DOE–EM/GJ1640

Environmental Management - Grand Junction Office

UMTRA Project

Moab UMTRA Project
Flood Mitigation Plan

Revision 1

May 2011

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U.S. Department of Energy

Office of Environmental Management

Prepared by the Technical Assistance Contractor under contract number DE-AC30-07CC60012
and by the Remedial Action Contractor under contract number DE-AT30-07CC00014
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Revision History

Revision No.	Date	Reason/Basis for Revision
0	May 2008	Initial issue.
1	May 2011	Annual update.

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Acronyms and Abbreviations

cfs	cubic feet per second
DOE	U.S. Department of Energy
LO/TO	lockout/tagout
msl	mean sea level
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
RAC	Remedial Action Contractor
TAC	Technical Assistance Contractor
UMTRA	Uranium Mill Tailings Remedial Action
USGS	United States Geological Survey
VFD	variable frequency drive

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1.0 Introduction

The U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project site (Moab site) is a former uranium ore-processing facility located about three miles northwest of the city of Moab in Grand County, Utah, and lies on the west bank of the Colorado River at the confluence with the Moab Wash (Figure 1).

Section 2.0 of this plan provides information about river stage and flood predictions. Section 3.0 presents the trigger points which mandate specific actions, Section 4.0 provides guidance on specific steps in flood preparation, and Section 5.0 provides guidance to the steps that should be taken after the flood water has receded.

1.1 Purpose

Above-normal snowfall in the Rocky Mountains during the 2010 to 2011 winter has increased the likelihood of abnormally high runoff and, therefore, flow rate in the Colorado River. Because the Moab site is bounded on the east by about 3,500 feet of riverbank and the site is transected by the Moab Wash, protection of the site from flood damage is essential.

This plan is intended to minimize adverse impacts on DOE-owned or managed property associated with the Moab Project from river flooding.

1.2 Scope

This plan is applicable to flooding that may occur at or near the Moab site and outlines the planning and actions to be taken by the Technical Assistance Contractor (TAC) and Remedial Action Contractor (RAC) in preparation for possible flood conditions. In the event of flooding, the *Moab UMTRA Project Emergency Response Plan* (DOE-EM/GJ1520) will be utilized. The *Emergency Response Plan* contains a Flood Action Plan checklist that includes actions to be taken when the RAC Operations Manager calls a Flood Alert.

Activities in this plan will be performed in accordance with the established integrated work planning process.

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1.3 Background

Historical data collected from the nearest upriver gauging station, the United State Geological Survey (USGS) Cisco gauge, reveals that during the 1983 and 1984 runoffs, the river flow rate increased from approximately 20,000 to 30,000 cubic feet per second (cfs) in only 2 to 3 days (Figure 2). In another 2 to 3 days, the flow rates exceeded 40,000 cfs. Figure 2 is a high-altitude photo of the Moab site showing the area inundated during the 1984 flood. These runoffs were the most recent events that flooded low-lying areas of the Moab site, including where the interim action ground water remediation system well field is located. During these years, abnormally high snowfall occurred in the month of May.

Figure 3 shows the 100-year floodplain boundary for the Moab site.

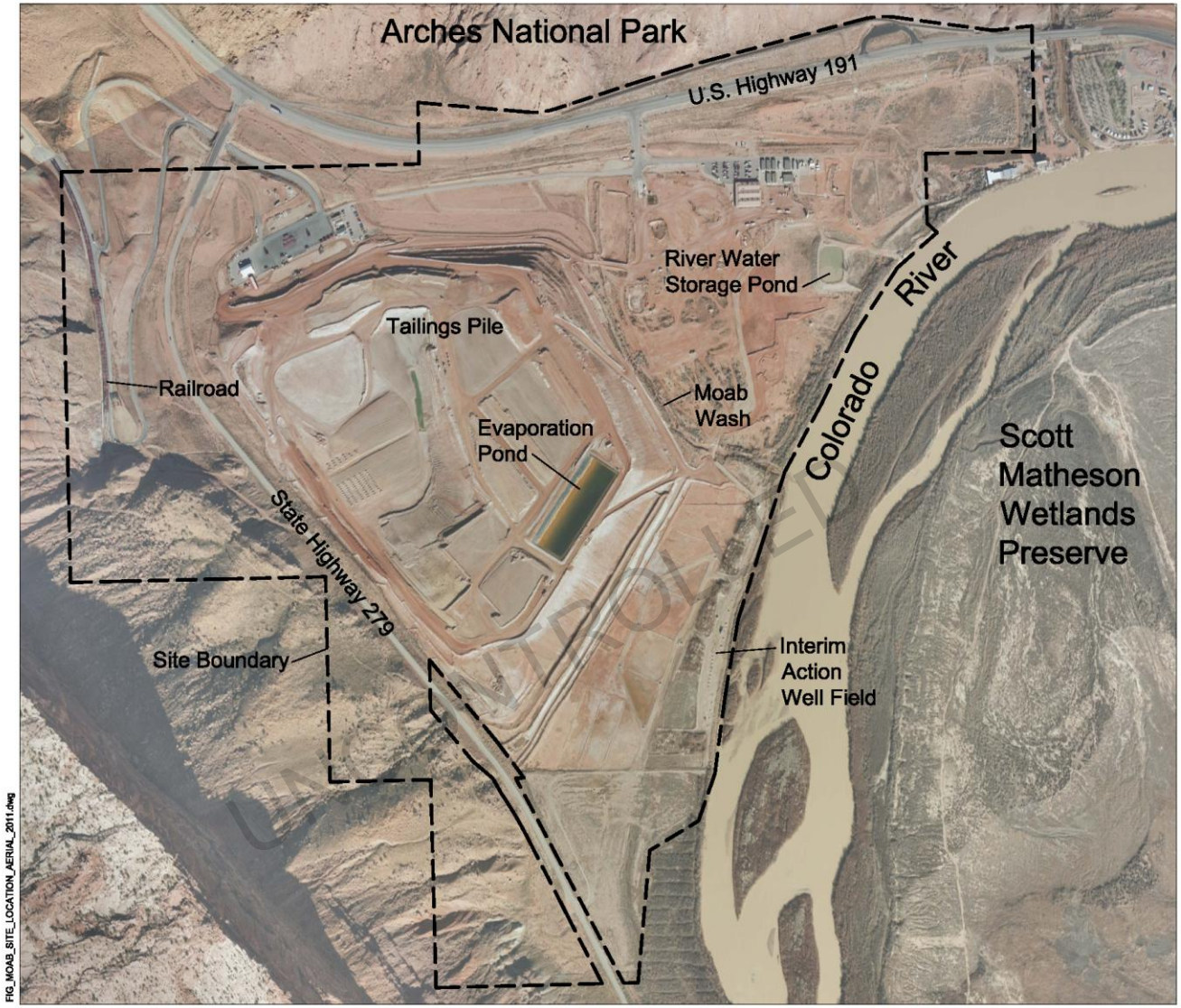

Figure 1. Moab Site Location

Figure 2. Area Inundated by May 1984 Flood
(courtesy USGS Global Visualization Viewer Earth Resources Observation and Science Center)

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The ground surface elevation in the vicinity of the well field at the site is 3,966 feet above mean sea level (msl). A flow rate of approximately 40,000 cfs (approximate on-site elevation of 3,968.5 ft msl), as measured at the Cisco, Utah, gauge (USGS Station No. 09180500), would be necessary to flood this area. A berm along the riverbank is at an elevation of 3,968 ft msl south of the Moab Wash. The berm elevation north of the Moab Wash is currently 3,967 ft msl, and when the river flow is between 35,000 and 40,000 cfs, it is likely that this area will be flooded with water.

Flow rates exceeding 60,000 cfs at the Cisco gauge could potentially reach the toe of the tailings pile. Due to the wide girth of the river at Moab, even if inundated, there is insufficient energy in the river to adversely impact the tailings pile. Therefore, protection of the tailings pile from flooding is limited to maintaining the berms during lower river stages. Additional information is available in:

- Flood Insurance Study, Grand County, Utah. Federal Emergency Management Agency, 2006.
- U.S. Geological Survey Scientific Investigations Report 2005-5022, Initial Phase Investigation of Multi-Dimensional Streamflow Simulations in the Colorado River, Moab Valley, Grand County, Utah, 2004.

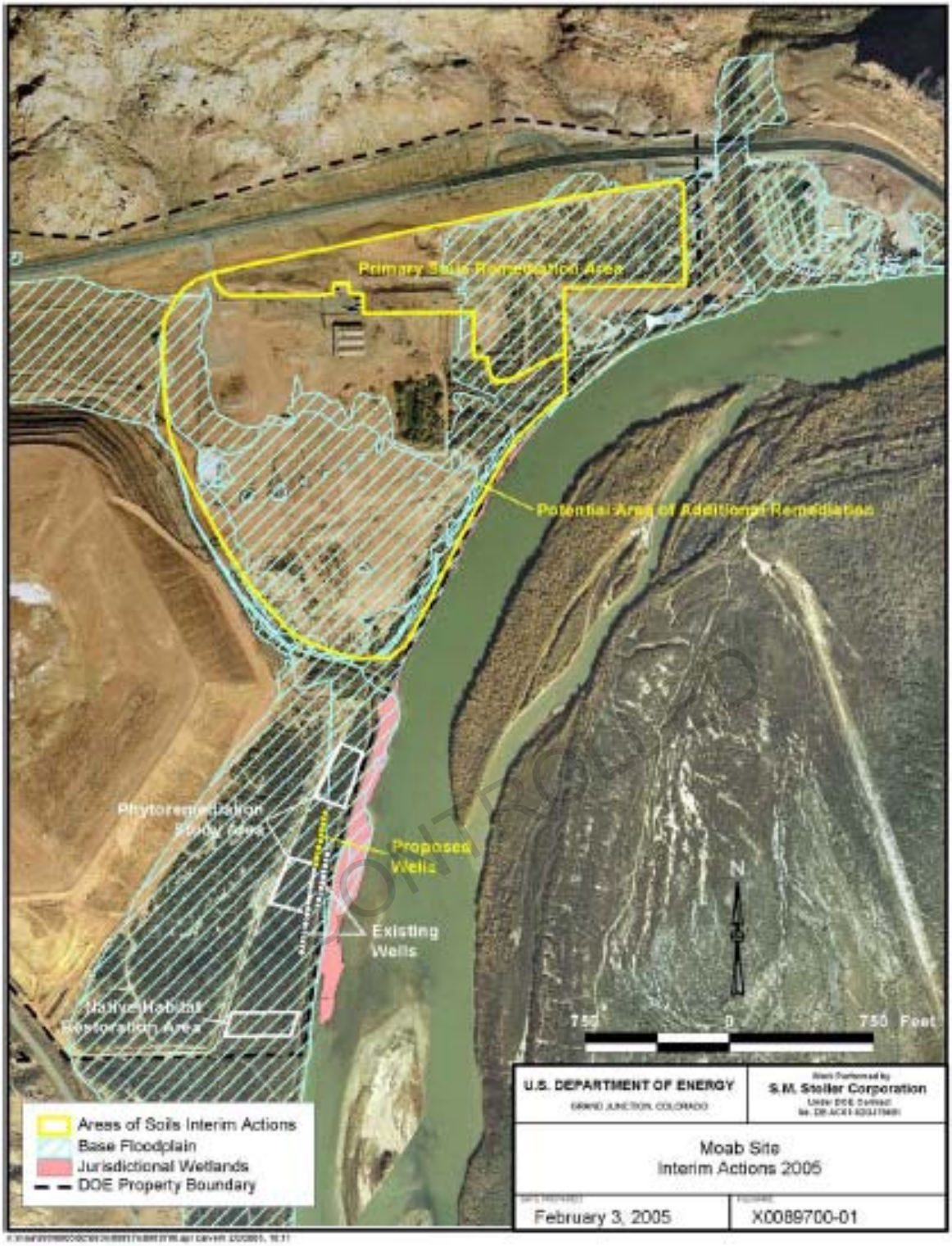

Figure 3. Moab Site 100-Year Floodplain

2.0 Monitoring Colorado River Stage

When river flow rate at the Cisco gauge is expected to exceed 10,000 cfs, the TAC monitors the current and forecast river stage daily and reports the status to the RAC in the Plan of the Day.

2.1 Flood Designations

The National Weather Service (NWS) has a flood warning notification system that includes several flood designations applicable to the Moab site, including flash flood warning, flood warning, and river flood warning (http://www.nws.noaa.gov/floodsafety/index). The NWS reports forecast the river stage for two weeks.

Each designation is described as follows:

- **Flash Flood Warning** – Issued to inform the public, emergency management, and other cooperating agencies that flash flooding is in progress, imminent, or highly likely.
- **Flood Warning** – In hydrologic terms, a release by NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts.
- **River Flood Warning** – This warning is issued by the local NWS when the forecast points at specific communities (those that have formal gauging sites and established flood stages) or areas along rivers where flooding has been forecast is imminent or is in progress. Flooding is defined as the inundation of normally dry areas as a result of increased water levels in an established water course. The flood warning normally specifies crest information. It usually occurs 6 hours or later after the causative event, and it is usually associated with widespread heavy rain and/or snowmelt or ice jams.

The warning will contain the forecast point covered, the current stage (if it is available), and the established flood stage. From the forecast crest, the NWS determines which areas will be affected by the river flooding. This information is included in the warning that is issued as a site/event-specific call-to-action.

The TAC will monitor the NWS website and report any warnings to the RAC at the daily safety briefing or will contact the site Operations Manager if an immediate threat occurs.

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2.2 River Stage Reporting

Estimated Colorado River flow rates for the Cisco, Utah, gauging station (based on upstream flow rates and weather systems impacting the Colorado River basin) can be monitored on the National Oceanic and Atmospheric Administration (NOAA) website at http://www.cbrfc.noaa.gov/river/station/flowplot/flowplot.cgi?CLRU1. Figure 4 shows an example hydrograph from the Cicso Gage for the month of April 2011.

In addition, the NOAA Western Water Supply Forecast web page, http://wateroutlook.nwrfc.noaa.gov/point/evolution?id=CLRU1&mode=r, provides a long-term seasonal runoff volume forecast that can be closely monitored.

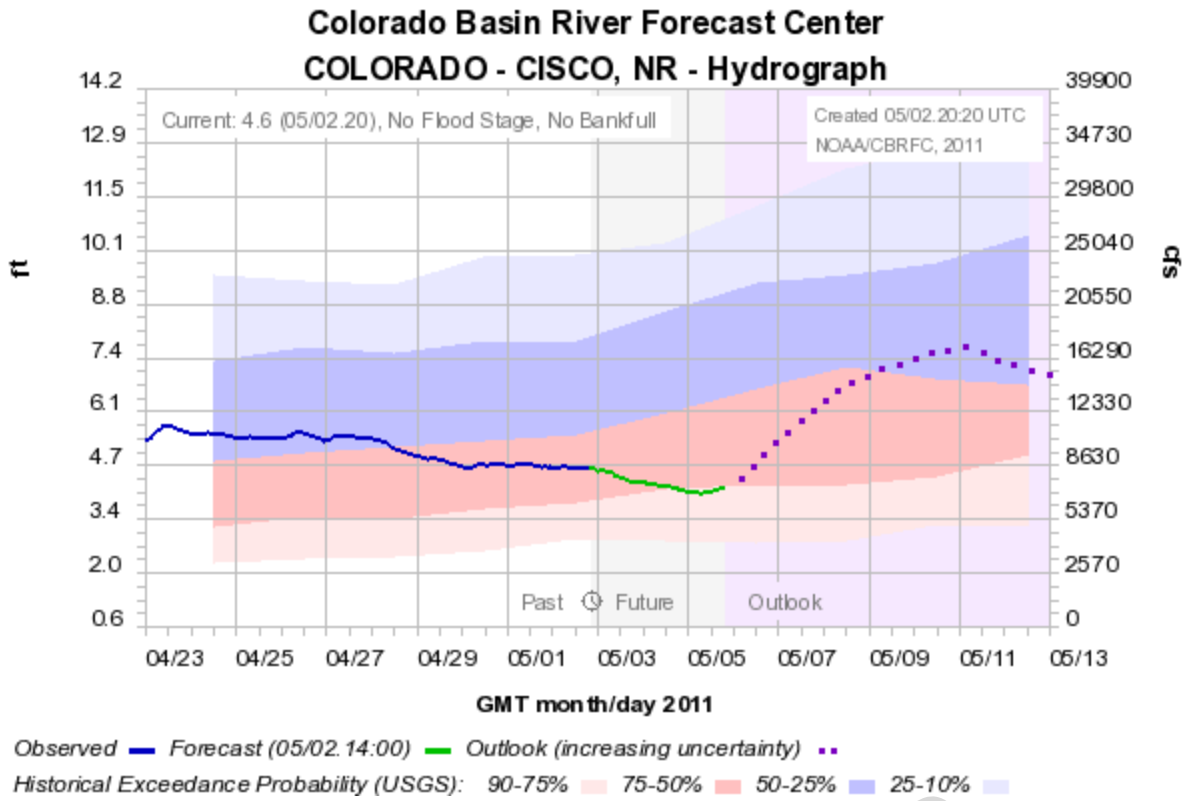

Figure 4. Example Hydrograph From Cisco, Utah, Gauging Station

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3.0 Decision-making for Mitigating Potential Flood Damage

To avoid unnecessary efforts and associated costs with flood preparation, specific actions are triggered by observed river flow rates and stage forecasts for the Cisco gauge. Taking the historical data into account, this plan establishes trigger points for action at 15,000 cfs, 25,000 cfs, and 30,000 cfs. These trigger points account for increases in flow rate that may occur over the weekend when site support is reduced.

River surface elevations are collected by the TAC on a daily basis. The elevation data can be used to determine flooding potential on site. Figure 5 shows the correlation of the river surface elevation and the river flow on the Cisco gauging station.

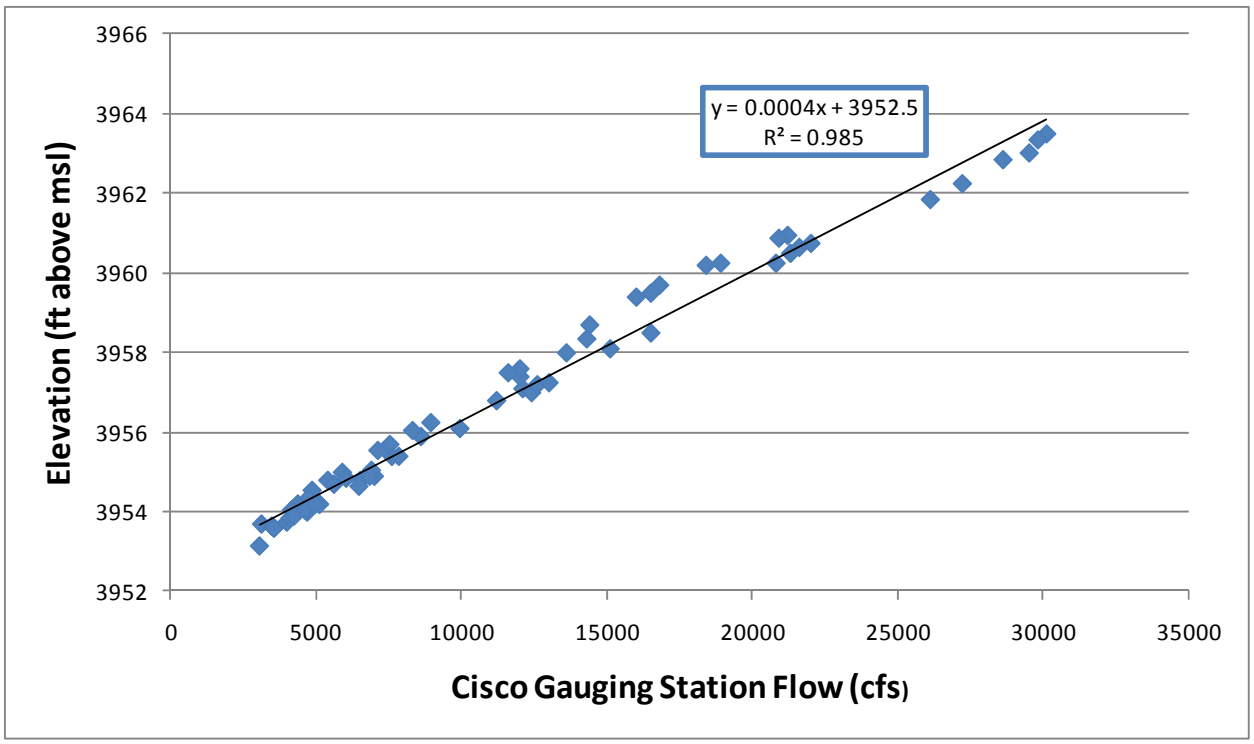

Figure 5. Cisco River Gauge versus Site Elevation Gauge

3.1 Specific Actions at 15,000 cfs and Two-week Forecast of 40,000 cfs

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If the forecast indicates maximum flow rates will exceed 40,000 cfs within the next 2 weeks, the TAC will take the following actions associated with the well field once the flow rate at the Cisco gauge reaches approximately 15,000 cfs:

- Notify RAC Emergency Response Coordinator, who will then notify RAC and TAC Site Supervisors, DOE Facility Representative, the Federal Project Director, and TAC Public Affairs.
- Notify electrician to schedule Configurations 1, 3, and 4 transformer removal from the well field variable frequency drive (VFD) removal from Configuration 5.
- Coordinate with RAC and TAC to conduct a walkdown of areas to identify potentially vulnerable assets and establish corrective actions.
- Shut down all freshwater injection into the well field when the river flow reaches 15,000 cfs.
- Verify all riverbed well point and observation well caps have been installed.
- Monitor the lower wash crossing for backed-up river water. Access through the crossing will be closed when deemed unsafe (approximately 24,000 cfs).

The RAC will take the following actions in other areas of the site at the 15,000 cfs level should the forecast predict flows greater than 40,000 cfs:

- The RAC Emergency Response Coordinator will complete the Emergency Response Checklist found in Attachment 3 of the *Moab UMTRA Project Emergency Response Plan* (DOE-EM/GJ1520).
- Remove all equipment stored in low-lying areas and transport to areas of the site that will not be impacted by higher flow rates. Keep the keys to any equipment in the Administration Office.
- Remove all air monitoring equipment from the well field.

- Instruct site security to notify the on-call manager of any flooding during off hours.
- Inform site security and site personnel during daily safety briefing of flood-prone areas at the site where operations will be restricted for that day.

3.2 Specific Actions at 25,000 cfs and Two-week Forecast of 40,000 cfs

Once the flow rate exceeds 25,000 cfs at the Cisco gauge and is forecast to exceed 40,000 cfs within the next 2 weeks, the TAC will perform the following tasks:

- Shut down all power to the well field and secure power following lockout/tagout (LO/TO) procedures to prevent inadvertent energization to the well field.
- Measure water levels at each location equipped with a data logger/pressure transducer. Label, download, and remove each data logger/pressure transducer.
- Record all individual extraction/injection well flow meter values. Label and remove each well head flow meter display plate. Remove Configurations 1, 3, and 4 Badger meter displays.
- Have electricians remove transformers and VFDs from well field.
- Inventory ground water shed and flammable cabinet in Configuration 5. Remove any equipment that can be damaged by potentially rising water and relocate to higher ground.
- Shut down the well field access road across Moab Wash. All access will be through the alternative route off State Route 279.
- Contact Chad Shepherd of Williams Northwest Pipeline at 435-220-0139 to inform him that we are expecting a flow of greater than 40,000 cfs, so they will have time to remove electrical equipment from their equipment located adjacent to the river intake structure.

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4.0 Specific Actions for Flood Mitigation

Representatives of the RAC and TAC will jointly observe the Colorado River bank and lower portion of the Moab Wash and associated berms to identify low points, erosional features, or loose soils that may be subject to further erosion during flooding. Objects that may be disrupted during flooding will be noted to determine if relocation or protection in place is preferred. Pay attention to possible hazardous materials (see list with security guards at the site entry kiosk.) that may require special actions. The walkdown survey may result in corrective actions.

5.0 Specific Actions After Flood Water Recedes

Once the well field is accessible and there is no longer a threat of flooding or danger, the TAC will perform the following tasks:

- Assess any flood damage on the river berm and in the well field. Complete any necessary corrective actions.
- Contact the electricians to re-install the VFDs on the Configuration 5 wells and reinstall the transformers in Configurations 1, 3, and 4.
- Return flow meter and badger meter face plates to all of the wells.
- Return data loggers/pressure transducers to wells.
- Identify areas of standing water and determine whether mosquito abatement is necessary.
- Remove the LO/TO on the well field power.

- Resume well field extraction.
- Resume well field injection after the river flow drops to less than 15,000 cfs.

The RAC will complete the following actions after the flood water has receded, and the area adjacent to the river is deemed safe.

- Scan the lower wash crossing for any potential contamination.
- Return air monitoring stations to the well field.

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