
	WALL MOUNTED LUMINAIRE
	FLOOD LIGHTS
	LUMINAIRE W/EMERGENCY BATTERY PACK
	EMERGENCY DC LIGHT UNIT

(LUMINAIRE through EMERGENCY DC LIGHT UNIT: TYPE INDICATED SEE LUMINAIRE SCHEDULE)

SYMBOL	DESCRIPTION
LA-2	HOME RUN - DESTINATION SHOWN
or G	EXPOSED CONDUIT AND CONDUCTORS*
or G	CONCEALED CONDUIT AND CONDUCTORS*

NOTE:

RUNS WITH CROSSHATCHES INDICATE NUMBER OF NO.12 CONDUCTORS MINIMUM. CROSSHATCH WITH SUBSCRIPT "G" INDICATES GREEN GROUND WIRE. SIZE CONDUIT ACCORDING TO SPECIFICATIONS AND APPLICABLE CODES.

SYMBOL	DESCRIPTION
	CROSSHATCHES WITH BAR INDICATE #10 CONDUCTOR. SIZE CONDUIT ACCORDING TO SPECIFICATIONS & APPLICABLE CODE.
CE	CONCRETE ENCASED DUCT BANK
	CONDUIT DOWN
	CONDUIT UP
S_a or 2a	SMALL LETTER SUBSCRIPT AT SWITCH AND LUMINAIRE INDICATES SWITCHING. SUBSCRIPT NUMBER AT LUMINAIRE INDICATES CIRCUIT IN PANELBOARD.
S	WALL SWITCH: 2- DOUBLE POLE; P- PILOT LIGHT 3- THREE WAY; K- KEY OPERATED 4- FOUR WAY; D- DIMMER WP- WEATHERPROOF; CRE- CORROSION RESISTANT S_M = MANUAL MOTOR STARTER SWITCH
T	SPRING WOUND TIME SWITCH
T	THERMOSTAT
	TERMINAL POLE
	HAND HOLE

SYMBOL	DESCRIPTION
	CONVENIENCE RECEPTACLE - DUPLEX UNLESS SPECIFIED OTHERWISE WP- WEATHERPROOF; C- CLOCK HANGER TL- TWIST LOCK; CRE- CORROSION RESISTANT
PNL 4-1-1 (2)	CONVENIENCE RECEPTACLE - WITH PANEL NUMBER AND CIRCUIT NUMBER IN PARENTHESIS.
	CONVENIENCE RECEPTACLE, PEDESTAL, DUPLEX SINGLE FACE UNLESS INDICATED OTHERWISE
30	RECEPTACLE - 240V, 1 PH, AMPERAGE INDICATED
30	RECEPTACLE, SPECIAL PURPOSE - AMPERAGE AS INDICATED
	MULTI OUTLET ASSEMBLY
	RECEPTACLE - 4-PLEX
	TELEPHONE RECEPTACLE (OUTLET BOX ONLY) FLUSH IN FLOOR
	TELEPHONE RECEPTACLE (OUTLET BOX ONLY)
J	GENERAL CONTROL OR WIRING DEVICE. NEMA 4 ENCLOSURE UNLESS INDICATED OTHERWISE. LETTER SYMBOLS OR ABBREVIATIONS INDICATE TYPE OF DEVICE.
CS	CONTROL STATION, NEMA 4 ENCLOSURE UNLESS INDICATED OTHERWISE.
30	NONFUSED DISCONNECT SWITCH, SIZE INDICATED, 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, WP = WEATHERPROOF (NEMA 4X)
60/40 F	FUSED DISCONNECT SWITCH, SIZE INDICATED (60/40, 60 = SWITCH RATING: 40 = FUSE RATING) 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, WP = WEATHERPROOF (NEMA 4X)
2	CONTACTOR, MAGNETIC, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE, UNLESS INDICATED OTHERWISE.
30 L	LIGHTING CONTACTOR, CURRENT RATING INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM FOR NUMBER OF POLES.
2	STARTER MAGNETIC NEMA SIZE INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM.
2	COMBINATION (FUSE OR CIRCUIT BREAKER AS INDICATED) MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM.
	METERING FACILITIES
	TERMINAL CABINET FOR COMMUNICATIONS SYSTEM
F	FIRE ALARM STATION, MANUAL
FA	FIRE ALARM STATION, AUTOMATIC, HEAT DETECTOR
F	FIRE ALARM BELL
F	FIRE ALARM HORN
	GROUND ROD

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SYMBOL	DESCRIPTION
1	CONTACT - NORMALLY OPEN WITH NEMA SIZE INDICATED AS APPLICABLE
1	CONTACT - NORMALLY CLOSED WITH NEMA SIZE INDICATED AS APPLICABLE
TDR TC or TDR TO	TIME DELAY RELAY CONTACT (TIME ACTION INDICATED)
	REMOTE DEVICE
XX	RELAY COIL: CR= CONTROL RELAY, TDR=TIME DELAY RELAY
	OVERLOAD RELAY HEATER
1	MAGNETIC STARTER WITH NEMA SIZE INDICATED
100/M	CIRCUIT BREAKER, MAGNETIC TRIP ONLY, FRAME SIZE SHOWN, 3 POLE UNLESS INDICATED OTHERWISE.
400	CIRCUIT BREAKER, THERMAL MAGNETIC TRIP SHOWN, 3 POLE UNLESS INDICATED OTHERWISE.
400 400	CIRCUIT BREAKER WITH CURRENT LIMITING FUSES, TRIP AND FUSE RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
400 225	FUSED SWITCH, SWITCH AND FUSE CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
100	SWITCH - CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
	DRAWOUT AIR CIRCUIT BREAKER, LOW VOLTAGE
	DRAWOUT AIR CIRCUIT BREAKER, MEDIUM VOLTAGE
	DRAWOUT FUSED SWITCH, MEDIUM VOLTAGE
	LIGHTNING ARRESTER
	FUSE
10	CAPACITOR - KVAR INDICATED
SW V 0-600V	METER WITH SWITCH - SCALE RANGE SHOWN
	GROUND
120V or 120/240V 15 KVA 1 PH	TRANSFORMER, SECONDARY VOLTAGES, PHASE AND RATING INDICATED AS APPLICABLE
GFR 25A 0.1	PICK-UP SETTING; TIME CURRENT CHARACTERISTIC (GROUND FAULT RELAY WITH C.T.)
	PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN
	PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY CLOSED
	PUSH BUTTON SWITCH, MAINTAINED CONTACTS WITH MECHANICAL INTERLOCK
	TEMPERATURE SWITCH, CLOSES ON TEMPERATURE RISE
	3 POSITION SELECTOR SWITCH MAINTAINED CONTACT
HAND OFF AUTO XOO OOX	SELECTOR SWITCH - MAINTAINED CONTACT - CHART IDENTIFIES OPERATION:

	POSITION		
CKT.	HAND	OFF	AUTO
1	X	O	O
2	O	O	X

X - CLOSED CONTACT
O - OPEN CONTACT

SYMBOL	DESCRIPTION
(3)	CURRENT TRANSFORMER, NUMBER INDICATED
A	INDICATING LIGHT, PUSH-TO-TEST, LETTER INDICATES COLOR
A	INDICATING LIGHT LETTER INDICATES COLOR A - AMBER; G - GREEN B - BLUE; R - RED C - CLEAR; W - WHITE

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
A	AMMETER, AMPERE
AC	ALTERNATING CURRENT
AF	AMPERE FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AS	AMPERE SENSOR
ASU	AIR SUPPLY UNIT
ATCS	AUTOMATIC TRANSFER CONTROL SYSTEM
ATS	AUTOMATIC TRANSFER SW
AT	AMP TRIP
BO	BOILER
BCU	BARE COPPER
BRKR	BREAKER
C	CONDUIT, CONTACTOR
CB	CIRCUIT BREAKER
CC	CONTROL CABLE
CKT	CIRCUIT
COMM	COMMUNICATIONS
COND	CONDUCTOR
CONT	CONTINUED
CPT	CONTROL POWER XFMR
CR	CONTROL RELAY
CRS	COATED RIGID STEEL CONDUIT
CS	CONTROL STATION
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DCU	DISTRIBUTED CONTROL UNIT
DIV	DIVISION
DPI	DIGITAL PROCESS INDICATOR
E	EXISTING
ECP	ENVIRONMENT CONTROL PNL
EF	EXHAUST FAN
EMER	EMERGENCY
ETM	ELAPSED TIME METER
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
F, FU	FUSE
FLA	FULL LOAD AMPS
FLR	FLOOR
FLUOR	FLUORESCENT
G	GREEN GROUND, GROUND
GALV	GALVANIZED
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
H	HIGH SPEED
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HPS	HIGH PRESSURE SODIUM
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATING & AIR CONDITIONING
IC	INTERRUPTING CAPACITY
I & C	INSTRUMENTATION AND CONTROL
ICL	INDUSTRIAL CONTROL LINKS
INST	INSTANTANEOUS
INSTR	INSTRUMENTATION
J, J-BOX	JUNCTION BOX
K	KEY INTERLOCK
L	LIGHTING CONTACTOR, LOW SPEED
LA	LIGHTNING ARRESTER
LC	LOAD CENTER
LDRS	LEAK DETECTION RECOVERY SYSTEM
LIT	LEVEL INDICATE / TRANSMIT
LP	LIGHTING PANELBOARD
LS	LIMIT SWITCH
LTG	LIGHTING
LV	LOW VOLTAGE
M	MAGNETIC CONTACTOR COIL
MCC	MOTOR CONTROL CENTER
MD	MOTORIZED DAMPER
MEP	MESA EVAPORATION PONDS
MERC	MERCURY VAPOR
MFR	MANUFACTURER
MH	MANHOLE
MMP	MECHANICAL MOUNTING PANEL
MO	MOTOR OPERATOR
MS	MOTOR STARTER
MSC	MANUFACTURER SUPPLIED CABLE
MT	MOUNT
MTD	MOUNTED
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
MX	MIXER
N	NEUTRAL
NC	NORMALLY CLOSED
NEMA	NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION
NO	NORMALLY OPEN
NP	NAMEPLATE
OL	OVERLOAD RELAY
PB	PULL BOX
PC	PHOTOCELL
PH	PHASE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE CONDUIT
RECEPT	RECEPTACLE
REQD	REQUIRED
RM	REMOTE MULTIPLEXER
RP	RELAY PANEL
RPA	RISING POST ASSEMBLY
RS	RIGID STEEL CONDUIT
RTU	REMOTE TELEMETRY UNIT
RVSS	REDUCED VOLTAGE SOLID STATE
S	SWITCH
SC	SPEED CONTROL
SH	SPACE HEATER
S/N	SOLID NEUTRAL
SPD	SPEED
SPEC	SPECIFICATIONS
SSRV	SOLID STATE REDUCED VOLTAGE
SST	STAINLESS STEEL
ST	SHUNT TRIP
SV	SOLENOID VALVE
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
T	THERMOSTAT
TB	TERMINAL BOARD
TBD	TO BE DETERMINED
TC	TIME CLOSED
TSH	TEMPERATURE SWITCH HIGH
TDR	TIME DELAY RELAY
TJB	TERMINAL JUNCTION BOX
TS	TRANSFER SWITCH
TSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
UH	UNIT HEATER
UVR	UNDER VOLTAGE RELAY
V	VOLTMETER, VOLT
VFD	VARIABLE FREQUENCY DRIVE
VCS	VALVE CONTROL STATION
VSP	VALVE SEQUENCING PANEL
W	WATT
WC	WATER COIL
WH	WATTHOUR
WHD	WATTHOUR DEMAND
WP	WEATHERPROOF (NEMA 4X)
XFMR	TRANSFORMER
XP	EXPLOSION PROOF CLASS 1, DIV 1
ZS	POSITION SWITCH

NOTES:

1. THIS IS A STANDARD LEGEND SHEET. SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS SHEET AND NOT ON THE PLANS.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	RC	SWD

DSGN R. CONSTANTINESCU DR J. WALKER CHK M. TOVAR APVD S. DETHLOFF

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NV Energy

CH2MHILL

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

ELECTRICAL LEGEND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	G-5
SHEET	6 OF 147

RECORD DRAWING

INSTRUMENTATION IDENTIFICATION

EXAMPLE SYMBOLS

ISA DESIGNATOR, SEE TABLE

THE TOTAL NUMBER OF COMPONENTS OF THE SAME TYPE (VARIES)

X
X
(2)

LOOP AND COMPONENT IDENTIFICATION

FE — FIELD MOUNTED INSTRUMENT

FY I/I — REAR-OF-PANEL MOUNTED INSTRUMENT

FIC — PANEL MOUNTED INSTRUMENT

YL — PANEL MOUNTED INDICATING LIGHT

YL 00 — MOTOR CONTROL CENTER MOUNTED INSTRUMENT

SPECIAL CASES

HS 00 — ON-OFF HAND SWITCH. MAINTAINED CONTACT SWITCH (CONTROLLED DEVICE WILL RESTART ON A RETURN OF POWER AFTER POWER FAILURE)

HS SS — STOP-START HAND SWITCH MOMENTARY CONTACT SWITCH (CONTROLLED DEVICE WILL NOT RESTART ON RETURN OF POWER AFTER POWER FAILURE)

INSTRUMENT IDENTIFICATION LETTERS TABLE

	FIRST LETTER (S)		SUCCEEDING LETTERS		
LETTER	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (+)		ALARM		
B	BURNER FLAME		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION				MIDDLE
N	USERS CHOICE (+)		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
O	USERS CHOICE (+)		ORIFICE		
P	PRESSURE (OR VACUUM)		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (+)		MULTIFUNCTION	MULTIFUNCTION (+)	MULTIFUNCTION (+)
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED (+)		UNCLASSIFIED (+)	UNCLASSIFIED (+)	UNCLASSIFIED (+)
Y	EVENT			RELAY OR COMPUTE (+)	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

TABLE BASED ON THE INSTRUMENTATION, SYSTEMS, AND AUTOMATION SOCIETY (ISA) STANDARD.

(+) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS.

INTERFACE SYMBOLS & LINE LEGEND

S A = PROCESS INTERFACE — a D

S A = SIGNAL INTERFACE — a D

A,a =INTERFACE LETTER

D =DESTINATION SHEET NO.
S =SOURCE SHEET NO.

PROCESS LINE

ANALOG SIGNAL

—P—P—P—P— POWER SIGNAL

DISCRETE SIGNAL

CONNECTING LINES

INTERFACE TO OR FROM PROCESS EXTERNAL TO PROJECT

SELF CONTAINED VALVE & EQUIPMENT TAG NUMBERS

D-X

D: ARV = AIR RELEASE VALVE
ASV = ANTI-SYPHON VALVE
AVRV = AIR AND VACUUM RELEASE VALVE
E = INJECTOR
FCV = FLOW CONTROL VALVE
G = GATE
LCV = LEVEL CONTROL VALVE
M = MECHANICAL EQUIPMENT
MX = MIXER
P = PUMP
PCV = PRESSURE CONTROL VALVE
PSE = RUPTURE DISK
PSV = PRESSURE RELIEF VALVE
T = TANK
TCV = TEMPERATURE CONTROL VALVE

X = LOOP IDENTIFICATION

VALVE SYMBOLS

- GATE
- KNIFE GATE
- BUTTERFLY
- GLOBE
- BALL
- PLUG
- SEAT PORT ECCENTRIC PLUG
- PINCH
- NEEDLE
- DIAPHRAGM
- SWING CHECK
- BALL CHECK
- SAMPLE
- PRESSURE RELIEF
- AIR AND/OR VACUUM RELEASE
- REGULATED SIDE PRESSURE CONTROL
- PRESSURE RELIEF (IN-LINE)

ACTUATOR SYMBOLS

- ELECTRIC W/ POSITIONER (XX)
- HYDRAULIC (XX)
- SOLENOID (XX)
- PNEUMATIC W/ SOLENOID (XX)

NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL OR HYDRAULIC)

XX: FO = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

GATE SYMBOLS

- SLUICE
- SLIDE GATE
- SLIDE GATE WITH OPERATOR
- FLAP GATE

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- ULTRASONIC FLOW METER
- ELECTROMAGNETIC FLOWMETER
- LEVEL (FLOAT)
- THERMAL MASS FLOWMETER
- PROPELLER OR TURBINE METER
- BUBBLER
- SUBMERSIBLE PRESSURE TRANSDUCER
- LEVEL (ULTRASONIC)

PUMP SYMBOLS

NOTE: XX : AS ADJUSTABLE SPEED
CS-1 CONSTANT SPEED (SINGLE SPEED)
CS-2 CONSTANT SPEED (TWO SPEED)

- CENTRIFUGAL PUMP (DRY PIT)
- CENTRIFUGAL WET PIT PUMP OR TURBINE PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- PROGRESSIVE CAVITY PUMP
- INJECTOR
- SUBMERSIBLE PUMP
- ROTARY SCREW COMPRESSOR
- CENTRIFUGAL BLOWER

MISCELLANEOUS SYMBOLS

- AIR GAP DRAIN (DR)
- VENT TO ATMOSPHERE (V)
- DIAPHRAGM SEAL
- ANNULAR SEAL
- AUTOMATIC DRAIN TRAP
- RELAY
- INTERLOCK,SEE CONTROL DIAGRAMS (OR)
- FLEXIBLE CONNECTION
- 120V — 120 VOLT, 60-HZ POWER
- 480V — 480 VOLT, 3-PHASE, 60-HZ POWER
- 4160V — 4160 VOLT, 3 PHASE 60-HZ POWER
- WYE STRAINER
- ISR — INTRINSICALLY SAFE RELAY
- MANUAL DRIP TRAP
- RUPTURE DISK
- SEAL WATER SET
- FLUSHING CONNECTION
- HOSE ADAPTOR
- MIXER
- MOTOR
- MOTOR WITH BRAKE
- SP — SURGE PROTECTOR

ABBREVIATIONS

ACK	ACKNOWLEDGE
AFD	ADJUSTABLE FREQUENCY DRIVE
CS	CONSTANT SPEED
DIO	DISTRIBUTED INPUT/OUTPUT
DSC	DISTRIBUTED CONTROL SYSTEM
EFPS	EFFLUENT FORWARDING PUMP STATION
EMERG	EMERGENCY
FWD	FORWARD
GW	GROUNDWATER
HOA	HAND-OFF-AUTO
H_2O_2	HYDROGEN PEROXIDE
I/O	INPUT / OUTPUT
LCP	LOCAL CONTROL PANEL
LDRS	LEAK DETECTION RECOVERY SYSTEM
LOR	LOCAL-OFF-REMOTE
LR	LOCAL-REMOTE
MA	MANUAL-AUTO
MCC	MOTOR CONTROL CENTER
MFR	MANUFACTURER
MLD	MOTOR LEAKAGE DETECTOR
MSC	MANUFACTURER SUPPLIED CABLE
MX	MIXER
OC	OPEN-CLOSE (D)
OCR	OPEN-CLOSE-REMOTE
OCA	OPEN-CLOSE-AUTO
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
OSC	OPEN-STOP-CLOSE
REV	REVERSE
RSL	RAISE-STOP-LOWER
PLC	PROGRAMMABLE LOGIC CONTROLLER
QTY	QUANTITY
RM	RAPID MIX
RPA	RISING POST ASSEMBLY
SSRV	SOLID STATE REDUCED VOLTAGE
SS	START-STOP
SW	SURFACE WATER
TBD	TO BE DETERMINED
TYP	TYPICAL

GENERAL NOTES

1. THIS A STANDARD LEGEND, THEREFORE NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.
2. FOR FLOW STREAM IDENTIFICATION, SEE MECHANICAL LEGEND.

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	RC	SWD

DSGN	DR	CHK	APVD
R. CONSTANTINESCU	J. WALKER	M. TOVAR	S. DETHLOFF

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NVEnergy.
REID GARDNER STATION
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Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

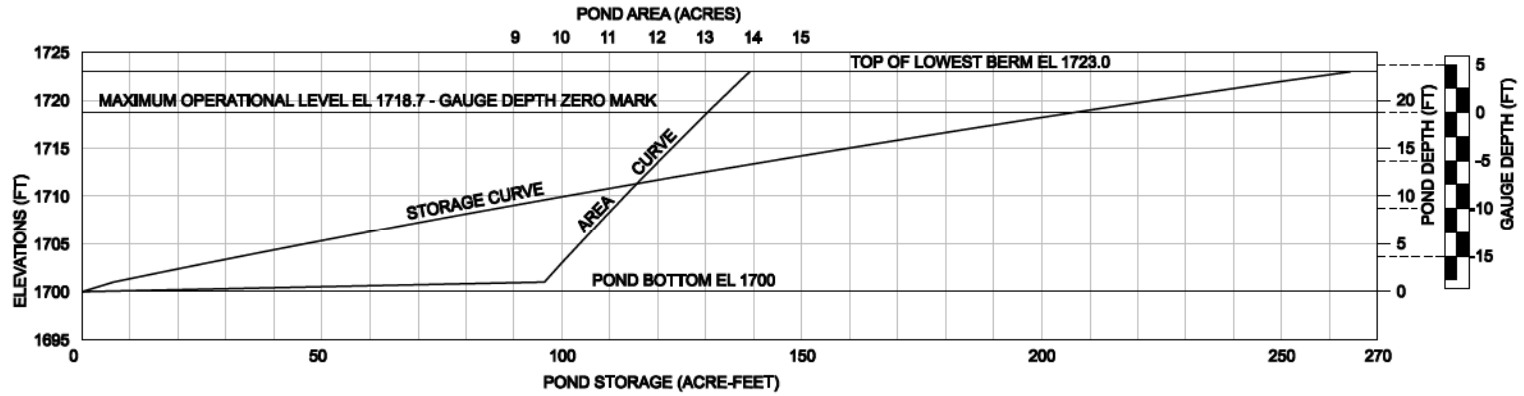
INSTRUMENTATION AND CONTROL LEGEND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	G-6
SHEET	7 OF 147

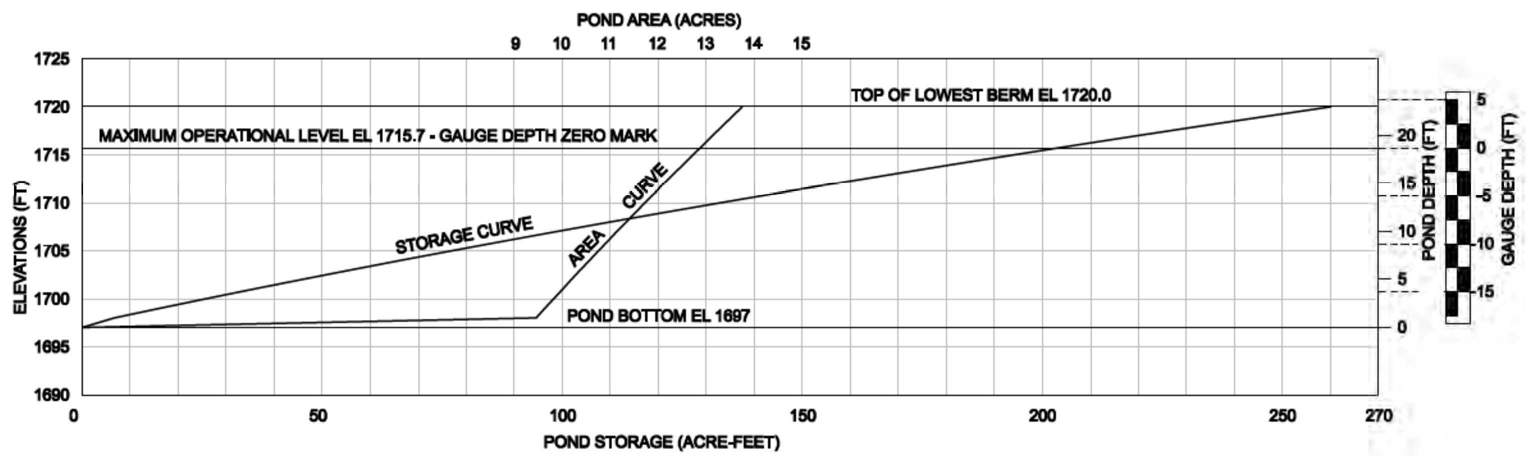
RECORD DRAWING

1 2 3 4 5 6



POND M7 STORAGE AND AREA CURVES

NTS



POND M5 STORAGE AND AREA CURVES

NTS

POND M5

	Pond Depth (Ft)	EL	Area (Acres)	Cumulative Volume (AF)
	0	1697	0	0
	1	1698	9.45	6.61
	2	1699	9.63	16.11
	3	1700	9.82	25.79
	4	1701	10.00	35.66
	5	1702	10.19	45.72
	6	1703	10.37	55.96
	7	1704	10.56	66.39
	8	1705	10.75	77.02
	9	1706	10.94	87.83
	10	1707	11.14	98.84
	11	1708	11.33	110.05
	12	1709	11.52	121.45
	13	1710	11.72	133.04
	14	1711	11.92	144.84
	15	1712	12.12	156.84
	16	1713	12.32	169.03
	17	1714	12.52	181.43
	18	1715	12.72	194.04
MAX OPERATION LEVEL	18.7	1715.7	12.86	202.99
	19	1716	12.92	206.85
	20	1717	13.13	219.86
	21	1718	13.33	233.09
	22	1719	13.54	246.52
	23	1720	13.75	260.17

POND M7

	Pond Depth (Ft)	EL	Area (Acres)	Cumulative Volume (AF)
	0	1700	0	0
	1	1701	9.63	6.49
	2	1702	9.81	16.21
	3	1703	10.00	26.12
	4	1704	10.18	36.20
	5	1705	10.36	46.48
	6	1706	10.55	56.93
	7	1707	10.74	67.58
	8	1708	10.93	78.41
	9	1709	11.12	89.43
	10	1710	11.31	100.64
	11	1711	11.50	112.04
	12	1712	11.69	123.64
	13	1713	11.89	135.43
	14	1714	12.09	147.42
	15	1715	12.28	159.60
	16	1716	12.48	171.99
	17	1717	12.68	184.57
	18	1718	12.89	197.35
MAX OPERATION LEVEL	18.7	1718.7	13.03	206.42
	19	1719	13.09	210.34
	20	1720	13.29	223.53
	21	1721	13.50	236.93
	22	1722	13.71	250.53
	23	1723	13.91	264.34

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND DR J. WALKER CHK P. TSCHESCHKE APVD S. DETHLOFF

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REID GARDNER STATION
Wastewater System
Improvement Projects
Moapa, Nevada

NV Energy

CH2MHILL

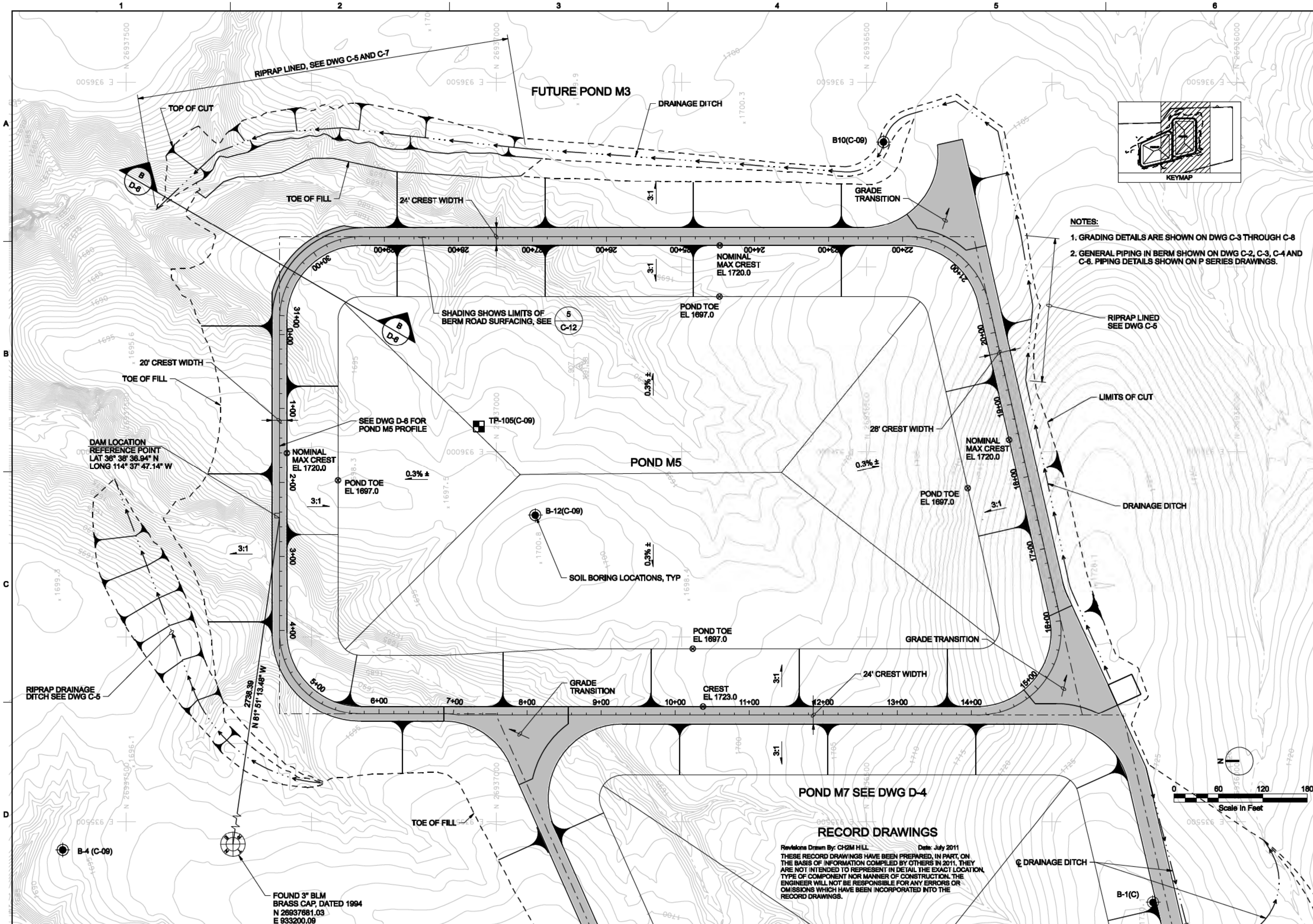
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9826550201, M7:RC171 WO#9821855101

ELEVATION/CAPACITY AND ELEVATION/AREA CURVES

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	D-1
SHEET	8 OF 147

RECORD DRAWING



NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	4/30/10	DRAWING REVISION	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR | CHK J. WALKER | P. TSCHESCHKE | APVD S. DETHLOFF

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NV Energy

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Moapa, Nevada

CH2MHILL

MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825550201, M7:RC171 WO#9821855101

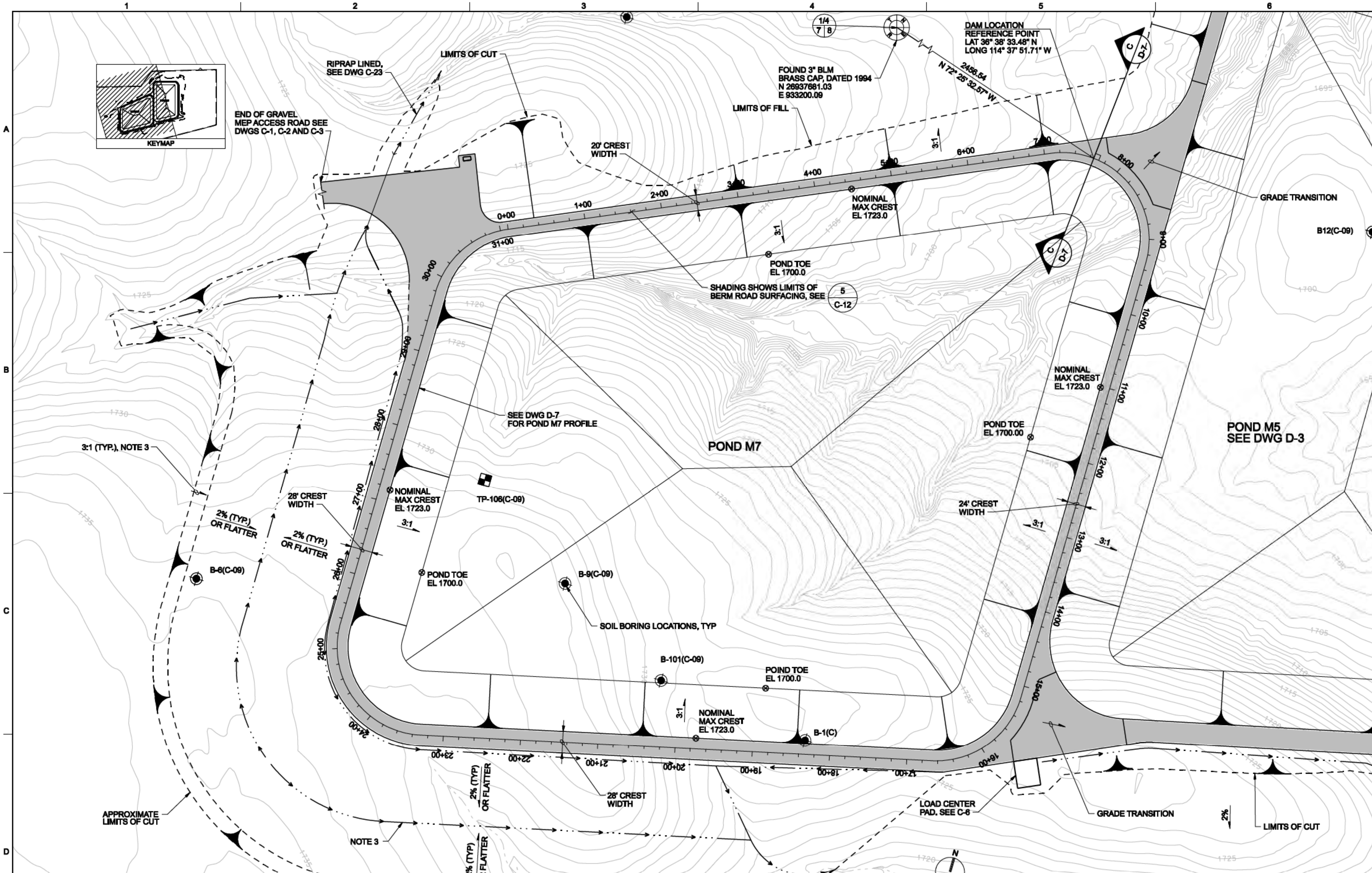
GENERAL LAYOUT PLAN POND M5

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	D-3
SHEET	9 OF 147

RECORD DRAWING

NDM-LAS:RGS Mesa Facility IDP\ 200-C-20213_401621RD.dgn PLOT DATE: 7/11/2011 PLOT TIME: 4:06:29 PM



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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0 60 120 180
Scale In Feet

NOTES:

1. GRADING DETAILS ARE SHOWN ON DWG C-3 THROUGH C-8.
2. GENERAL PIPING DETAIL IN BERM SHOWN ON DWG C-2, C-3, C-4 AND C-6. PIPING DETAILS SHOWN ON P SERIES DRAWINGS.
3. FLOWLINE AND SLOPE CREATED BY REGRADING BORROW AREA.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN	DR	CHK	APVD
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Moapa, Nevada

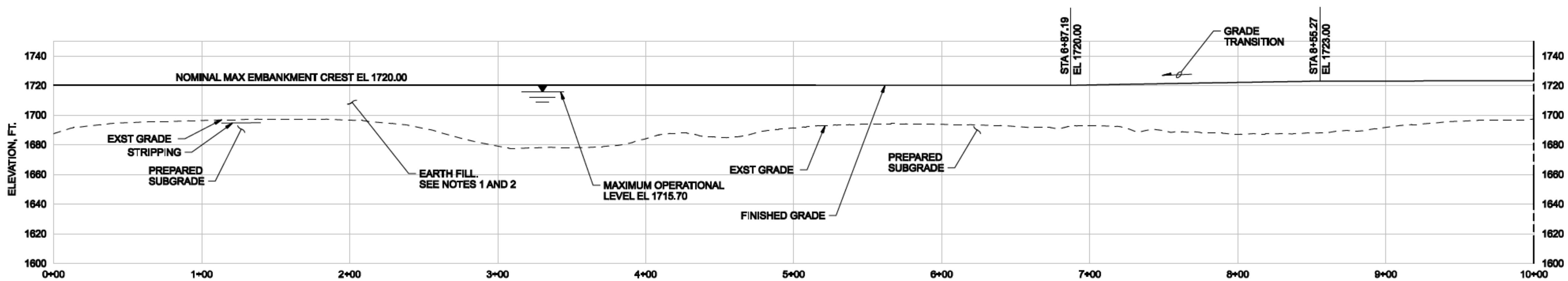
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825850201, M7:RC171 WO#9821855101

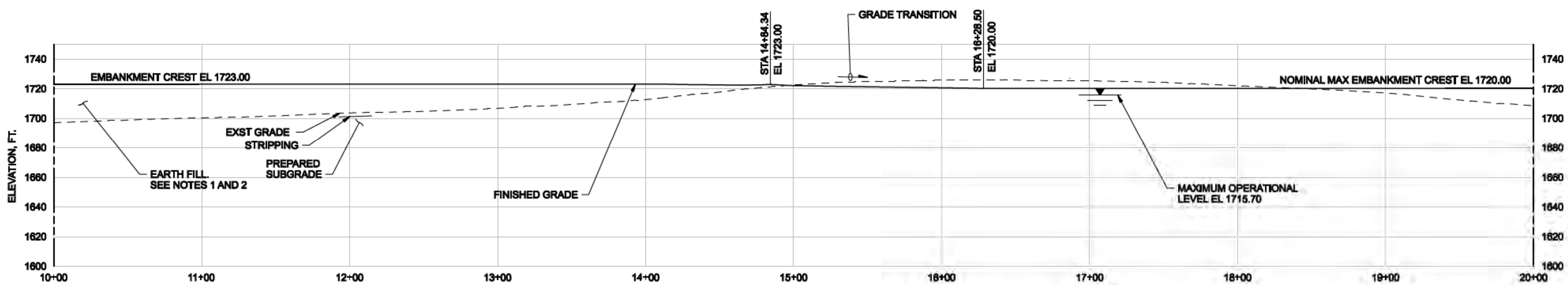
GENERAL LAYOUT PLAN POND M7

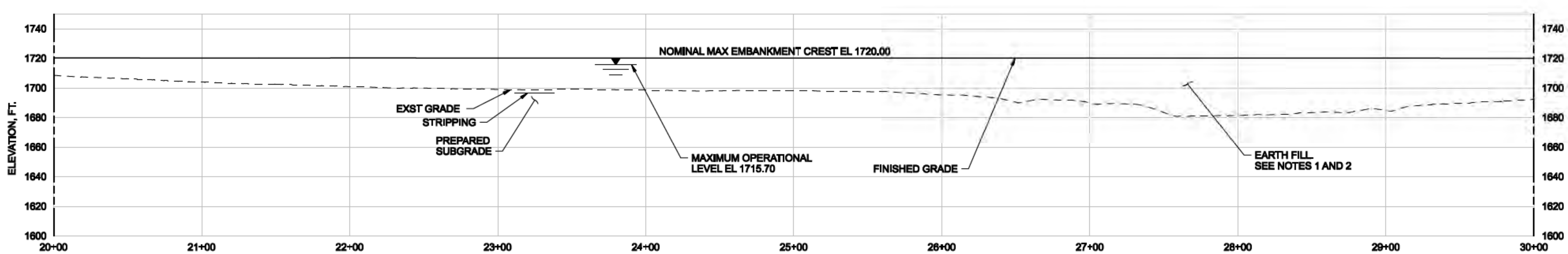
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

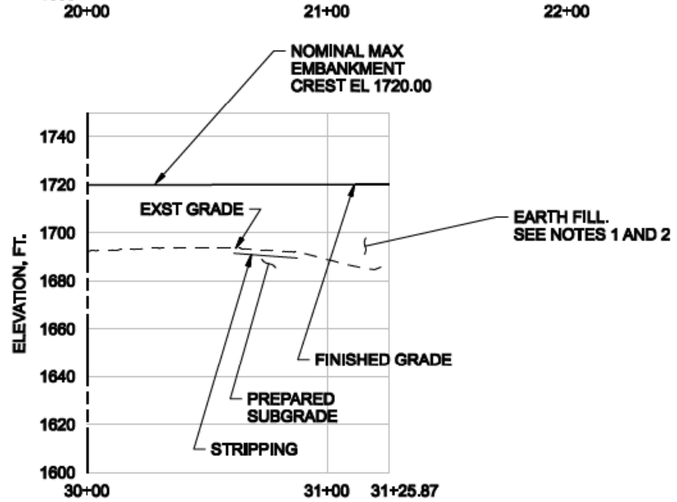
DATE	JULY 2011
PROJ	401621
DWG	D-4
SHEET	10 OF 147

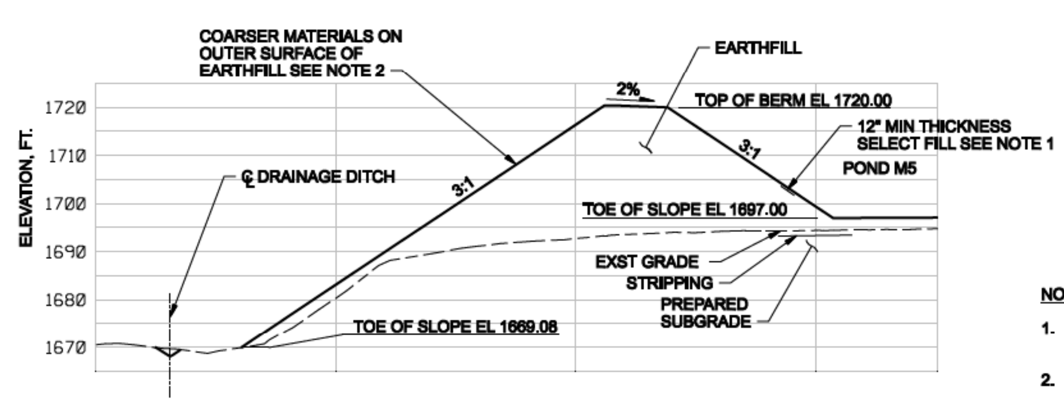
RECORD DRAWING











B SECTION
D-3
H: 1"=40'-0"
V: 1"=20'-0"

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NOTES:

1. A MINIMUM THICKNESS OF 12 INCHES OF SELECT FILL SHALL BE PLACED IN ALL AREAS TO BE LINED WITH HDPE IN THIS CONTRACT.
2. OUTER SURFACE OF BERMS NOT TO BE LINED WITH HDPE SHALL HAVE COARSER MATERIALS EARTHFILL.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NVEnergy

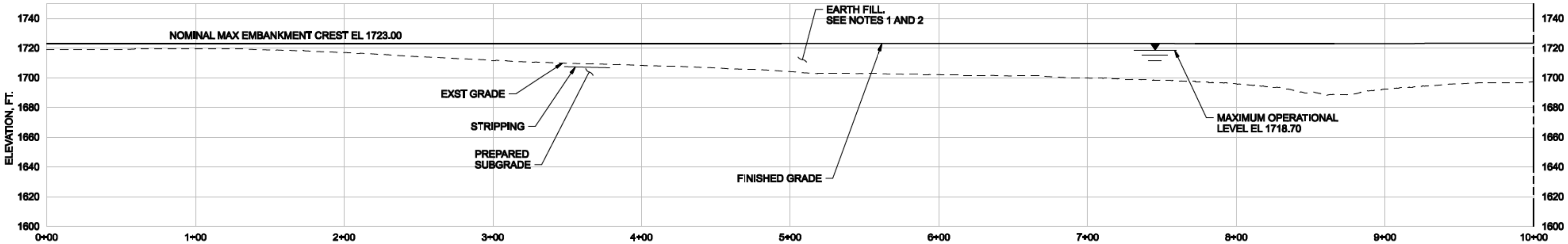
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#8825650201, M7:RC171 WO#8821855101

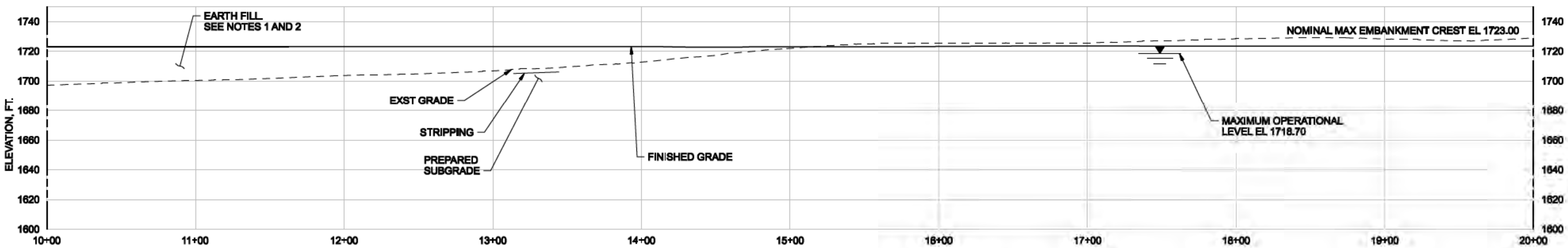
BERM PROFILE POND M5

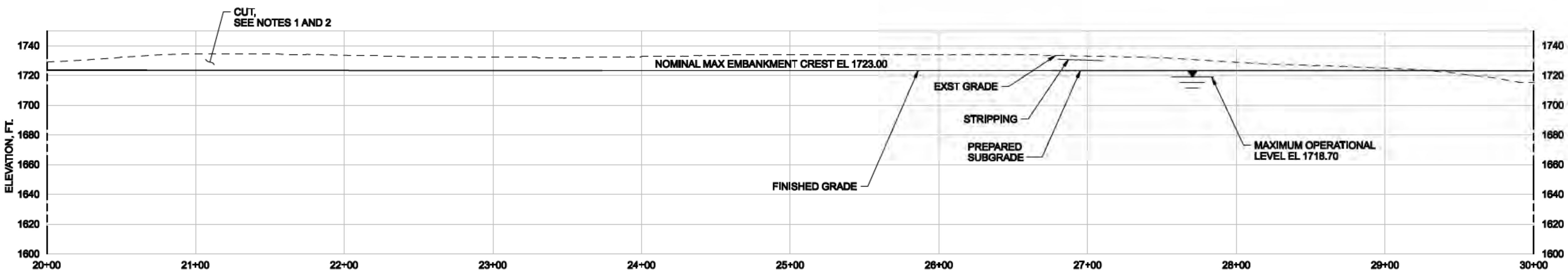
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

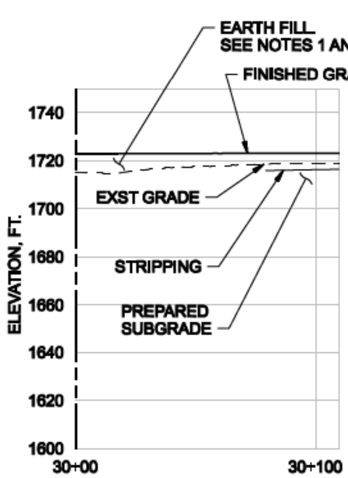
DATE	JULY 2011
PROJ	401621
DWG	D-6
SHEET	11 OF 147

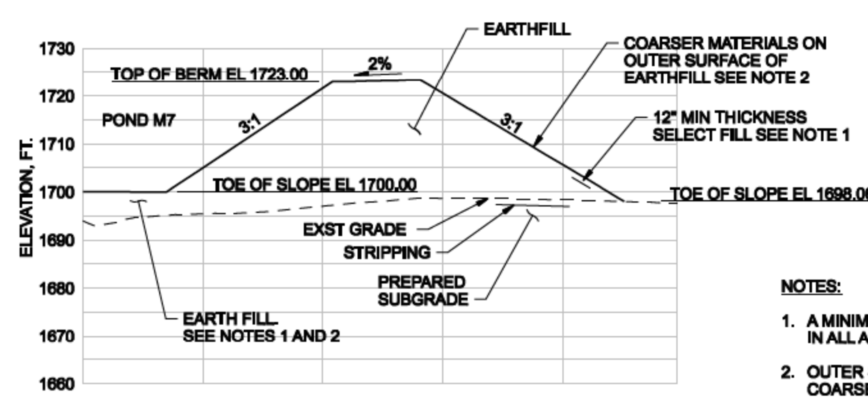
RECORD DRAWING











C SECTION
D-4
H: 1"=40'-0"
V: 1"=20'-0"

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL   Date: July 2011

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NOTES:

1. A MINIMUM THICKNESS OF 12 INCHES OF SELECT FILL SHALL BE PLACED IN ALL AREAS TO BE LINED WITH HDPE IN THIS CONTRACT.
2. OUTER SURFACE OF BERMS NOT TO BE LINED WITH HDPE SHALL HAVE COARSER MATERIALS EARTHFILL.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND DR J. WALKER CHK P. TSCHESCHKE APVD S. DETHLOFF

CH2MHILL
2485 VILLAGE VIEW DRIVE, SUITE 350
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PHONE: 702-369-6175

NV Energy

REID GARDNER STATION
Wastewater System
Improvement Projects
Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825650201, M7:RC171 WO#9821855101

BERM PROFILE POND M7

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

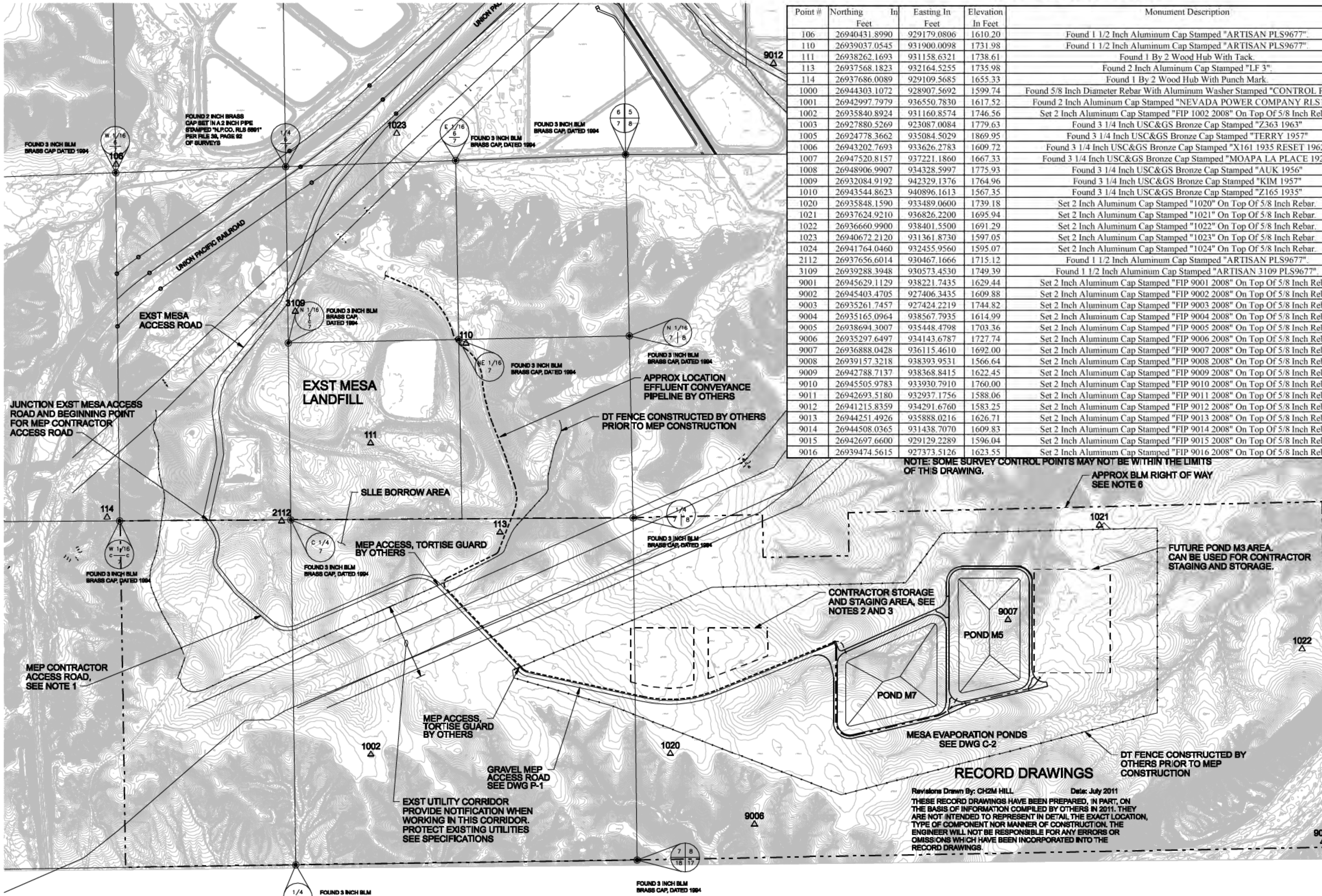
DATE	JULY 2011
PROJ	401621
DWG	D-7
SHEET	12 OF 147

RECORD DRAWING

SURVEY CONTROL POINTS

Point #	Northing In Feet	Easting In Feet	Elevation In Feet	Monument Description
106	26940431.8990	929179.0806	1610.20	Found 1 1/2 Inch Aluminum Cap Stamped "ARTISAN PLS9677".
110	26939037.0545	931900.0098	1731.98	Found 1 1/2 Inch Aluminum Cap Stamped "ARTISAN PLS9677".
111	26938262.1693	931158.6321	1738.61	Found 1 By 2 Wood Hub With Tack.
113	26937568.1823	932164.5255	1735.98	Found 2 Inch Aluminum Cap Stamped "LF 3".
114	26937686.0089	929109.5685	1655.33	Found 1 By 2 Wood Hub With Punch Mark.
1000	26944303.1072	928907.5692	1599.74	Found 5/8 Inch Diameter Rebar With Aluminum Washer Stamped "CONTROL POINT"
1001	26942997.7979	936550.7830	1617.52	Found 2 Inch Aluminum Cap Stamped "NEVADA POWER COMPANY RLS1798"
1002	26935840.8924	931160.8574	1746.56	Set 2 Inch Aluminum Cap Stamped "FIP 1002 2008" On Top Of 5/8 Inch Rebar.
1003	26927880.5269	923087.0084	1779.63	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "Z363 1963"
1005	26924778.3662	935084.5029	1869.95	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "TERRY 1957"
1006	26943202.7693	933626.2783	1609.72	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "X161 1935 RESET 1962"
1007	26947520.8157	937221.1860	1667.33	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "MOAPA LA PLACE 1925"
1008	26948906.9907	934328.5997	1775.93	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "AUK 1956"
1009	26932084.9192	942329.1376	1764.96	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "KIM 1957"
1010	26943544.8623	940896.1613	1567.35	Found 3 1/4 Inch USC&GS Bronze Cap Stamped "Z165 1935"
1020	26935848.1590	933489.0600	1739.18	Set 2 Inch Aluminum Cap Stamped "1020" On Top Of 5/8 Inch Rebar.
1021	26937624.9210	936826.2200	1695.94	Set 2 Inch Aluminum Cap Stamped "1021" On Top Of 5/8 Inch Rebar.
1022	26936660.9900	938401.5500	1691.29	Set 2 Inch Aluminum Cap Stamped "1022" On Top Of 5/8 Inch Rebar.
1023	26940672.2120	931361.8730	1597.05	Set 2 Inch Aluminum Cap Stamped "1023" On Top Of 5/8 Inch Rebar.
1024	26941764.0460	932455.9560	1595.07	Set 2 Inch Aluminum Cap Stamped "1024" On Top Of 5/8 Inch Rebar.
2112	26937656.6014	930467.1666	1715.12	Found 1 1/2 Inch Aluminum Cap Stamped "ARTISAN PLS9677".
3109	26939288.3948	930573.4530	1749.39	Found 1 1/2 Inch Aluminum Cap Stamped "ARTISAN 3109 PLS9677".
9001	26945629.1129	938221.7435	1629.44	Set 2 Inch Aluminum Cap Stamped "FIP 9001 2008" On Top Of 5/8 Inch Rebar.
9002	26945403.4705	927406.3435	1609.88	Set 2 Inch Aluminum Cap Stamped "FIP 9002 2008" On Top Of 5/8 Inch Rebar.
9003	26935261.7457	927424.2219	1744.82	Set 2 Inch Aluminum Cap Stamped "FIP 9003 2008" On Top Of 5/8 Inch Rebar.
9004	26935165.0964	938567.7935	1614.99	Set 2 Inch Aluminum Cap Stamped "FIP 9004 2008" On Top Of 5/8 Inch Rebar.
9005	26938694.3007	935448.4798	1703.36	Set 2 Inch Aluminum Cap Stamped "FIP 9005 2008" On Top Of 5/8 Inch Rebar.
9006	26935297.6497	934143.6787	1727.74	Set 2 Inch Aluminum Cap Stamped "FIP 9006 2008" On Top Of 5/8 Inch Rebar.
9007	26936888.0428	936115.4610	1692.00	Set 2 Inch Aluminum Cap Stamped "FIP 9007 2008" On Top Of 5/8 Inch Rebar.
9008	26939157.3218	938393.9531	1566.64	Set 2 Inch Aluminum Cap Stamped "FIP 9008 2008" On Top Of 5/8 Inch Rebar.
9009	26942788.7137	938368.8415	1622.45	Set 2 Inch Aluminum Cap Stamped "FIP 9009 2008" On Top Of 5/8 Inch Rebar.
9010	26945505.9783	933930.7910	1760.00	Set 2 Inch Aluminum Cap Stamped "FIP 9010 2008" On Top Of 5/8 Inch Rebar.
9011	26942693.5180	932937.1756	1588.06	Set 2 Inch Aluminum Cap Stamped "FIP 9011 2008" On Top Of 5/8 Inch Rebar.
9012	26941215.8359	934291.6760	1583.25	Set 2 Inch Aluminum Cap Stamped "FIP 9012 2008" On Top Of 5/8 Inch Rebar.
9013	26944251.4926	935888.0216	1626.71	Set 2 Inch Aluminum Cap Stamped "FIP 9013 2008" On Top Of 5/8 Inch Rebar.
9014	26944508.0365	931438.7070	1609.83	Set 2 Inch Aluminum Cap Stamped "FIP 9014 2008" On Top Of 5/8 Inch Rebar.
9015	26942697.6600	929129.2289	1596.04	Set 2 Inch Aluminum Cap Stamped "FIP 9015 2008" On Top Of 5/8 Inch Rebar.
9016	26939474.5615	927373.5126	1623.55	Set 2 Inch Aluminum Cap Stamped "FIP 9016 2008" On Top Of 5/8 Inch Rebar.

NOTE: SOME SURVEY CONTROL POINTS MAY NOT BE WITHIN THE LIMITS OF THIS DRAWING.



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS IN 2011. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NOTES:

1. CONTRACTOR ACCESS ROAD LOCATIONS ARE APPROXIMATE. CONTRACTOR TO IMPROVE AND MAINTAIN AS NEEDED APPROXIMATELY 1,000-FT OF EXISTING MESA ACCESS ROAD NORTH OF THE JUCNTION WITH MEP CONTRACTOR ACCESS ROAD, IN SECTIONS WHERE ROAD PASSES OVER THE EXISTING LANDFILL. MINIMUM ROAD IMPROVEMENTS ON EXISTING LANDFILL TO INCLUDE GRADING AND COMPACTION AS NEEDED FOR VEHICLE PASSAGE AND DUST CONTROL. CONTRACTOR TO IMPROVE AND MAINTAIN MEP CONTRACTOR ACCESS ROAD AS NEEDED TO COMPLETE WORK. FOR ALL ROAD IMPROVEMENTS, HORIZONTAL AND VERTICAL ALIGNMENTS TO BE SUITABLE FOR FUTURE CHEMICAL DELIVERY TO PONDS BY OWNER. DESIGN CHEMICAL DELIVERY TRUCK SIZE SHALL BE WB-62. CONTRACTOR ACCESS ROAD SHALL FOLLOW EXISTING ROADS AND TRACKS. CROSS UTILITY CORRIDOR AT EXISTING LOCATIONS ESTABLISHED AT TORTOISE GUARD ACCESS POINTS. COORDINATE ACCESS ROAD IMPROVEMENT AND MAINTENANCE WITH SLLE BORROW WORK.
2. LOCATION FOR CONTRACTOR STORAGE AND STAGING AREA IS APPROXIMATE. CONTRACTOR CAN ADJUST TO FACILITATE EXECUTION OF WORK. CONTRACTOR CAN USE FUTURE POND M3 FOR ADDITIONAL STAGING ACCESS. MINIMIZE DISTURBANCE AREA AND RESTORE PER SPECIFICATIONS.
3. CONTRACTOR TO STOCKPILE SURPLUS EXCAVATION MATERIALS IN AREA ADJACENT TO MEP ACCESS ROAD FOR OWNERS FUTURE USE. AREAS SHOWN ARE APPROXIMATE AND TO BE DETERMINED BY CONTRACTOR. GET OWNER APPROVAL PRIOR TO START OF CLEARING. AREA SHALL BE CLEARED, GRUBBED AND PREPARED PER SPECIFICATIONS.
4. PRESERVE AND PROTECT DESERT TORTOISES PER SPECIFICATIONS. ALL PERSONNEL WORKING ON THIS PROJECT MUST ATTEND OWNER'S TORTOISE TRAINING CLASS.
5. PROVIDE NOTIFICATION WHEN WORKING IN UTILITY CORRIDOR PER SPECIFICATIONS. MAINTAIN MINIMUM SAFE CLEARANCE FROM OVERHEAD POWER LINES.
6. SPECIAL REQUIREMENTS APPLY TO WORK ON BLM PROPERTY. REFER TO SPECIFICATIONS FOR REQUIREMENTS.

N

400 0 400 800
Scale In Feet

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Moapa, Nevada

NV Energy

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

GENERAL SITE PLAN

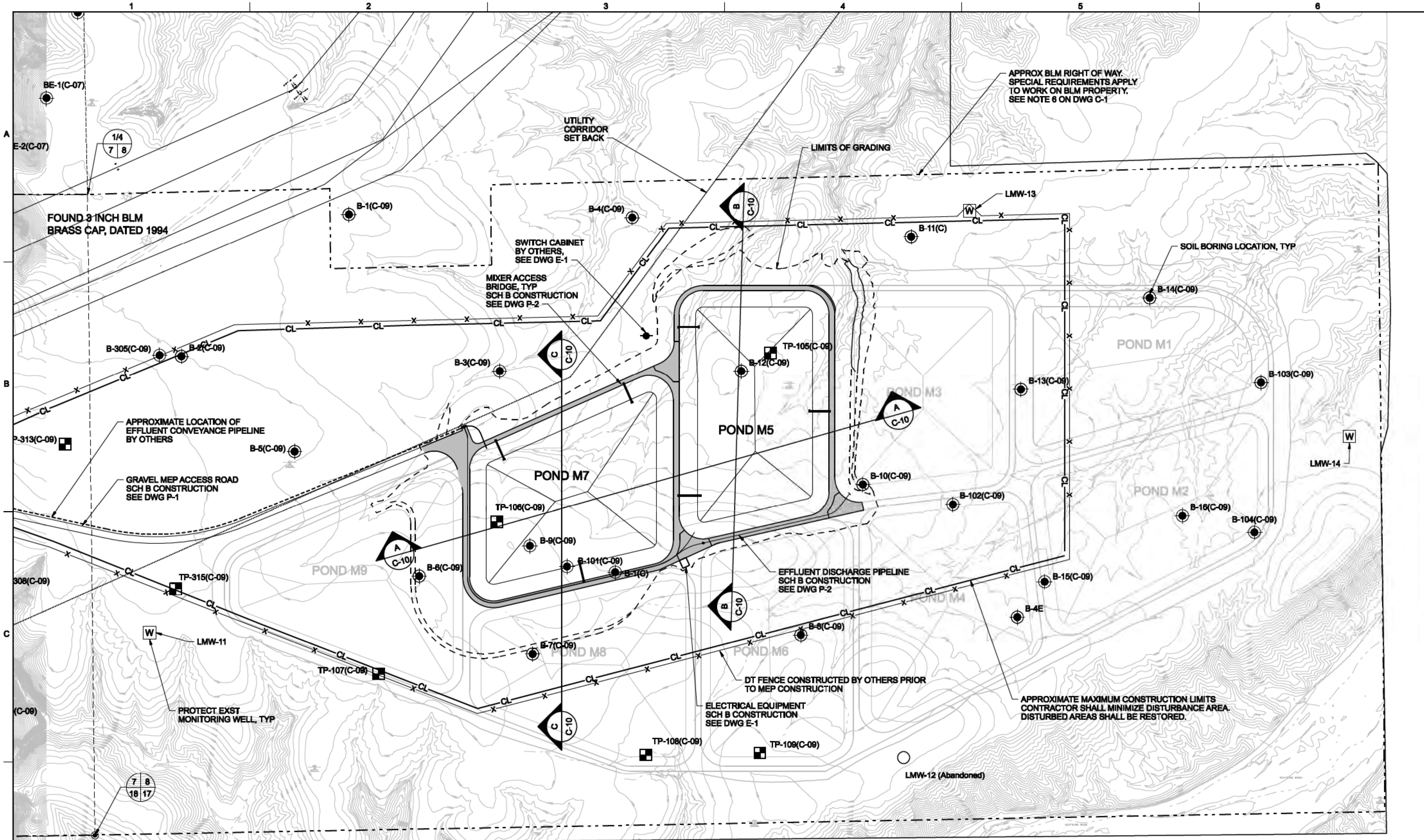
NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN P. TSCHESCHKE DR J. WALKER CHK J. SCHNEIDER APVD S. DETHLOFF

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-1
SHEET	13 OF 147

RECORD DRAWING



FOUND 3 INCH BLM
BRASS CAP, DATED 1994

N

0 200 400 600
Scale In Feet

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821655101

GENERAL POND SITE PLAN

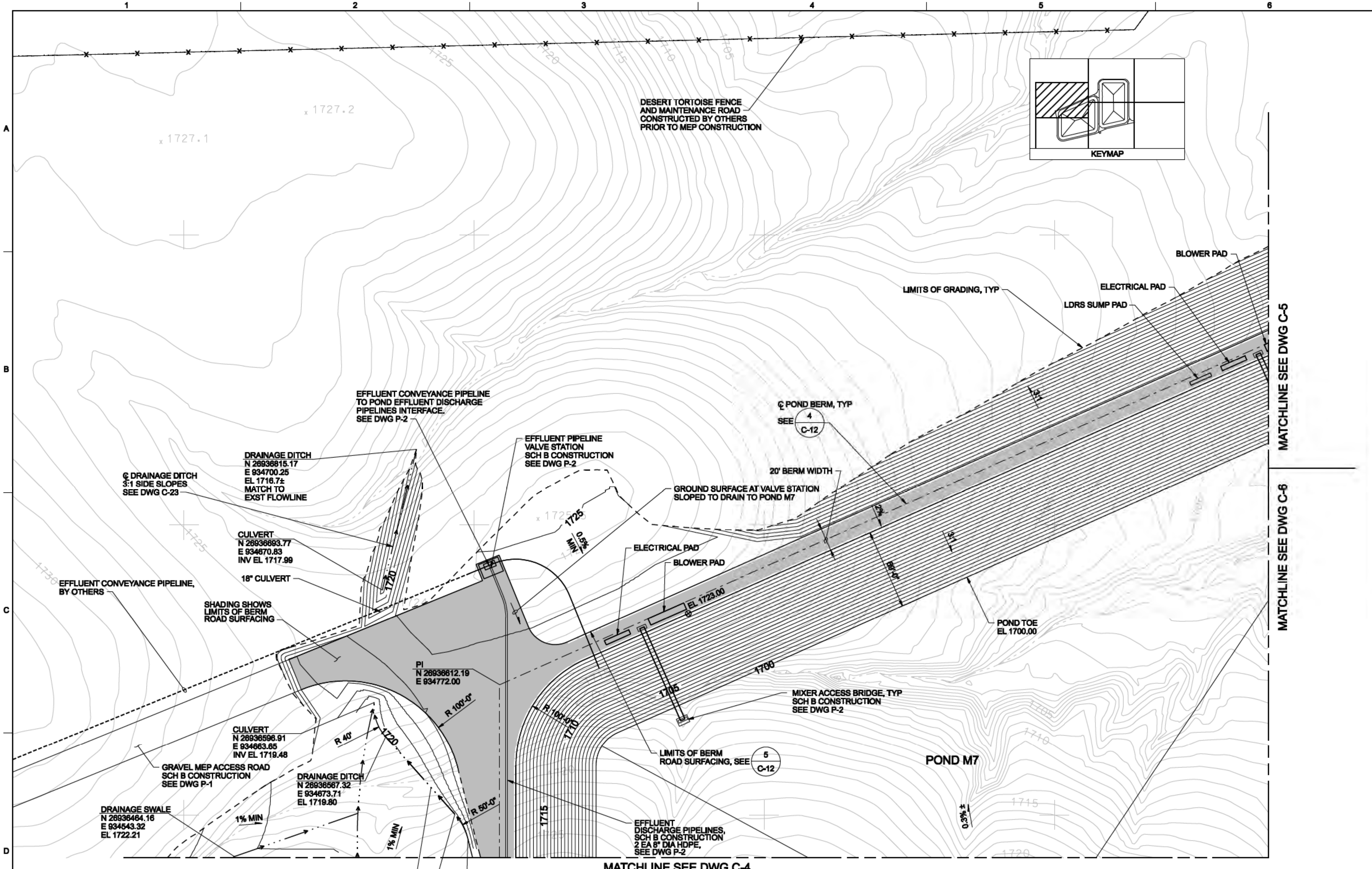
NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	9/7/10	DRAWING REVISION - MIXER ACCESS BRIDGES	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-2
SHEET	14 OF 147

RECORD DRAWING



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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Improvement Projects
Moapa, Nevada

MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#8825650201, M7:RC171 WO#8821855101

POND SITE PLAN - AREA 1

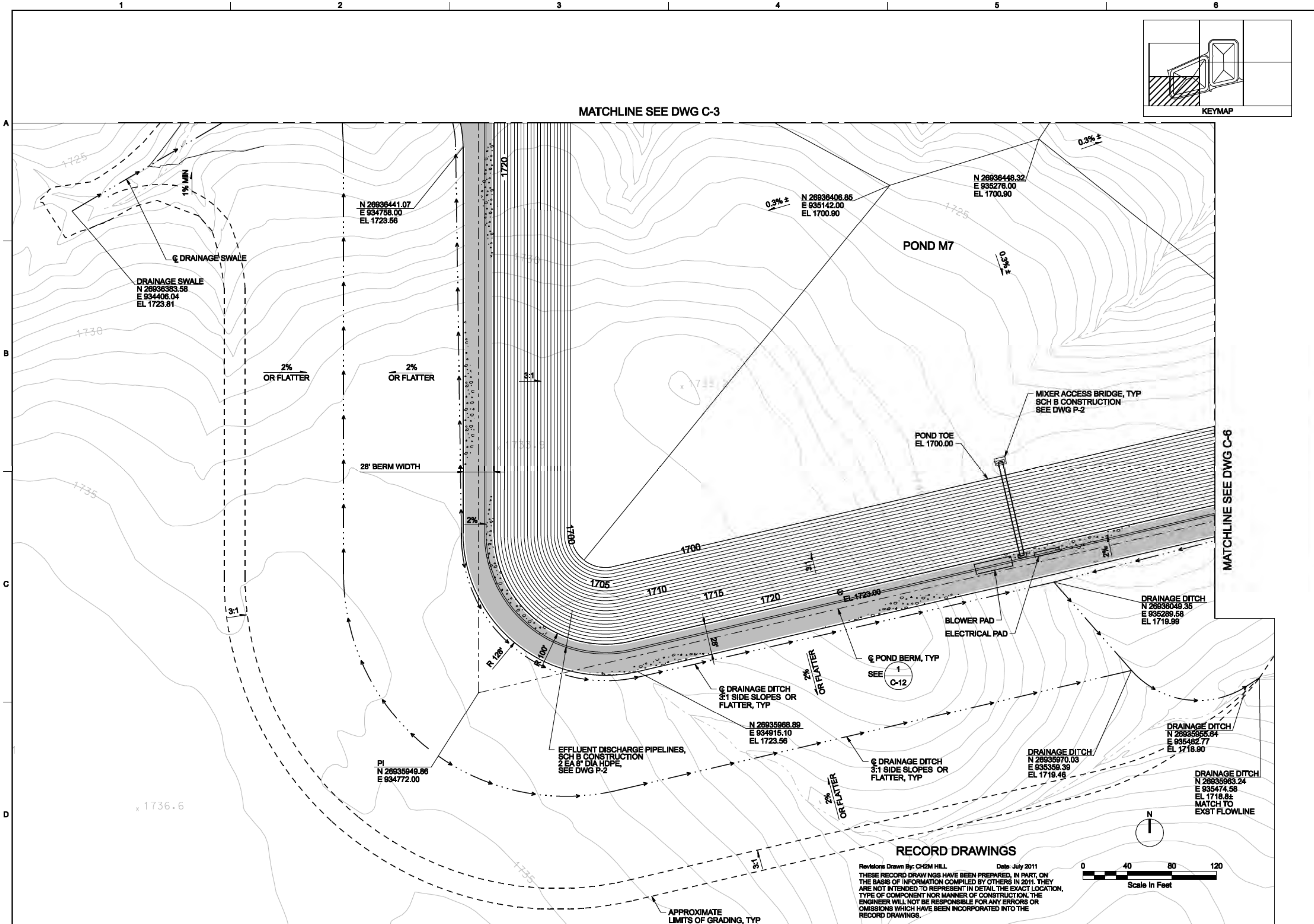
NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-3
SHEET	15 OF 147

RECORD DRAWING



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	5/04/10	DRAWING REVISION	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NV Energy

CH2MHILL

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821655101

POND SITE PLAN - AREA 2

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-4
SHEET	16 OF 147

RECORD DRAWING

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL   Date: July 2011

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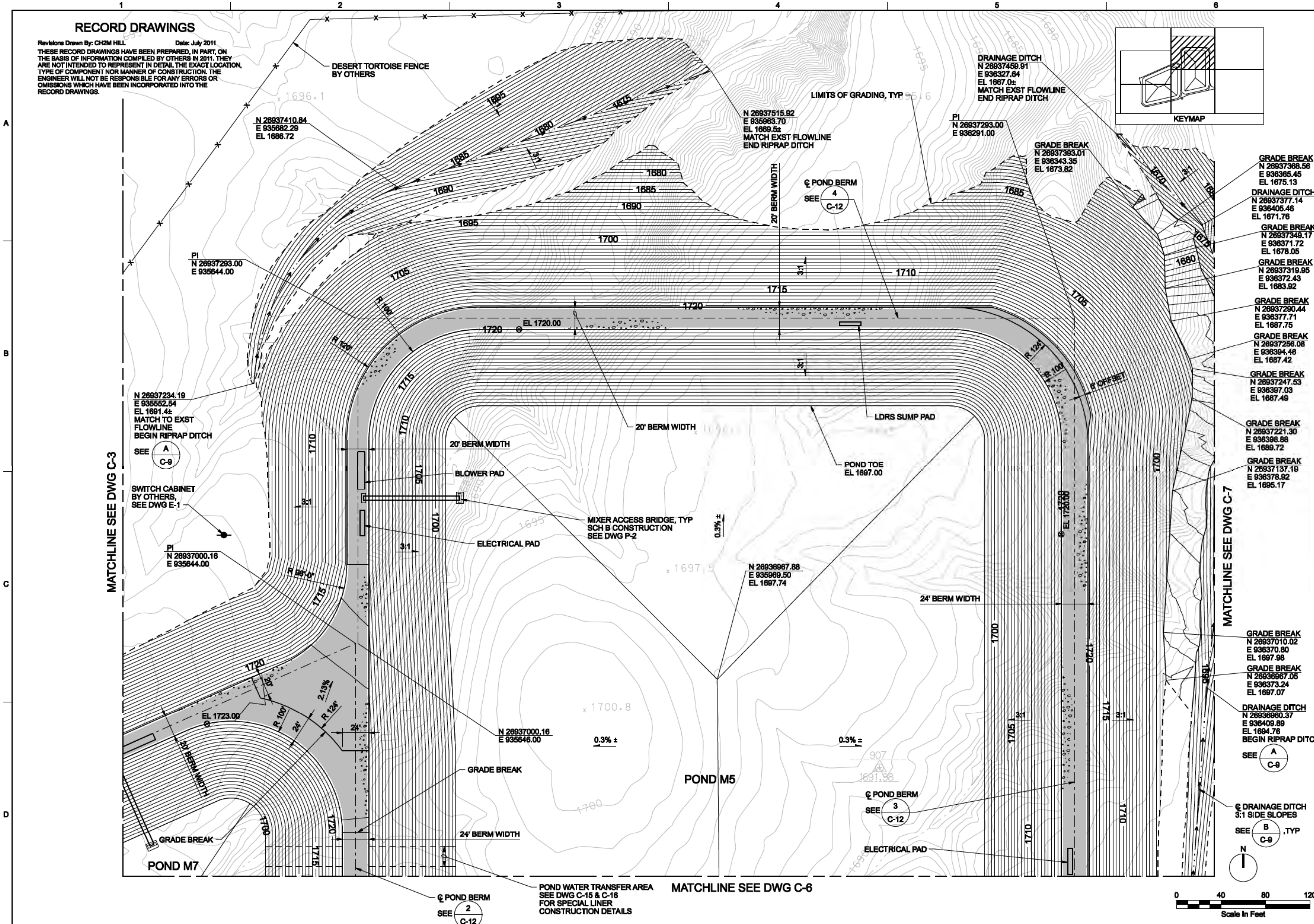

NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	4/30/10	DRAWING REVISION	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR | CHK J. WALKER | APVD P. TSCHESCHKE | S. DETHLOFF

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NV Energy

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Wastewater System Improvement Projects
Moapa, Nevada

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MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821655101

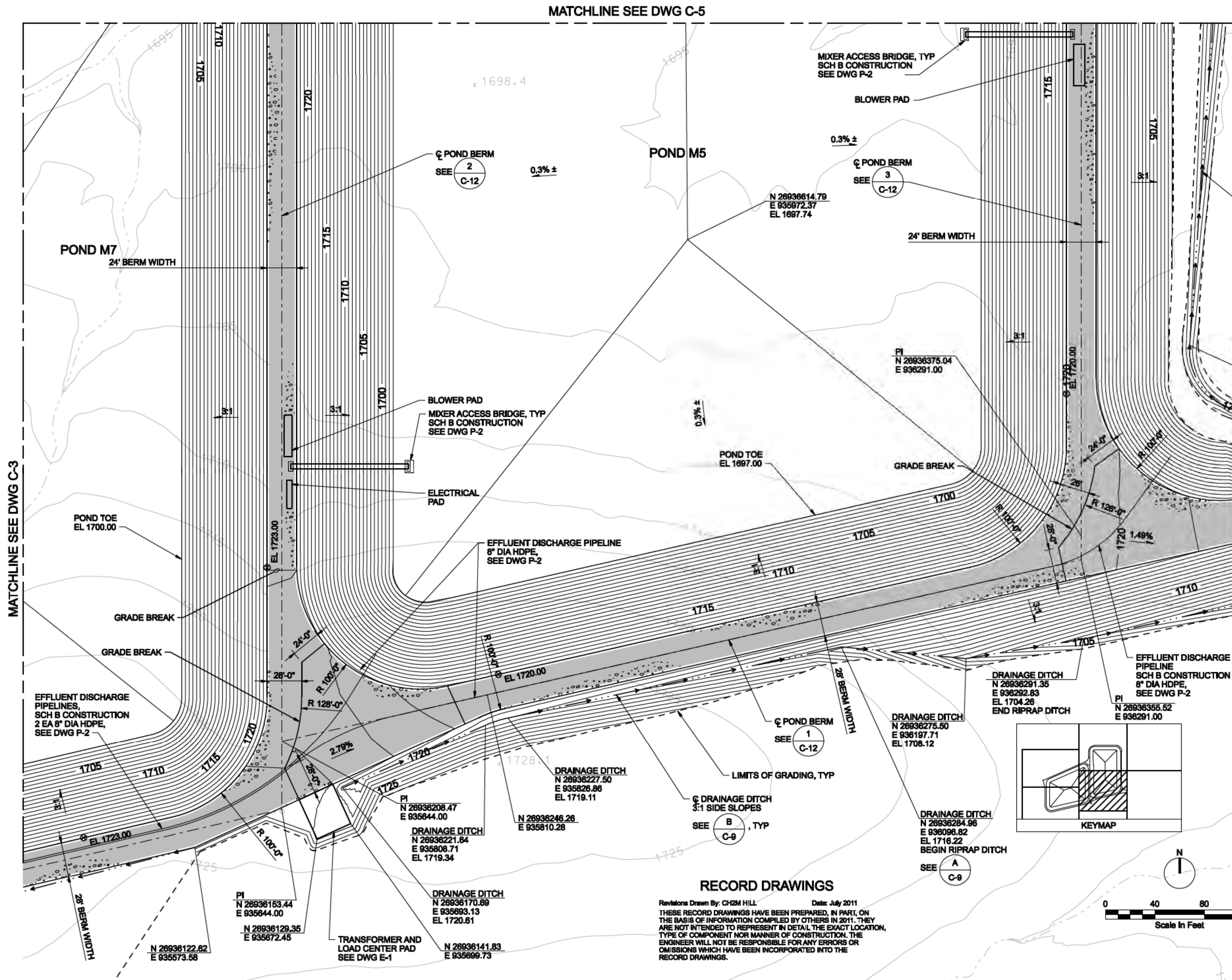
POND SITE PLAN - AREA 3

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.

DATE	JULY 2011
PROJ	401621
DWG	C-5
SHEET	17 OF 147

RECORD DRAWING

NDM-LAS:RGS Mesa Facility IDP\ 200-C-20204_401621RD.dgn   PLOT DATE: 7/12/2011   PLOT TIME: 9:03:21 AM



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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0 40 80 120
Scale In Feet

NO.	DATE	REVISION	BY	APVD
3	07/14/11	RECORD DRAWING	NKB	SWD
2	6/9/10	DRAWING REVISION	PDT	SWD
1	4/30/10	DRAWING REVISION	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

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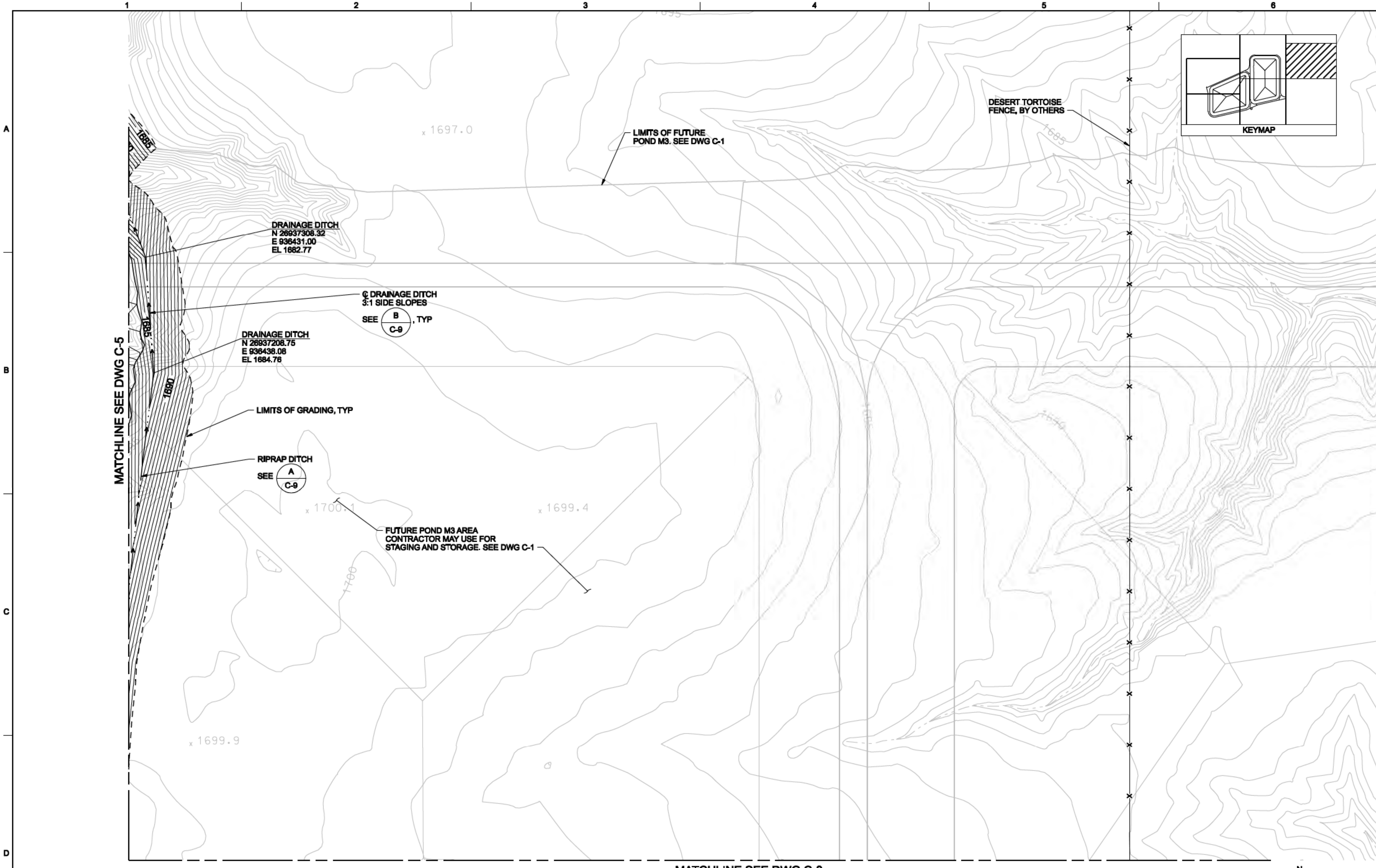
MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

POND SITE PLAN - AREA 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-6
SHEET	18 OF 147

RECORD DRAWING



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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0 40 80 120
Scale In Feet

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NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	4/30/10	DESIGN REVISION	PDT	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN	DR	CHK	APVD
R. TOWNSEND	J. WALKER	P. TSCHESCHKE	S. DETHLOFF

MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825650201, M7:RC171 WO#9821855101

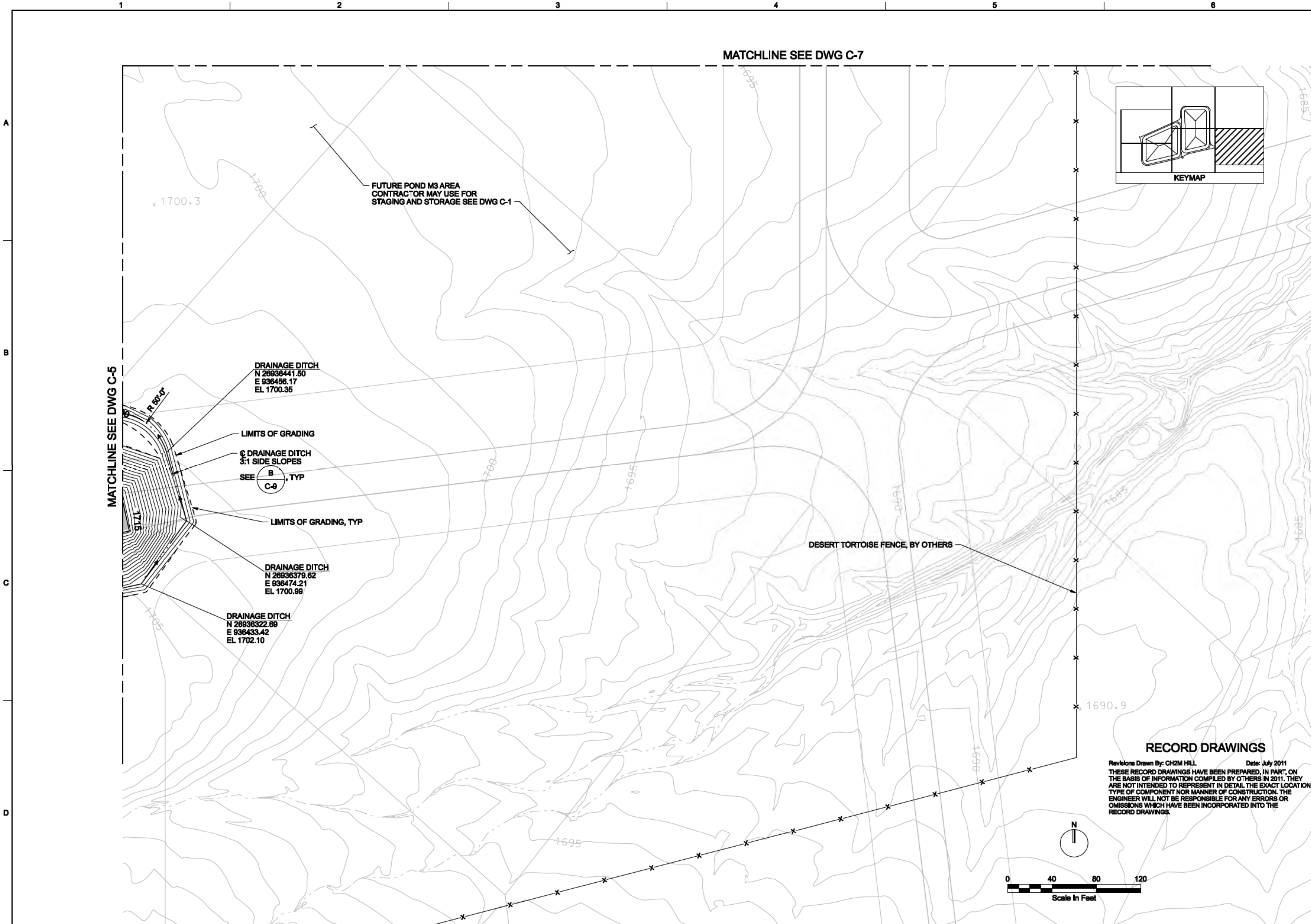
POND SITE PLAN - AREA 5

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-7
SHEET	19 OF 147

RECORD DRAWING

NDM-LAS:RGS Mesa Facility IDP\ 200-C-20206_401621RD.dgn PLOT DATE: 7/12/2011 PLOT TIME: 9:11:34 AM



RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN	DR	CHK	APVD
R. TOWNSEND	J. WALKER	P. TSCHESCHKE	S. DETHLOFF

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REID GARDNER STATION
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Moapa, Nevada

NVEnergy.

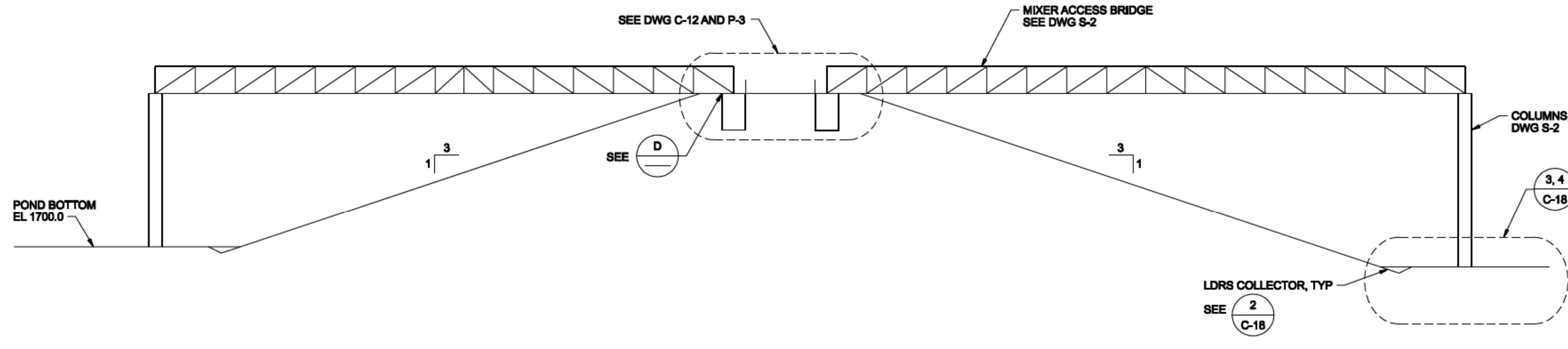
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#98256650201, M7:RC171 WO#9821855101

POND SITE PLAN - AREA 6

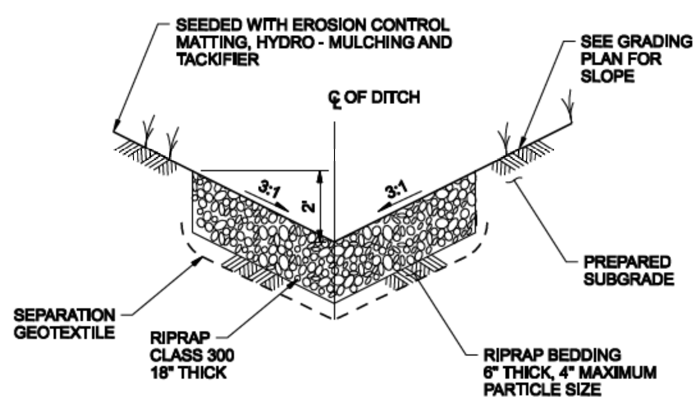
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-8
SHEET	20 OF 147

RECORD DRAWING

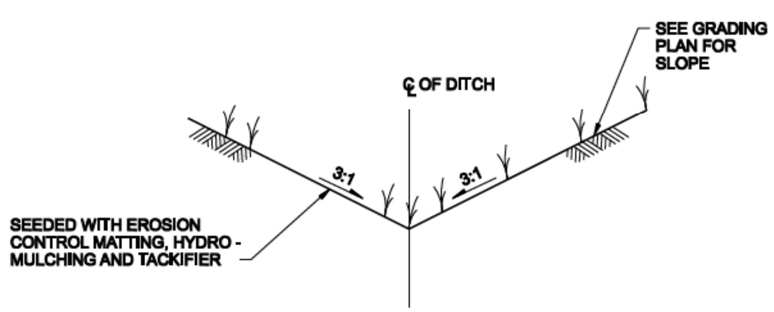


C CONCEPTUAL BERM SECTION
1"=10'



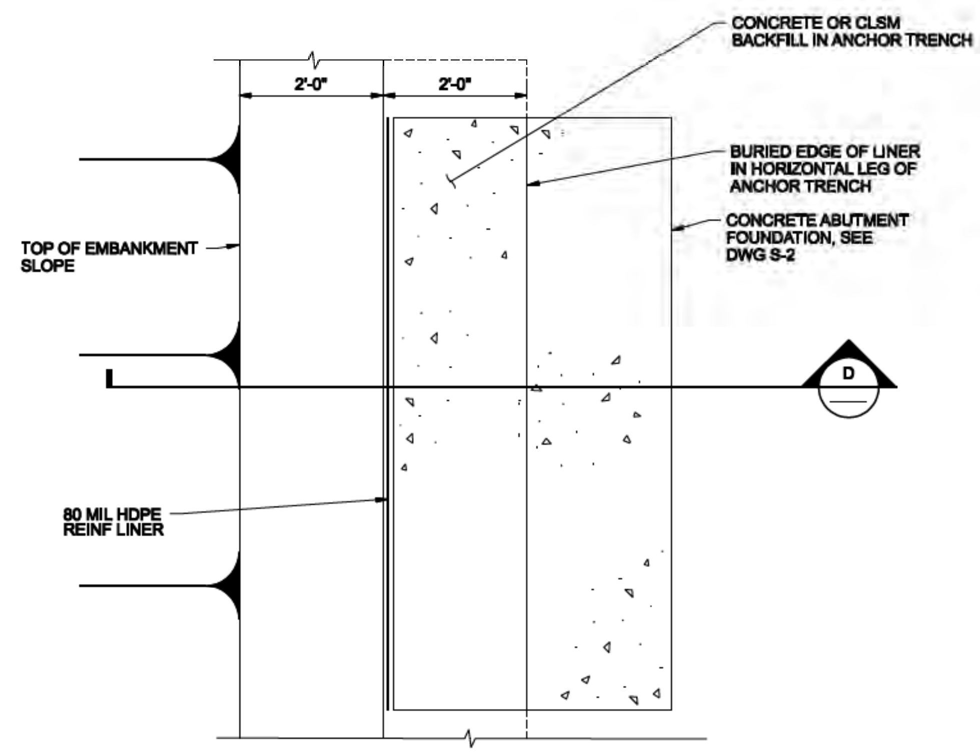
A RIPRAP DITCH TYPICAL SECTION
NTS

C-5
C-6
C-7



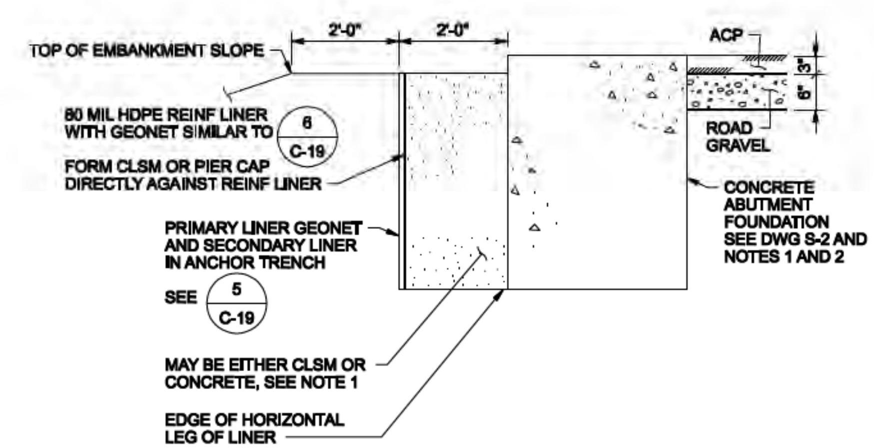
B DITCH TYPICAL SECTION
NTS

C-3
C-4
C-5
C-7
C-8



ANCHOR TRENCH AT BRIDGE

PLAN
NTS



NOTES:

1. THE FINAL DESIGN OF THE BRIDGE FOUNDATION SHALL BE BY THE CONTRACTOR. THE CONCEPT SHOWN IS FOR A SINGLE PIER SUPPORT. FINAL DESIGN TO BE APPROVED BY OWNER.
2. CONCEPTUAL SECTION SHOWN IS TYPICAL OF ALL BRIDGE PIERS.

ANCHOR TRENCH AT BRIDGE

D SECTION
NTS

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
2	07/14/11	RECORD DRAWING	NKB	SWD
1	6/9/10	DRAWING REVISION	PDT	SWD
0	04/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN R. TOWNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

APRIL 2010

CH2MHILL
2485 VILLAGE VIEW DRIVE, SUITE 350
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REID GARDNER STATION
Wastewater System
Improvement Projects
Moapa, Nevada

NV Energy

MESA EVAPORATION PONDS M5 AND M8
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

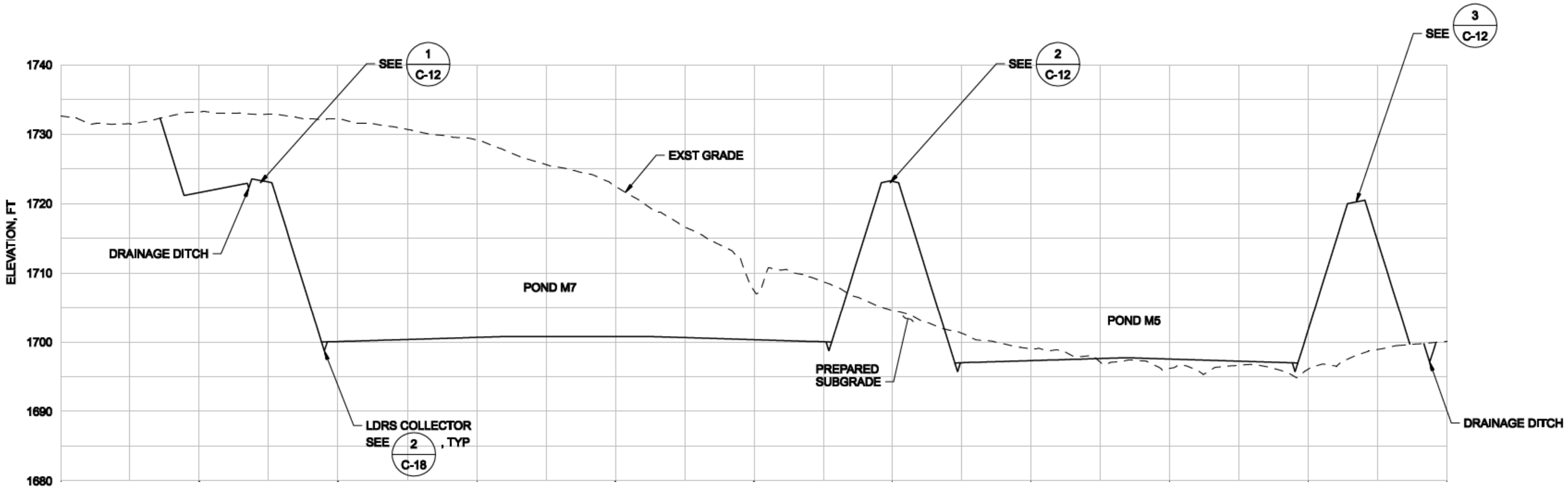
DRAINAGE DITCH DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

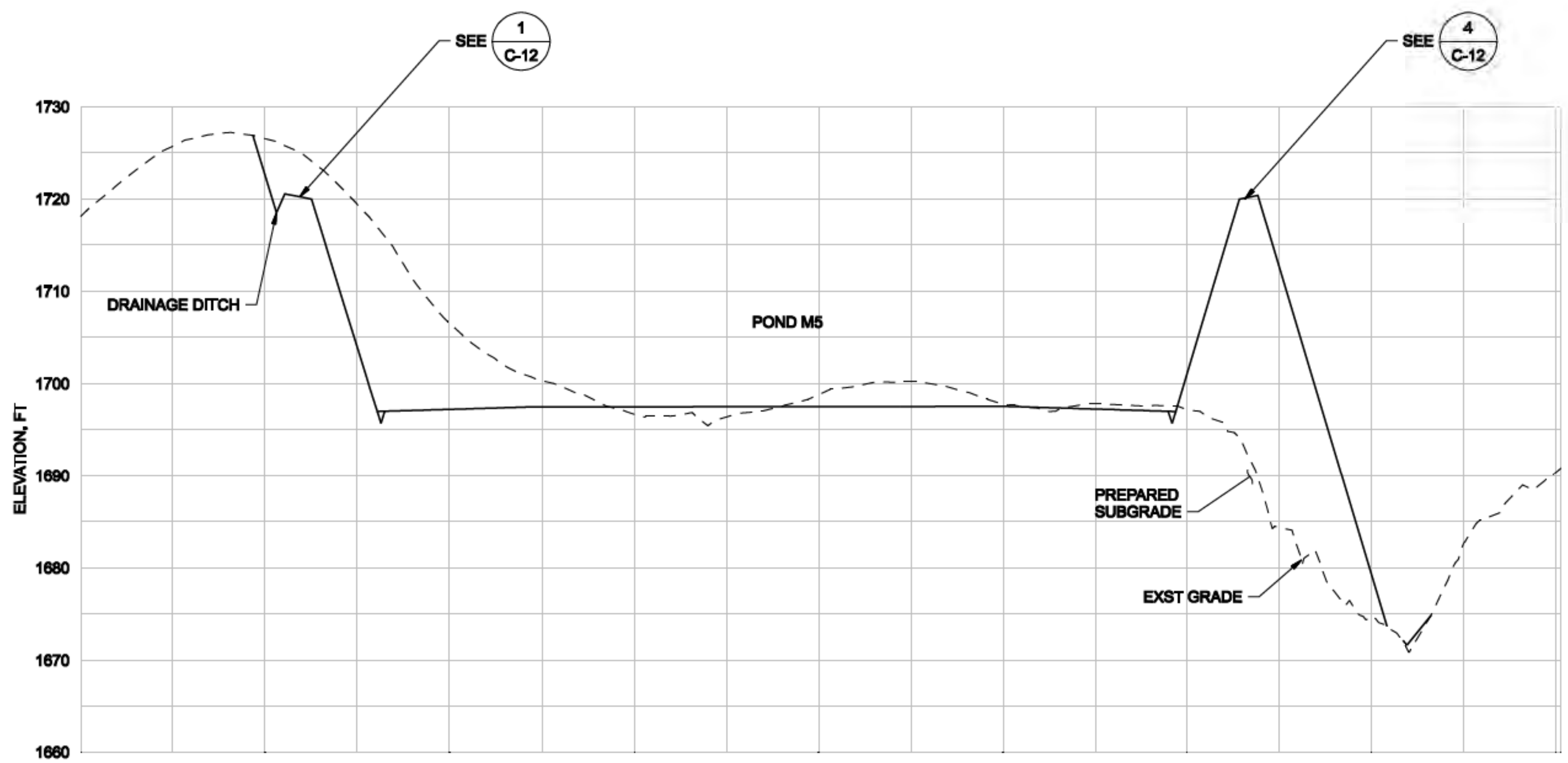
DATE	JULY 2011
PROJ	401621
DWG	C-9
SHEET	21 OF 147

RECORD DRAWING

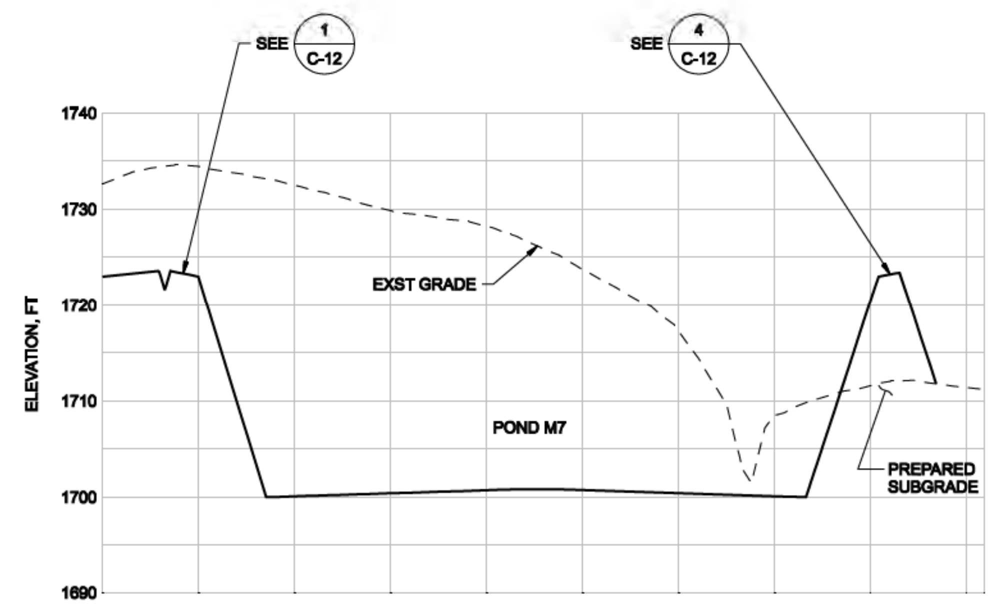
C-9



A SECTION
1"=100'-0"
C-2



B SECTION
1"=100'-0"
C-2



C SECTION
1"=100'-0"
C-2

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

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Moapa, Nevada

NVEnergy

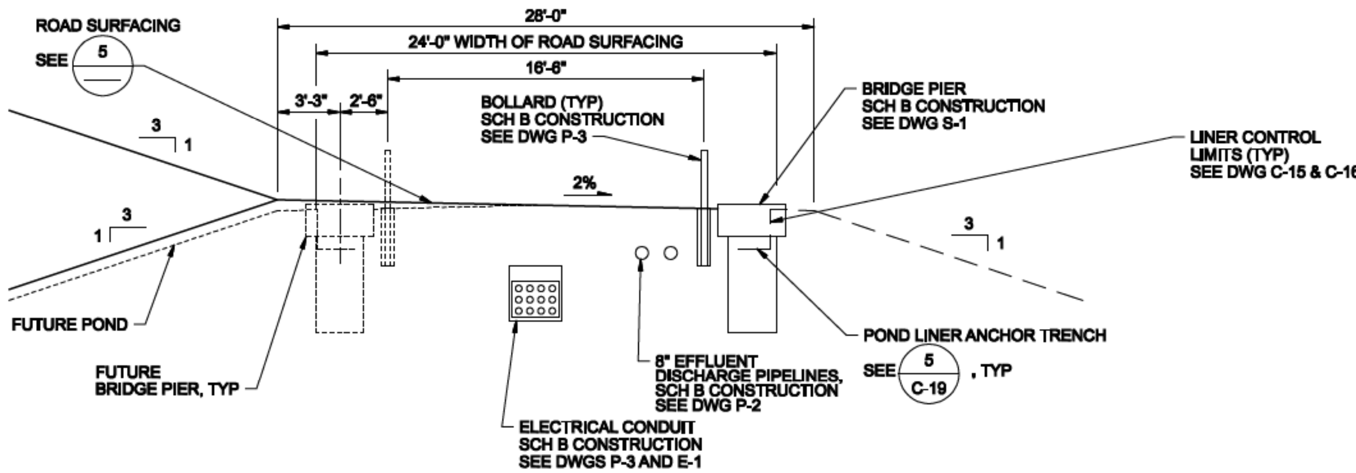
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825650201, M7:RC171 WO#9821855101

POND SECTIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-10
SHEET	22 OF 147

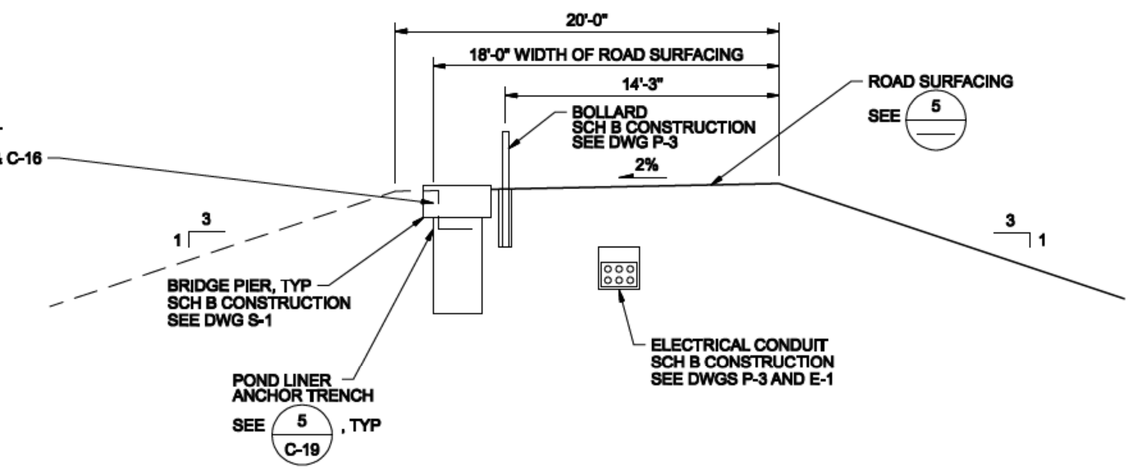
RECORD DRAWING



1 CENTRAL INTERIOR BERM

1"=5'-0"

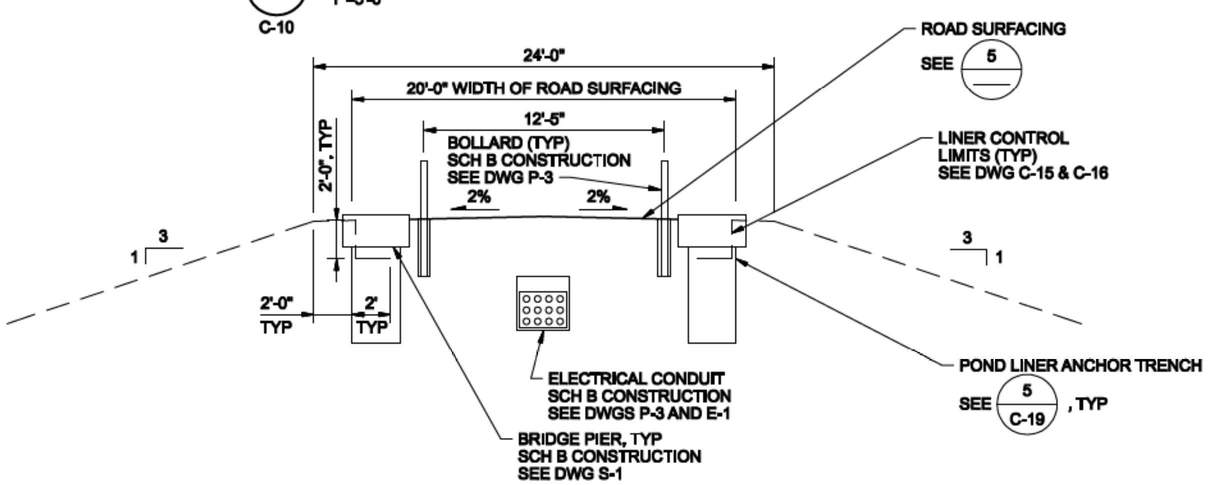
C-10



4 EXTERIOR BERM

1"=5'-0"

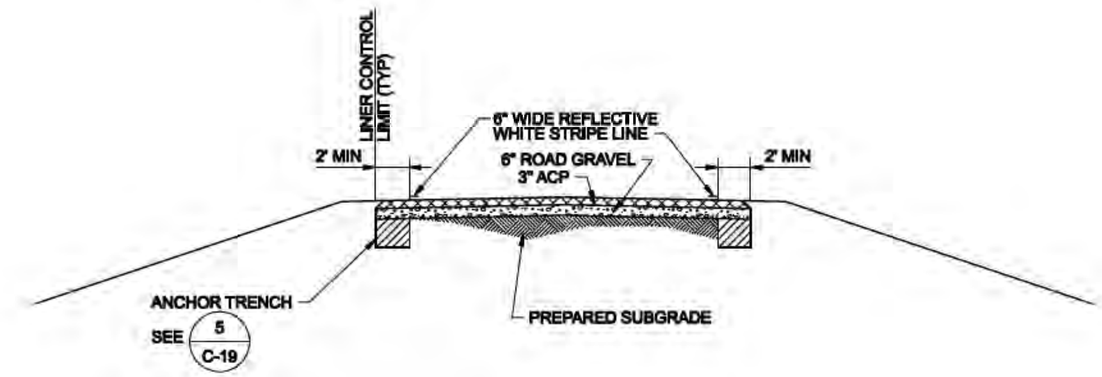
C-10



2 INTERIOR BERM (CROWNED)

1"=5'-0"

C-10



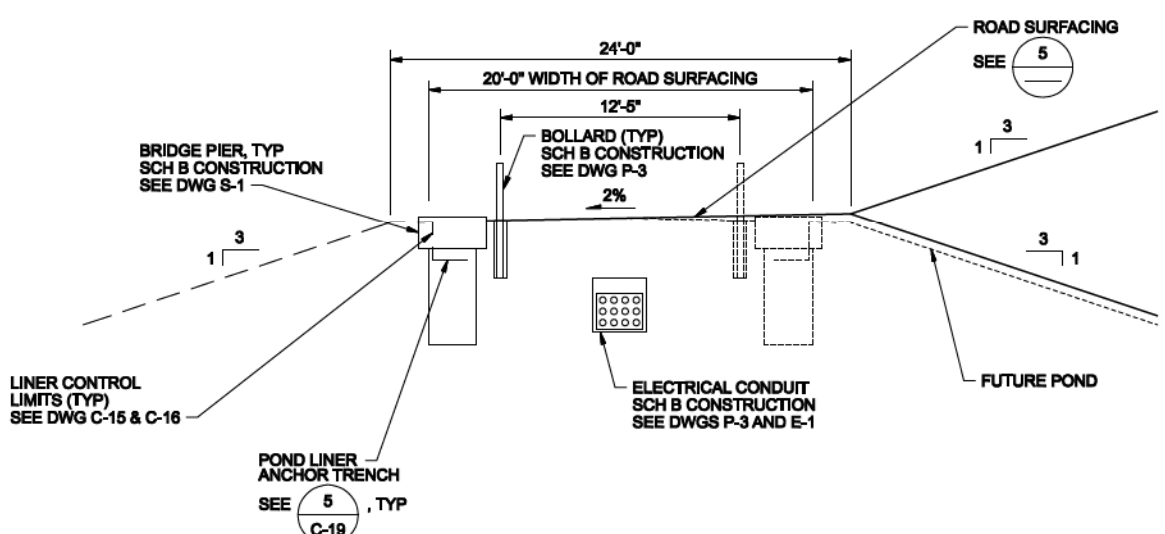
NOTES:

1. TOP SEAL ASPHALT EMULSION COATING TO SEAL ANCHOR TRENCH AND CONVEY RUNOFF FROM ROAD TO POND.
2. PAINT WHITE STRIPE LINE FOR TRAVEL WAYS, BOTH SIDES OF ALL ROADS PER NVDOT STDS.

5 BERM ROAD SURFACING AND MARKING

NTS

C-19



3 INTERIOR BERM (SLOPED)

1"=5'-0"

C-10

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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DSGN R. TOSNSEND | DR J. WALKER | CHK P. TSCHESCHKE | APVD S. DETHLOFF

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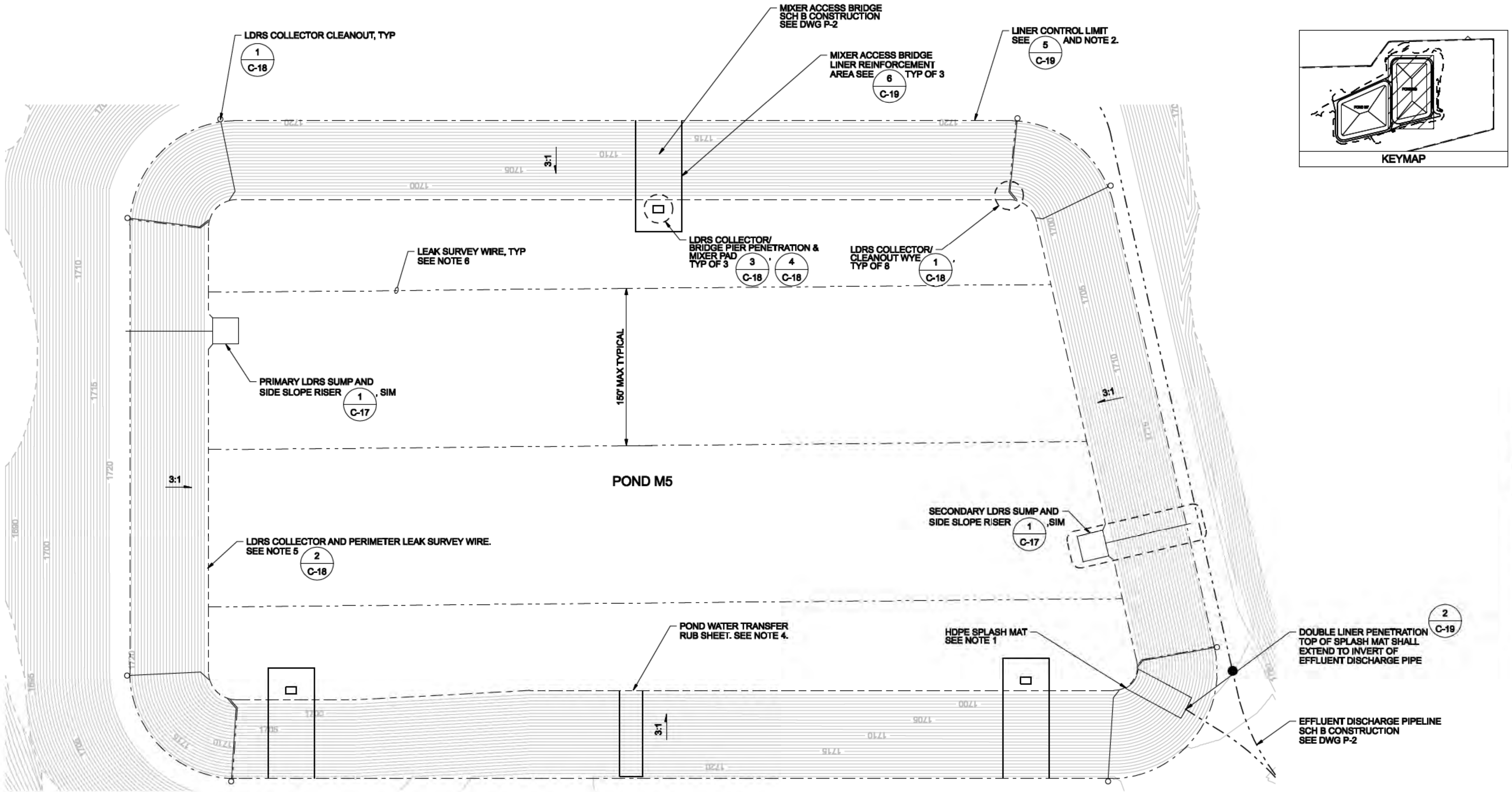
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#98256550201, M7:RC171 WO#9821855101

POND BERM TYPICAL SECTIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-12
SHEET	23 OF 147

RECORD DRAWING



KEYMAP

NOTES:

1. INSTALL HDPE SPASH MAT TO PROTECT PRIMARY LINER FROM EFFLUENT DISCHARGE. MAT TO EXTEND FROM EFFLUENT DISCHARGE PIPE TO TOE OF SLOPE. MAT TO BE 22' MIN WIDTH, 80 – MIL HDPE LINER, EXTRUSION WELDED TO PRIMARY LINER AROUND PERIMETER. PLACE CUSHION GEOTEXTILE BENEATH SPASH MAT SIMILAR TO 6 C-19
2. LINER CONTROL LIMIT IS LOCATION WHERE GEOMEMBRANE DROPS INTO ANCHOR TRENCH. SEE DWG C-12. ANCHOR TRENCH ALIGNMENT SHALL BE STRAIGHT AND SMOOTH.
3. LINER SEAMS SHALL EXTEND THROUGH THE ANCHOR TRENCH TO THE END OF THE GEOMEMBRANE PANEL.
4. POND WATER TRANSFER RUB SHEET LOCATIONS APPROXIMATE, SEE DWG C-5. COORDINATE WITH OWNER ON FINAL POSITION. RUB SHEET TO BE 22' MIN WIDTH, 80- MIL HDPE LINER EXTRUSION WELDED TO PRIMARY LINER AROUND PERIMETER. INSTALL WHITE 60-MIL TEXTURED HDPE ALONG EDGES OF SHEET. PLACE GEONET BENEATH RUB SHEET SIMILAR TO 6 C-19
5. LEAK SURVEY WIRES SHALL BE CONTINUOUS 8 GA COPPER, SPLICED ONLY AT INTERSECTION POINTS. SEE SPLICE DETAIL 4 C-19
6. LEAK SURVEY WIRE SHALL ALSO RUN IN A LOOP AROUND THE BASE OF THE POND IN THE LDRS COLLECTOR TRENCH. WIRES SHALL EXTEND TO THE TOP OF DIKE AT ONE OF THE CLEANOUTS AT EACH OF THE FOUR CORNERS.

SHEET LEGEND

- LDRS CLEANOUT
- LDRS COLLECTOR AND PERIMETER LEAK SURVEY WIRE
- LINER CONTROL LIMITS
- LEAK SURVEY WIRE

50 0 50 100
SCALE IN FEET

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NV Energy

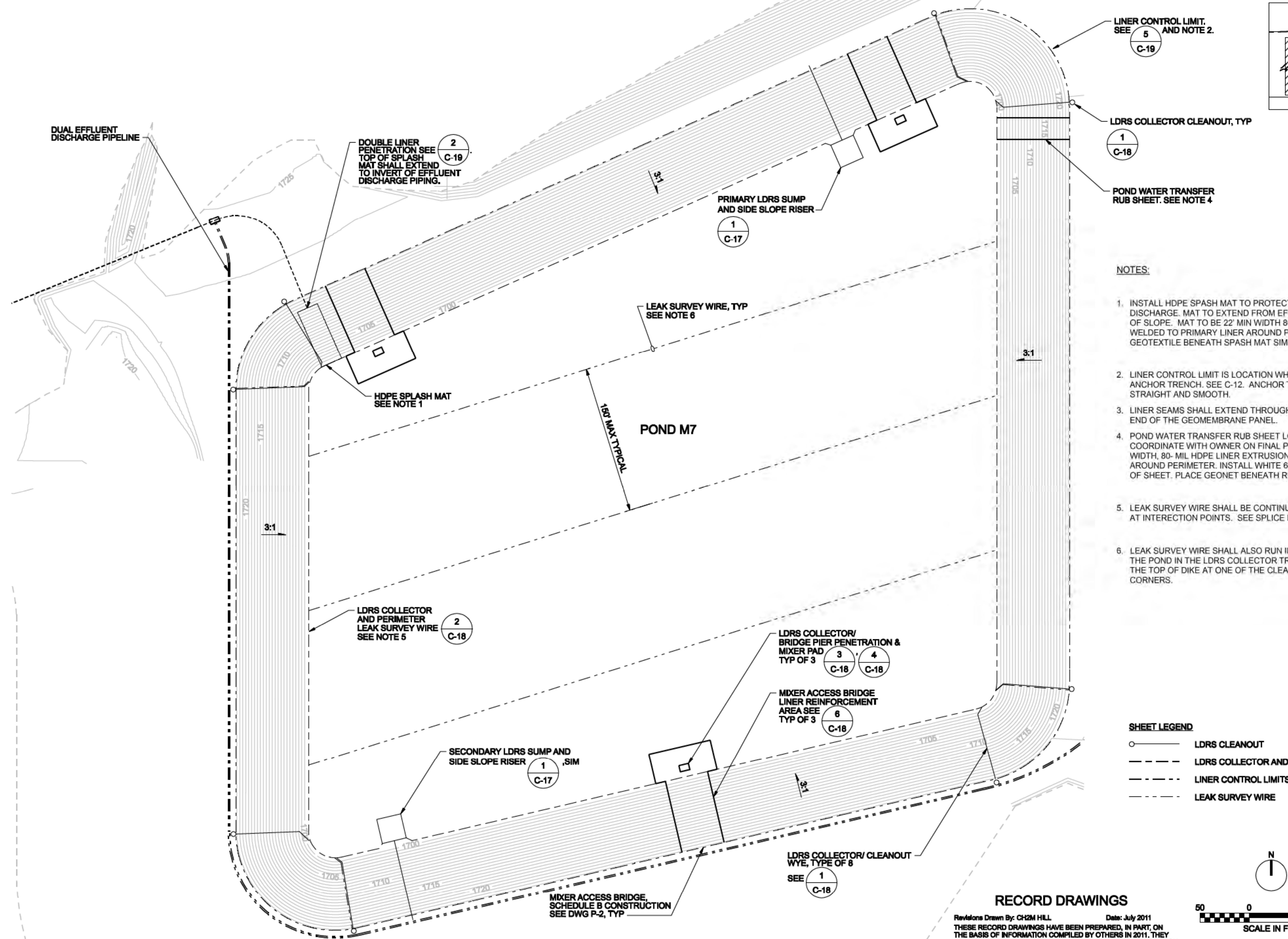
MESA EVAPORATION PONDS M5 AND M9
M5:RC171 WO#8825650201, M7:RC171 WO#8821855101

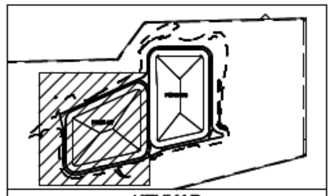
POND M5 LINER PLAN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-15
SHEET	24 OF 147

RECORD DRAWING





NOTES:

1. INSTALL HDPE SPASH MAT TO PROTECT PRIMARY LINER FROM EFFLUENT DISCHARGE. MAT TO EXTEND FROM EFFLUENT DISCHARGE PIPE TO TOE OF SLOPE. MAT TO BE 22' MIN WIDTH 80 – MIL HDPE LINER EXTRUSION WELDED TO PRIMARY LINER AROUND PERIMETER. PLACE CUSHION GEOTEXTILE BENEATH SPASH MAT SIMILAR TO 6 C-19
2. LINER CONTROL LIMIT IS LOCATION WHERE GEOMEMBRANE DROPS INTO ANCHOR TRENCH. SEE C-12. ANCHOR TRENCH ALIGNMENT SHALL BE STRAIGHT AND SMOOTH.
3. LINER SEAMS SHALL EXTEND THROUGH THE ANCHOR TRENCH TO THE END OF THE GEOMEMBRANE PANEL.
4. POND WATER TRANSFER RUB SHEET LOCATIONS APPROXIMATE. COORDINATE WITH OWNER ON FINAL POSITION. RUB SHEET TO BE 22' MIN WIDTH, 80- MIL HDPE LINER EXTRUSION WELDED TO PRIMARY LINER AROUND PERIMETER. INSTALL WHITE 60-MIL TEXTURE HDPE ALONG EDGE OF SHEET. PLACE GEONET BENEATH RUB SHEET SIMILAR TO 6 C-19
5. LEAK SURVEY WIRE SHALL BE CONTINUOUS 8 GA COPPER, SPLICED ONLY AT INTERECTION POINTS. SEE SPLICE DETAIL 4 C-19
6. LEAK SURVEY WIRE SHALL ALSO RUN IN A LOOP AROUND THE BASE OF THE POND IN THE LDRS COLLECTOR TRENCH. WIRES SHALL EXTEND TO THE TOP OF DIKE AT ONE OF THE CLEANOUTS AT EACH OF THE FOUR CORNERS.

SHEET LEGEND

—o	LDRS CLEANOUT
— — —	LDRS COLLECTOR AND PERIMETER LEAK SURVEY WIRE
—·—·—	LINER CONTROL LIMITS
-·-·-	LEAK SURVEY WIRE

N

50 0 50 100
SCALE IN FEET

RECORD DRAWINGS

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DSGN	DR	CHK	APVD
T. PYLE	M. RARDIN	P. TSCHESCHKE	S. DETHLOFF

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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada
NV Energy

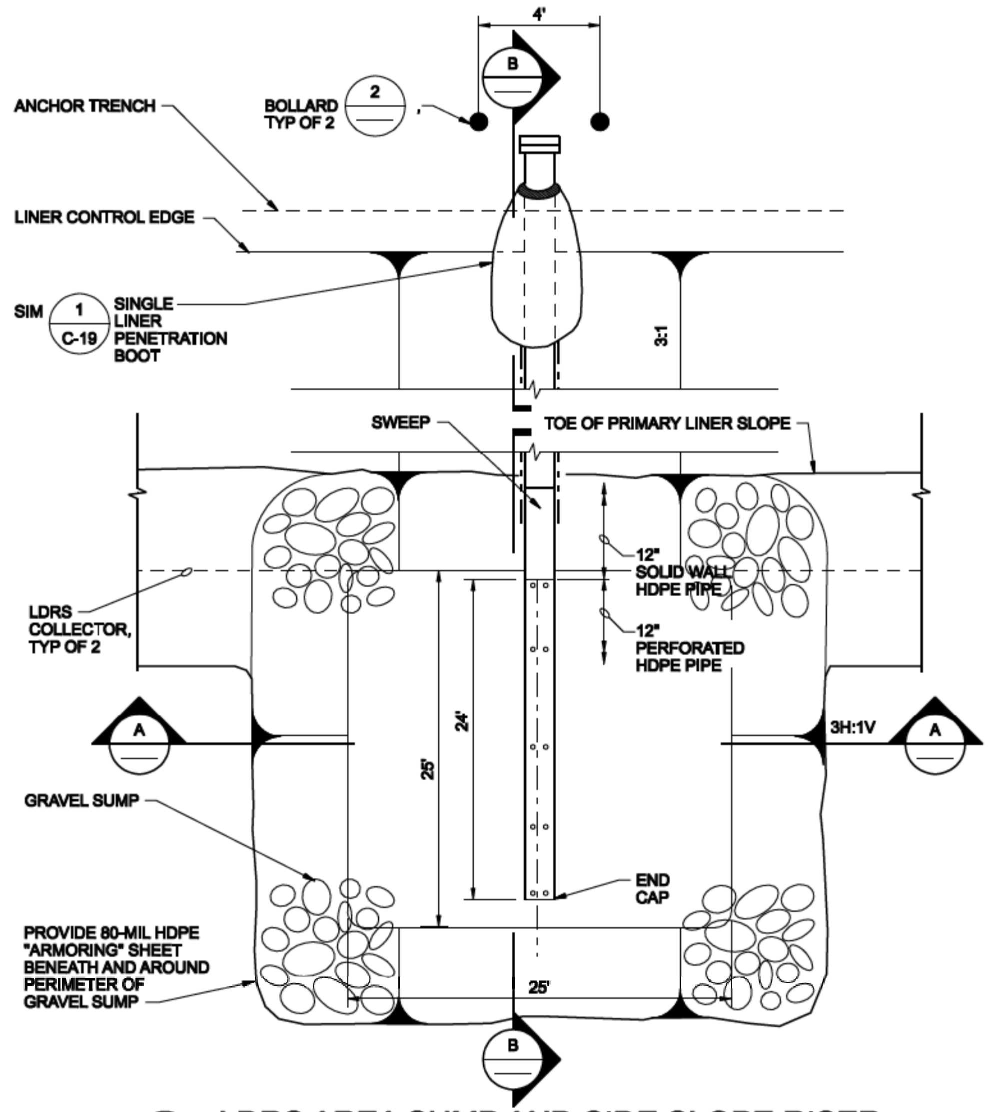
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#8825650201, M7:RC171 WO#8821855101

POND M7 LINER PLAN

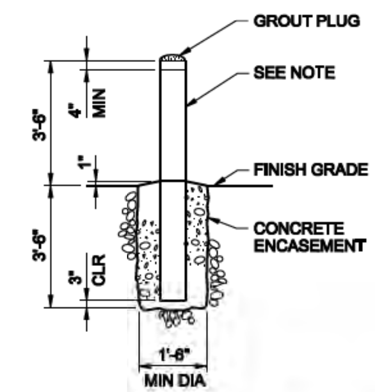
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-16
SHEET	25 OF 147

RECORD DRAWING



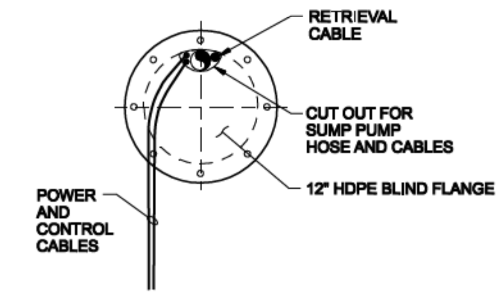
1 LDRS AREA SUMP AND SIDE SLOPE RISER
NTS
C-15, C-16



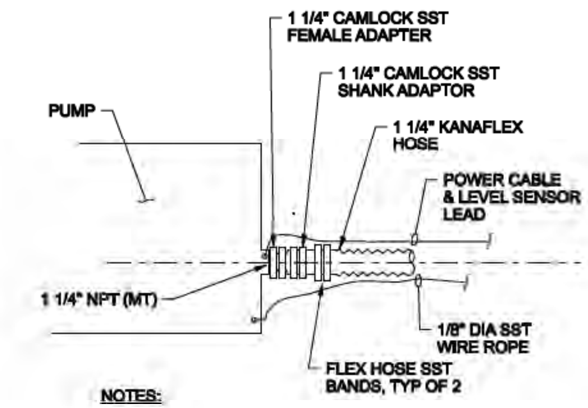
NOTE:
8" DIA SCHED 40 STEEL PIPE, GRIND SMOOTH FILL WITH CONC AND COVER WITH PREMANUFACTURED BOLLARD COVER. COVER SHALL BE REFLECTIVE YELLOW

2 BOLLARD
NTS

NOTES:
1. PROPERLY SECURE 1-1/2" KANAFLEX HOSE (AND CABLE) AT TERMINATION POINT SO THEY DO NOT SLIP DOWN THE RISER PIPE OR PULL ON THE CONDUIT CONNECTION.

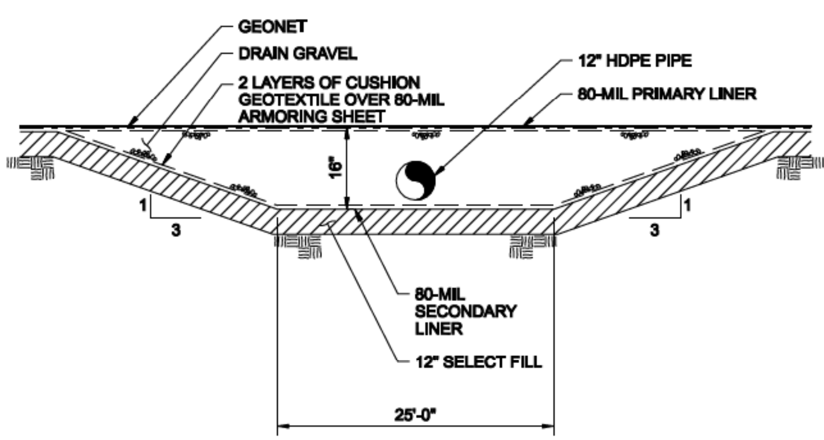


3 LDRS SIDE SLOPE RISER TERMINATION
NTS (END VIEW)

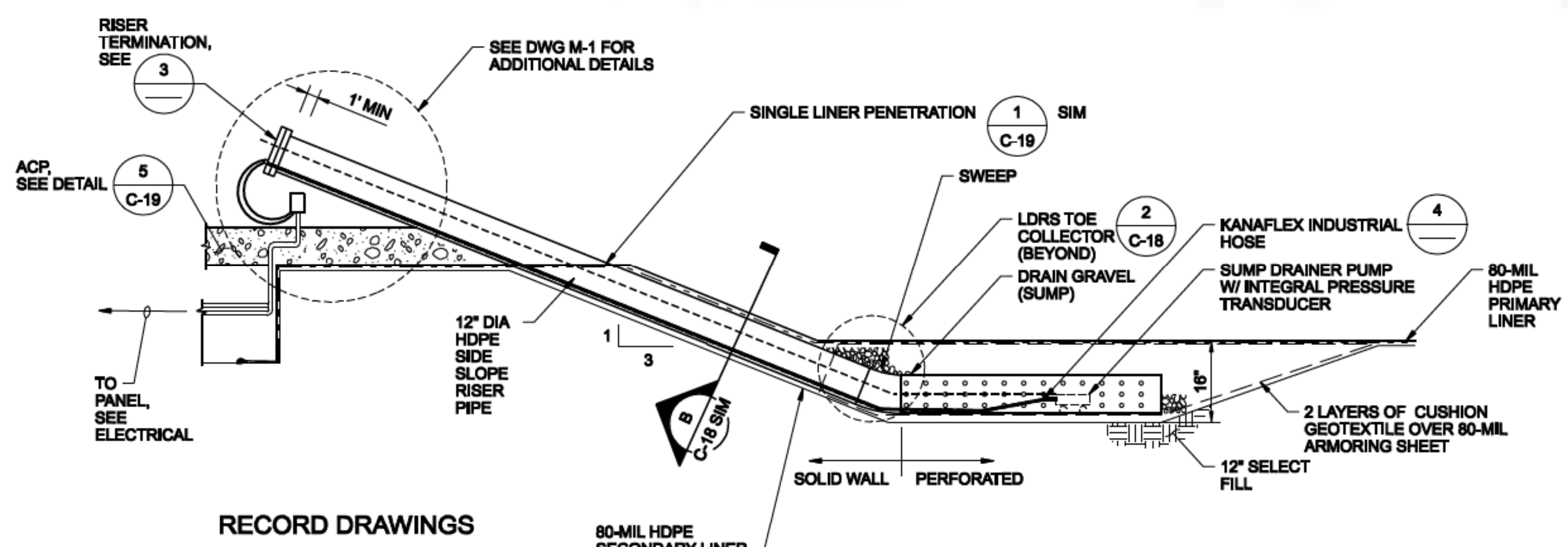


NOTES:
1. ZIP-TIE CAMLOCKS W/ INDUSTRIAL GRADE TIES.
2. ZIP-TIE LEADS AND WIRE ROPE TO KANAFLEX HOSE.

4 LDRS SUMP PUMP DISCHARGE PIPE/PUMP CONNECTION CONCEPT
NTS
SCH B CONSTRUCTION SEE DWG M-2



SECTION A
NTS



SECTION B
NTS

RECORD DRAWINGS

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NOTE: SEE DWG M-2 (SCH B CONSTRUCTION) FOR LDRS PUMP AND DISCHARGE PUMP TO BE INSTALLED IN THE PRIMARY LDRS SUMP ONLY.

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1	07/14/11	RECORD DRAWING	NKB	SWD
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REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada
NV Energy.

MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

LEAK DETECTION AND RECOVERY SYSTEM
CIVIL DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-17
SHEET	26 OF 147

RECORD DRAWING

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

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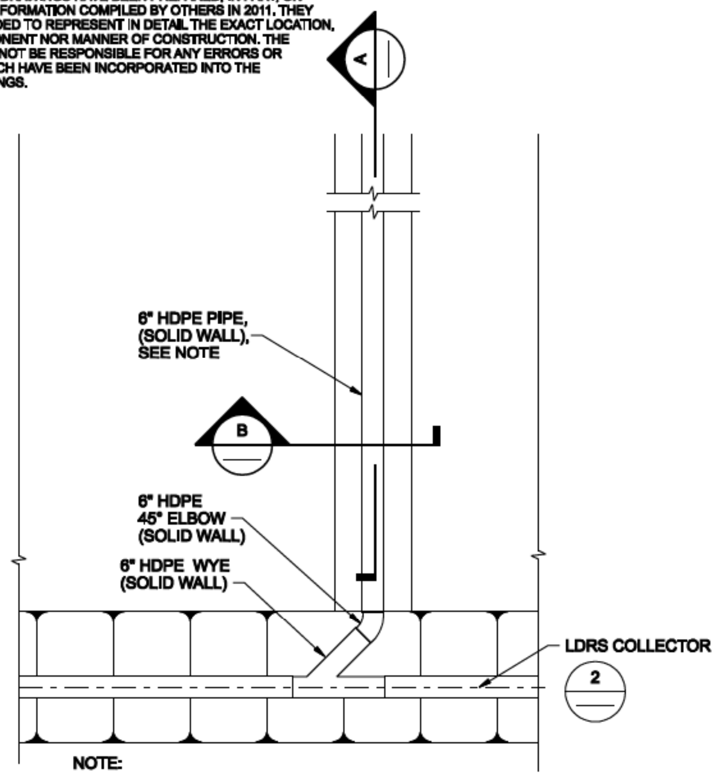


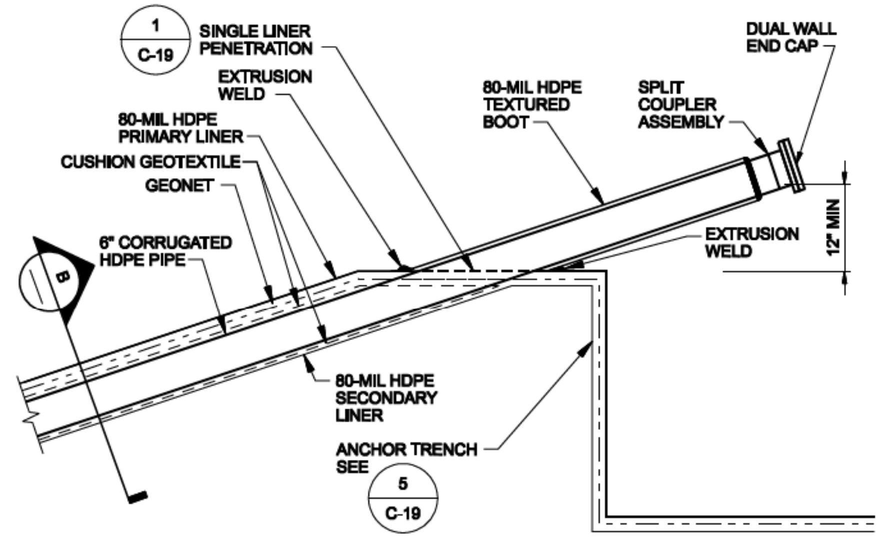
NOTE:

HDPE PIPE IS CORRUGATED. CLEAN OUTS ON NORTHEAST AND SOUTHEAST CORNERS OF POND M5 ARE PERFORATED.

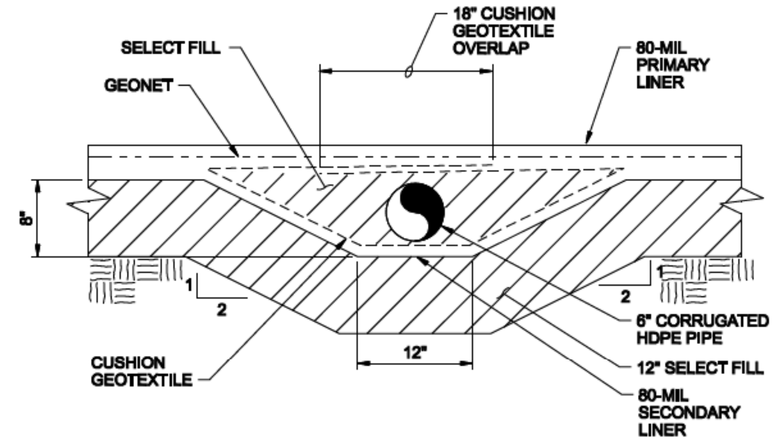
1 LDRS COLLECTOR CLEANOUT WYE
NTS

NOTE:

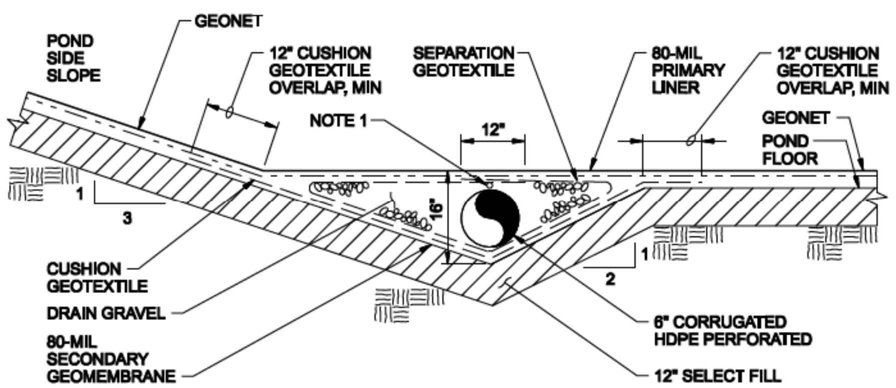
PROVIDE BOLLARDS SIMILAR TO THOSE SHOWN FOR LDRS SUMP 1/C-17



A LDRS COLLECTOR CLEANOUT
NTS



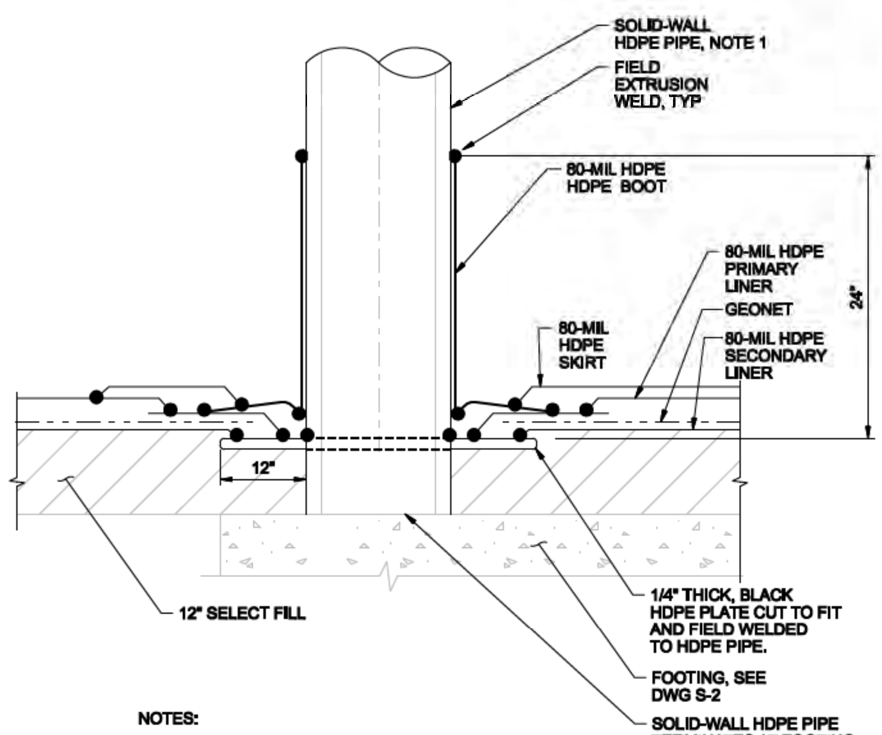
B LDRS COLLECTOR CLEANOUT
NTS



NOTES:

1. LDRS SURVEY WIRE: 8GA COPPER. TAPE TO TOP OF LDRS COLLECTOR PIPE @ 24" OC.

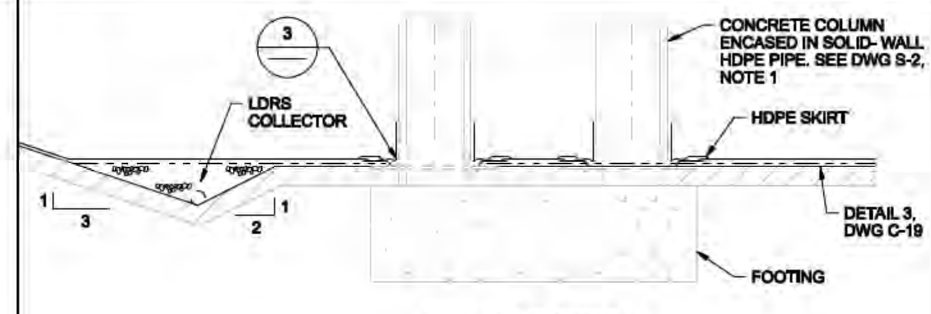
2 LDRS COLLECTOR
NTS



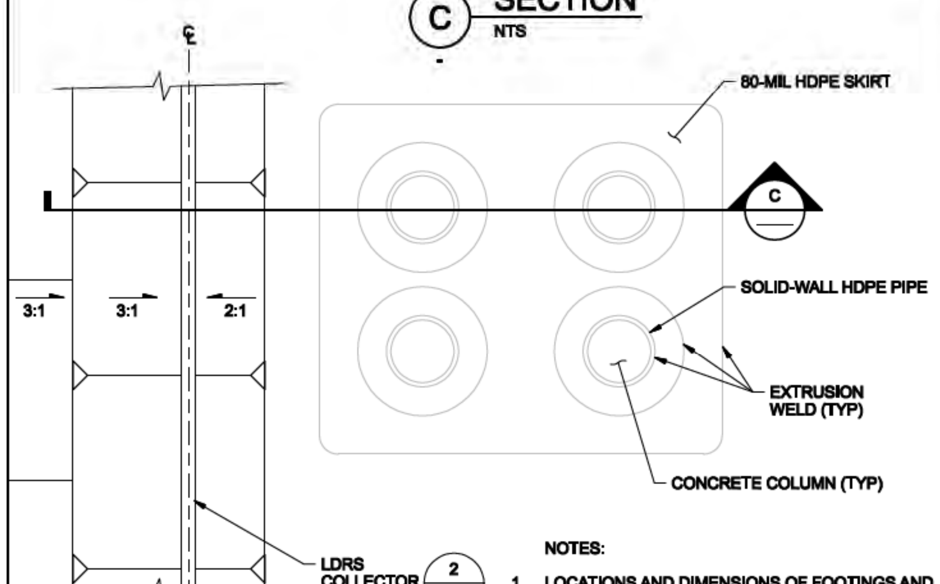
NOTES:

1. SOLID-WALL HDPE PIPE ENCLOSES THE CONCRETE COLUMNS FOR THE MIXER ACCESS WALKWAY PIER. SEE DRAWING S-2.
2. THIS DETAIL REPRESENTS THE MINIMUM DESIGN REQUIREMENTS FOR THIS PENETRATION. CONTRACTOR CAN ALTER OR ADJUST AS NEEDED TO MATCH BRIDGE PIER DESIGN, AND TO MEET PERFORMANCE REQUIREMENTS FOR PROJECT.
3. LINER FOR PROTECTION OF MAT FOOTING IS NOT SHOWN ON THIS DETAIL, SEE DWG S-11B. REINFORCED LINER LAYER (NOT SHOWN) INSTALLED OVER PENETRATION AND SKIRT, SEE DWG C-19.

3 BRIDGE PIER LINER PENETRATION MINIMUM REQUIREMENTS
NTS



C SECTION
NTS



NOTES:

1. LOCATIONS AND DIMENSIONS OF FOOTINGS AND COLUMNS VARY, SEE DWG S-2 THRU S-6.
2. SEAMS ARE CUT AND WELDED BETWEEN THE COLUMNS AND FROM THE COLUMNS TO THE EDGE AS NECESSARY.

4 LDRS COLLECTOR / BRIDGE PIER LINER PENETRATION
NTS

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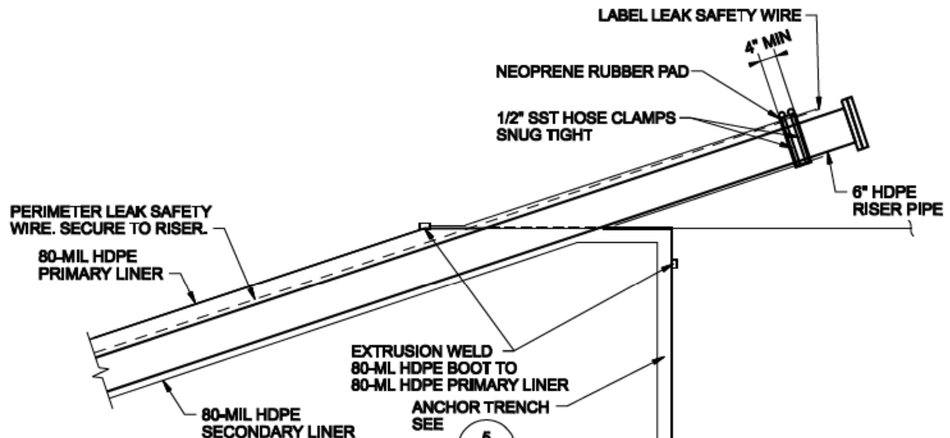
MESA EVAPORATION PONDS M5 AND M7
M5: RC171 WO# 9825650201 M7: RC171 WO# 9821855101

LEAK DETECTION AND RECOVERY SYSTEM LINER SYSTEM DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	401621
DWG	C-18
SHEET	27 OF 147

RECORD DRAWING



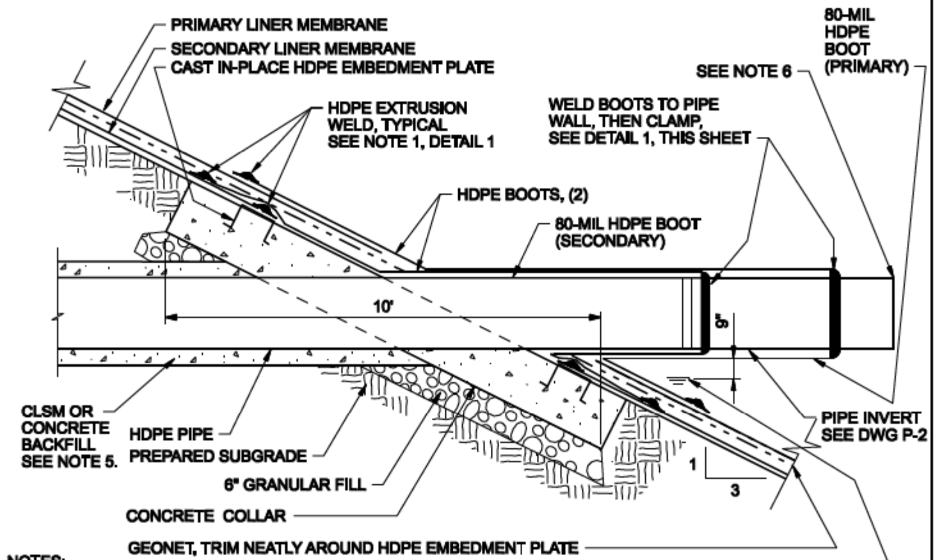
NOTES:

1. CUT HOLE TO PASS 6" HDPE PIPE TO FIT TIGHT WITH PRIMARY HDPE LINER.
2. EXTRUSION WELD HDPE BOOT TO PRIMARY LINER AROUND ENTIRE PENETRATION. ADJUST PRIMARY LINER IN ANCHOR TRENCH AS NEEDED TO PROPERLY BOOT AND SEAL.
3. FORM BOOT WITH SUFFICIENT MATERIAL TO PREVENT OVER-STRESSING DURING CONSTRUCTION AND OPERATION.

1 SINGLE LINER PENETRATION MINIMUM REQUIREMENTS

NTS

C-18



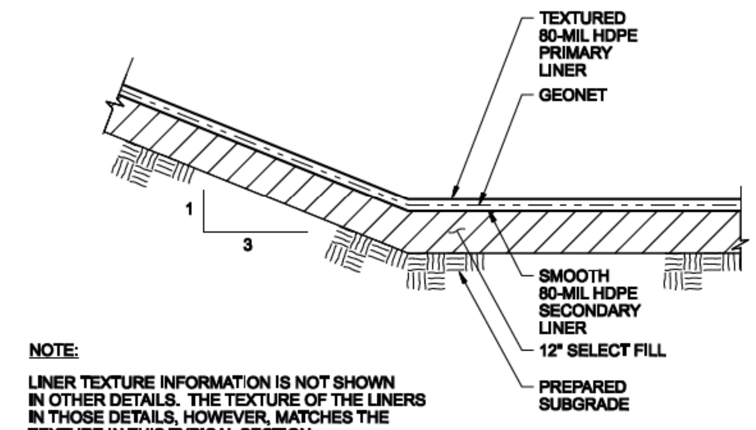
NOTES:

1. EXTRUSION WELD HDPE BOOT TO HDPE EMBEDMENT PLATE AROUND ENTIRE PENETRATION.
2. FORM BOOT WITH SUFFICIENT MATERIAL TO PREVENT OVER-STRESSING/TEARING OF HDPE LINING, BUT WITHOUT FOLDS OR WRINKLES OF HDPE GEOMEMBRANE.
3. PROVIDE 5' WIDE BY 10' LONG BY 6" THICK REINFORCED CONCRETE PAD (COLLAR). CENTER REINFORCEMENT MAT IN CENTER OF PAD. ALSO CENTER PIPE PENETRATION IN CENTER OF PAD (ALL DIRECTIONS). PROVIDE SMOOTH SURFACE FINISH ON PAD. REINFORCE WITH NO. 4 BAR @ 12" OC EA. MIN COVER 1-1/2".
4. THIS DETAIL REPRESENTS THE MINIMUM DESIGN REQUIREMENTS FOR THIS PENETRATION. CONTRACTOR CAN ALTER OR ADJUST AS NEEDED TO MEETPERFORMANCE REQUIREMENTS FOR PROJECT.
5. INSTALL 30 LINEAR FEET OF CLSM OR CONCRETE BACKFILL. CLSM OR CONCRETE BACKFILL TO FILL ENTIRE EXCAVATED TRENCH BEDDING AND PIPE ZONE AREAS TO A LEVEL 12 INCHES ABOVE TOP OF PIPE.
6. PROVIDE TEMPORARY RESTRAINED FITTINGS AS RECOMMENDED BY PIPING MANUFACTURER FOR END CAPS OR PLUGS TO PERFORM SPECIFIED 300 PSI PRESSURE TEST.

2 DOUBLE LINER PENETRATION MINIMUM REQUIREMENTS

NTS

C-15
C-16



NOTE:

LINER TEXTURE INFORMATION IS NOT SHOWN IN OTHER DETAILS. THE TEXTURE OF THE LINERS IN THOSE DETAILS, HOWEVER, MATCHES THE TEXTURE IN THIS TYPICAL SECTION.

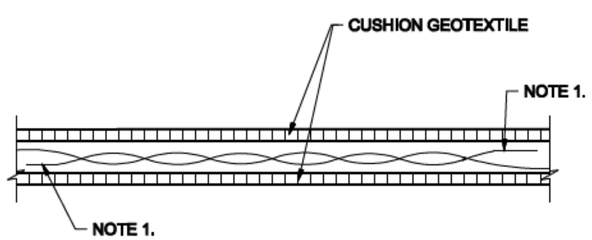
3 TYPICAL LINER SECTION

NTS

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS IN 2011. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.



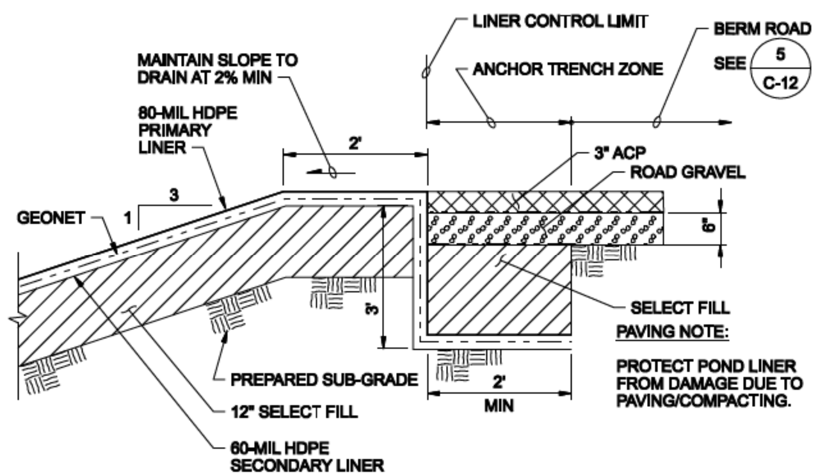
NOTES:

1. TIGHTLY TWIST WIRES TOGETHER MAKING SURE THE ENDS LAY FLAT. DO NOT ALLOW WIRE ENDS TO STICK UP.
2. LEAVE THE ENDS OF THE SPLICED WIRE LONG (MIN 6" EACH) TO LAY FLAT. TRIM SHARP EDGES FROM ENDS.
3. WRAP JOINT THROUGHOUT ITS LENGTH WITH ELECTRICAL TAPE.
4. PLACE CUSHION GEOTEXTILE ABOVE AND BELOW SPLICE LENGTH.

4 LEAK SURVEY WIRE SPLICE

NTS

C-15
C-16



PAVING NOTE:

PROTECT POND LINER FROM DAMAGE DUE TO PAVING/COMPACTING.

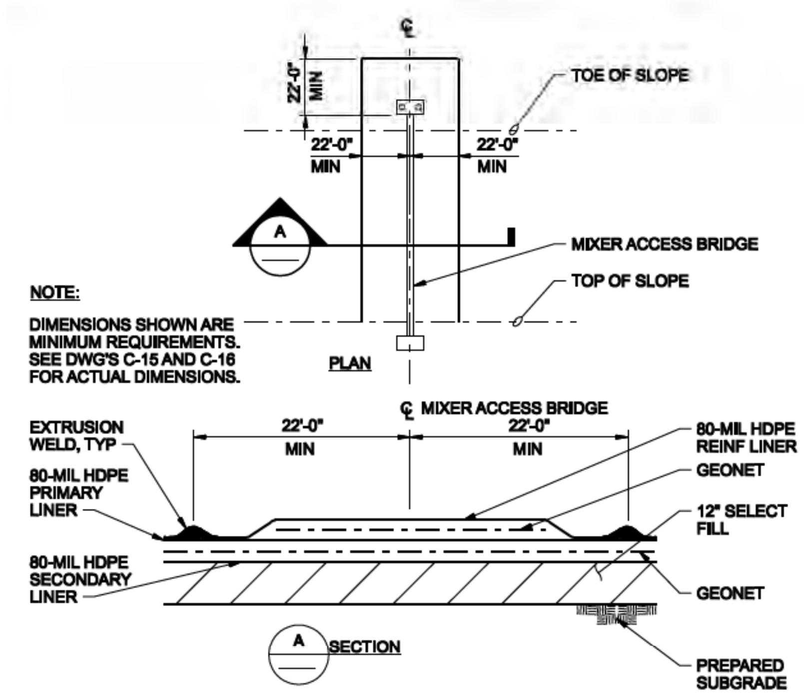
NOTES:

1. LINER SYSTEM COMPONENT SPACING IS EXAGGERATED FOR CLARITY.
2. PROVIDE PROTECTION OF 80-MIL PRIMARY LINER DURING COMPACTION OF ROAD GRAVEL AND INSTALLATION OF ROAD SURFACING.

5 ANCHOR TRENCH

NTS

C-12



NOTE:

DIMENSIONS SHOWN ARE MINIMUM REQUIREMENTS. SEE DWG'S C-15 AND C-16 FOR ACTUAL DIMENSIONS.

6 MINIMUM REQUIREMENTS FOR MIIXER ACCESS BRIDGE LINER REINF AREA

NTS

C-15
C-16

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	4/16/10	ISSUED FOR CONSTRUCTION	PDT	SWD

DSGN	DR	CHK	APVD
R. WARD	M. RARDIN	P. TSCHESCHKE	S DETHLOFF

CH2MHILL

2485 VILLAGE VIEW DRIVE, SUITE 350
HENDERSON, NEVADA 89074
PHONE: 702-369-6175

NV Energy

REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

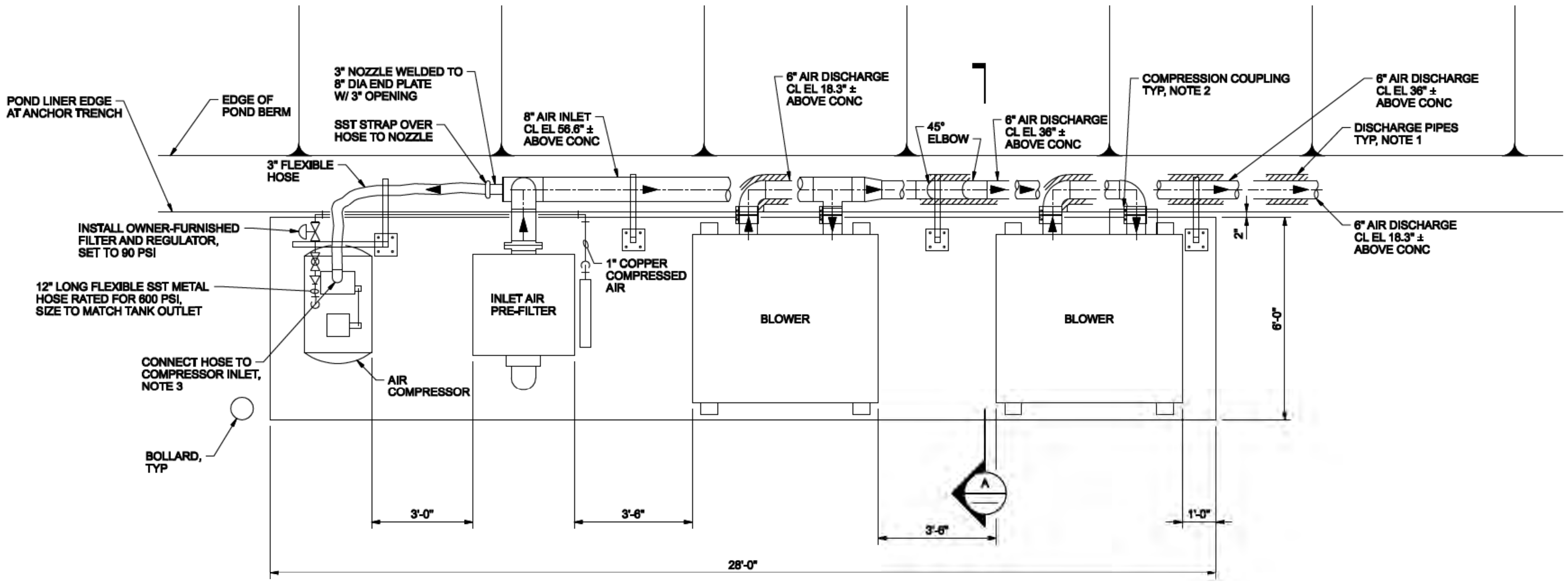
MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#9825650201, M7:RC171 WO#9821655101

LINER SYSTEM DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

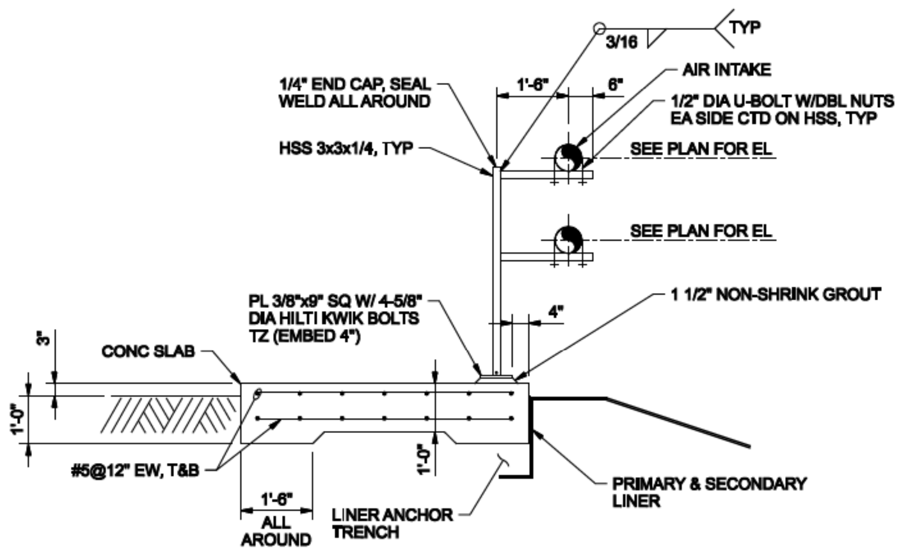
DATE	JULY 2011
PROJ	401621
DWG	C-19
SHEET	28 OF 147

RECORD DRAWING



PLAN

1/4"=1'-0"



(A) SECTION

1/4"=1'-0"

NOTES:

1. PIPE SHALL BE UNPAINTED SCH 5S TYPE 316 SST.
2. USE 3-BOLT COMPRESSION COUPLING TO CONNECT BOTH PLAIN END PIPES. LEAVE 1/4" GAP BETWEEN PIPE ENDS. COMPRESSION COUPLING SHALL BE MORRIS CODE 6-3C W/ GASKET RATED FOR 400 DEGREES F.
3. REMOVE FILTER ASSEMBLY FROM COMPRESSOR INLET. PROVIDE SCREWED FITTINGS AND HOSE ADAPTER TO CONNECT TO FLEX HOSE.
4. COPPER PIPE SHALL BE TYPE K, SEAMLESS PER ASTM B88. FITTINGS SHALL BE SOLDER TYPE AND NPT AT EQUIPMENT. PROVIDE UNIONS AT CONNECTION TO INLET AIR PRE-FILTER AND AT AIR COMPRESSOR.

RECORD DRAWINGS

Revisions Drawn By: CH2M HILL Date: July 2011

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS IN 2011. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NO.	DATE	REVISION	BY	APVD
1	07/14/11	RECORD DRAWING	NKB	SWD
0	3/16/11	ISSUED FOR CONSTRUCTION	WM	SWD

DSGN W MISSLIN | DR | CHK C MCCOY | M RIESS | APVD S DETHLOFF

CH2MHILL

2485 VILLAGE VIEW DRIVE, SUITE 350
HENDERSON, NEVADA 89074
PHONE: 702-369-6175

REID GARDNER STATION
Wastewater System Improvement Projects
Moapa, Nevada

NVEnergy.

MESA EVAPORATION PONDS M5 AND M7
M5:RC171 WO#82560201, M7:RC171 WO#82155101

BLOWER PAD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2011
PROJ	387530
DWG	M-6
SHEET	135 OF 147

RECORD DRAWING

Appendix C
Forms and Reports

Emergency Response Event Log

Reid Gardner Station Mesa Ponds M5 and M7

(To be completed during the emergency)

Name: ______________________ Position: ________________

Event Start Date: _______________ Event Start Time: ___________

Event Description: ____
____

Initial Event Level: ____
____

When and how was the event detected? ____
____

Weather conditions: ____
____

General description of the unusual or emergency event: ___________________________
____

Log all Notifications and Activity in the table below:

Date	Time	Action/Event Progression	Taken by

Report prepared by: ____

Date: ________

Event Termination Log

Reid Gardner Station Mesa Ponds M5 and M7

(To be completed during the emergency)

Date: ____________ Time:____________

Weather conditions: ____
____

General description of emergency situation: ____
____
____

Area(s) of Ponds affected: ____
____
____

Extent of damage: ____
____

Possible cause(s): ____
____

Effect on Pond's operation: ____
____

Initial reservoir elevation: ________________________ Time: ______________

Maximum Reservoir elevation: ______________________ Time: ______________

Final Reservoir elevation: __________________________ Time: ______________

Description of area flooded downstream/damages/injuries/loss of life: ______________________
____
____
____

Other data and comments: ____
____

Observer's name and telephone number: ____
____

Report prepared by: ____ Date: ______________

Emergency Action Plan Exercise Reporting Form

Date and Time of Exercise: ____

Name of Exercise Coordinator: ____

Attendees/Participants: ____

____

____

Type of Exercise:

- ☐ Orientation Seminar
- ☐ Drill
- ☐ Tabletop Exercise
- ☐ Annual Functional Exercise

If Functional Exercise,

Time to Complete Exercise: ____

Critique on Notification Procedure: _______________________________________

____

____

Verification that all persons notified had current copies of the EAP (Plan) [Yes or No]: __________
Use the Annual Functional Exercise Verification Form on the follow page. Have a competed copy included with this form in this Appendix.

Recommended updates to the EAP (Plan): ___________________________________

____

____

Additional Notes (attach sheets if necessary):

Appendix D
Periodic (5 Year) Hazard Potential Classification Assessment, Ponds M5 and M7 (Inundation Model)

REPORT

Periodic (5 Year) Hazard Potential Classification Assessment, Ponds M5 and M7, Reid Gardner Station

PREPARED FOR:	File
PREPARED BY:	NV Energy, Jacobs
DATE:	October 11, 2021

1.0 INTRODUCTION

This report documents the first five year (quinquennial) periodic review and update of the Hazard Classification Assessment for surface impoundments M5 and M7 at the Reid Gardner Station (Station) as required by the U.S. Environmental Protection Agency's Coal Combustion Residuals (CCR) Rule. This periodic assessment concluded that the initial 2016 assessment hazard potential classification of the Ponds M5 and M7 as "high hazard potential CCR surface impoundments" continues to meet the CCR Rule requirements.

1.1 Purpose and Scope

In accordance with §257.73(f)(3), Hazard Classification Assessment reviews and updates must be competed when conditions change or at 5-year intervals. This quinquennial review and update of the existing CCR surface impoundments M5 and M7 Hazard Classification Assessment included checking for changes in site conditions since the initial Hazard Class Assessment in 2016, conducting new calculations and modeling for a breach and inundation analysis, and development of an updated dam breach inundation map.

1.2 Site Description, Background and Pond Closure Initiation

The Station is located 50 miles northeast of Las Vegas, within the Moapa Valley and was formerly a coal-fired electric power generation facility that produced approximately 557 megawatts of power from four generating units. Units 1 through 3 were retired in 2014 and Unit 4 was retired in 2017. Station demolition was completed in 2020.

Ponds M5 and M7 are defined under §257.53 of the CCR Rule as existing CCR surface impoundments because the ponds received CCR both before and after October 19, 2015.

Ponds M5 and M7 are also permitted as dams by the Nevada Division of Water Resources (State Engineer). The National Inventory of Dam Number for Pond M5 is NV10779 and the Nevada State Identification Number is J-652. The National Inventory of Dam Number for Pond M7 is NV10780 and the Nevada State Identification Number is also J-652. Closure of Ponds M5 and M7 was initiated on April 7, 2021, when the influent piping was air-gapped and the influent pumping station decommissioned. Notification of Intent to Initiate Closure, as required under §257.101(a) and §257.102(g), was placed in the operating record on April 6, 2021, in accordance with

P.O. BOX 98910, LAS VEGAS, NEVADA 89151-0001 6226 WEST SAHARA AVENUE, LAS VEGAS, NEVADA 89146
P.O. BOX 10100, RENO, NEVADA 89520-0024 6100 NEIL ROAD, RENO, NEVADA 89511 nvenergy.com

§257.105(i)(7). Accordingly, Ponds M5 and M7 no longer receive any influent, are largely empty, and the residual pools of standing water are diminishing by evaporation.

2.0 REGULATORY OVERVIEW

The CCR Rule was published in the Federal Register on April 17, 2015, and became effective on October 19, 2015. The CCR Rule regulates the disposal of CCR as solid waste in landfills, surface impoundments, and lateral expansions under Subtitle D of the Resource Conservation and Recovery Act. The CCR Rule sets forth minimum criteria for the structural integrity of CCR surface impoundments in §257.73.

Ponds M5 and M7 are subject to the structural integrity criteria in the CCR Rule because the ponds are considered existing unlined CCR surface impoundments. A CCR surface impoundment is a "man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit, treats, stores, and disposes of CCR" (§257.53). Furthermore, they are classified as existing CCR surface impoundments under the CCR Rule because they received CCR both before and after October 19, 2015. As a result, both ponds must comply with the CCR Rule and more specifically the structural integrity criteria as required by §257.73.

Per §257.73(a) and §257.73(a)(2) of the CCR Rule, a hazard potential classification assessment must be conducted for all existing CCR surface impoundments, except for incised impoundments. Ponds M5 and M7 do not qualify as an incised CCR surface impoundment, as defined in §257.53, because they were not "constructed by excavating entirely below the natural ground surface."

The CCR Rule defines a hazard potential classification as "the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances" (§257.53). The different hazard potential classifications listed in Section 257.73(a)(2)(i) are defined in §257.53 and listed in the following paragraphs:

- "Low hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property."
- "Significant hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns."
- "High hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation will probably cause loss of human life."

The initial hazard potential classification assessment was completed and placed in the Station's operating record on October 12, 2016, in accordance with §257.73(f)(1) and §257.105(f)(5). Within 30 days of placement, the State Director was notified as required by §257.106(d) and §257.106(f)(4), and the assessment was placed on a publicly accessible internet site per §257.107(d) and §257.107(f)(4).

Periodic hazard potential classification assessments are required to be completed and placed in the operating record every 5 years from the date that the initial assessment was placed into the operating record (§257.73(f)(3) and §257.105(f)(5)). Accordingly, this updated Hazard Classification Assessment must be placed in the operating record by October 12, 2021, and within

30 days of placing in the operating record, the required notifications to the State Director (§257.106(d) and §257.106(f)(4)) and placement of the update plan on the publicly accessible internet site must also be completed (§257.107(d) and §257.107(f)(4)). The initial and periodic hazard potential classification assessments must be certified by a qualified professional engineer (§257.73(a)(2)(ii)). "

3.0 INITIAL HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The initial 2016 Hazard Assessment (CH2M, 2016) classified Ponds M5 and M7 as "High" hazard potential dams, primarily due to the existence of residences and structures in the downstream floodplain that would be created by a potential dam failure. The CH2M initial 2016 Hazard Assessment Ponds M5 and M7 breach inundation maps and HEC-RAS analysis are included in Attachment 1.

Although Ponds M5 and M7 are designated as "High" hazard under the CCR Rule (§257.53), they are registered as "Significant" hazard dams by the Nevada Division of Water Resources (State Engineer). As part of the permitting process, the State Engineer assigned a hazard classification rating of "Significant" to ponds M5 and M7, in accordance with Nevada Administrative Code (NAC) 535.140, as determined by a review attached to the initial Emergency Action Plan (EAP) and developed by Stanley Consultants (Stanley 2010). Per NAC 535.140, a dam will be classified as a "significant hazard if failure of the dam carries a: (1) Reasonable probability of causing a loss of human life; or (2) High probability of causing extensive economic loss or disruption in a lifeline.

The inundation map and technical memo from the 2010 Stanley EAP has been included in Attachment 2. The EAP itself was subsequently revised as required by §257.73(a)(3) (Jacobs, 2021c).

4.0 REVIEW OF HAZARD POTENTIAL CLASSIFICATION

A review of current topography confirms the available storage volume in each of the ponds has not changed from the amounts described in the 2016 Hazard Assessment. Pond M5 can hold 260.17 acre-feet at the embankment crest. Pond M7 can hold 264.34 acre-feet.

Similar to the assessment done in 2016, Pond M5 was chosen for analysis in this 2021 assessment because it has a more direct path to the Muddy River based on downstream topography. Additionally, it is expected that modeling the failure of Pond M7 would produce an inundation area that is nearly identical to the one produced by failure of Pond M5. As a result, it is expected that the impact of failure on downstream areas would be the same for Ponds M5 and M7.

For this assessment, it was conservatively assumed that the water surface elevation in Pond M5 reached the top of the embankment before flowing over the crest or breaching the embankment. Modeling the breach flood as an overtopping of the embankment crest is conservative compared to applying the maximum storage pool or maximum surcharge loading conditions used in the Safety Factor Assessment (Jacobs 2021d), as those conditions have some freeboard inside the embankment. Because closure of these impoundments was initiated in April 2021 (Jacobs 2021a, 2021b) the current liquid level inside both impoundments is considerably lower than maximum storage pool, with approximately 18 feet of freeboard. The assumption used for the breach flood corresponds to a water surface elevation of approximately 1,720 feet and a water volume of approximately 260.17 acre-feet as shown on the Record Drawings (CH2M HILL, 2011). The size of the breach created by water flowing over the crest was estimated using the Froehlich 2008 Method. The detailed calculation for the breach size is provided in Attachment 3.

The analysis limits in this study extend from the upstream limits, defined as the subject Pond M5 embankment, to the downstream limits defined as the Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA) boundary for the Muddy River. It is common practice that an emergency dam breach analysis terminates at the next viable FEMA SFHA in the downstream watercourse because the property owners are aware and required to carry flood insurance in case of a major flood event. Additionally, based on the previous dam breach analysis in the EAP (Stanley, 2010) and the Initial Hazard Assessment (CH2M, 2016), the unsteady flood wave dissipates to a 100-year flow rate significantly less than the FIS base flood elevations within the SFHA. Therefore, the use of the SFHA boundary downstream of the breach analysis is considered acceptable.

Using the US Army Corps of Engineers HEC-RAS Version 5.0.7 software, a conservative hydraulic analysis was prepared for this assessment by analyzing a steady state flow condition with the maximum flow from the breach computed as 7,506 cubic feet per second conveyed through the watercourse to the SFHA. The boundary conditions were set as critical depth at the upstream boundary due to breaching water at the discharge point, and normal depth at the downstream boundary in the Muddy River. The manning's roughness for the watercourse of cavernous washes has been selected as 0.08 to represent the sluggish, weedy, deep pools, similar to the 2016 analysis.

Ponds M5 and M7 are located on top of a plateau, approximately 150 vertical feet above the Muddy River floodplain. The downstream inundation resulting from a breach of the embankment or overtopping of the embankment of Ponds M5 and M7 migrates through well incised cavernous washes in a northerly direction and then turns east into a Zone 'AE' with Floodway SFHA that encumbers the Muddy River floodplain, per Flood Insurance Rate Map (FIRM) Panels 32003C0670E and 32003C0690E dated September 27, 2002. Figure 1 included in Attachment 4 displays the SFHA from the FEMA FIRM panels along with the breach inundation boundary that extends from the Ponds to the Muddy River floodplain. The inundation boundary is shown by extent of the flood water surface elevation lines

The land downstream of Ponds M5 and M7 was examined to understand the potential effects of the downstream inundation in case of a potential embankment failure. The Clark County Assessor's site, aerial photography and a site visit were utilized to understand the conditions of the downstream property and if any habitable structures are present in the watercourse. Based on this review, it was determined that the dam breach travels a watercourse that includes washes on an undeveloped private property and into the Muddy River floodplain that is encumbered by a FEMA designated SFHA that is generally used for agriculture. There are a few structures (of which one is assumed to be habitable) located near the discharge point from the washes located downstream of the two ponds, as well as a rural roadway that acts as primary access to the area from Interstate 15. As the dam breach material and excess flow travels downstream in the Muddy River and SFHA, it is expected the impacts will lessen due to flood wave dissipation and the conditions of the Muddy River such as lateral inflows, abstractions, etc. approaching State Route 168 and Interstate 15. The M5 and M7 Pond Breach Inundation Map (Attachment 4) is used as reference for the potential impacts of an emergency scenario.

5.0 CONCLUSION AND RECOMMENDATION

Similar to 2016, the evaluation of the appropriate hazard potential classification includes a stepwise consideration of each hazard classification. The stepwise consideration is repeated in the following paragraphs along with a discussion of their relevance to Ponds M5 and M7.

- A low hazard potential classification is appropriate for CCR surface impoundments where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses (§257.53). Due to the potential agricultural impacts that salt and sediment laden flow resulting from a breach and drainage of the impoundments would produce along the Muddy River, a risk for environmental impacts is considered. Therefore, a low hazard potential classification is not appropriate for Ponds M5 and M7.
- A significant hazard potential classification is appropriate for CCR surface impoundments where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns (§257.53). As a result of the downstream road and residence structures observed in the Muddy River floodplain there may be a risk for human life. As a result, a significant hazard potential classification is not appropriate for Ponds M5 and M7.
- A high hazard potential classification is appropriate for CCR surface impoundments where failure or mis-operation will probably cause loss of human life (§257.53). The impacts that dam breach flooding would have on structures and a primary access road for the area from Interstate 15 in close proximity to the breach, results in an appropriate classification at this time of "high hazard" for Ponds M5 and M7.

Therefore, this 2021 quinquennial review of the Hazard Assessment results in the "high hazard" classification remaining for Ponds M5 and M7. Because the ponds are classified as a high hazard potential CCR surface impoundments, a written EAP is maintained in the operating records as required by §257.73(a)(3)(i) and §257.105(F)(6)). The most recent EAP revision was April 2021 (Jacobs, 2021c).

6.0 CERTIFICATION

This section of the assessment contains the certification by a qualified professional engineer as required by Section 257.73(a)(2)(ii) of the CCR Rule.

PROFESSIONAL ENGINEER - STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-23
CIVIL
No. 19638

10/12/2021

Stephen M. Jones, P.E.

Digitally signed by Stephen M. Jones, P.E.
DN: C=US, E=steve.jones1@jacobs.com, O=Jacobs, CN="Stephen M. Jones, P.E."
Date: 2021.10.12 08:55:36-07'00'

The originally certified document inadvertently included Adobe comment call-outs on one map attachment. After the certification above, the call-outs were removed. No other changes were made, as certified below.

7.0 REFERENCES

CH2M HILL, Inc. 2011. *Reid Gardner Station Drawings for Construction of Mesa Evaporation Ponds – M5 and M7. Record Drawings.* Schedule A. July.

CH2M HILL, Inc. 2016. *Initial Hazard Potential Classification Assessment for CCR Surface Impoundments Ponds M5 and M7, Reid Gardner Generating Station.* October 12.

Jacobs Engineering Group Inc. (Jacobs). 2021a. *Notification of Intent to Initiate Closure, Pond M5, Reid Gardner Generating Station.* April 5.

Jacobs Engineering Group Inc. (Jacobs). 2021b. *Notification of Intent to Initiate Closure, Pond M7, Reid Gardner Generating Station.* April 5.

Jacobs Engineering Group (Jacobs). 2021c. *Emergency Action Plan, Ponds M5 and M7, Reid Gardner Generating Station.* Revision 3. April.

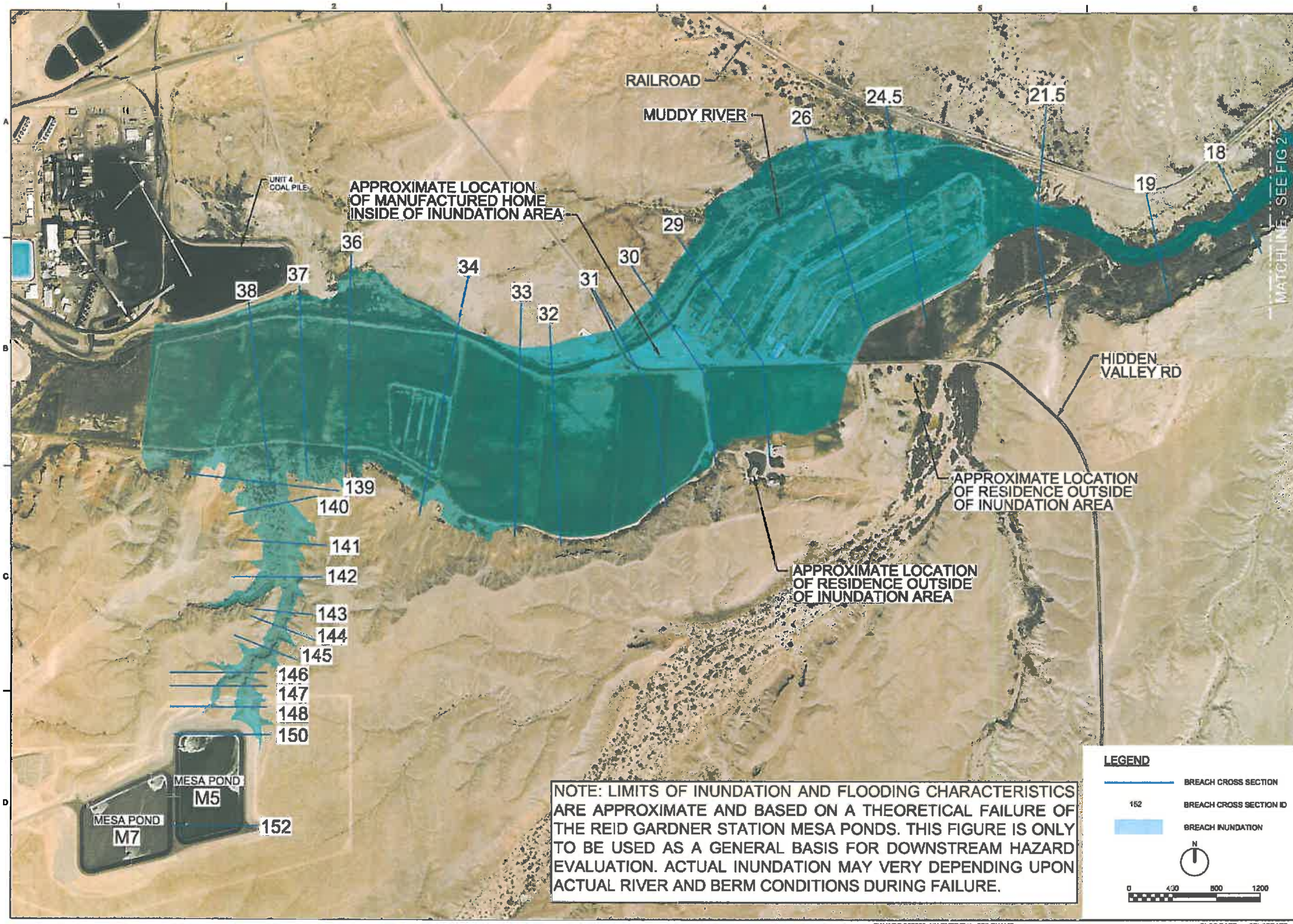
Jacobs Engineering Group Inc. (Jacobs). 2021d. *Quinquennial Safety Factor Assessment, Ponds M5 and M7, Reid Gardner Generating Station.* August 10.

8.0 LIST OF ATTACHMENTS

1. Previous Dam Breach Inundation Results – 2016 Analysis
2. Previous Dam Breach Inundation Results – 2010 Analysis
3. Dam Breach HEC-RAS Calculations – 2021 Analysis
4. Revised Dam Breach Inundation Map – 2021 Analysis

Attachment 1
Dam Breach Inundation Results – 2016 Analysis

Inundation Map – 2016



M5M7 BREACH INUNDATION MAP

REID GARDNER STATION
Moapa, Nevada

NV Energy

ch2m:

VERIFY SCALE

DATE	OCT 2016
PROJ	671059
DWG	FIG 1
SHEET	1 OF 2

PW-WBG:387230_NV ENERGY1 $FILENAME PLOT DATE: $PLOTDATE PLOT TIME: $PLOTTIME

ch2m:

RGS

M5M7 BREACH INUNDATION MAP

REID GARDNER STATION
Moapa, Nevada

NVEnergy

2485 VILLAGE VIEW DRIVE, SUITE 350
HENDERSON, NEVADA 89074
PHONE: 702-[illegible]-6175

NO.	DATE	REVISION	BY	APVD
0				

DSGN M.SCHWAB | DR R. VILORIA | CHK | APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

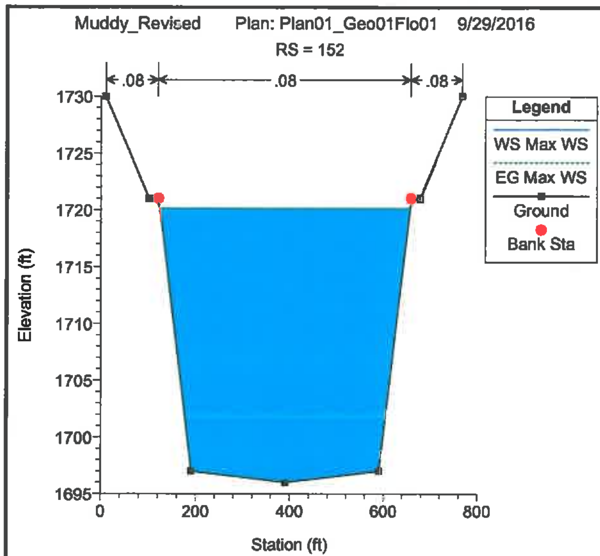
DATE	OCT 2016
PROJ	671059
DWG	FIG 2
SHEET	2 OF 2

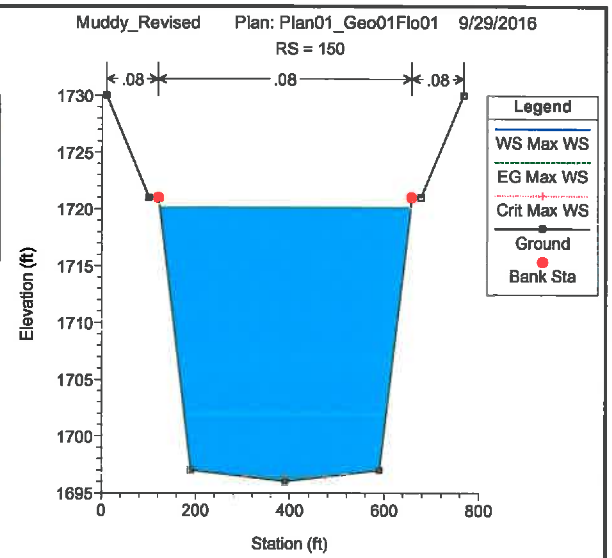
PW-WBG:387230_NV ENERGY\ RGS_M5M7_Breach_Analysis2_670439.dgn PLOT DATE: 2016\10\07 PLOT TIME: 10:27:11 AM

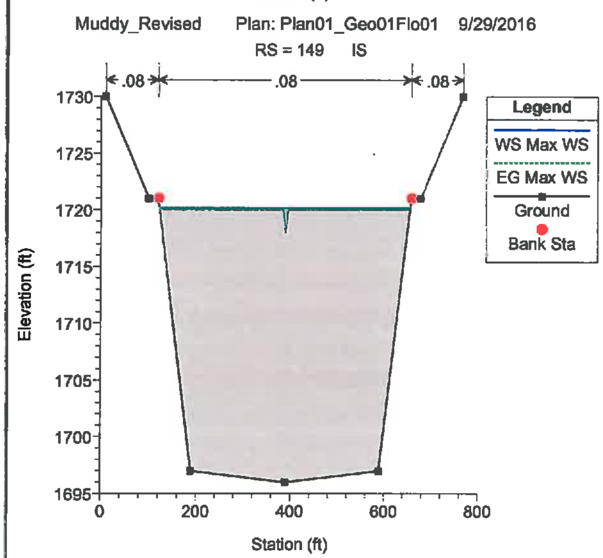
HEC-RAS Analysis Table and Sections - 2016

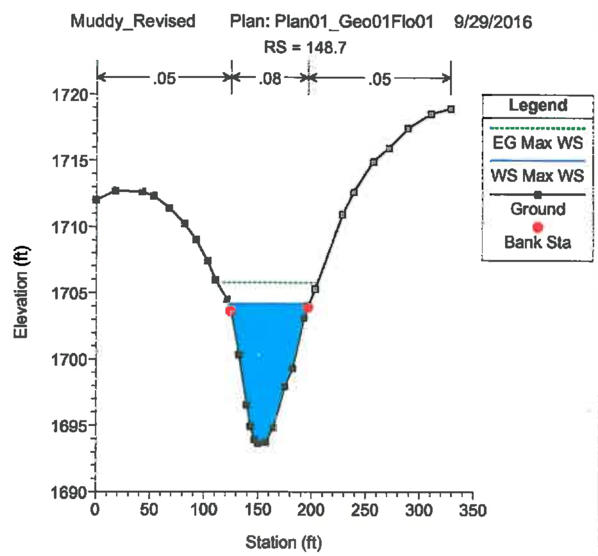
HEC-RAS Plan: Plan01 River: RIVER-1 Reach: Reach-1 Profile: Max WS

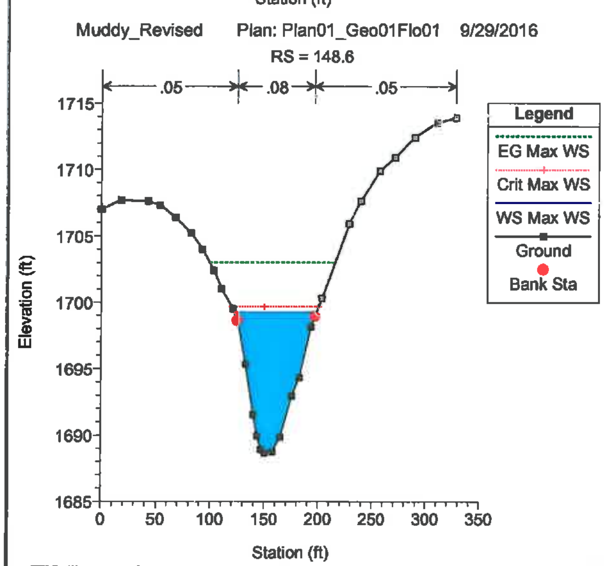
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	152	Max WS	100.00	1696.00	1720.13		1720.13	0.000000	0.01	10989.60	532.99	0.00
Reach-1	150	Max WS	99.97	1696.00	1720.13	1696.43	1720.13	0.000000	0.01	10989.60	532.99	0.00
Reach-1	149		Inl Struct									
Reach-1	148.7	Max WS	4619.34	1693.60	1704.16		1705.71	0.025691	10.01	462.24	74.84	0.69
Reach-1	148.6	Max WS	7267.19	1688.60	1699.22	1699.63	1702.99	0.061454	15.58	467.20	75.44	1.07
Reach-1	148.5	Max WS	7281.66	1683.60	1700.06		1700.79	0.005531	7.15	1094.11	141.23	0.36
Reach-1	148.3	Max WS	7253.21	1678.60	1686.19	1689.62	1697.42	0.281209	26.90	269.67	57.14	2.18
Reach-1	148	Max WS	7264.54	1673.60	1683.73	1684.63	1688.14	0.078514	16.84	431.39	71.08	1.20
Reach-1	147	Max WS	7055.68	1667.10	1678.46		1679.28	0.009812	7.24	974.46	120.69	0.45
Reach-1	146	Max WS	7279.86	1657.40	1669.26	1670.38	1673.29	0.089961	16.13	451.42	86.91	1.25
Reach-1	145	Max WS	7265.51	1626.50	1636.62	1639.24	1645.17	0.153370	23.47	309.62	47.11	1.61
Reach-1	144	Max WS	7253.56	1611.70	1621.87		1624.81	0.047114	13.77	526.64	77.63	0.93
Reach-1	143	Max WS	7215.02	1604.20	1615.97		1617.34	0.017628	9.41	766.90	97.41	0.59
Reach-1	142	Max WS	7198.49	1593.70	1601.24	1601.22	1603.83	0.055818	12.90	557.81	107.82	1.00
Reach-1	141	Max WS	7172.30	1583.10	1587.60		1588.59	0.033342	7.96	900.56	249.02	0.74
Reach-1	140	Max WS	7149.76	1575.20	1579.02		1579.52	0.019731	5.65	1266.47	397.22	0.56
Reach-1	139	Max WS	6401.05	1569.70	1575.15		1575.21	0.001494	2.04	3297.15	971.85	0.16
Reach-1	38	Max WS	6486.53	1561.36	1572.47		1572.57	0.002553	3.46	2840.01	1555.55	0.23
Reach-1	37	Max WS	6331.11	1559.89	1570.31		1570.58	0.006179	5.38	1838.92	1201.56	0.35
Reach-1	36.5	Max WS	5401.49	1559.35	1569.50		1569.56	0.002155	2.76	2754.55	1620.31	0.20
Reach-1	36	Max WS	4658.66	1558.80	1569.21		1569.24	0.000694	2.01	3478.99	1625.92	0.12
Reach-1	35	Max WS	4383.93	1557.60	1568.75		1568.82	0.001098	2.43	2181.28	793.65	0.15
Reach-1	34.5	Max WS	4326.19	1557.17	1568.29		1568.34	0.000910	2.18	2363.47	753.76	0.14
Reach-1	34	Max WS	4304.32	1556.58	1566.83		1567.18	0.009020	5.92	969.79	479.50	0.41
Reach-1	33	Max WS	4261.23	1554.70	1563.63		1563.83	0.005133	4.86	1519.21	1245.46	0.32
Reach-1	32.5	Max WS	4242.15	1553.20	1562.20		1562.45	0.007946	5.26	1348.39	1250.12	0.38
Reach-1	32	Max WS	4136.85	1551.92	1561.00		1561.12	0.003716	3.71	1648.89	1509.84	0.26
Reach-1	31	Max WS	3997.44	1550.90	1559.27		1559.38	0.003618	3.51	1635.76	1097.85	0.28
Reach-1	30	Max WS	3960.42	1549.89	1557.85		1557.94	0.002363	3.19	1862.60	1111.41	0.25
Reach-1	29	Max WS	3904.52	1548.90	1556.19		1556.33	0.004336	3.50	1473.36	1005.26	0.35
Reach-1	28	Max WS	3889.44	1547.89	1554.55		1554.63	0.002614	2.86	1843.37	1108.51	0.22
Reach-1	27	Max WS	3352.05	1546.89	1553.34		1553.38	0.001758	1.93	2060.29	1261.22	0.17
Reach-1	26	Max WS	3141.53	1545.80	1552.79		1552.81	0.000607	1.26	2787.03	1335.26	0.10
Reach-1	25.5	Max WS	3124.90	1545.25	1552.49		1552.53	0.001616	1.46	1954.04	1314.98	0.16
Reach-1	25	Max WS	3120.37	1544.80	1552.09		1552.15	0.002219	1.84	1641.10	998.02	0.18
Reach-1	24.5	Max WS	3104.58	1544.30	1551.10		1551.22	0.005623	2.89	1123.05	777.69	0.29
Reach-1	24	Max WS	3068.83	1543.33	1550.18		1550.27	0.003234	3.16	1396.59	975.68	0.24
Reach-1	23	Max WS	3022.79	1539.12	1548.55		1548.74	0.003123	3.91	930.40	419.45	0.25
Reach-1	22	Max WS	3017.99	1536.17	1546.23		1546.56	0.006242	4.61	654.33	115.52	0.34
Reach-1	21.5	Max WS	2956.89	1532.90	1542.80		1543.16	0.009368	4.79	616.84	139.75	0.40
Reach-1	21	Max WS	2805.13	1531.49	1541.40		1541.52	0.002123	2.76	1017.02	173.90	0.20
Reach-1	20	Max WS	2627.09	1527.60	1540.06		1540.15	0.001159	2.31	1139.73	162.95	0.15
Reach-1	19	Max WS	2528.53	1525.85	1538.84		1539.04	0.002498	3.52	717.60	92.20	0.22
Reach-1	18	Max WS	2493.78	1524.10	1538.09		1538.14	0.000517	1.77	1407.43	159.13	0.10
Reach-1	17	Max WS	2490.09	1522.80	1537.41		1537.51	0.000983	2.52	1005.38	133.48	0.15
Reach-1	16	Max WS	2484.37	1521.89	1536.81		1536.90	0.000894	2.37	1059.58	144.77	0.14
Reach-1	15	Max WS	2445.46	1520.46	1531.83		1532.29	0.007233	5.47	447.22	64.98	0.37
Reach-1	14	Max WS	2333.84	1517.78	1529.27		1529.36	0.001021	2.39	976.32	115.52	0.14
Reach-1	13	Max WS	2307.73	1514.10	1528.53		1528.65	0.001388	2.85	814.45	111.69	0.17
Reach-1	12	Max WS	2298.80	1511.61	1528.07		1528.14	0.000671	2.01	1141.28	125.55	0.12
Reach-1	11	Max WS	2283.30	1510.70	1526.10		1526.42	0.005333	4.55	501.59	71.81	0.30
Reach-1	10	Max WS	2267.16	1509.83	1524.38		1524.49	0.001278	2.69	842.62	96.21	0.16
Reach-1	9	Max WS	2256.11	1508.89	1523.01		1523.23	0.002774	3.75	601.79	74.49	0.23
Reach-1	8	Max WS	2210.61	1508.38	1521.41		1521.78	0.005756	4.90	469.35	97.44	0.33
Reach-1	7.2	Max WS	2184.17	1507.81	1520.55	1513.23	1520.65	0.001438	2.52	866.94	124.73	0.17
Reach-1	7.15		Bridge									
Reach-1	7.1	Max WS	2182.10	1507.69	1520.43		1520.53	0.001580	2.58	846.89	127.05	0.18
Reach-1	7	Max WS	2152.70	1506.15	1519.44		1519.61	0.002123	3.35	641.86	74.69	0.20
Reach-1	6.5	Max WS	2097.01	1505.32	1518.16		1518.57	0.005952	5.11	410.15	52.63	0.32
Reach-1	6	Max WS	2059.00	1504.27	1517.36		1517.39	0.000337	1.34	1541.76	195.63	0.08
Reach-1	5	Max WS	2047.79	1503.14	1516.80		1516.88	0.001055	2.34	873.67	110.29	0.15
Reach-1	4	Max WS	2037.26	1502.33	1515.22		1515.43	0.003270	3.67	554.98	82.37	0.25
Reach-1	3.2	Max WS	2035.65	1502.10	1514.83	1508.15	1514.97	0.001744	2.98	683.23	86.15	0.19
Reach-1	3.15		Bridge									
Reach-1	3.1	Max WS	2034.25	1501.30	1514.23		1514.39	0.002243	3.23	629.78	84.72	0.21
Reach-1	3	Max WS	2030.16	1501.67	1513.48		1513.67	0.002812	3.49	581.23	83.11	0.23
Reach-1	2	Max WS	2026.07	1500.90	1512.36		1512.46	0.001574	2.55	795.31	121.43	0.18
Reach-1	1	Max WS	2024.97	1500.25	1508.22		1508.72	0.011721	5.72	354.20	71.41	0.45
Reach-1	0.5	Max WS	2024.72	1499.87	1506.90	1503.84	1507.18	0.002422	4.29	471.51	91.79	0.33


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 152
.08
.08
.08
Legend
WS Max WS
EG Max WS
Ground
Bank Sta
Elevation (ft)
1730
1725
1720
1715
1710
1705
1700
1695
0
200
400
600
800
Station (ft)


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 150
.08
.08
.08
Legend
WS Max WS
EG Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
1730
1725
1720
1715
1710
1705
1700
1695
0
200
400
600
800
Station (ft)


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 149 IS
.08
.08
.08
Legend
WS Max WS
EG Max WS
Ground
Bank Sta
Elevation (ft)
1730
1725
1720
1715
1710
1705
1700
1695
0
200
400
600
800
Station (ft)


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 148.7
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1720
1715
1710
1705
1700
1695
1690
0
50
100
150
200
250
300
350
Station (ft)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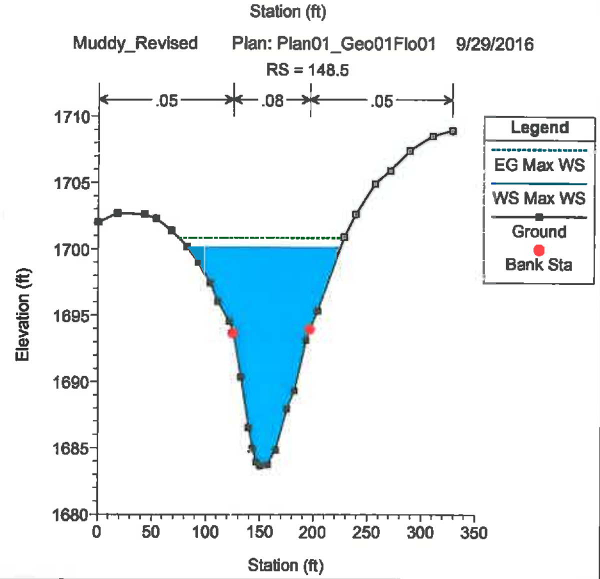
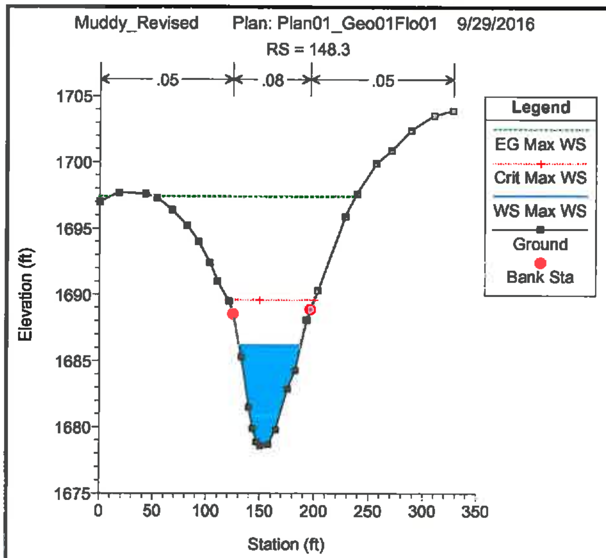
RS = 148.6
.05
.08
.05
Legend
EG Max WS
Crit Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1715
1710
1705
1700
1695
1690
1685
0
50
100
150
200
250
300
350
Station (ft)


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 148.5
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1710
1705
1700
1695
1690
1685
1680
0
50
100
150
200
250
300
350
Station (ft)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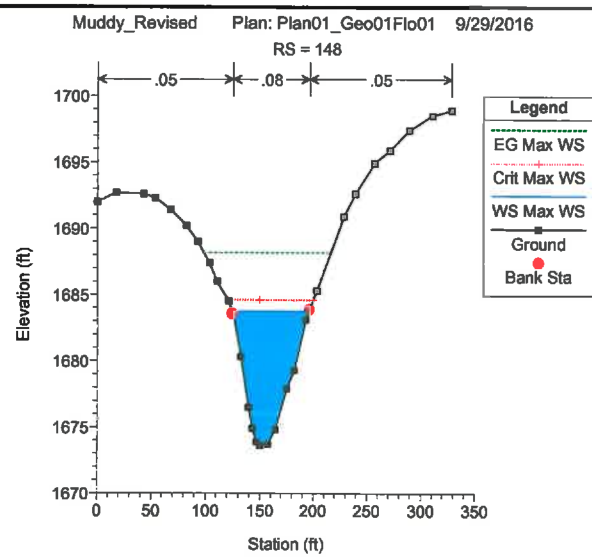
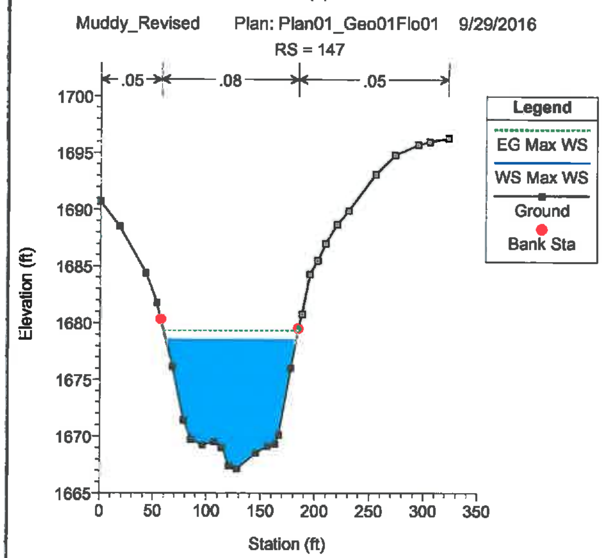
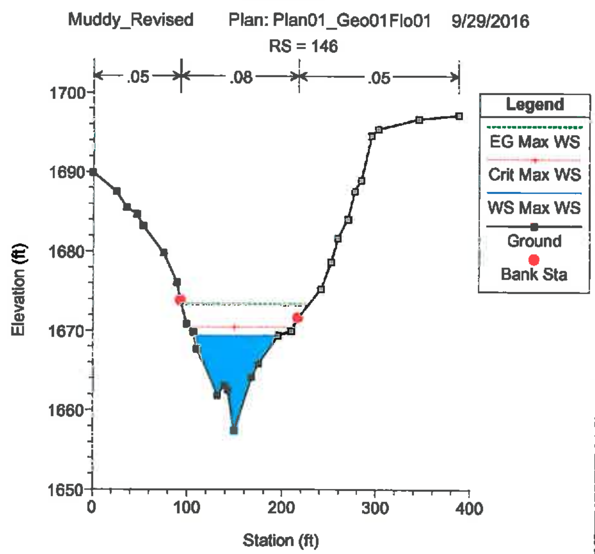
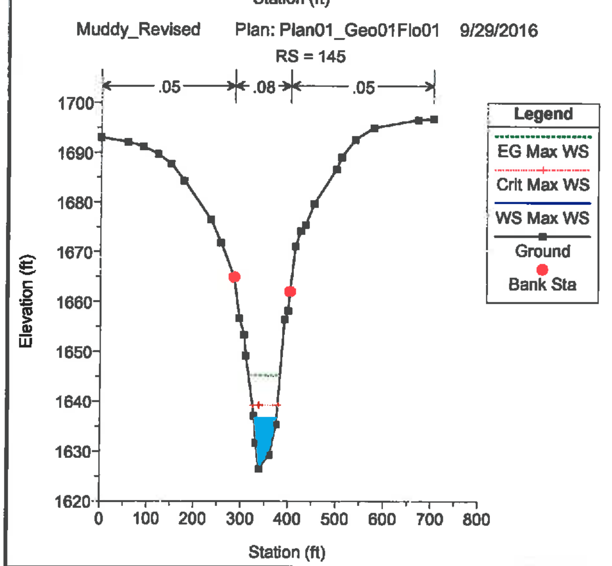
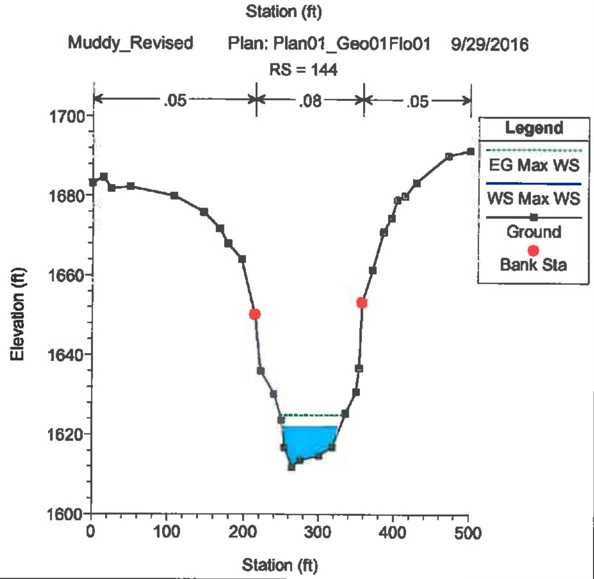
RS = 148.3
.05
.08
.05
Elevation (ft)
Station (ft)
1705
1700
1695
1690
1685
1680
1675
0 50 100 150 200 250 300 350
Legend
EG Max WS
Crit Max WS
WS Max WS
Ground
Bank Sta

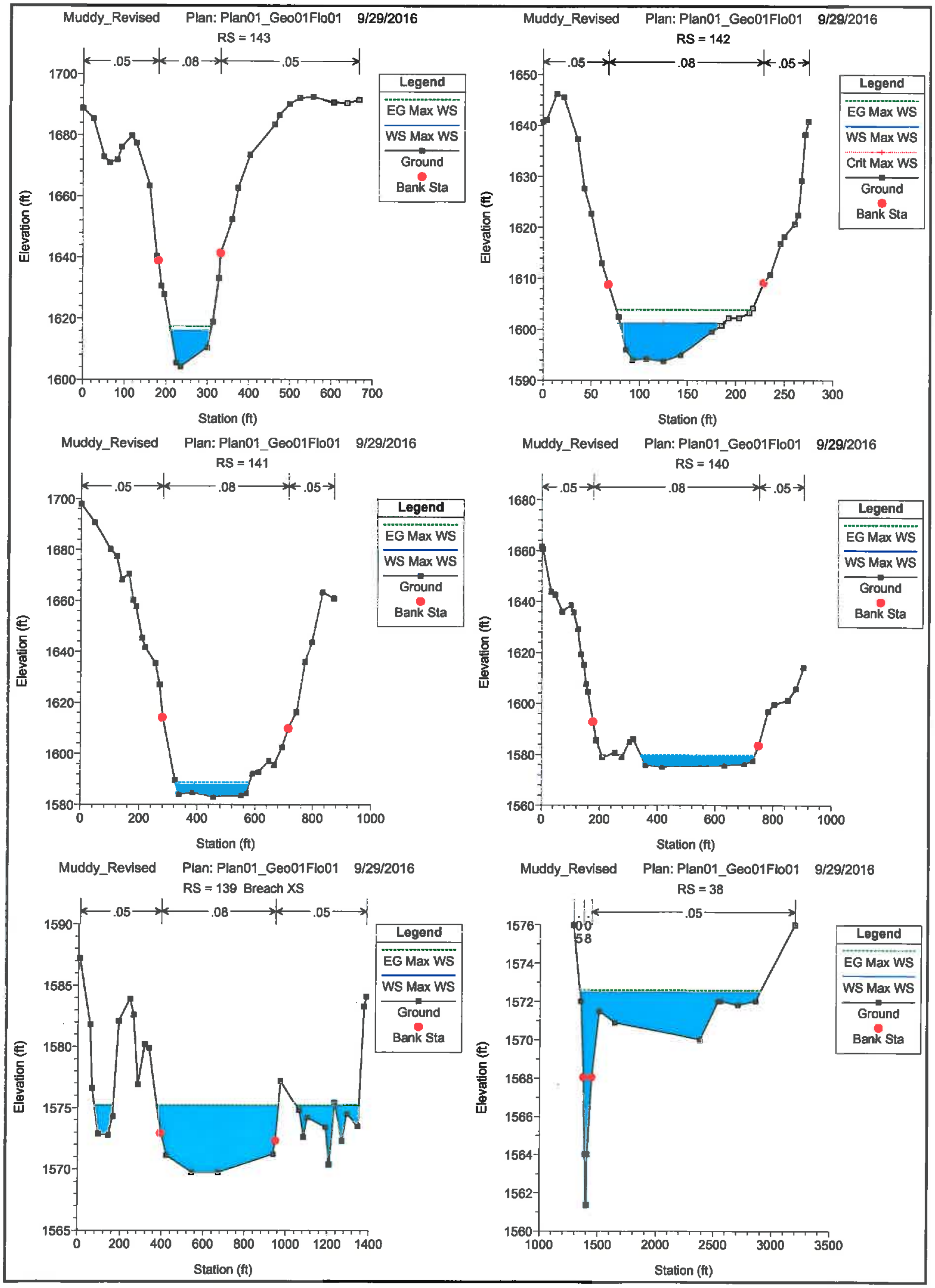

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 148
.05
.08
.05
Elevation (ft)
Station (ft)
1700
1695
1690
1685
1680
1675
1670
0 50 100 150 200 250 300 350
Legend
EG Max WS
Crit Max WS
WS Max WS
Ground
Bank Sta


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 147
.05
.08
.05
Elevation (ft)
Station (ft)
1700
1695
1690
1685
1680
1675
1670
1665
0 50 100 150 200 250 300 350
Legend
EG Max WS
WS Max WS
Ground
Bank Sta

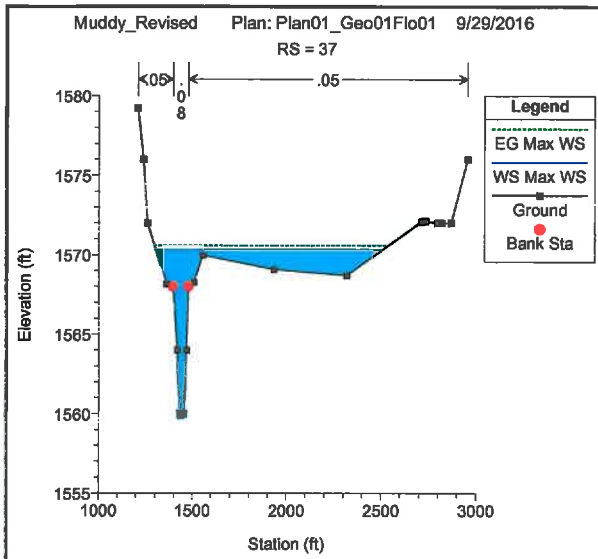

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 146
.05
.08
.05
Elevation (ft)
Station (ft)
1700
1690
1680
1670
1660
1650
0 100 200 300 400
Legend
EG Max WS
Crit Max WS
WS Max WS
Ground
Bank Sta

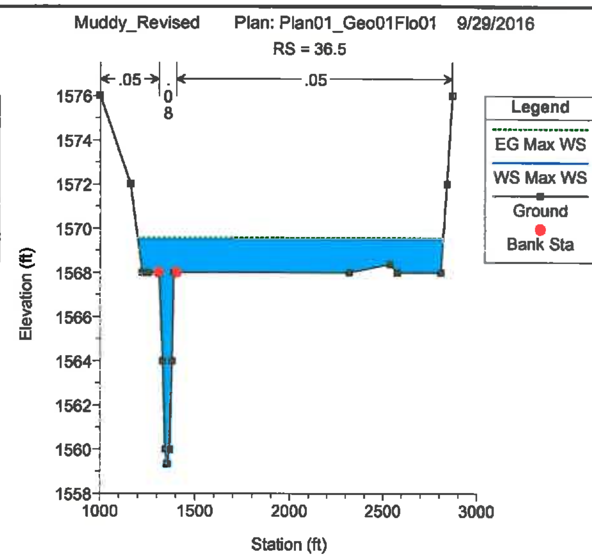

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 145
.05
.08
.05
Elevation (ft)
Station (ft)
1700
1690
1680
1670
1660
1650
1640
1630
1620
0 100 200 300 400 500 600 700 800
Legend
EG Max WS
Crit Max WS
WS Max WS
Ground
Bank Sta


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 144
.05
.08
.05
Elevation (ft)
Station (ft)
1700
1680
1660
1640
1620
1600
0 100 200 300 400 500
Legend
EG Max WS
WS Max WS
Ground
Bank Sta



Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 143
.05 .08 .05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 142
.05 .08 .05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 141
.05 .08 .05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 140
.05 .08 .05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 139 Breach XS
.05 .08 .05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 38
.05
Elevation (ft)
Station (ft)
Legend
EG Max WS
WS Max WS
Ground
Bank Sta


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 37
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1555
1560
1565
1570
1575
1580
1000
1500
2000
2500
3000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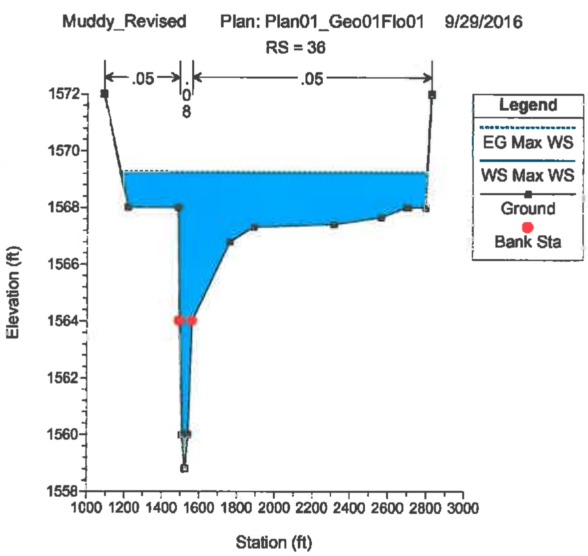
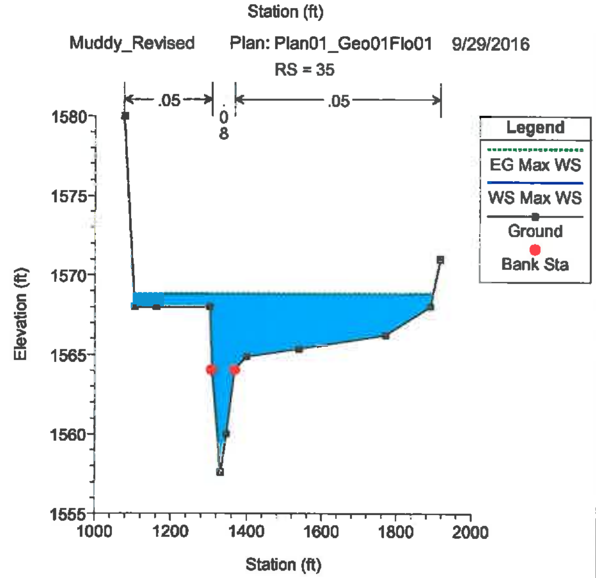
RS = 36.5
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1558
1560
1562
1564
1566
1568
1570
1572
1574
1576
1000
1500
2000
2500
3000


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 36
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1558
1560
1562
1564
1566
1568
1570
1572
1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000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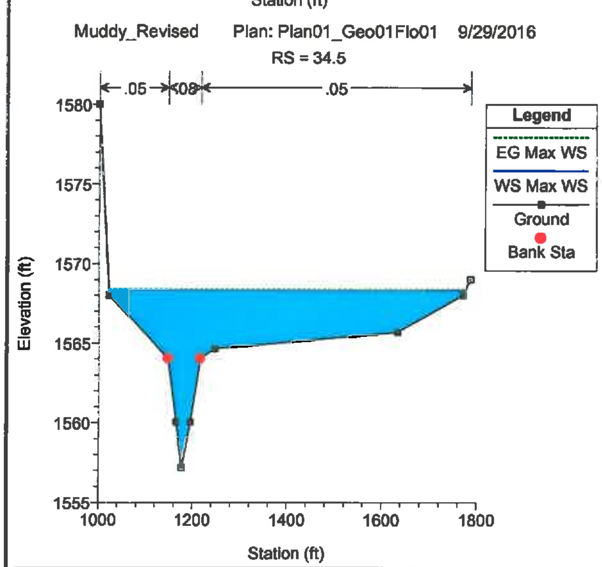
RS = 35
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1555
1560
1565
1570
1575
1580
1000
1200
1400
1600
1800
2000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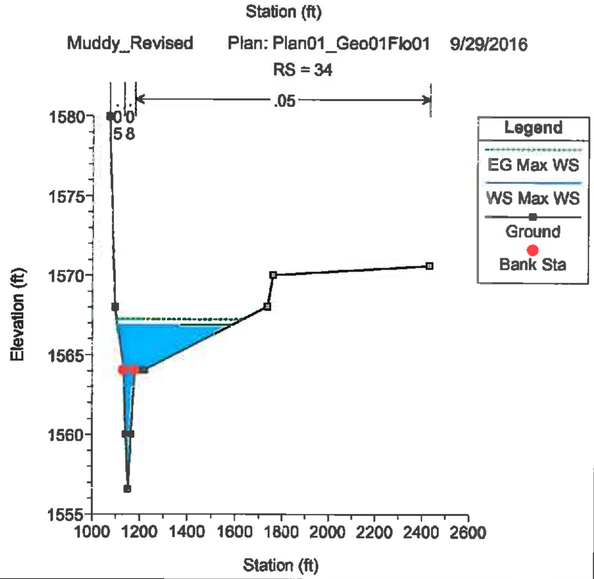
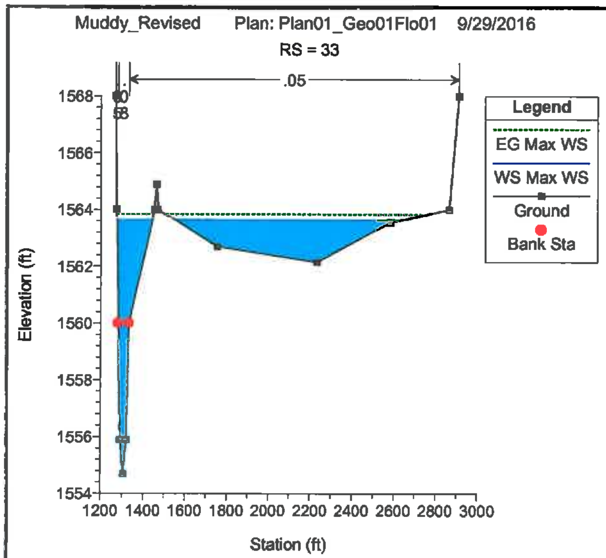
RS = 34.5
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1555
1560
1565
1570
1575
1580
1000
1200
1400
1600
1800


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 34
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1555
1560
1565
1570
1575
1580
1000 1200 1400 1600 1800 2000 2200 2400 2600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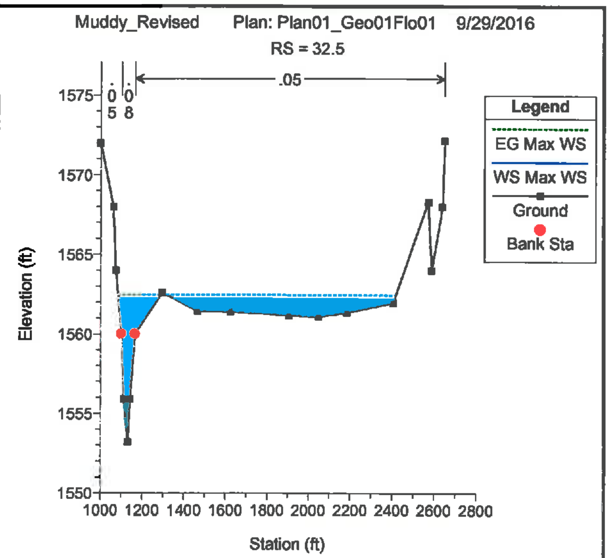
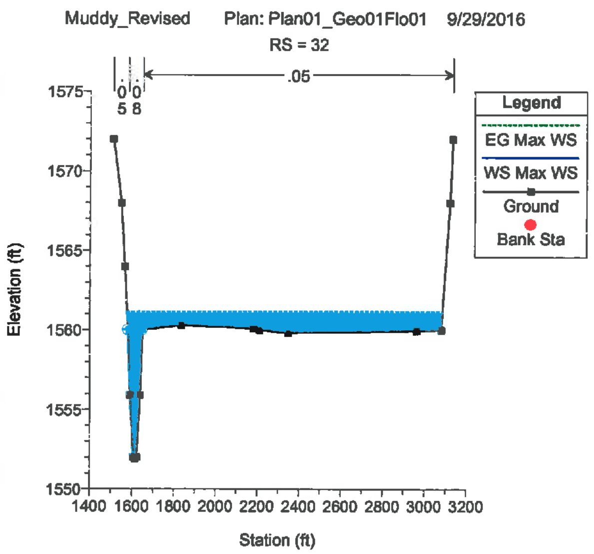
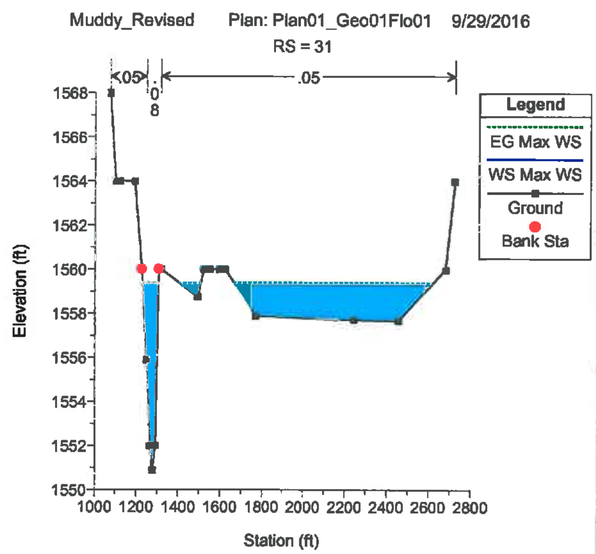
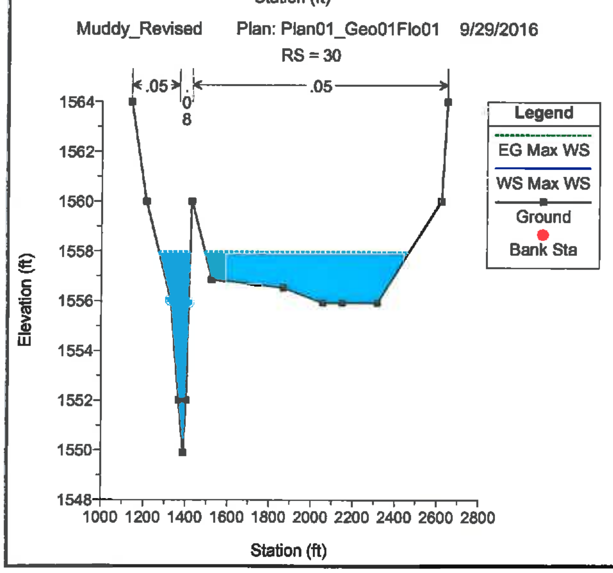
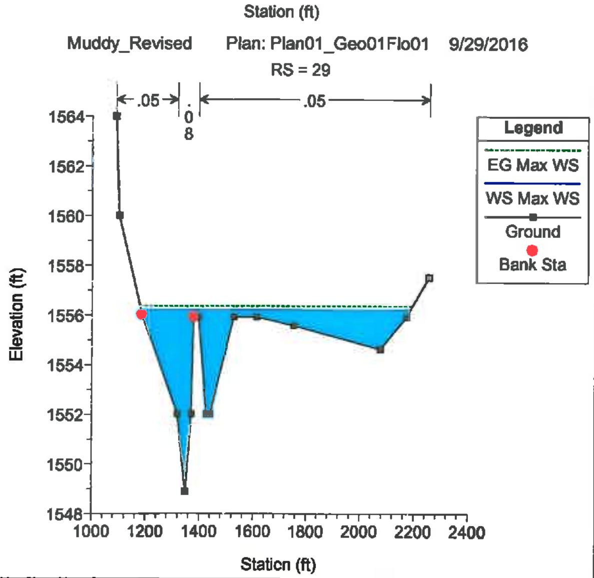
RS = 33
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

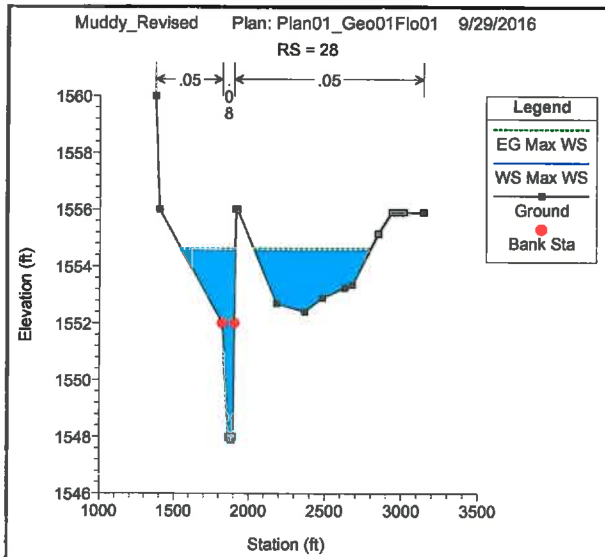

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 32.5
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

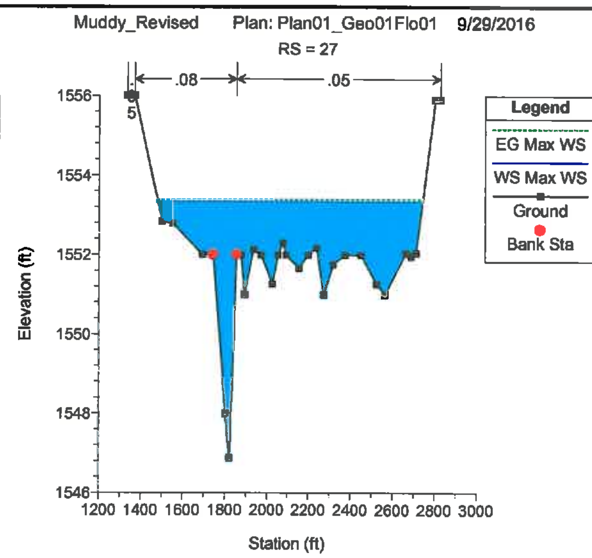

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 32
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

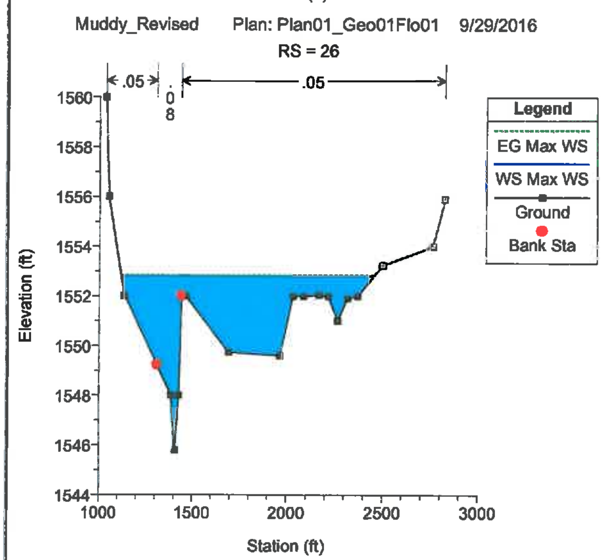

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 31
.05
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

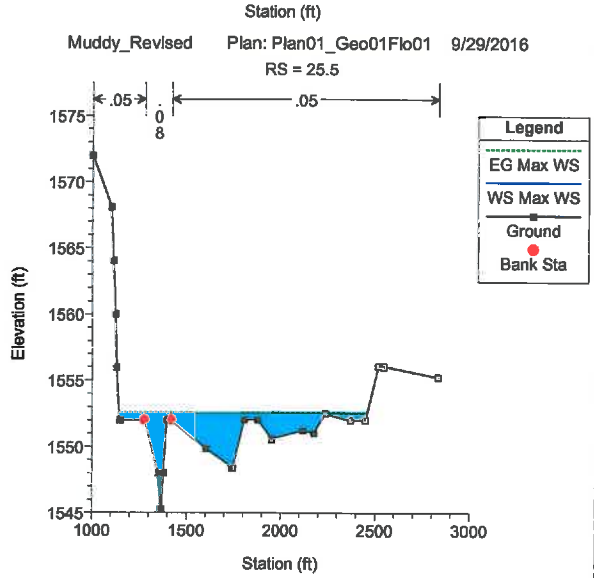

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 30
.05
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

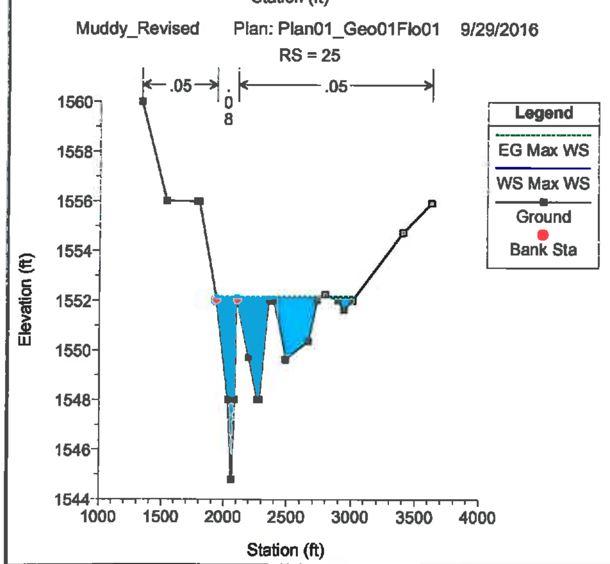

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 29
.05
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

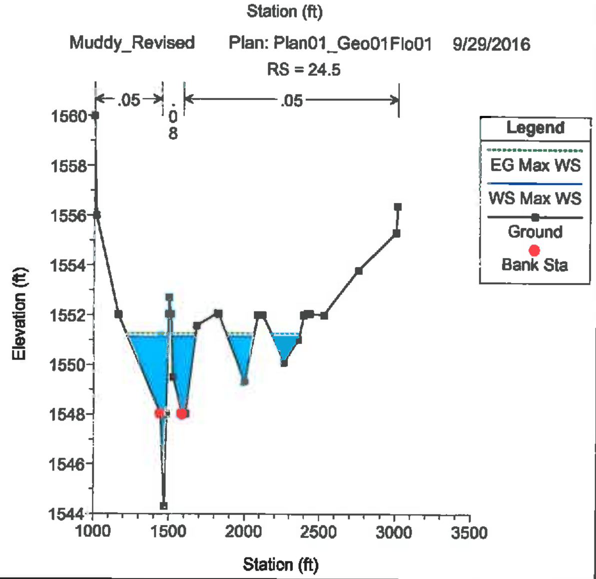

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 28
.05
0
8
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1546
1548
1550
1552
1554
1556
1558
1560
1000
1500
2000
2500
3000
3500

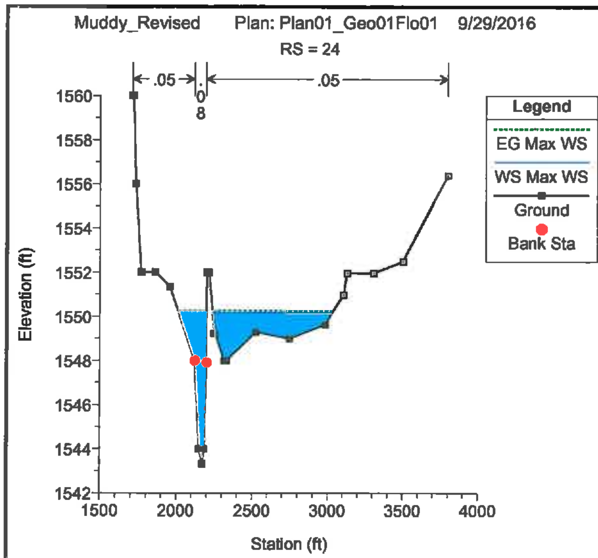

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 27
5
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1546
1548
1550
1552
1554
1556
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000

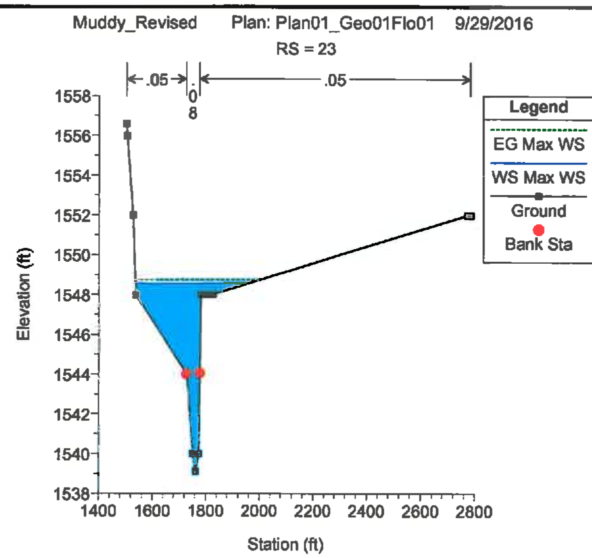

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 26
.05
0
8
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1544
1546
1548
1550
1552
1554
1556
1558
1560
1000
1500
2000
2500
3000

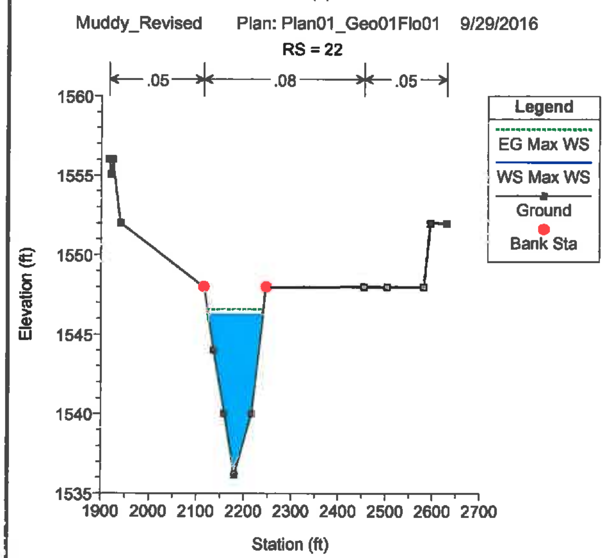

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 25.5
.05
0
8
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1545
1550
1555
1560
1565
1570
1575
1000
1500
2000
2500
3000

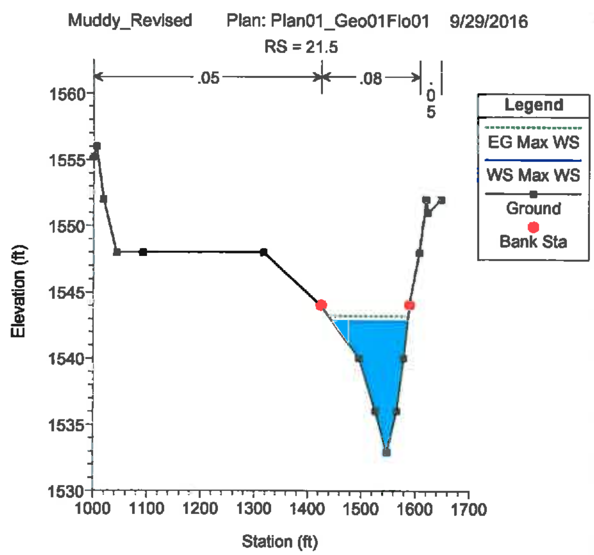

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 25
.05
0
8
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1544
1546
1548
1550
1552
1554
1556
1558
1560
1000
1500
2000
2500
3000
3500
4000

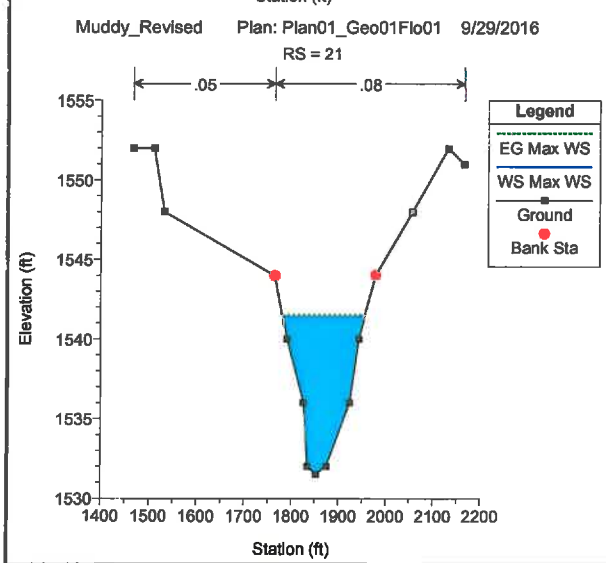

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 24.5
.05
0
8
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1544
1546
1548
1550
1552
1554
1556
1558
1560
1000
1500
2000
2500
3000
3500

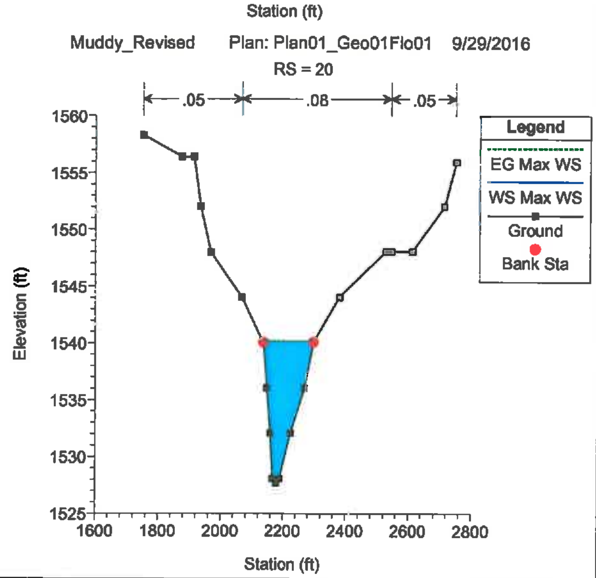

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 24
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1542
1544
1546
1548
1550
1552
1554
1556
1558
1560
1500
2000
2500
3000
3500
4000
Station (ft)

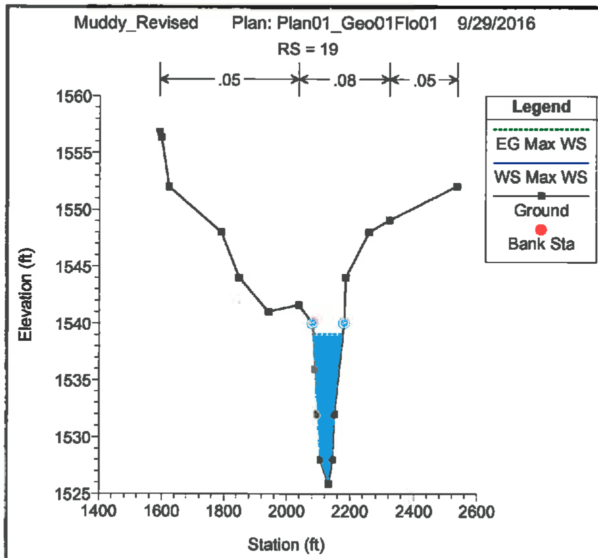

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 23
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1538
1540
1542
1544
1546
1548
1550
1552
1554
1556
1558
1400
1600
1800
2000
2200
2400
2600
2800
Station (ft)

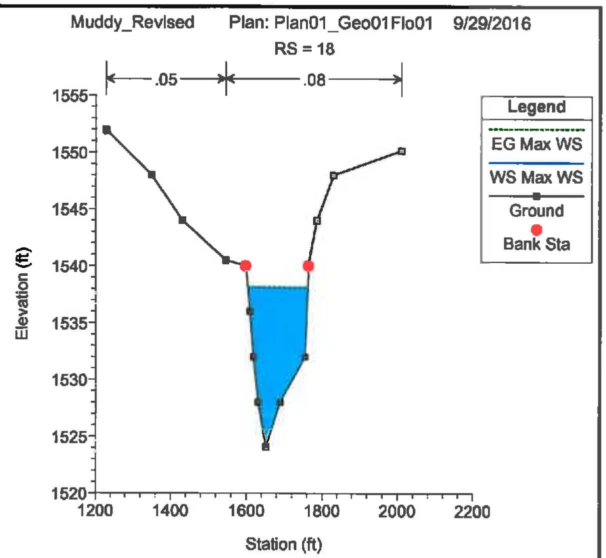

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 22
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1535
1540
1545
1550
1555
1560
1900
2000
2100
2200
2300
2400
2500
2600
2700
Station (ft)

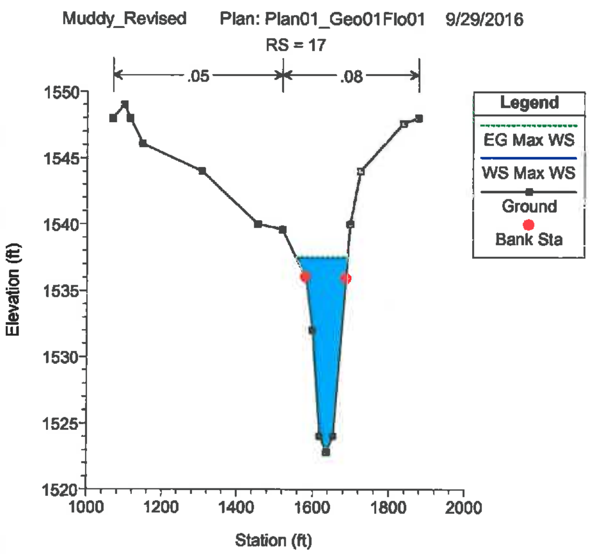

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 21.5
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1530
1535
1540
1545
1550
1555
1560
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)

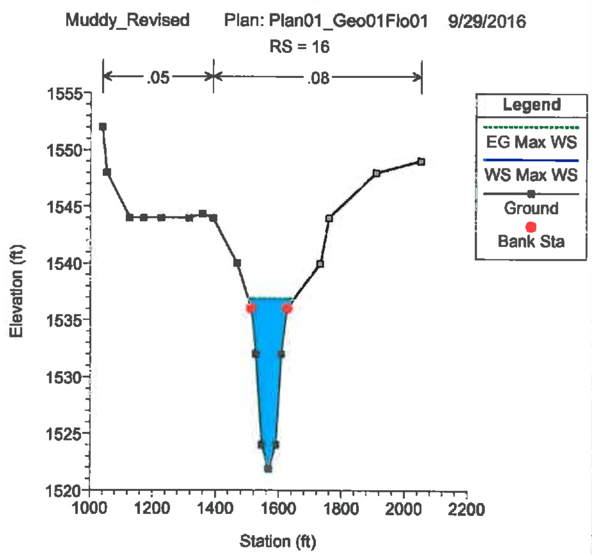

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 21
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1530
1535
1540
1545
1550
1555
1400
1500
1600
1700
1800
1900
2000
2100
2200
Station (ft)

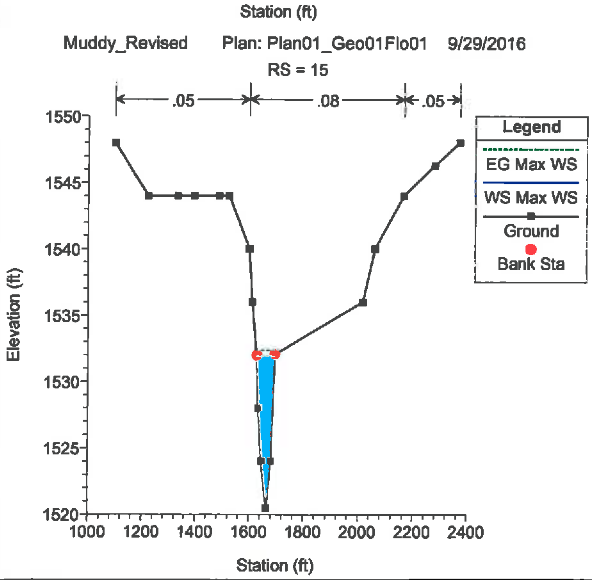

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 20
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1525
1530
1535
1540
1545
1550
1555
1560
1600
1800
2000
2200
2400
2600
2800
Station (ft)

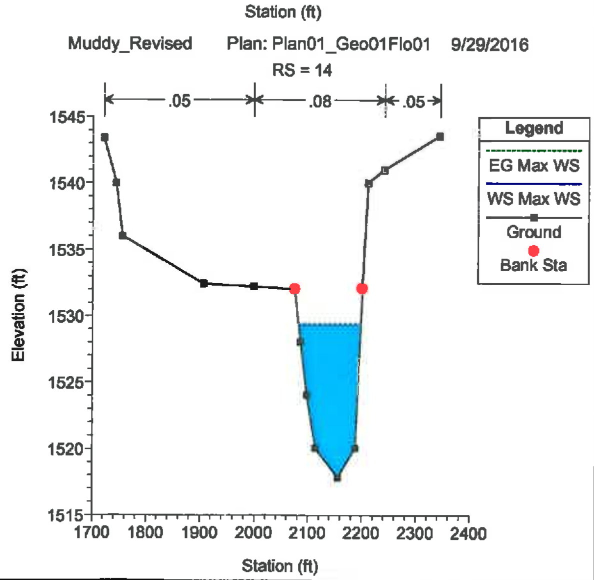

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 19
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1525 1530 1535 1540 1545 1550 1555 1560
Station (ft)
1400 1600 1800 2000 2200 2400 2600

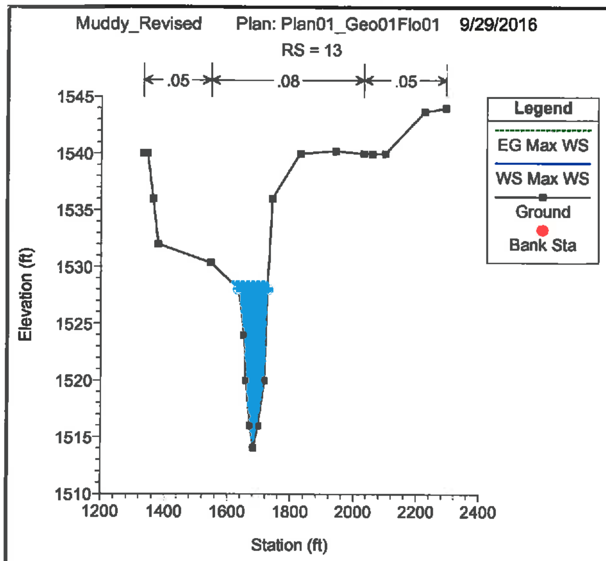

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 18
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1520 1525 1530 1535 1540 1545 1550 1555
Station (ft)
1200 1400 1600 1800 2000 2200

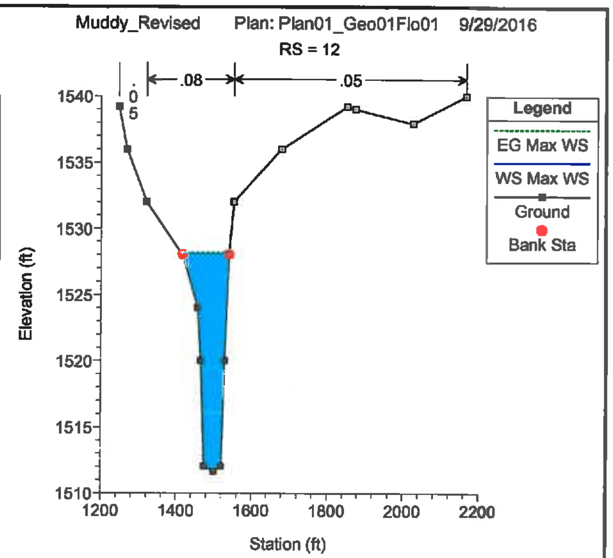

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 17
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1520 1525 1530 1535 1540 1545 1550
Station (ft)
1000 1200 1400 1600 1800 2000

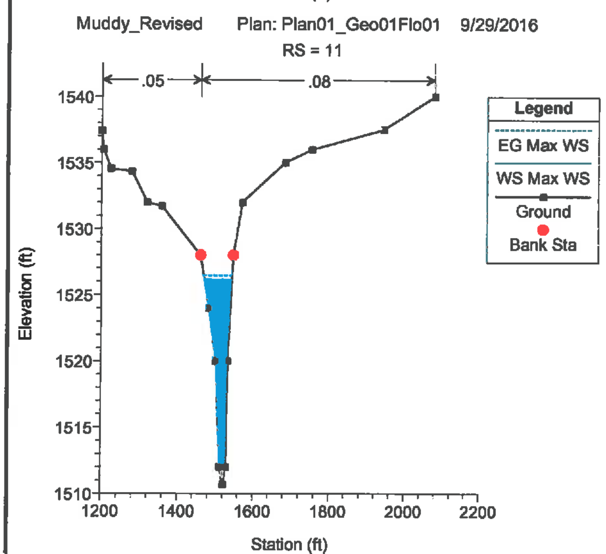

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 16
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1520 1525 1530 1535 1540 1545 1550 1555
Station (ft)
1000 1200 1400 1600 1800 2000 2200

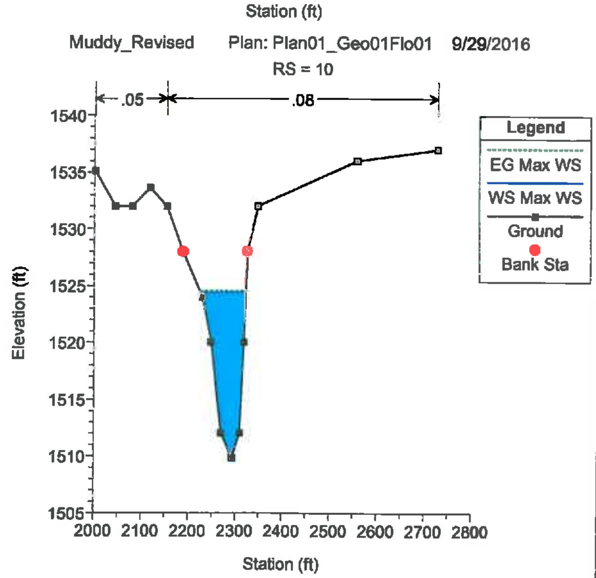

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 15
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1520 1525 1530 1535 1540 1545 1550
Station (ft)
1000 1200 1400 1600 1800 2000 2200 2400

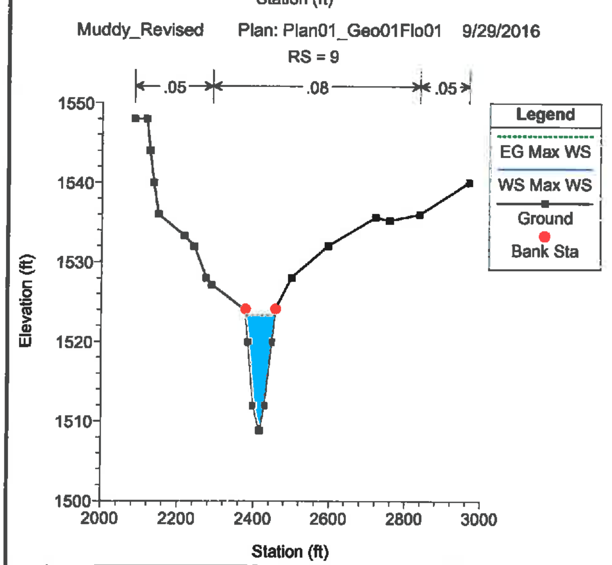

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 14
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
1515 1520 1525 1530 1535 1540 1545
Station (ft)
1700 1800 1900 2000 2100 2200 2300 2400

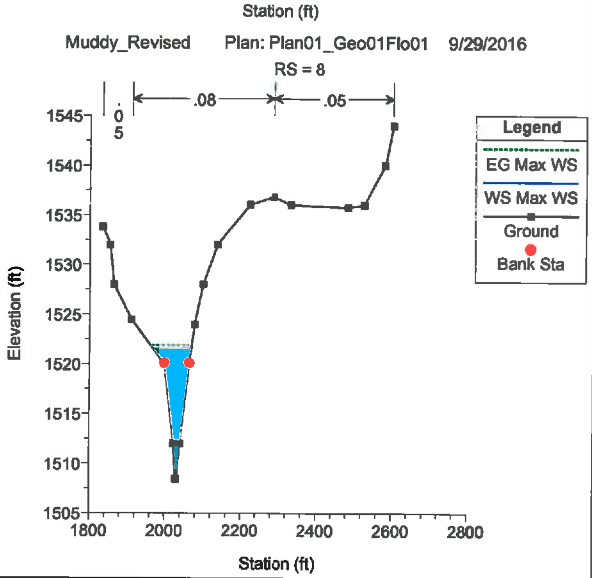

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 13
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1510
1515
1520
1525
1530
1535
1540
1545
1200
1400
1600
1800
2000
2200
2400


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 12
0
5
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1510
1515
1520
1525
1530
1535
1540
1200
1400
1600
1800
2000
2200


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 11
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1510
1515
1520
1525
1530
1535
1540
1200
1400
1600
1800
2000
2200


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 10
.05
.08
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1505
1510
1515
1520
1525
1530
1535
1540
2000
2100
2200
2300
2400
2500
2600
2700
2800


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 9
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1510
1520
1530
1540
1550
2000
2200
2400
2600
2800
3000


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 8
0
5
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1505
1510
1515
1520
1525
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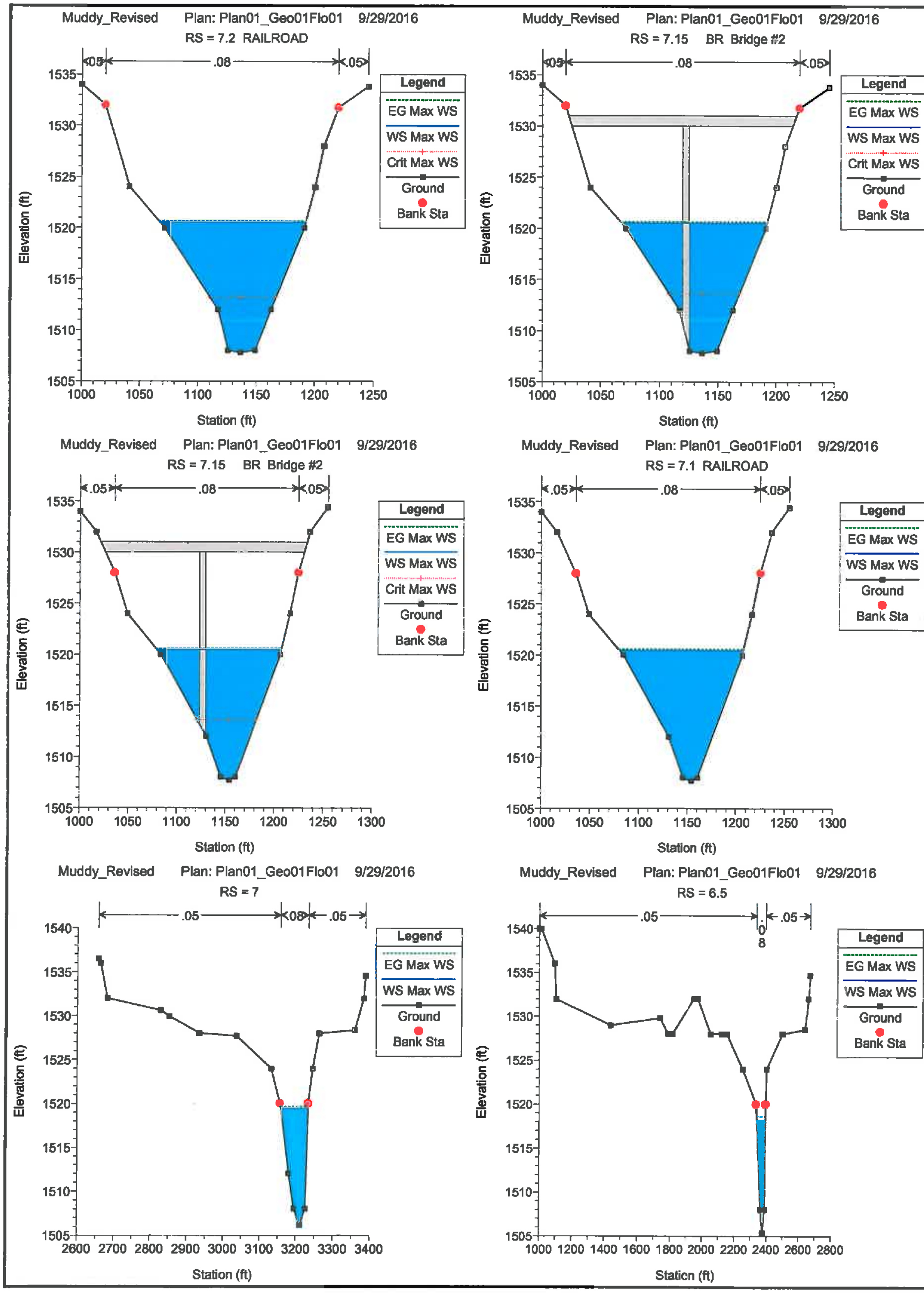
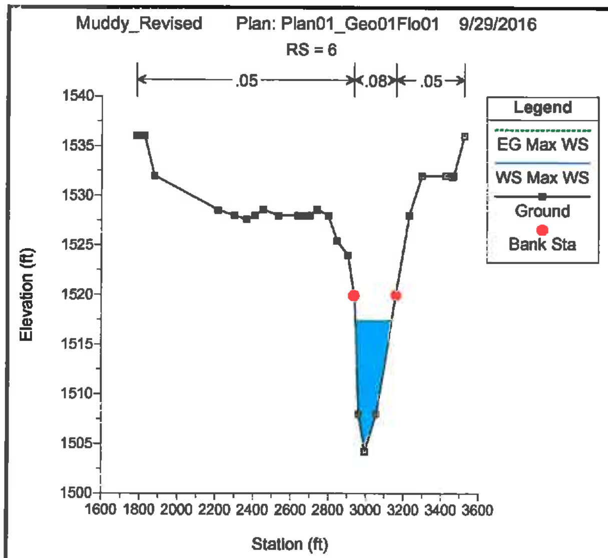
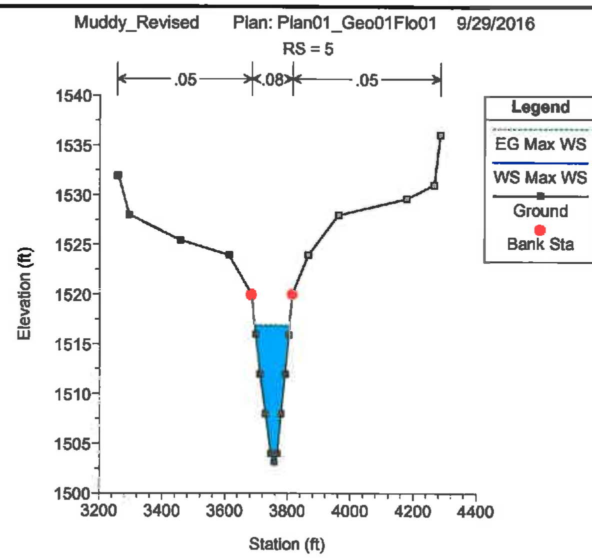
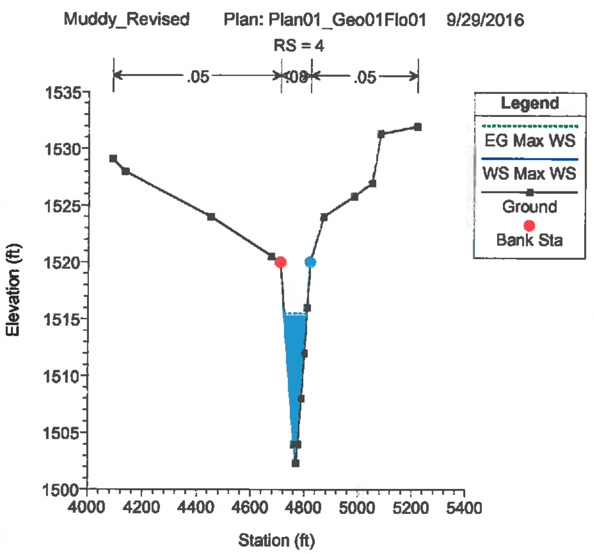
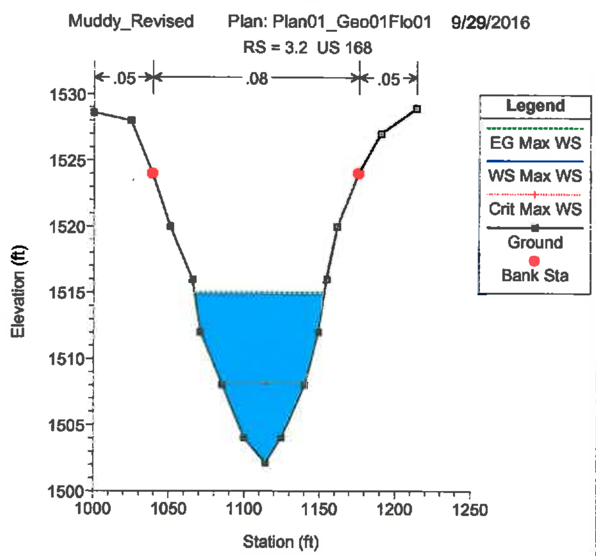
1535
1540
1545
1800
2000
2200
2400
2600
2800

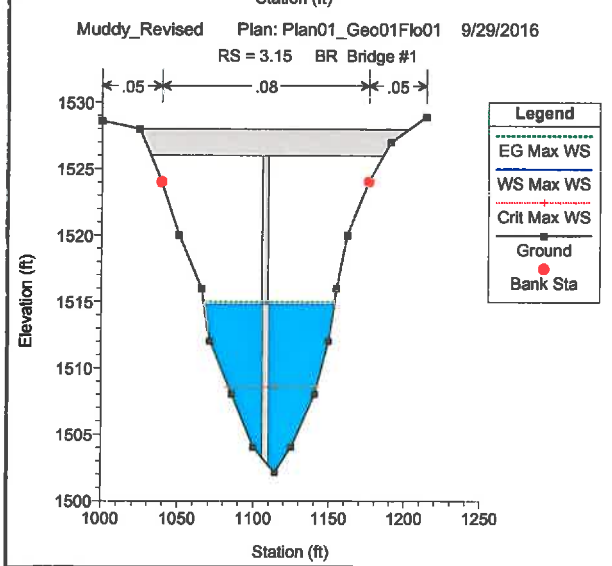

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 7.2 RAILROAD
.05 .08 .05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 7.15 BR Bridge #2
.05 .08 .05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 7.15 BR Bridge #2
.05 .08 .05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 7.1 RAILROAD
.05 .08 .05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 7
.05 .08 .05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 6.5
.05 0.08 .05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)

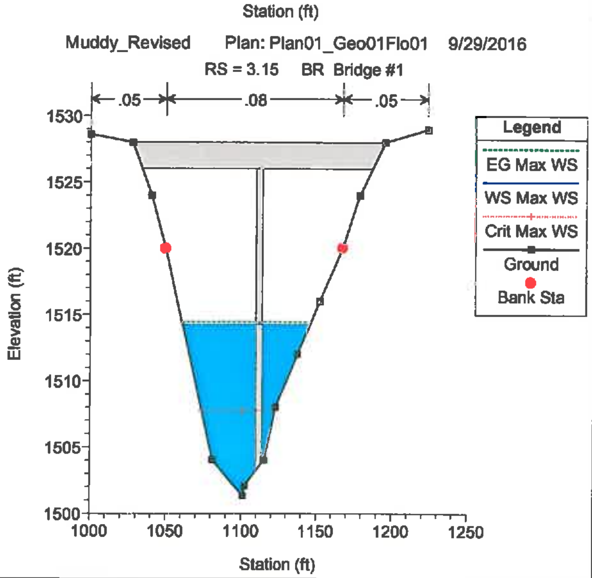

Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 6
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1535
1540
1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 5
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1535
1540
3200 3400 3600 3800 4000 4200 4400


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 4
.05
.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1535
4000 4200 4400 4600 4800 5000 5200 5400


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 3.2 US 168
.05
.08
.05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1000 1050 1100 1150 1200 1250


Muddy_Revised Plan: Plan01_Geo01Flo01 9/29/2016
RS = 3.15 BR Bridge #1
.05
.08
.05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1000 1050 1100 1150 1200 1250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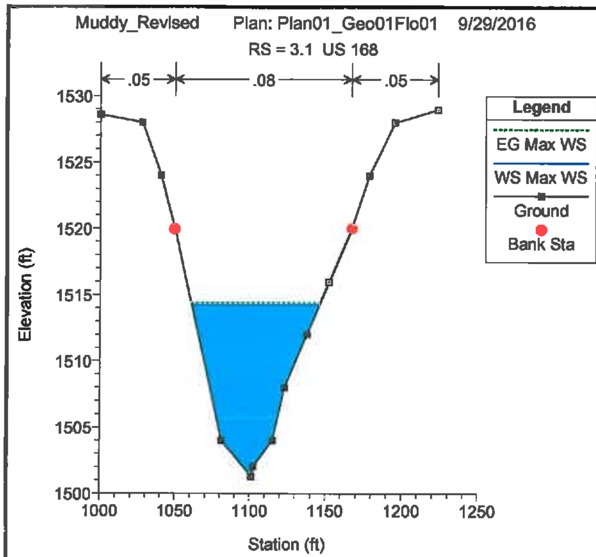
.08
.05
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1505
1510
1515
1520
1525
1530
1000 1050 1100 1150 1200 1250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.08
.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
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1505
1510
1515
1520
1525
1530
Station (ft)
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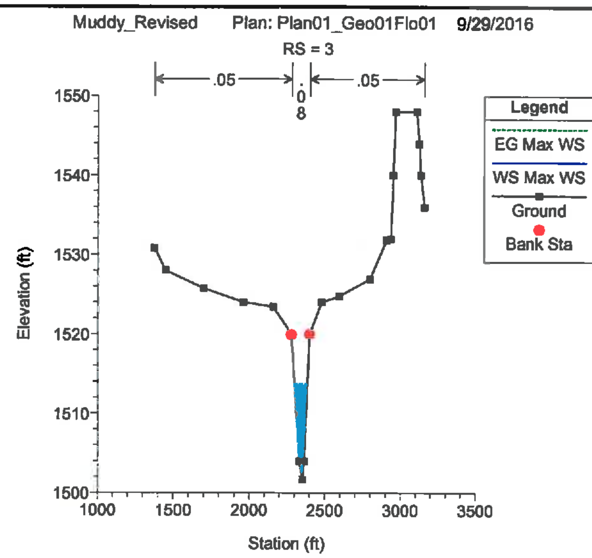
1050
1100
1150
1200
1250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Legend
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WS Max WS
Ground
Bank Sta
Elevation (ft)
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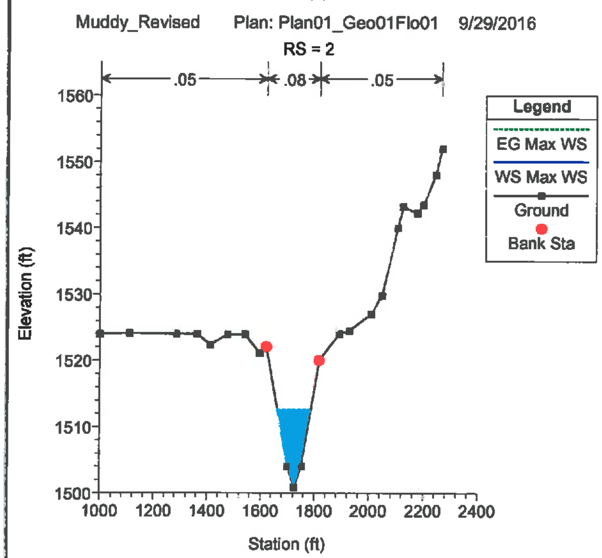
1510
1520
1530
1540
1550
Station (ft)
1000
1500
2000
2500
3000
3500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.05
Legend
EG Max WS
WS Max WS
Ground
Bank Sta
Elevation (ft)
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1510
1520
1530
1540
1550
1560
Station (ft)
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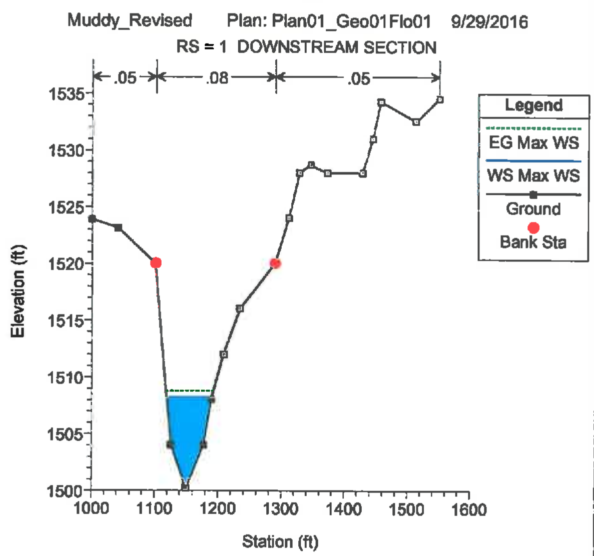
1200
1400
1600
1800
2000
2200
2400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WS Max WS
Ground
Bank Sta
Elevation (ft)
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Station (ft)
1000
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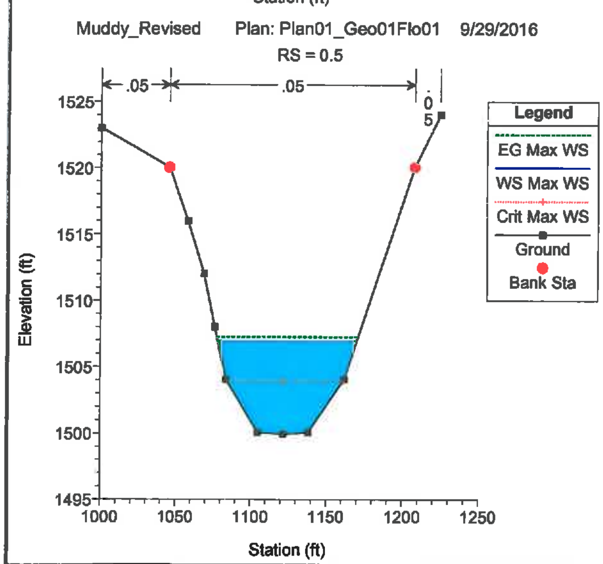
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Bank Sta
Elevation (ft)
1495
1500
1505
1510
1515
1520
1525
Station (ft)
1000
1050
1100
1150
1200
1250

Attachment 2
Dam Breach Inundation Results – 2010 Analysis

MEMO

Minneapolis, MN

TO: Becky Svatos, P.E. – Project Manager **DATE:** September 20, 2010

FROM: Andrew Judd, P.E. – Hydraulic Engineer

SUBJECT: Nevada Energy – Reid Gardner Station
Proposed Mesa Ponds M5 & M7
Dam Breach Analysis and Results

The purpose of this analysis is to evaluate the downstream hydraulic impacts (inundation) due to a "sunny day" breach of one of the proposed Mesa Evaporation Ponds to be constructed at Nevada Energy's Reid Gardner Station. The facility is located on the Muddy River, 3 miles west of Glendale, Nevada. Breach flows from the ponds would be conveyed by the Muddy River. The Dam Breach Analysis model was developed utilizing the cross-sections from the 1996 Flood Insurance Study (FIS) for Muddy River. The vertical datum of the cross-sectional data is NAVD 1988.

Analysis

The analysis consisted of the following steps:

- Obtain Muddy River HEC-2 model of the Moapa Reach (extends upstream of Reid Gardner Station and downstream to Glendale) from the 1996 FIS analysis.
- Import HEC-2 model into HEC-RAS.
- Adjust Muddy River HEC-RAS model to replicate the FIS results (peak water surface elevation) of the HEC-2 model.
- Obtain digital elevation model (DEM) of the Reid Gardner Site (1-meter resolution).
- Obtain FEMA Digital Flood Insurance Rate Map (DFIRM) which is a GIS representation of the Flood Insurance Study (FIS) elements, including floodplain extents and FIS cross-section locations.
- Develop Mesa Pond breach channel cross-sections down existing gulley that is the most likely pathway for breach flows using DEM connecting Mesa Ponds to Muddy River.
- Create HEC-RAS Dam Breach Model (Dam Breach Model) using new Mesa Pond breach channel cross-sections and FIS Muddy River geometry.
- Run Dam Breach Model and establish peak water surface elevations in downstream channel cross-sections.
- Create Dam Breach Inundation Maps for Mesa Ponds and downstream section of Muddy River.

The following is a list of Analysis assumptions/comments:

- The Dam Breach Model ends at the City of Glendale (downstream end at cross-section BH).
- A constant base flow of 100 cfs was included in the Dam Breach Model (helps prevent unsteady HEC-RAS model from crashing).
- Breach channel cross-sections used Manning's roughness coefficients similar to the FIS cross-sections.
- Bridges from the HEC-2 model were included in the HEC-RAS model.
- The dam/breach enters the Muddy River Channel at cross-section BZ in the FIS
- The breach occurs with water level at the top of the embankment at hour 4.0
- The breach does not coincide with a flooding event on Muddy River (Sunny Day Failure).

Pond breach parameters were developed using the Federal Energy Regulatory Commission guidelines. The M5 and M7 Mesa Ponds are of similar size, height and volume. Pond M5 has a more direct connection to the Muddy River (i.e. flood wave would have less opportunity to dissipate) so was used for the breach simulation. Pond Geometry and Breach Parameters are summarized by the following:

- Reservoir top of embankment elevation – 1720.0 ft
- Water surface area at 1720.0 ft – 13.8 Acres
- Reservoir volume at 1720.0 – 260 ac-ft
- Reservoir bottom elevation – 1697.0 ft
- Water surface area at 1697.0 ft – 9.2 Acres
- Water elevation at time of breach – 1720.0 ft
- Bottom of breach elevation – 1697.0 ft
- Side slope of breach – 0.75H:1V
- Breach bottom width – 40 ft
- Time to breach = 0.6 hr

Results

- The Dam Breach Model results are compared in Table 1 to the FIS water surface elevations which are representative of the 100-year flood.
- Table 2 compares the Dam Breach Model sunny day failure peak elevations with the Dam Breach Model no failure elevations.
- Maps 1 and 2 display the analysis cross-sections, inundation and floodplain extents, and aerial imagery.
- The flows for the 10 and 50 year events were not available for the upper reach of Muddy River and floodplain extents were not available for the full reach of Muddy River.

Conclusions

- The flood wave peak flow from the Dam Breach Model is 90% of the peak 100-year flow from the FIS model at the point where the breach flow enters the Muddy River Channel (FIS cross-section BZ, near the Reid Gardner Site).
- The flood wave peak flow from the Dam Breach Model is 12% of the peak 100-year flow from the FIS model at the downstream end near where the Muddy River flows through the City of Glendale (FIS cross-section BH).
- The Dam Breach Model estimated a travel time for the leading edge of the flood wave (beginning of significant rise in flow) of approximately 2 hours and a travel time for the peak of the flood wave of approximately 2.8 hours from the Mesa Ponds to the City of Glendale (FIS cross-section BH).
- Flood depths from the Dam Breach Model in the City of Glendale are in the range of 10 feet from the deepest point in the channel.
- The Dam Breach Model demonstrated the flood wave peak elevations through the City of Glendale are contained within the channel banks and will continue to attenuate (dissipate) downstream.

Table 1: Dam Breach Model – Sunny Day Failure

Cross Section Number	River Mile (mi)	FIS – 10 yr	FIS – 50 yr	FIS – 100 yr		Dam Breach Model – Sunny Day Failure			
								Arrival Time (hr)	
		Flow (cfs)	Flow (cfs)	Flow (cfs)	Elev (ft)	Peak Flow (cfs)	Peak Elev (ft)	Peak	Leading Edge
BZ	11.022	na	na	6500	1572.3	5447	1572.2	0.63	0.33
BY	11.119	na	na	6500	1570.4	5461	1570.1	0.65	0.38
BX	11.213	na	na	6500	1569.8	4052	1568.9	0.82	0.38
BW	11.456	na	na	6500	1567.3	3747	1566.6	0.88	0.45
BV	11.646	na	na	6500	1561.6	3625	1560.9	0.98	0.53
BU	11.933	na	na	6500	1556.8	3386	1556.0	1.17	0.63
BT	12.225	na	na	6500	1553.7	2897	1552.6	1.43	0.77
BS	12.371	na	na	6500	1552.2	2862	1551.0	1.50	0.82
BR	12.700	na	na	6500	1550	2747	1542.5	1.72	0.98
BQ	13.032	3620	10900	16000	1547.8	2306	1538.4	1.98	1.12
BP	13.430	3620	10900	16000	1543.5	2266	1536.4	2.00	1.37
BO	13.876	3620	10900	16000	1538.9	2104	1528.0	2.32	1.47
BN	14.193	3620	10900	16000	1535.6	2060	1523.9	2.40	1.58
BM	14.376	3620	10900	16000	1533.2	2013	1520.9	2.50	1.63
BL	14.536	3620	10900	16000	1530.6	1958	1518.9	2.58	1.75
BK	14.649	3620	10900	16000	1529.8	1901	1517.7	2.65	1.80
BJ	14.919	3620	10900	16000	1528.8	1845	1514.8	2.73	1.90
BI	15.018	3620	10900	16000	1526.6	1842	1513.8	2.75	1.95
BH	15.123	3620	10900	16000	1525.9	1839	1513.1	2.77	1.97

Notes:

na – Not Available

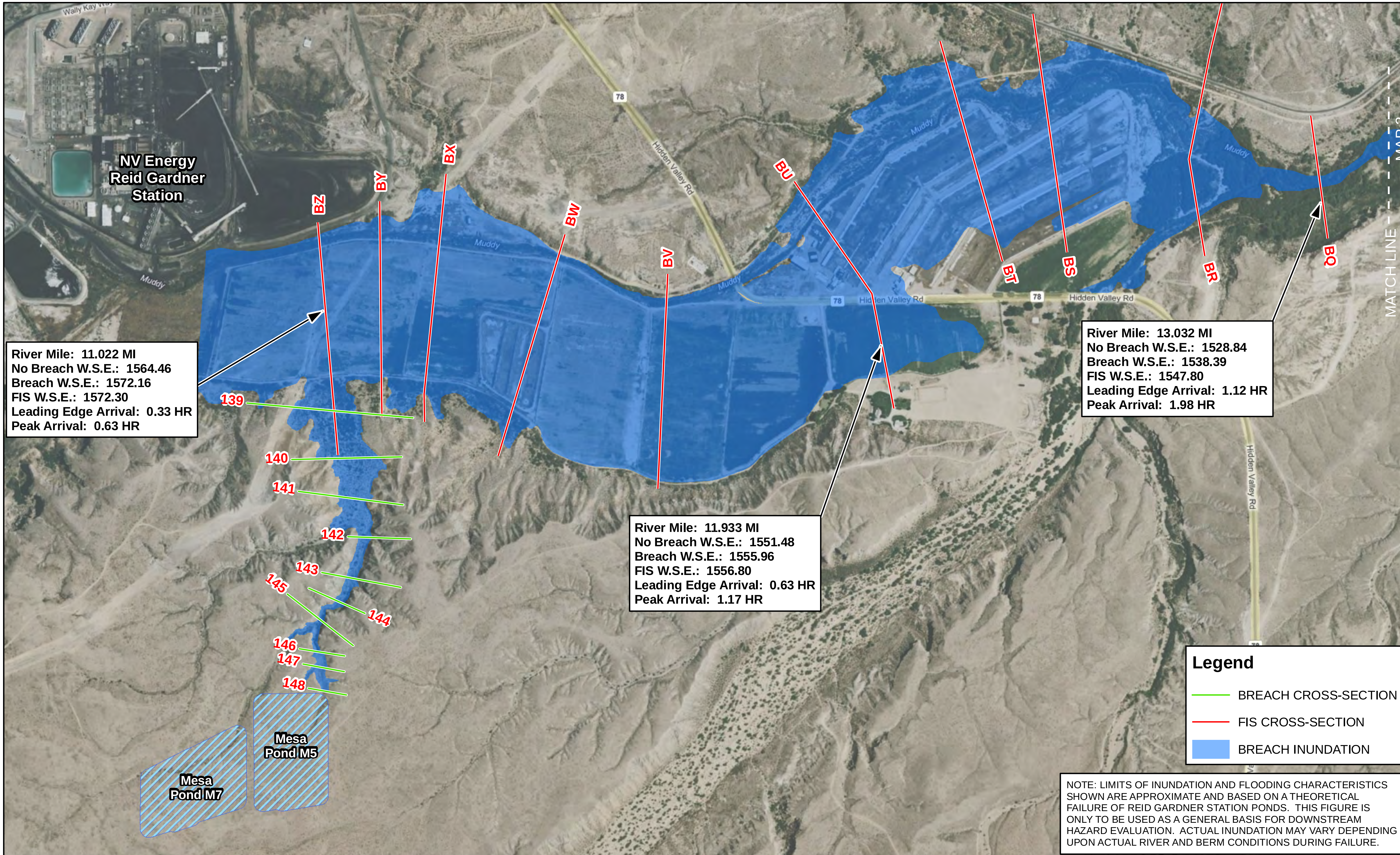
Vertical Datum is NAVD 1988

Table 2: Elevation Difference

Cross Section Number	River Mile (mi)	Sunny Day Failure		No Failure		Elevation Difference (ft)
		Peak Flow (cfs)	Peak Elev (ft)	Flow (cfs)	Elev (ft)	
BZ	11.022	5447	1572.2	100	1564.5	7.7
BY	11.119	5461	1570.1	100	1562.9	7.2
BX	11.213	4052	1568.9	100	1562.4	6.5
BW	11.456	3747	1566.6	100	1560.1	6.5
BV	11.646	3625	1560.9	100	1555.0	5.9
BU	11.933	3386	1556.0	100	1551.5	4.5
BT	12.225	2897	1552.6	100	1549.3	3.3
BS	12.371	2862	1551.0	100	1547.1	3.9
BR	12.700	2747	1542.5	100	1535.5	7.0
BQ	13.032	2306	1538.4	100	1528.8	9.6
BP	13.430	2266	1536.4	100	1525.4	11.0
BO	13.876	2104	1528.0	100	1515.8	12.2
BN	14.193	2060	1523.9	100	1513.8	10.1
BM	14.376	2013	1520.9	100	1511.7	9.3
BL	14.536	1958	1518.9	100	1509.4	9.5
BK	14.649	1901	1517.7	100	1508.2	9.5
BJ	14.919	1845	1514.8	100	1506.7	8.1
BI	15.018	1842	1513.8	100	1505.6	8.2
BH	15.123	1839	1513.1	100	1505.3	7.81

Notes:

Vertical Datum is NAVD 1988



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Stanley Consultants INC.

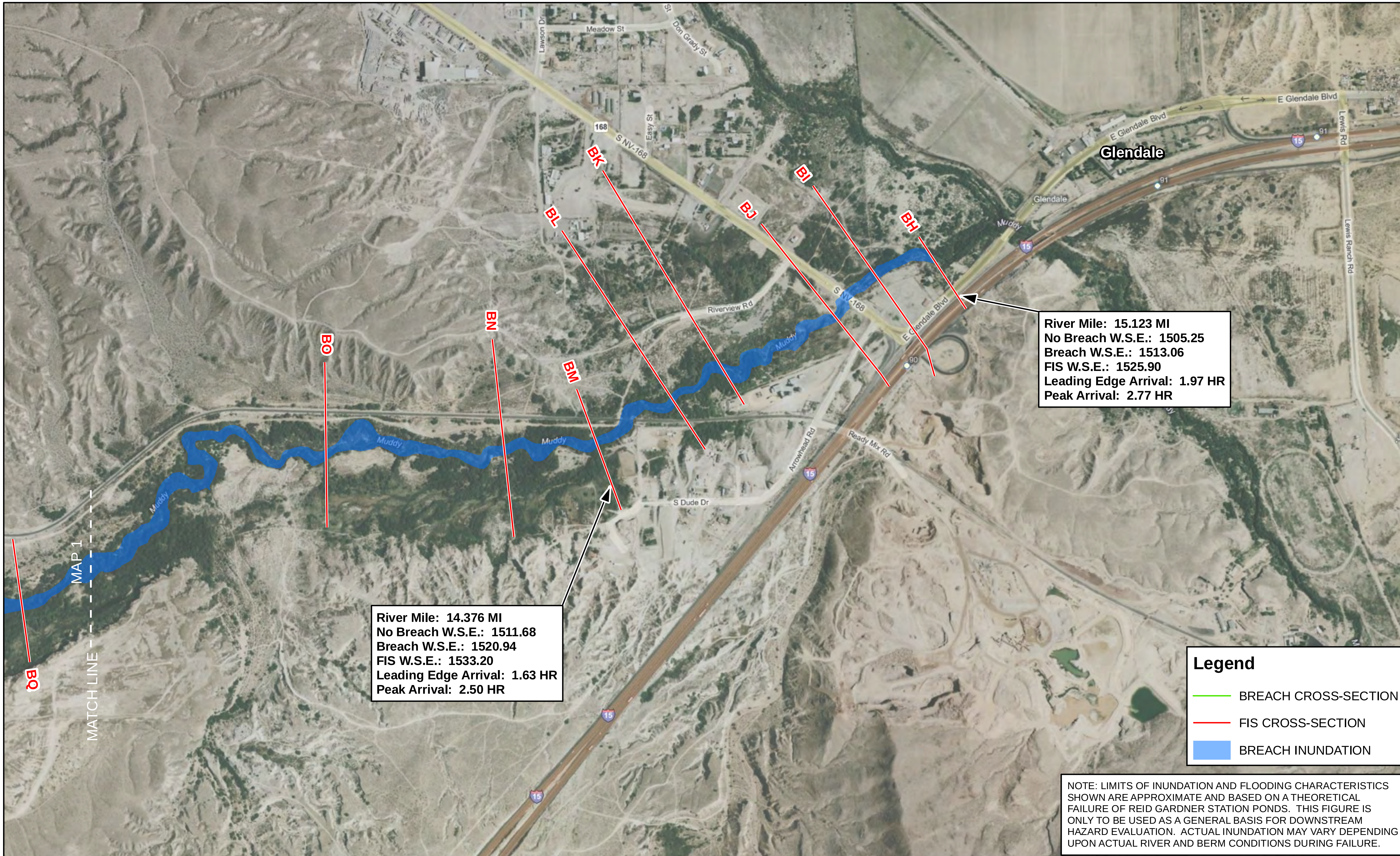
0 500 1,000 Feet

REVISIONS	DWN	CKD	APPD

DRAWN BY: D. ROTSCHAFER
CHECKED BY: A. JUDD
APPROVED BY: B. SVATOS
DATE: 9-JUNE-2010

NEVADA ENERGY
REID GARDNER STATION
CLARK COUNTY, NEVADA

MESA POND BREACH ANALYSIS MAP 1 OF 2



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Stanley Consultants INC.

0 500 1,000 Feet

REVISIONS	DWN	CKD	APPD

DRAWN BY: D. ROTSCHAFER
CHECKED BY: A. JUDD
APPROVED BY: B. SVATOS
DATE: 9-JUNE-2010

NEVADA ENERGY
REID GARDNER STATION
CLARK COUNTY, NEVADA

MESA POND BREACH ANALYSIS MAP 2 OF 2

Attachment 3
Dam Breach HEC-RAS Calculations – 2021 Analysis

Froelich Breach Calculations – 2021

ESTIMATION OF DAM BREACH PARAMETERS
USING THE FROEHLICH 2008 METHOD

PROJECT: **M5 MESA POND**

BREACH INPUT PARAMETERS:

Select Failure Mode From Drop-Down Menu:	OVERTOPPING	
Height of water over base elevation of breach (H_w) =	23.0	Feet
Volume of water in the reservoir at the time of failure (V_w) =	260.0	Acre-Feet
Reservoir Surface Area at Hw (A_s) =	13.8	Acres
Height of breach (H_b) =	23.0	Feet
Failure Mode Factor (K_o) =	1.3	
Breach Side-Slope Ratio (Z_b) =	1	Z(H):1(V)
Dam Size Class:	Small	Assumes Full Reservoir At Time of Breach.

CALCULATED BREACH CHARACTERISTICS:

Average Breach Width (B_{avg}) =	72.0	Feet
Bottom Width of Breach (B_b) =	49.0	Feet
Breach Formation Time (T_f) =	0.45	Hours
Storage Intensity (SI) =	11.3	Acre Feet/Foot
Predicted Peak Flow (Q_p) =	7506	Cubic Feet per Second

RESULTS CHECK:

Average Breach Width Divided by Height of Breach (B_{avg}/H_b) =	3.13	If (B_{avg}/H_b) > 0.6, Full Breach Devlopment is Anticipated
Erosion Rate (ER), Calculated as (B_{avg}/T_f) =	159.0	
Erosion Rate Divided by Height of Water Over Base of Breach (ER/H_w) =	6.9	If 1.6 < (ER/H_w) < 21, Erosion Rate is Assumed Reasonable

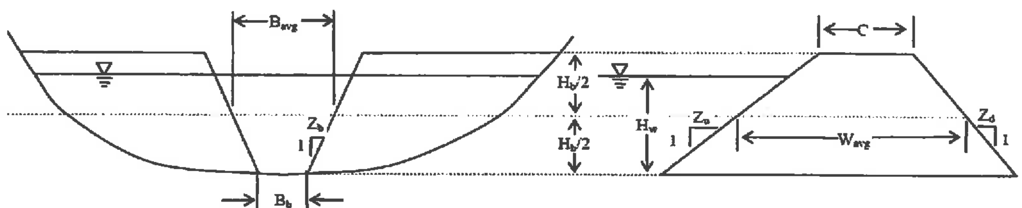


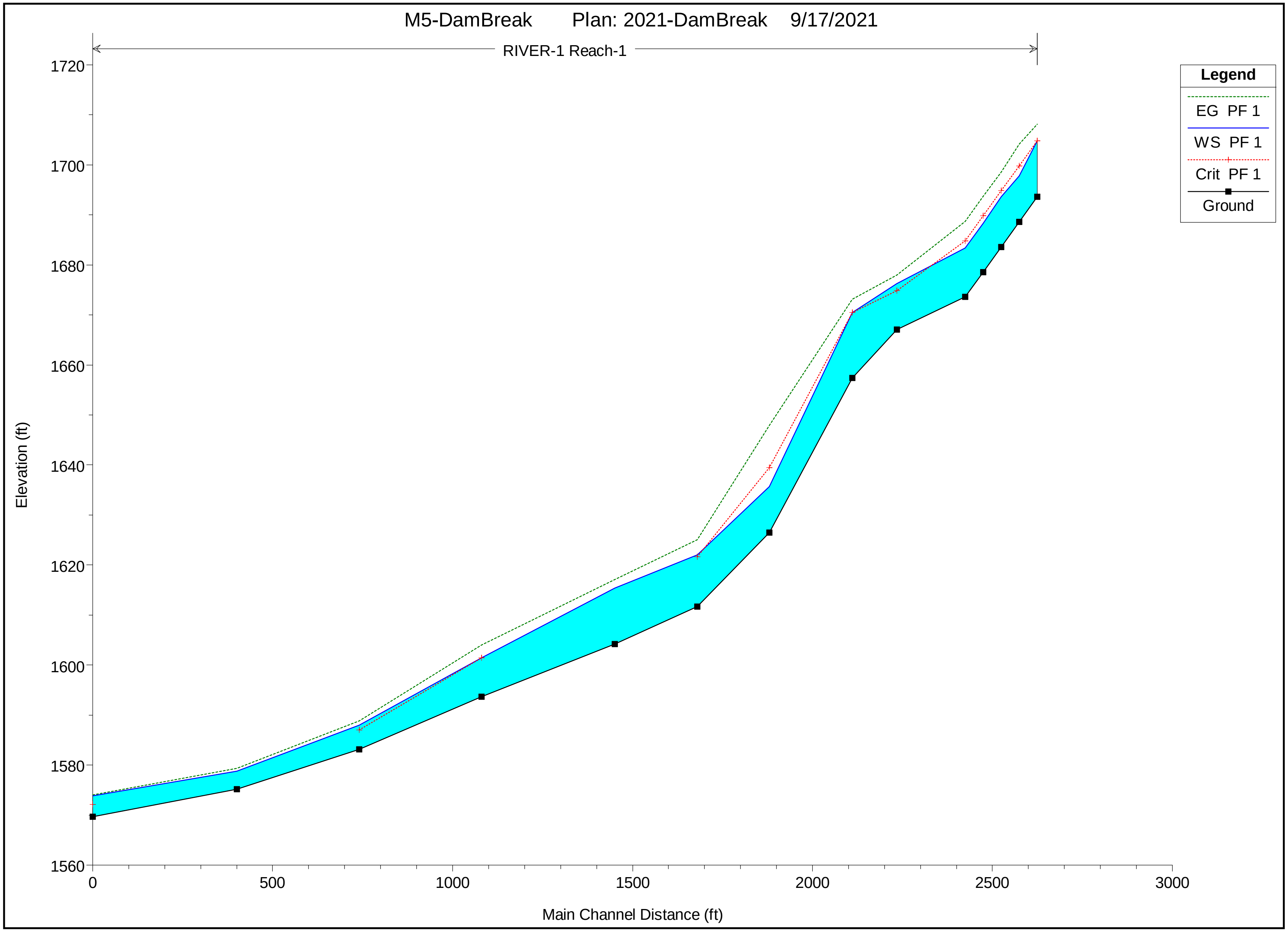
Figure 1- Breach Variable Definition Sketch

RAS Summary Table – 2021

HEC-RAS Plan: 2021-DamBreak River: RIVER-1 Reach: Reach-1 Profile: PF 1

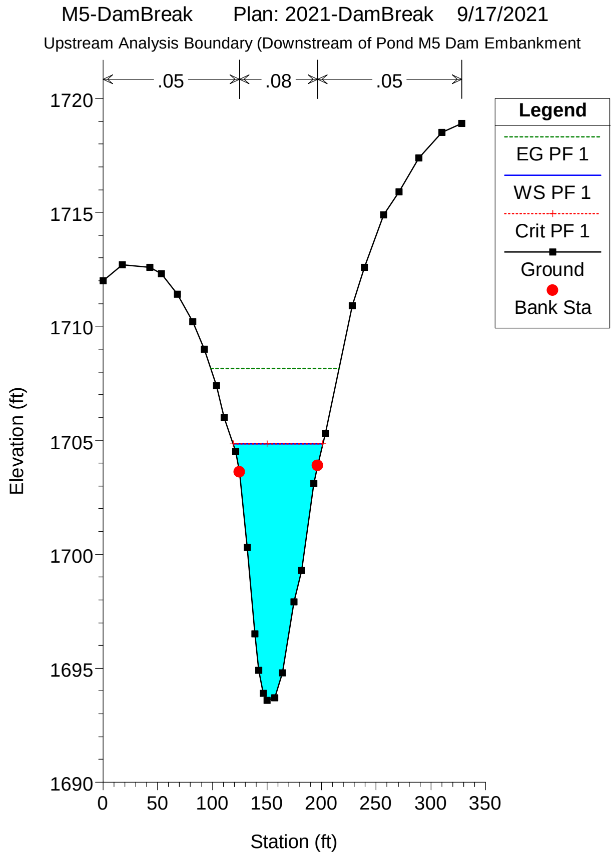
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Max Chl Dpth	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	148.7	PF 1	7506.00	1693.60	1704.84	11.24	1704.84	1708.17	0.048248	14.66	515.70	82.15	0.97
Reach-1	148.6	PF 1	7506.00	1688.60	1697.85	9.24	1699.84	1704.21	0.125034	20.23	371.03	65.36	1.50
Reach-1	148.5	PF 1	7506.00	1683.60	1693.59	9.99	1694.84	1698.52	0.089554	17.82	421.32	69.88	1.28
Reach-1	148.3	PF 1	7506.00	1678.60	1688.32	9.72	1689.84	1693.72	0.100766	18.65	402.39	68.06	1.35
Reach-1	148	PF 1	7506.00	1673.60	1683.35	9.74	1684.84	1688.70	0.099505	18.56	404.37	68.25	1.34
Reach-1	147	PF 1	7506.00	1667.10	1676.27	9.17	1674.86	1677.96	0.026877	10.41	720.76	110.77	0.72
Reach-1	146	PF 1	7506.00	1657.40	1670.50	13.10	1670.50	1673.15	0.057845	13.05	574.96	110.06	1.01
Reach-1	145	PF 1	7506.00	1626.50	1635.72	9.22	1639.45	1647.93	0.250702	28.03	267.77	45.74	2.04
Reach-1	144	PF 1	7506.00	1611.70	1622.02	10.32	1621.68	1625.04	0.047311	13.95	538.20	78.01	0.94
Reach-1	143	PF 1	7506.00	1604.20	1615.37	11.17		1617.11	0.024091	10.59	709.08	95.64	0.69
Reach-1	142	PF 1	7506.00	1593.70	1601.40	7.70	1601.40	1604.05	0.055595	13.06	574.71	108.73	1.00
Reach-1	141	PF 1	7506.00	1583.10	1587.97	4.86	1587.00	1588.86	0.026773	7.57	991.75	250.99	0.67
Reach-1	140	PF 1	7506.00	1575.20	1578.74	3.54		1579.39	0.028462	6.49	1155.73	386.79	0.66
Reach-1	139	PF 1	7506.00	1569.70	1573.82	4.12	1572.12	1574.03	0.007501	3.68	2092.52	795.71	0.35

RAS Profile – 2021



M5-DamBreak Plan: 2021-DamBreak 9/17/2021
RIVER-1 Reach-1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
1720
1700
1680
1660
1640
1620
1600
1580
1560
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

RAS Sections – 2021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Upstream Analysis Boundary (Downstream of Pond M5 Dam Embankment
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Legend
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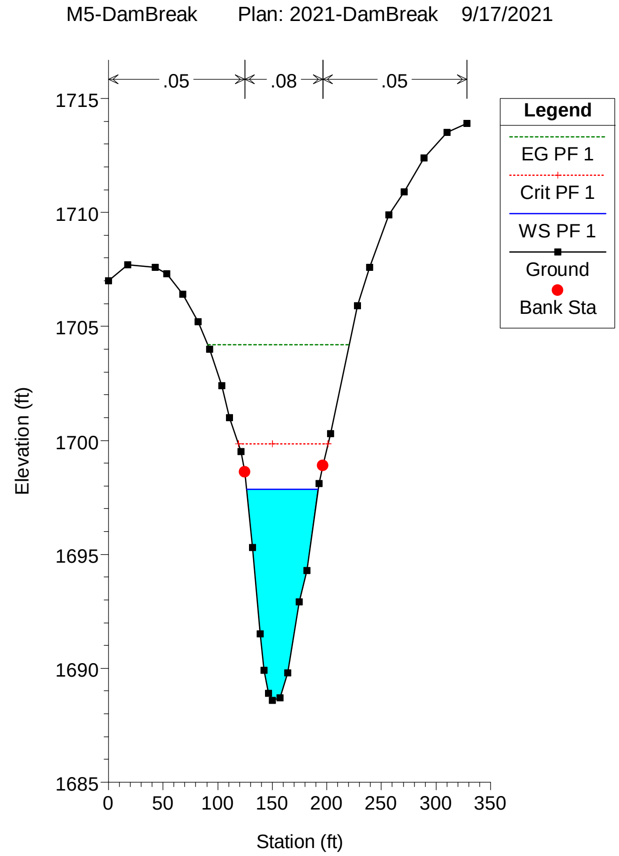
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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WS PF 1
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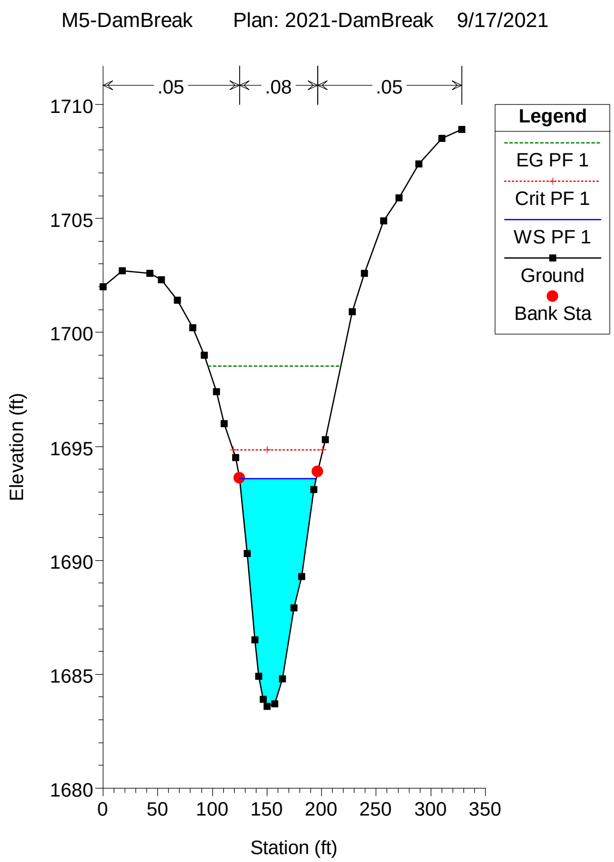
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WS PF 1
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Elevation (ft)
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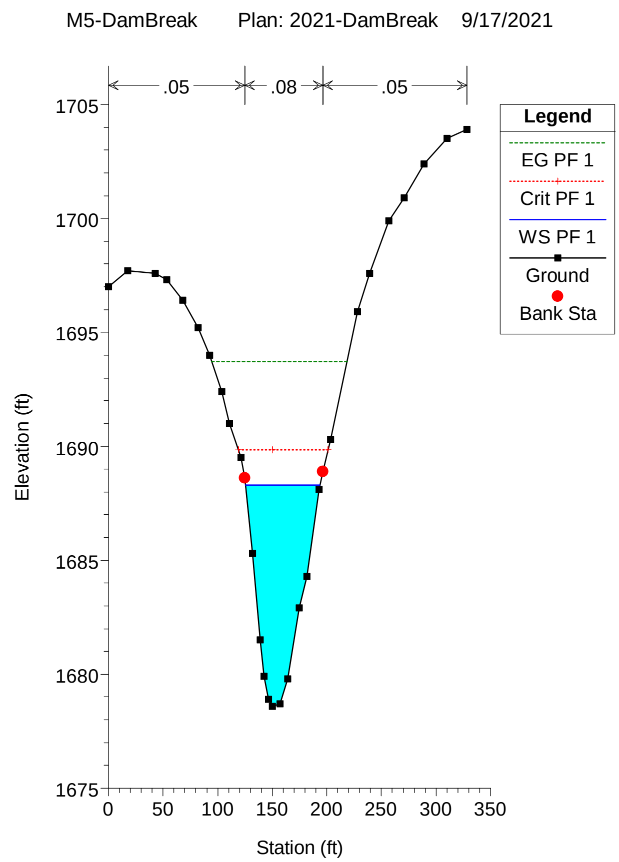
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Elevation (ft)
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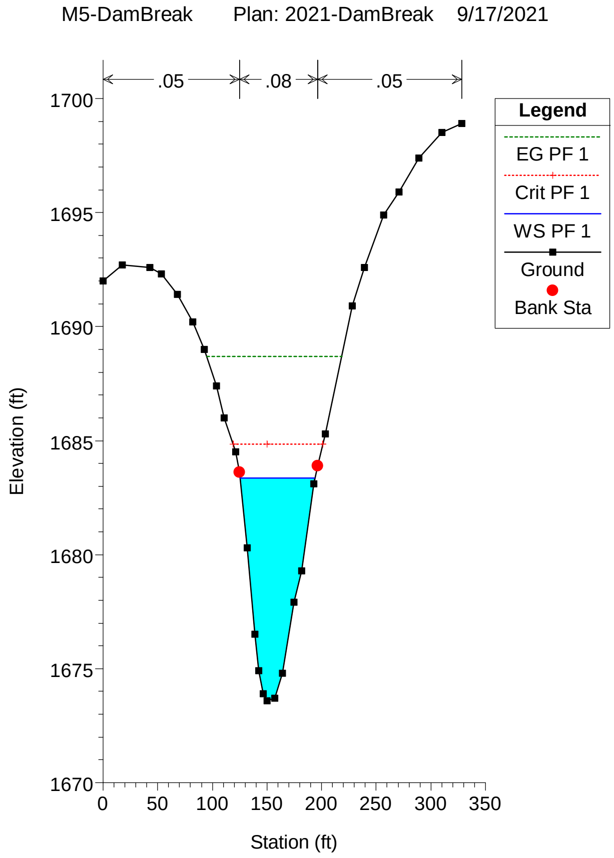
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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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50
100
150
200
250
300
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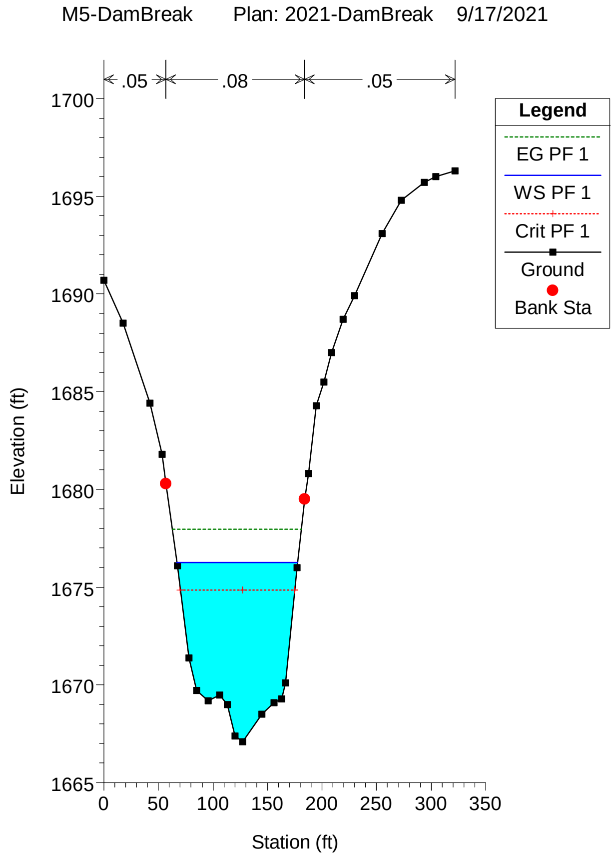
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EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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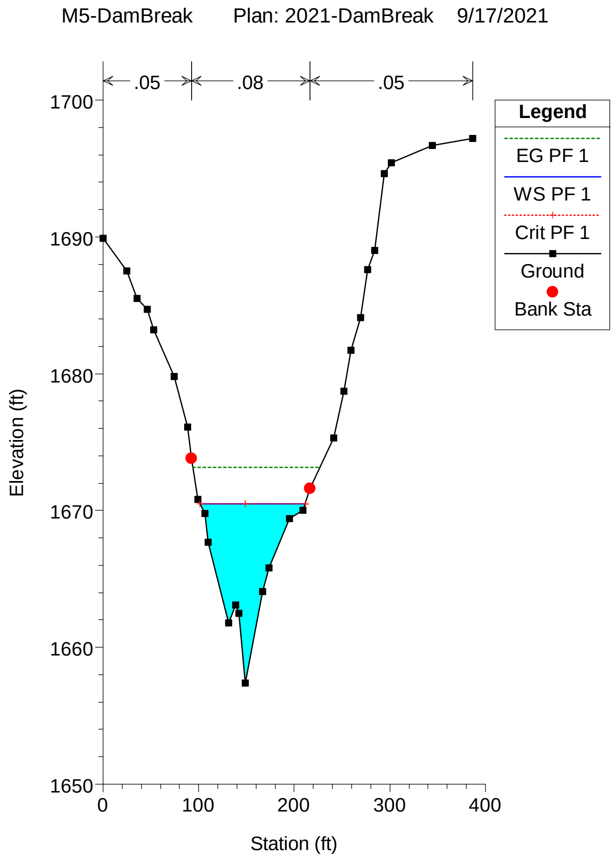
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Legend
EG PF 1
WS PF 1
Crit PF 1
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Bank Sta
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Station (ft)
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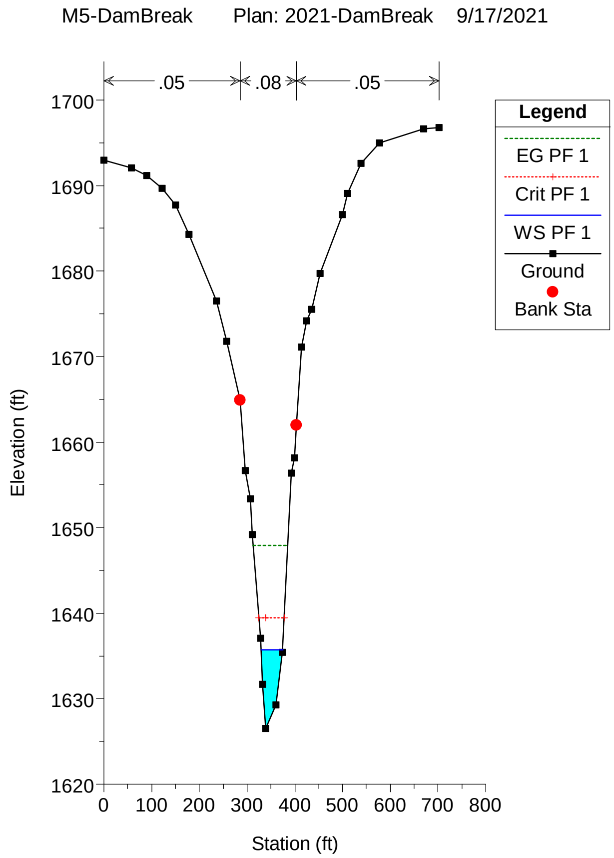
200
300
400


M5-DamBreak Plan: 2021-DamBreak 9/17/2021
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.08
.05
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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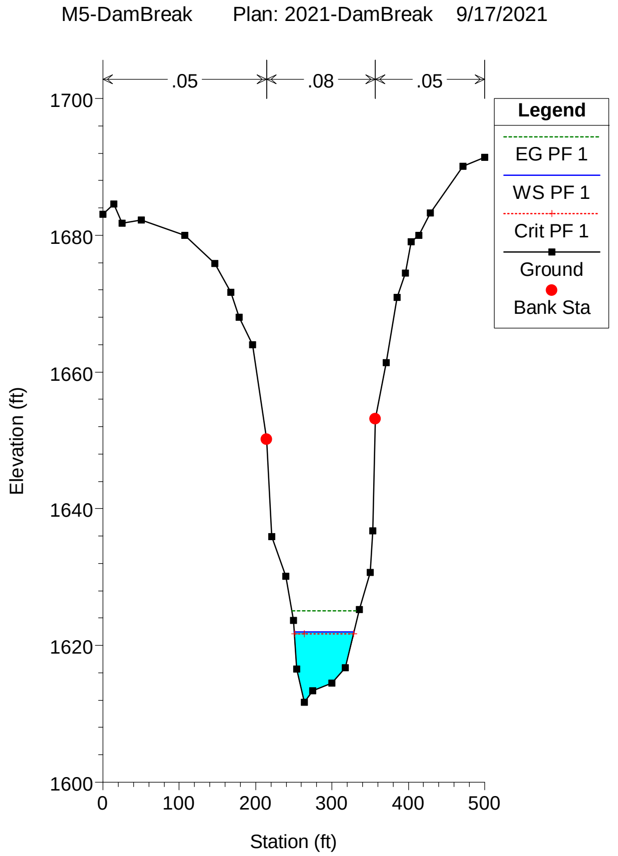
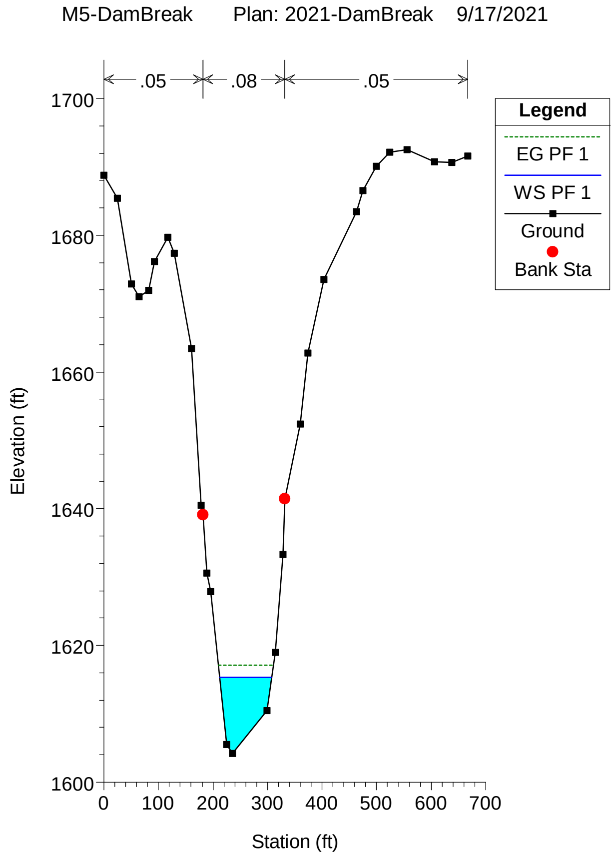
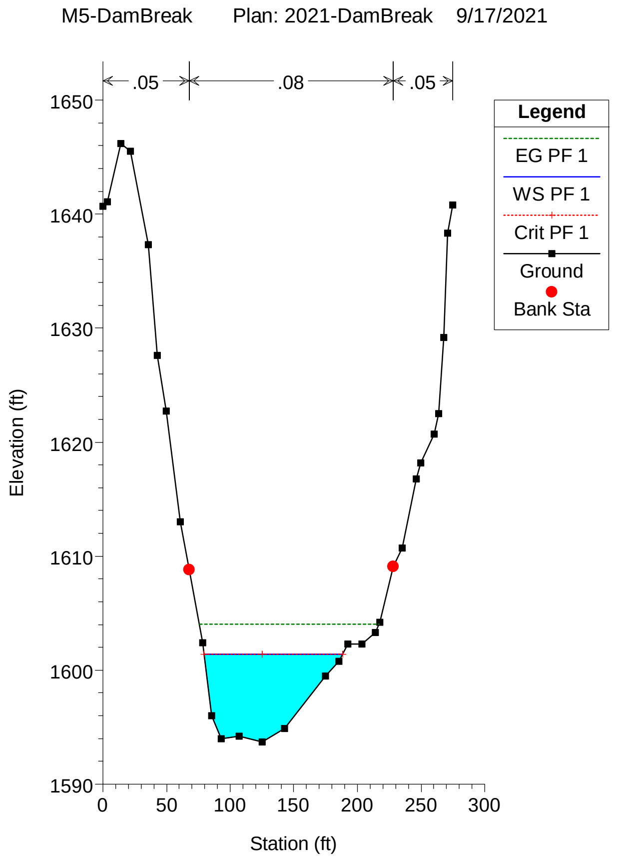
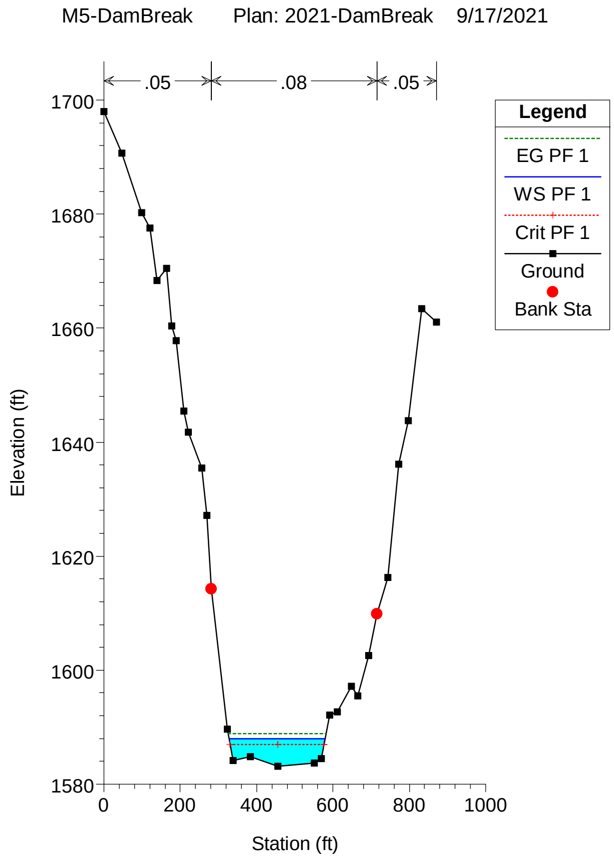
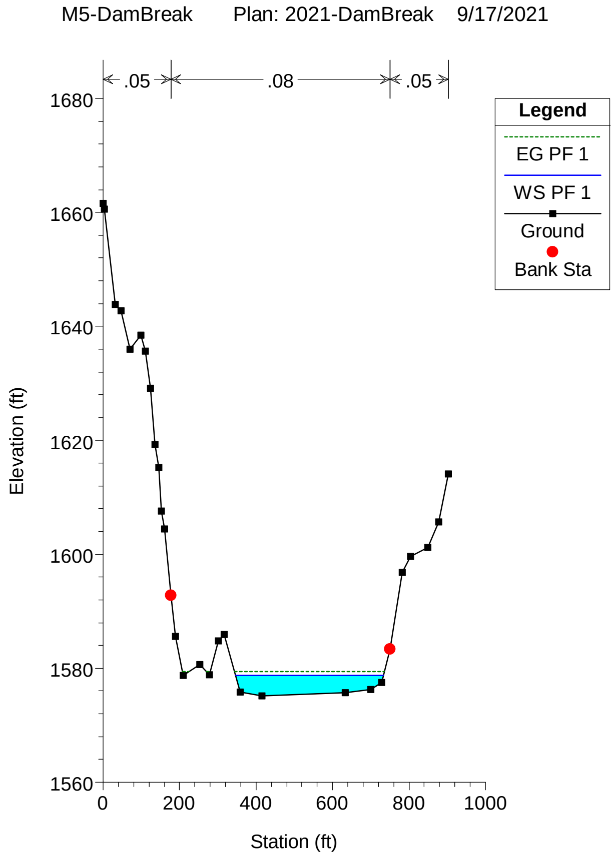
600
700
800


M5-DamBreak Plan: 2021-DamBreak 9/17/2021
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1600
1620
1640
1660
1680
1700
0
100
200
300
400
500

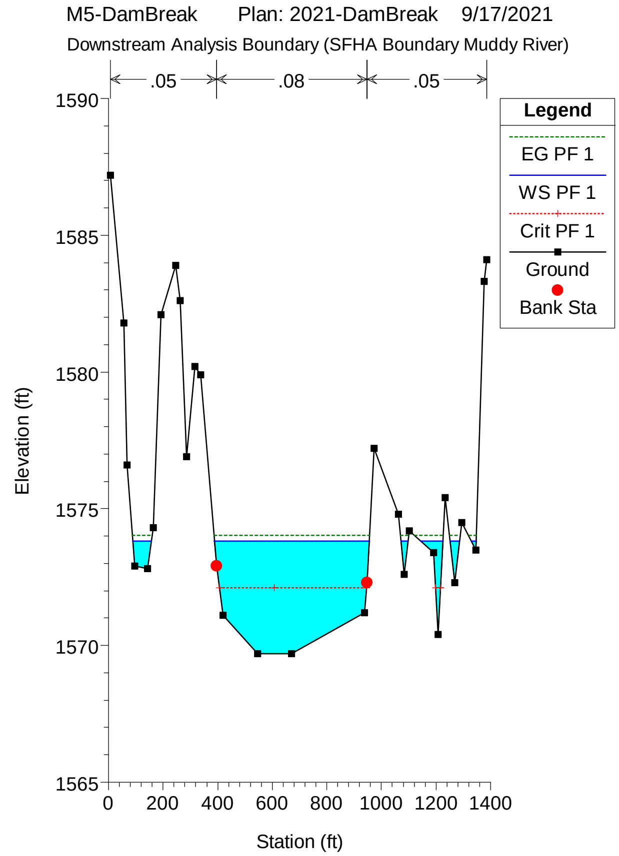

M5-DamBreak Plan: 2021-DamBreak 9/17/2021
.05
.08
.05
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1600
1620
1640
1660
1680
1700
0
100
200
300
400
500
600
700


M5-DamBreak Plan: 2021-DamBreak 9/17/2021
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1590
1600
1610
1620
1630
1640
1650
0
50
100
150
200
250
300


M5-DamBreak Plan: 2021-DamBreak 9/17/2021
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1580
1600
1620
1640
1660
1680
1700
0
200
400
600
800
1000



M5-DamBreak Plan: 2021-DamBreak 9/17/2021
.05
.08
.05
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1560
1580
1600
1620
1640
1660
1680
0
200
400
600
800
1000
Station (ft)



M5-DamBreak Plan: 2021-DamBreak 9/17/2021
Downstream Analysis Boundary (SFHA Boundary Muddy River)
.05
.08
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1565
1570
1575
1580
1585
1590
0
200
400
600
800
1000
1200
1400
Station (ft)

RAS Report - 2021

```
                        HEC-RAS HEC-RAS 5.0.7 March 2019
                          U.S. Army Corps of Engineers
                         Hydrologic Engineering Center
                               609 Second Street
                               Davis, California

            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
            X     X  X        X            X  X     X    X        X
            X     X  X        X    X       X   X    X    X        X
            X     X  XXXXXX    XXXX        X    X   X    X   XXXXX



PROJECT DATA
Project Title: M5-DamBreak
Project File : M5-DamBreak.prj
Run Date and Time: 9/17/2021 2:45:32 PM

Project in English units

Project Description:
2021 NVE Pond M5
Dam Breach Emergency Inundation
Steady State Analysis
M5
Embankment to Muddy River SFHA



PLAN DATA

Plan Title: 2021-DamBreak
Plan File : p:\NVEnergy\NVE01918_CCR_2021_Mesa_LF_M5M7\900_Working_Documents\M5_M7_Hazard_Classification\2021_Calcs\HEC-RAS\M5-DamBreak.p09

           Geometry Title: 2021 Shortened Geometry - SFHA Limits
           Geometry File :
p:\NVEnergy\NVE01918_CCR_2021_Mesa_LF_M5M7\900_Working_Documents\M5_M7_Hazard_Classification\2021_Calcs\HEC-RAS\M5-DamBreak.g02

           Flow Title    : 2021-DamBreak
           Flow File     :
p:\NVEnergy\NVE01918_CCR_2021_Mesa_LF_M5M7\900_Working_Documents\M5_M7_Hazard_Classification\2021_Calcs\HEC-RAS\M5-DamBreak.f04

Plan Summary Information:
Number of:  Cross Sections =   14    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: Between every coordinate point (HEC2 Style)
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow



FLOW DATA

Flow Title: 2021-DamBreak
Flow File : p:\NVEnergy\NVE01918_CCR_2021_Mesa_LF_M5M7\900_Working_Documents\M5_M7_Hazard_Classification\2021_Calcs\HEC-RAS\M5-DamBreak.f04

Flow Data (cfs)

  River          Reach          RS                   PF 1
  RIVER-1        Reach-1        148.7                7506


Boundary Conditions

  River          Reach          Profile                        Upstream                 Downstream

  RIVER-1        Reach-1        PF 1                             Critical           Normal S = 0.0075



GEOMETRY DATA
```

Geometry Title: 2021 Shortened Geometry - SFHA Limits
Geometry File : p:\NVEnergy\NVE01918_CCR_2021_Mesa_LF_M5M7\900_Working_Documents\M5_M7_Hazard_Classification\2021_Calcs\HEC-RAS\M5-DamBreak.g02

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 148.7

INPUT
Description: Upstream Analysis Boundary (Downstream of Pond M5 Dam Embankment)
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1712	17.8	1712.7	42.8	1712.6	53.5	1712.3	67.8	1711.4
82.1	1710.2	92.8	1709	103.5	1707.4	110.6	1706	121.3	1704.5
124.9	1703.6	132	1700.3	139.1	1696.5	142.7	1694.9	146.3	1693.9
149.8	1693.6	157	1693.7	164.1	1694.8	174.8	1697.9	181.9	1699.3
192.6	1703.1	196.2	1703.9	203.4	1705.3	228.3	1710.9	239	1712.6
256.9	1714.9	271.1	1715.9	289	1717.4	310.4	1718.5	328.2	1718.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	124.9	.08	196.2	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
124.9	196.2	50	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1708.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.33	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1704.84	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1704.84	Flow Area (sq ft)	3.25	510.18	2.27
E.G. Slope (ft/ft)	0.048248	Area (sq ft)	3.25	510.18	2.27
Q Total (cfs)	7506.00	Flow (cfs)	16.34	7480.82	8.84
Top Width (ft)	82.15	Top Width (ft)	6.02	71.30	4.83
Vel Total (ft/s)	14.56	Avg. Vel. (ft/s)	5.02	14.66	3.90
Max Chl Dpth (ft)	11.24	Hydr. Depth (ft)	0.54	7.16	0.47
Conv. Total (cfs)	34171.9	Conv. (cfs)	74.4	34057.3	40.2
Length Wtd. (ft)	50.00	Wetted Per. (ft)	6.16	74.88	4.92
Min Ch El (ft)	1693.60	Shear (lb/sq ft)	1.59	20.52	1.39
Alpha	1.01	Stream Power (lb/ft s)	8.00	300.94	5.41
Frctn Loss (ft)	3.67	Cum Volume (acre-ft)	0.33	47.58	0.47
C & E Loss (ft)	0.30	Cum SA (acres)	0.42	11.25	0.64

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 148.6

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1707	17.8	1707.7	42.8	1707.6	53.5	1707.3	67.8	1706.4
82.1	1705.2	92.8	1704	103.5	1702.4	110.6	1701	121.3	1699.5
124.9	1698.6	132	1695.3	139.1	1691.5	142.7	1689.9	146.3	1688.9
149.8	1688.6	157	1688.7	164.1	1689.8	174.8	1692.9	181.9	1694.3
192.6	1698.1	196.2	1698.9	203.4	1700.3	228.3	1705.9	239	1707.6
256.9	1709.9	271.1	1710.9	289	1712.4	310.4	1713.5	328.2	1713.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	124.9	.08	196.2	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
124.9	196.2	50	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1704.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	6.36	Wt. n-Val.		0.080	
W.S. Elev (ft)	1697.85	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1699.84	Flow Area (sq ft)		371.03	
E.G. Slope (ft/ft)	0.125034	Area (sq ft)		371.03	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	65.36	Top Width (ft)		65.36	
Vel Total (ft/s)	20.23	Avg. Vel. (ft/s)		20.23	
Max Chl Dpth (ft)	9.24	Hydr. Depth (ft)		5.68	
Conv. Total (cfs)	21227.3	Conv. (cfs)		21227.3	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		68.63	
Min Ch El (ft)	1688.60	Shear (lb/sq ft)		42.20	
Alpha	1.00	Stream Power (lb/ft s)		853.67	

Frctn Loss (ft)	5.25	Cum Volume (acre-ft)	0.33	47.08	0.47
C & E Loss (ft)	0.43	Cum SA (acres)	0.42	11.17	0.64

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 148.5

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1702	17.8	1702.7	42.8	1702.6	53.5	1702.3	67.8	1701.4
82.1	1700.2	92.8	1699	103.5	1697.4	110.6	1696	121.3	1694.5
124.9	1693.6	132	1690.3	139.1	1686.5	142.7	1684.9	146.3	1683.9
149.8	1683.6	157	1683.7	164.1	1684.8	174.8	1687.9	181.9	1689.3
192.6	1693.1	196.2	1693.9	203.4	1695.3	228.3	1700.9	239	1702.6
256.9	1704.9	271.1	1705.9	289	1707.4	310.4	1708.5	328.2	1708.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	124.9	.08	196.2	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
124.9	196.2	50	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1698.52	Wt. n-Val.		0.080	
Vel Head (ft)	4.93	Reach Len. (ft)	50.00	50.00	50.00
W.S. Elev (ft)	1693.59	Flow Area (sq ft)		421.32	
Crit W.S. (ft)	1694.84	Area (sq ft)		421.32	
E.G. Slope (ft/ft)	0.089554	Flow (cfs)		7506.00	
Q Total (cfs)	7506.00	Top Width (ft)		69.88	
Top Width (ft)	69.88	Avg. Vel. (ft/s)		17.82	
Vel Total (ft/s)	17.82	Hydr. Depth (ft)		6.03	
Max Chl Dpth (ft)	9.99	Conv. (cfs)		25082.2	
Conv. Total (cfs)	25082.2	Wetted Per. (ft)		73.42	
Length Wtd. (ft)	50.00	Shear (lb/sq ft)		32.08	
Min Ch El (ft)	1683.60	Stream Power (lb/ft s)		571.55	
Alpha	1.00	Cum Volume (acre-ft)	0.33	46.62	0.47
Frctn Loss (ft)	4.75	Cum SA (acres)	0.42	11.09	0.64
C & E Loss (ft)	0.05				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 148.3

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1697	17.8	1697.7	42.8	1697.6	53.5	1697.3	67.8	1696.4
82.1	1695.2	92.8	1694	103.5	1692.4	110.6	1691	121.3	1689.5
124.9	1688.6	132	1685.3	139.1	1681.5	142.7	1679.9	146.3	1678.9
149.8	1678.6	157	1678.7	164.1	1679.8	174.8	1682.9	181.9	1684.3
192.6	1688.1	196.2	1688.9	203.4	1690.3	228.3	1695.9	239	1697.6
256.9	1699.9	271.1	1700.9	289	1702.4	310.4	1703.5	328.2	1703.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	124.9	.08	196.2	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
124.9	196.2	50	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1693.72	Wt. n-Val.		0.080	
Vel Head (ft)	5.41	Reach Len. (ft)	50.00	50.00	50.00
W.S. Elev (ft)	1688.32	Flow Area (sq ft)		402.39	
Crit W.S. (ft)	1689.84	Area (sq ft)		402.39	
E.G. Slope (ft/ft)	0.100766	Flow (cfs)		7506.00	
Q Total (cfs)	7506.00	Top Width (ft)		68.06	
Top Width (ft)	68.06	Avg. Vel. (ft/s)		18.65	
Vel Total (ft/s)	18.65				

Max Chl Dpth (ft)	9.72	Hydr. Depth (ft)		5.91	
Conv. Total (cfs)	23645.7	Conv. (cfs)		23645.7	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		71.51	
Min Ch El (ft)	1678.60	Shear (lb/sq ft)		35.40	
Alpha	1.00	Stream Power (lb/ft s)		660.33	
Frctn Loss (ft)	5.01	Cum Volume (acre-ft)	0.33	46.15	0.47
C & E Loss (ft)	0.02	Cum SA (acres)	0.42	11.01	0.64

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 148

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1692	17.8	1692.7	42.8	1692.6	53.5	1692.3	67.8	1691.4
82.1	1690.2	92.8	1689	103.5	1687.4	110.6	1686	121.3	1684.5
124.9	1683.6	132	1680.3	139.1	1676.5	142.7	1674.9	146.3	1673.9
149.8	1673.6	157	1673.7	164.1	1674.8	174.8	1677.9	181.9	1679.3
192.6	1683.1	196.2	1683.9	203.4	1685.3	228.3	1690.9	239	1692.6
256.9	1694.9	271.1	1695.9	289	1697.4	310.4	1698.5	328.2	1698.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	124.9	.08	196.2	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
124.9	196.2	190	190	190	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1688.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.35	Wt. n-Val.		0.080	
W.S. Elev (ft)	1683.35	Reach Len. (ft)	190.00	190.00	190.00
Crit W.S. (ft)	1684.84	Flow Area (sq ft)		404.37	
E.G. Slope (ft/ft)	0.099505	Area (sq ft)		404.37	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	68.25	Top Width (ft)		68.25	
Vel Total (ft/s)	18.56	Avg. Vel. (ft/s)		18.56	
Max Chl Dpth (ft)	9.74	Hydr. Depth (ft)		5.92	
Conv. Total (cfs)	23795.0	Conv. (cfs)		23795.0	
Length Wtd. (ft)	190.00	Wetted Per. (ft)		71.71	
Min Ch El (ft)	1673.60	Shear (lb/sq ft)		35.03	
Alpha	1.00	Stream Power (lb/ft s)		650.23	
Frctn Loss (ft)	6.70	Cum Volume (acre-ft)	0.33	45.69	0.47
C & E Loss (ft)	0.49	Cum SA (acres)	0.42	10.93	0.64

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 147

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1690.7	17.7	1688.5	42.5	1684.4	53.1	1681.8	56.6	1680.3
67.2	1676.1	77.9	1671.4	84.9	1669.7	95.6	1669.2	106.2	1669.5
113.2	1669	120.3	1667.4	127.4	1667.1	145.1	1668.5	155.7	1669.1
162.8	1669.3	166.3	1670.1	177	1676	184	1679.5	187.6	1680.8
194.6	1684.3	201.7	1685.5	208.8	1687	219.4	1688.7	230	1689.9
254.8	1693.1	272.5	1694.8	293.7	1695.7	304.4	1696	322.1	1696.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	56.6	.08	184	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
56.6	184	124	124	124	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1677.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.69	Wt. n-Val.		0.080	
W.S. Elev (ft)	1676.27	Reach Len. (ft)	124.00	124.00	124.00
Crit W.S. (ft)	1674.86	Flow Area (sq ft)		720.76	
E.G. Slope (ft/ft)	0.026877	Area (sq ft)		720.76	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	110.77	Top Width (ft)		110.77	
Vel Total (ft/s)	10.41	Avg. Vel. (ft/s)		10.41	
Max Chl Dpth (ft)	9.17	Hydr. Depth (ft)		6.51	

Conv. Total (cfs)	45784.6	Conv. (cfs)		45784.6	
Length Wtd. (ft)	124.00	Wetted Per. (ft)		113.96	
Min Ch El (ft)	1667.10	Shear (lb/sq ft)		10.61	
Alpha	1.00	Stream Power (lb/ft s)		110.51	
Frctn Loss (ft)	4.71	Cum Volume (acre-ft)	0.33	43.23	0.47
C & E Loss (ft)	0.10	Cum SA (acres)	0.42	10.54	0.64

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 146

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1689.9	24.8	1687.5	35.5	1685.5	46.1	1684.7	53.2	1683.2
74.5	1679.8	88.7	1676.1	92.2	1673.8	99.3	1670.8	106.4	1669.8
110	1667.7	131.3	1661.8	138.4	1663.1	141.9	1662.5	149	1657.4
166.7	1664.1	173.8	1665.8	195.1	1669.4	209.3	1670	216.4	1671.6
241.2	1675.3	251.9	1678.7	259	1681.7	269.6	1684.1	276.7	1687.6
283.8	1689	294.4	1694.6	301.5	1695.4	344.1	1696.7	386.7	1697.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	92.2	.08	216.4	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
92.2	216.4	410.01	230.01	110.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1673.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.65	Wt. n-Val.		0.080	
W.S. Elev (ft)	1670.50	Reach Len. (ft)	410.01	230.01	110.01
Crit W.S. (ft)	1670.50	Flow Area (sq ft)		574.96	
E.G. Slope (ft/ft)	0.057845	Area (sq ft)		574.96	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	110.06	Top Width (ft)		110.06	
Vel Total (ft/s)	13.05	Avg. Vel. (ft/s)		13.05	
Max Chl Dpth (ft)	13.10	Hydr. Depth (ft)		5.22	
Conv. Total (cfs)	31208.6	Conv. (cfs)		31208.6	
Length Wtd. (ft)	230.01	Wetted Per. (ft)		115.09	
Min Ch El (ft)	1657.40	Shear (lb/sq ft)		18.04	
Alpha	1.00	Stream Power (lb/ft s)		235.52	
Frctn Loss (ft)	24.27	Cum Volume (acre-ft)	0.33	41.39	0.47
C & E Loss (ft)	0.96	Cum SA (acres)	0.42	10.23	0.64

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 145

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1693	57.1	1692.1	89.2	1691.2	121.3	1689.7	149.8	1687.7
178.3	1684.3	235.4	1676.5	256.8	1671.8	285.3	1664.9	296	1656.7
306.7	1653.4	310.3	1649.2	328.1	1637.1	331.7	1631.7	338.8	1626.5
360.2	1629.3	374.5	1635.4	392.3	1656.4	399.4	1658.2	403	1662
413.7	1671.1	424.4	1674.2	435.1	1675.5	452.9	1679.7	499.3	1686.6
510	1689.1	538.5	1692.6	577.7	1695	670.4	1696.6	702.5	1696.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	285.3	.08	403	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
285.3	403	150	200	270	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1647.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	12.21	Wt. n-Val.		0.080	
W.S. Elev (ft)	1635.72	Reach Len. (ft)	150.00	200.00	270.00
Crit W.S. (ft)	1639.45	Flow Area (sq ft)		267.77	
E.G. Slope (ft/ft)	0.250702	Area (sq ft)		267.77	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	45.74	Top Width (ft)		45.74	
Vel Total (ft/s)	28.03	Avg. Vel. (ft/s)		28.03	
Max Chl Dpth (ft)	9.22	Hydr. Depth (ft)		5.85	
Conv. Total (cfs)	14991.0	Conv. (cfs)		14991.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		51.17	
Min Ch El (ft)	1626.50	Shear (lb/sq ft)		81.90	
Alpha	1.00	Stream Power (lb/ft s)		2295.88	
Frctn Loss (ft)	10.31	Cum Volume (acre-ft)	0.33	39.16	0.47
C & E Loss (ft)	0.38	Cum SA (acres)	0.42	9.82	0.64

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Program found supercritical flow starting at this cross section.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1   RS: 144

INPUT
Description:
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1683.1	14.3	1684.6	25	1681.8	50	1682.2	107.1	1680
146.4	1675.9	167.8	1671.7	178.5	1668	196.3	1664	214.2	1650.1
221.3	1635.9	239.2	1630.1	249.9	1623.7	253.5	1616.6	264.2	1611.7
274.9	1613.4	299.9	1614.5	317.7	1616.7	335.6	1625.3	349.8	1630.7
353.4	1636.8	357	1653.1	371.3	1661.4	385.5	1670.9	396.3	1674.5
403.4	1679	414.1	1680	428.4	1683.3	471.2	1690.1	499.8	1691.4

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	214.2	.08	357	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
214.2	357	159.99	230.01	300	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1625.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.02	Wt. n-Val.		0.080	
W.S. Elev (ft)	1622.02	Reach Len. (ft)	159.99	230.01	300.00
Crit W.S. (ft)	1621.68	Flow Area (sq ft)		538.20	
E.G. Slope (ft/ft)	0.047311	Area (sq ft)		538.20	
Q Total (cfs)	7506.00	Flow (cfs)		7506.00	
Top Width (ft)	78.01	Top Width (ft)		78.01	
Vel Total (ft/s)	13.95	Avg. Vel. (ft/s)		13.95	
Max Chl Dpth (ft)	10.32	Hydr. Depth (ft)		6.90	
Conv. Total (cfs)	34508.8	Conv. (cfs)		34508.8	
Length Wtd. (ft)	230.01	Wetted Per. (ft)		83.91	
Min Ch El (ft)	1611.70	Shear (lb/sq ft)		18.94	
Alpha	1.00	Stream Power (lb/ft s)		264.20	
Frctn Loss (ft)	7.55	Cum Volume (acre-ft)	0.33	37.31	0.47
C & E Loss (ft)	0.38	Cum SA (acres)	0.42	9.53	0.64

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1   RS: 143

INPUT
Description:
Station Elevation Data   num=   30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1688.8	25	1685.4	49.9	1672.9	64.2	1671	82	1671.9
92.7	1676.1	117.7	1679.7	128.4	1677.4	160.5	1663.4	178.3	1640.5
181.9	1639.1	189	1630.6	196.1	1627.9	224.6	1605.5	235.3	1604.2
299.5	1610.5	313.8	1619	328.1	1633.3	331.6	1641.4	360.2	1652.4
374.4	1662.8	402.9	1673.5	463.6	1683.4	474.3	1686.5	499.2	1690.1
524.2	1692.1	556.3	1692.5	606.2	1690.7	638.3	1690.6	666.8	1691.6

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   181.9     .08   331.6     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         181.9   331.6              360     370     410             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1617.11    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              1.74    Wt. n-Val.                            0.080
  W.S. Elev (ft)          1615.37    Reach Len. (ft)          360.00     370.00     410.00
  Crit W.S. (ft)                     Flow Area (sq ft)                   709.08
  E.G. Slope (ft/ft)     0.024091    Area (sq ft)                        709.08
  Q Total (cfs)           7506.00    Flow (cfs)                         7506.00
  Top Width (ft)            95.64    Top Width (ft)                       95.64
  Vel Total (ft/s)          10.59    Avg. Vel. (ft/s)                     10.59
  Max Chl Dpth (ft)         11.17    Hydr. Depth (ft)                      7.41
  Conv. Total (cfs)       48359.6    Conv. (cfs)                        48359.6
  Length Wtd. (ft)         370.00    Wetted Per. (ft)                    100.78
  Min Ch El (ft)          1604.20    Shear (lb/sq ft)                     10.58
  Alpha                      1.00    Stream Power (lb/ft s)              112.02
  Frctn Loss (ft)           12.97    Cum Volume (acre-ft)       0.33      34.02       0.47
  C & E Loss (ft)            0.09    Cum SA (acres)             0.42       9.07       0.64


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: RIVER-1
REACH: Reach-1           RS: 142

INPUT
Description:
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1640.7     3.6  1641.1    14.3  1646.2    21.4  1645.5    35.7  1637.3
    42.8  1627.6    49.9  1622.7    60.6    1613    67.8  1608.8    78.5  1602.4
    85.6    1596    92.8    1594     107  1594.2   124.9  1593.7   142.7  1594.9
   174.8  1599.5   185.5  1600.8   192.6  1602.3   203.3  1602.3     214  1603.3
   217.6  1604.2   228.3  1609.1   235.4  1610.7   246.1  1616.8   249.7  1618.2
   260.4  1620.7     264  1622.5   267.6  1629.2   271.1  1638.3   274.7  1640.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    67.8     .08   228.3     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          67.8   228.3              370     340     310             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1604.05    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              2.65    Wt. n-Val.                            0.080
  W.S. Elev (ft)          1601.40    Reach Len. (ft)          370.00     340.00     310.00
  Crit W.S. (ft)          1601.40    Flow Area (sq ft)                   574.71
  E.G. Slope (ft/ft)     0.055595    Area (sq ft)                        574.71
  Q Total (cfs)           7506.00    Flow (cfs)                         7506.00
  Top Width (ft)           108.73    Top Width (ft)                      108.73
  Vel Total (ft/s)          13.06    Avg. Vel. (ft/s)                     13.06
  Max Chl Dpth (ft)          7.70    Hydr. Depth (ft)                      5.29
  Conv. Total (cfs)       31833.9    Conv. (cfs)                        31833.9
  Length Wtd. (ft)         340.00    Wetted Per. (ft)                    111.60
  Min Ch El (ft)          1593.70    Shear (lb/sq ft)                     17.87
  Alpha                      1.00    Stream Power (lb/ft s)              233.45
  Frctn Loss (ft)           12.69    Cum Volume (acre-ft)       0.33      28.57       0.47
  C & E Loss (ft)            0.53    Cum SA (acres)             0.42       8.21       0.64


Warning: The energy equation could not be balanced within the specified number of iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
         program defaulted to critical depth.

CROSS SECTION


RIVER: RIVER-1
REACH: Reach-1           RS: 141
```

```
INPUT
Description:
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1698    46.3  1690.7    99.6  1680.2     121  1677.5   138.8  1668.4
   163.7  1670.5   177.9  1660.4   188.6  1657.8   209.9  1645.4   220.6  1641.7
   256.2  1635.5   270.4  1627.1   281.1  1614.2   323.8  1589.6     338  1584.1
   384.3  1584.8   455.4  1583.1   551.5  1583.7   569.3  1584.5   590.6  1592.1
     612  1592.7   647.5  1597.2   665.3  1595.5   693.8  1602.6   715.1  1609.9
   743.6  1616.3   772.1  1636.1     797  1643.8   832.6  1663.4   871.7    1661

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   281.1     .08   715.1     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         281.1   715.1              250     340     405             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1588.86    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              0.89    Wt. n-Val.                            0.080
  W.S. Elev (ft)          1587.97    Reach Len. (ft)          250.00     340.00     405.00
  Crit W.S. (ft)          1587.00    Flow Area (sq ft)                   991.75
  E.G. Slope (ft/ft)     0.026773    Area (sq ft)                        991.75
  Q Total (cfs)           7506.00    Flow (cfs)                         7506.00
  Top Width (ft)           250.99    Top Width (ft)                      250.99
  Vel Total (ft/s)           7.57    Avg. Vel. (ft/s)                      7.57
  Max Chl Dpth (ft)          4.86    Hydr. Depth (ft)                      3.95
  Conv. Total (cfs)       45873.7    Conv. (cfs)                        45873.7
  Length Wtd. (ft)         340.00    Wetted Per. (ft)                    252.36
  Min Ch El (ft)          1583.10    Shear (lb/sq ft)                      6.57
  Alpha                      1.00    Stream Power (lb/ft s)               49.71
  Frctn Loss (ft)            9.38    Cum Volume (acre-ft)       0.33      22.45       0.47
  C & E Loss (ft)            0.07    Cum SA (acres)             0.42       6.80       0.64


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: RIVER-1
REACH: Reach-1            RS: 140

INPUT
Description:
Station Elevation Data    num=      30
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1661.6     3.6  1660.6      32  1643.9    46.2  1642.7    71.1    1636
    99.6  1638.5   110.2  1635.7   124.5  1629.2   135.1  1619.3   145.8  1615.2
   152.9  1607.6     160  1604.5   177.8  1592.8   188.5  1585.6   209.8  1578.8
   252.5  1580.6   277.4  1578.9   302.3  1584.8   316.5  1585.9   359.2  1575.8
   416.1  1575.2     633  1575.7   700.6  1576.3   729.1  1577.5   750.4  1583.4
   782.4  1596.8   803.7  1599.6     850  1601.2   878.4  1605.7   903.3  1614.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05   177.8     .08   750.4     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         177.8   750.4              480     400     330             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1579.39    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              0.66    Wt. n-Val.                            0.080
  W.S. Elev (ft)          1578.74    Reach Len. (ft)          480.00     400.00     330.00
  Crit W.S. (ft)                     Flow Area (sq ft)                  1155.73
  E.G. Slope (ft/ft)     0.028462    Area (sq ft)                       1155.73
  Q Total (cfs)           7506.00    Flow (cfs)                         7506.00
  Top Width (ft)           386.79    Top Width (ft)                      386.79
  Vel Total (ft/s)           6.49    Avg. Vel. (ft/s)                      6.49
  Max Chl Dpth (ft)          3.54    Hydr. Depth (ft)                      2.99
  Conv. Total (cfs)       44491.7    Conv. (cfs)                        44491.7
  Length Wtd. (ft)         399.09    Wetted Per. (ft)                    387.33
  Min Ch El (ft)          1575.20    Shear (lb/sq ft)                      5.30
  Alpha                      1.00    Stream Power (lb/ft s)               34.43
  Frctn Loss (ft)            5.23    Cum Volume (acre-ft)       0.33      14.07       0.47
  C & E Loss (ft)            0.14    Cum SA (acres)             0.42       4.31       0.64


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: RIVER-1
```

REACH: Reach-1 RS: 139

INPUT

Description: Downstream Analysis Boundary (SFHA Boundary Muddy River)

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
7.1	1587.2	57	1581.8	67.7	1576.6	96.2	1572.9	142.6	1572.8
163.9	1574.3	192.5	1582.1	245.9	1583.9	263.7	1582.6	285.1	1576.9
317.2	1580.2	338.6	1579.9	395.6	1572.9	420.6	1571.1	545.3	1569.7
670	1569.7	937.3	1571.2	948	1572.3	973	1577.2	1062.1	1574.8
1083.5	1572.6	1101.3	1574.2	1190.4	1573.4	1208.2	1570.4	1233.2	1575.4
1268.8	1572.3	1293.7	1574.5	1347.2	1573.5	1375.7	1583.3	1386.4	1584.1

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
7.1	.05	395.6	.08	948	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
395.6	948	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1574.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.050	0.080	0.050
W.S. Elev (ft)	1573.82	Reach Len. (ft)			
Crit W.S. (ft)	1572.12	Flow Area (sq ft)	59.18	1909.29	124.05
E.G. Slope (ft/ft)	0.007501	Area (sq ft)	59.18	1909.29	124.05
Q Total (cfs)	7506.00	Flow (cfs)	136.12	7020.01	349.87
Top Width (ft)	795.71	Top Width (ft)	75.49	552.40	167.81
Vel Total (ft/s)	3.59	Avg. Vel. (ft/s)	2.30	3.68	2.82
Max Chl Dpth (ft)	4.12	Hydr. Depth (ft)	0.78	3.46	0.74
Conv. Total (cfs)	86667.5	Conv. (cfs)	1571.7	81056.1	4039.7
Length Wtd. (ft)		Wetted Per. (ft)	75.64	552.53	168.86
Min Ch El (ft)	1569.70	Shear (lb/sq ft)	0.37	1.62	0.34
Alpha	1.02	Stream Power (lb/ft s)	0.84	5.95	0.97
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: Divided flow computed for this cross-section.

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	148.7	.05	.08	.05
Reach-1	148.6	.05	.08	.05
Reach-1	148.5	.05	.08	.05
Reach-1	148.3	.05	.08	.05
Reach-1	148	.05	.08	.05
Reach-1	147	.05	.08	.05
Reach-1	146	.05	.08	.05
Reach-1	145	.05	.08	.05
Reach-1	144	.05	.08	.05
Reach-1	143	.05	.08	.05
Reach-1	142	.05	.08	.05
Reach-1	141	.05	.08	.05
Reach-1	140	.05	.08	.05
Reach-1	139	.05	.08	.05

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	148.7	50	50	50
Reach-1	148.6	50	50	50
Reach-1	148.5	50	50	50
Reach-1	148.3	50	50	50
Reach-1	148	190	190	190
Reach-1	147	124	124	124
Reach-1	146	410.01	230.01	110.01
Reach-1	145	150	200	270
Reach-1	144	159.99	230.01	300
Reach-1	143	360	370	410
Reach-1	142	370	340	310
Reach-1	141	250	340	405
Reach-1	140	480	400	330
Reach-1	139	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	148.7	.1	.3
Reach-1	148.6	.1	.3
Reach-1	148.5	.1	.3
Reach-1	148.3	.1	.3
Reach-1	148	.1	.3
Reach-1	147	.1	.3
Reach-1	146	.1	.3
Reach-1	145	.1	.3
Reach-1	144	.1	.3
Reach-1	143	.1	.3
Reach-1	142	.1	.3
Reach-1	141	.1	.3
Reach-1	140	.1	.3
Reach-1	139	.1	.3

Attachment 4

Revised Dam Breach Inundation Map – 2021 Analysis

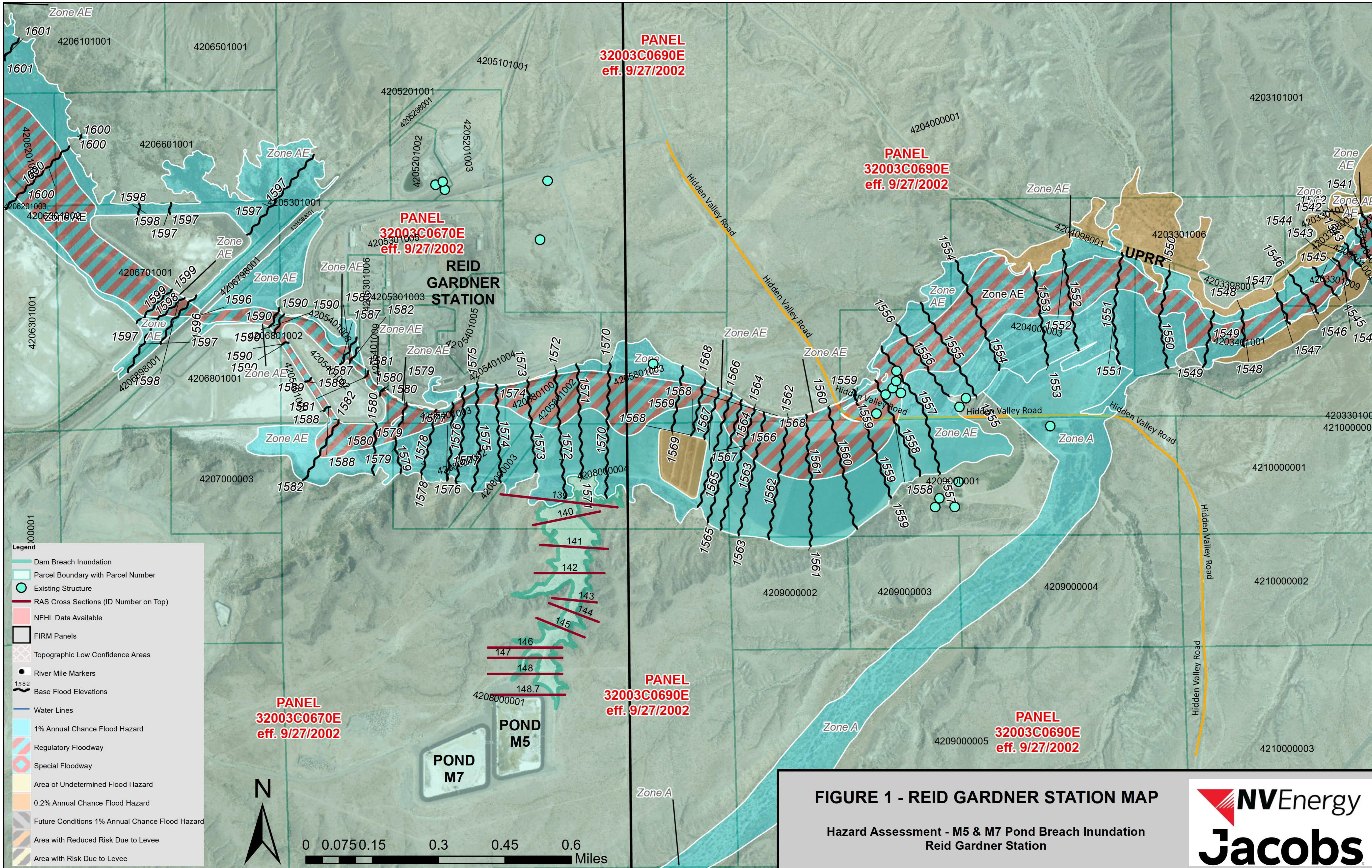


FIGURE 1 - REID GARDNER STATION MAP

Hazard Assessment - M5 & M7 Pond Breach Inundation
Reid Gardner Station