CEII VERSION

EMERGENCY ACTION PLAN

MADISON DEVELOPMENT

Missouri-Madison Project No. 2188-08

NATDAM-MT00561

Hydro Generation
11 East Park
Butte, MT 59701

December 18, 2019

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EAP Signatures

PART I: EAP INFORMATION

A. Summary of EAP Responsibilities

Tables A.1 and A.2 provide brief summaries of broad Emergency Action Plan (EAP) responsibilities and Northwestern Energy (NWE) responsibilities respectively, as a general reference for implementing this EAP. Additional details on procedures and general responsibilities for activation of this EAP are provided in Sections E and F, respectively, later in this document.

Table A.1: MADISON EAP RESPONSIBILITY SUMMARY

Northwestern Energy (NWE)	1. Detect, verify, and assess emergency conditions at the dam 2. If appropriate, evacuate area immediately below the dam 3. Notify emergency management and regulatory agencies 4. Notify downstream and upstream dams 5. Take corrective actions 6. Issue condition status reports 7. Declare termination of the emergency
County Emergency Services	1. Receive NWE condition status reports 2. Notify respective county Disaster and Emergency Services (DES) Coordinator(s) 3. Notify Public within respective counties, as necessary 4. Conduct evacuation from inundation areas within respective counties, if required. All evacuation activities will be coordinated by the respective County Sheriff 5. Provide mutual aid between counties if requested and able
City/Local Emergency Services	1. Receive NWE condition status reports 2. Notify Public within respective cities/local vicinities, as necessary 3. Conduct evacuation from inundation areas within respective localities, if required
Montana Disaster and Emergency Services (DES)	1. Receive condition status reports from NWE and/or respective county sheriffs 2. Contact the Governor's office 3. Be prepared to offer assistance to local and county officials
US National Weather Service (Great Falls)	1. Receive NWE condition status reports 2. Issue flood warnings and work with county sheriffs for Emergency Alert System (EAS) activation to supplement EAP notifications 3. Provide additional advanced warning to downstream areas

Table A.2: NORTHWESTERN ENERGY RESPONSIBILITIES SUMMARY

NWE Observer/Plant Operator NWE Plant O&M Supervisor	1. Detect and confirm incident at the dam 2. Determine emergency level 3. Make calls on notification flowchart 4. If appropriate, evacuate area immediately downstream of the dam 5. Coordinate with HSO and Engineering on emergency operations/procedures 6. Implement emergency operations/procedures 7. Provide regular status updates to HSO or senior management
Hydro System Operator (HSO) – Generation Control Center	1. Detect incident from alarms 2. Confirm incident via camera systems, if available 3. If no one is on-site, determine emergency level and dispatch operator to site 4. Make calls on notification flowchart 5. Coordinate with Operator and Engineering on emergency operations/procedures 6. Coordinate operations with upstream and downstream dams 7. Provide regular status updates to senior management
Hydro Operations – Supervisor On-Call	1. Make timely contact with each county sheriff/911 center on notification flowchart and clearly communicate situation at the dam 2. Support Operator and HSO, as appropriate 3. Receive status updates from HSO, Operator, or senior management 4. Provide regular status updates, as appropriate
NWE Superintendent, Hydro O&M	1. Support Operator and HSO on emergency level 2. Make calls on notification flowchart 3. Determine emergency operation and construction procedures 4. Coordinate with HSO on emergency operations/procedures 5. Dispatch engineers and construction crews, as required 6. Dispatch engineer as technical liaison to Emergency Operations Center 7. Provide regular status reports to senior management
NWE Chief Dam Safety Engineer	1. Make calls on notification flowchart 2. Initiate periodic status report conference calls with dam site, HSO, engineering, and corporate communications 3. Provide regular status reports to Emergency Operations Center 4. Coordinate with upper management 5. Coordinate with corporate communications staff and liaison at Emergency Operations Center
NWE Lead Resource Coordinator	1. Make calls on notification flowchart 2. Support HSO, as appropriate 3. Receive regular status updates 4. Provide regular status updates, as appropriate
NWE Director of Corporate Communications	1. Dispatch public relations staff, as appropriate 2. Participate in periodic status report conference calls with dam site, HSO, engineering, and management 3. Provide input to staff on emergency communications 4. Represent NWE to media

B. Notification Flowcharts

Notification flowcharts are provided on the following pages for each of the four color coded dam safety emergency level categories listed below:

Imminent Failure – Time has run out and the dam has failed, is failing, or is about to fail.

Potential Failure – Conditions are present at the dam that could lead to a failure.

Non-Failure – Incident at the dam that will not by itself, lead to a failure, but requires investigation by and notification of internal and/or external personnel.

High Flow – Flooding is occurring on the river system, but there is no apparent threat to the integrity of the dam.

MADISON DEVELOPMENT
MISSOURI-MADISON PROJECT NO. 2188-08

Revised 12/18/2019

WARNING FLOWCHART/NOTIFICATION FLOWCHART

IMMINENT FAILURE

THIS PROCEDURE TO BE IMPLEMENTED WHEN THE DAM HAS FAILED, IS FAILING, OR IS ABOUT TO FAIL

ALERT THE FOLLOWING RESERVOIRS OF THE SITUATION. REQUEST THAT A COORDINATED DRAFT BEGIN OF EACH DOWNSTREAM RESERVOIR AND TO PREPARE FOR PASSING HIGH FLOWS.

OBSERVER/PLANT OPERATOR
(406) 533-[redacted] OR (406) 682-[redacted]

BYPASS IF PLANT FOREMAN IS NOT AVAILABLE.

(DEPENDING ON THE SEVERITY OF THE EMERGENCY, THE PLANT FOREMAN SHALL HAVE THE OPTION OF MAKING INITIAL CONTACT WITH THE MADISON COUNTY SHERIFF; THEN CONTACTING THE HYDRO SUPERVISOR ON-CALL)

NWE PLANT FOREMAN
KURT KELLER
PLANT: (406) 533-[redacted] OR (406) 682-[redacted] OR
CELL: (406) [redacted]

OPERATORS
DAN CELL: (406) 490-[redacted] DAVID CELL: (406) 490-[redacted]
MITCH CELL: (406) 490-[redacted]

(FOREMAN MAY ASK HSO TO MAKE HIS CALLS)

CHANNEL 1 [redacted]
CHANNEL 2
CHANNEL 3
CHANNEL 4
CHANNEL 5
CHANNEL 6
CHANNEL 7
CHANNEL 8
CHANNEL 9
CHANNEL 10
CHANNEL 11
CHANNEL 12
CHANNEL 13
CHANNEL 14
CHANNEL 15
CHANNEL 16
CHANNEL 17
CHANNEL 18
CHANNEL 19
CHANNEL 20

(1)
NWE HYDRO OPERATIONS,
SUPERVISOR ON-CALL
REFER TO ON-CALL SCHEDULE **OR**
CALL NWE HYDRO SYSTEM OPERATOR (HSO) FOR SUPERVISOR ON-CALL

(2)
NWE HYDRO SYSTEM OPERATOR (HSO)
GENERATION CONTROL CENTER
(406) 268-[redacted] **(24 HR)**
CELL: (406) 241-[redacted]

(3)
NWE LEAD RESOURCE COORDINATOR
JAKE STAGNOLI
OFFICE: (406) 497-[redacted]
CELL: (406) 490-[redacted]

(2)
NWE DIRECTOR HYDRO O&M
JEREMY CLOTFELTER
OFFICE: (406) 268-[redacted]
CELL: (406) 868-[redacted]
HOME: (406) 467-[redacted]

(1)
NATIONAL WEATHER SERVICE
GREAT FALLS, MONTANA
(406) 952-[redacted] **(24 HR)**

(2)
PUBLIC RELATIONS SPECIALIST
JO DEE BLACK
OFFICE: (406) 497-[redacted]
CELL: (406) 788-[redacted]
(866) 622-[redacted] **(24HR)**

(1)
MADISON COUNTY SHERIFF
PHIL FORTNER
LOCAL: DIAL 911 **(24 HR)**
DISPATCH: (406) 843-[redacted] **(24 HR)**

(THIS POINT OF CONTACT WILL ASSUME RESPONSIBILITY FOR NOTIFYING MADISON COUNTY OFFICIALS HAVING DISASTER AND EMERGENCY SERVICES RESPONSIBILITIES)

(2)
GALLATIN COUNTY SHERIFF - BRIAN GOOTKIN
BOZEMAN 911 DISPATCH CENTER
DISPATCH: (406) 585-[redacted] **(24 HR. HIGH PRIORITY)**

WEST YELLOWSTONE POLICE DISPATCH
LOCAL: DIAL 911 or (406) 646-[redacted]

DEPUTY SHERIFF IN WEST YELLOWSTONE
MATT STUBBLEFIELD
CONTACT THRU POLICE DISPATCH 911 **OR**
(406) 585-[redacted] (BOZEMAN DISPATCH) or CELL: (406) 580-[redacted]

(THIS POINT OF CONTACT WILL ASSUME RESPONSIBILITY FOR NOTIFYING GALLATIN COUNTY OFFICIALS HAVING DISASTER AND EMERGENCY SERVICES RESPONSIBILITIES))

(3)
BROADWATER COUNTY SHERIFF
WYNN MEEHAN
LOCAL DIAL 911
OFFICE: (406) 266-[redacted] **OR**
(406) 266-[redacted] **(BOTH 24 HR)**

(THIS POINT OF CONTACT WILL ASSUME RESPONSIBILITY FOR NOTIFYING BROADWATER COUNTY OFFICIALS HAVING DISASTER AND EMERGENCY SERVICES RESPONSIBILITIES)

NOTE: SHERIFF AND DES SHALL BE RESPONSIBLE FOR PROVIDING EMERGENCY SERVICES TO NOTIFY AND EVACUATE AFFECTED RESIDENTS WITHIN THEIR JURISDICTIONAL AREA.

(1)
US BUREAU OF LAND MANAGEMENT – ENNIS
[redacted] ***McGRATH***
CELL: (406) 531-9173; OFFICE: (406) 682-[redacted] **OR**
CORNIE HUDSON: CELL: (406) 865-[redacted]

*DILLON INTERAGENCY DISPATCH: (406) 683-[redacted]

(4)
BROADWATER DAM
STATE OF MONTANA (DNRC)
POWERHOUSE CONTROL ROOM (406) 266-[redacted] **OR**
(406) 444-[redacted] [redacted] **(BOTH ARE DAY TIME ONLY)**
(406) 498-[redacted] **(24 HR CELL) OR**
(406) 595-[redacted] OR (406) 600-[redacted]

(5)
CASPER CONTROL CENTER
US BUREAU[redacted] RECLAMATION
(307) 234-7550 **OR** (307) 261-[redacted]
(BOTH 24 HR)
CASPER CONTROL CENTER WILL NOTIFY CANYON FERRY DAM

ALERT THE ABOVE RESERVOIRS OF THE SITUATION AND REQUEST THAT THE UPSTREAM RESERVOIR REDUCE ITS OUTFLOW TO MINIMUM LEVELS.

(6)
NWE ASSISTANT RESERVOIR ATTENDANT
BRET PEARSON
HEBGEN DAM OFFICE: [redacted] 548-[redacted]
CELL: 640-[redacted]
HOME: (406) 646-[redacted]

(1)
MONTANA DISASTER & EMERGENCY SERVICES
Duty Officer: (406) 324-[redacted] **(24 HR)**
(406) 431-[redacted] **(24 HR CELL)**

GOVERNOR'S OFFICE
STATE OF MONTANA
OFFICE: (406) 444-[redacted]

(2)
NORTHWESTERN ENERGY
GRID [redacted] CONTROL CENTER
(24 HR.): (406) 494-[redacted] PRESS 1 FOR SCHEDULER **OR**
(406) 497-[redacted] PRESS 1 **OR** (406) 497-[redacted] PRESS 1

NORTHWESTERN ENERGY
BOZEMAN DIVISION
SUPERVISOR-ON-CALL
(REFER TO ON-CALL SCHEDULE)

(7)
CHIEF DAM SAFETY ENGINEER
CARRIE HARRIS
OFFICE: (406) 497-[redacted]
CELL: (406) 490-[redacted]
2nd CELL: (406) 225-[redacted]

FERC - PORTLAND
REGIONAL ENGINEER
DOUG JOHNSON
OFFICE: (503) 552-[redacted]
CELL: (253) 691-[redacted]
HOME: (503) 206-[redacted]
OR CALL
BRANCH CHIEF
KARL SWANSON
OFFICE: (503) 552-[redacted]
CELL: (503) 928-[redacted]

NOTIFICATION WARNING EXAMPLE
"This is John Doe, Plant Operator for NWE at Madison Dam. I am calling to implement the Madison Dam EAP "Imminent Failure" Flowchart notification procedure on page 4 of the Plan. This is not a test! I repeat, this is not a test." Explain the failure circumstances and conclude with "Do you understand how to carry out your responsibilities according to the EAP?"

****NOTE: *DILLON INTERAGENCY DISPATCH IS NOT A 24/7 DISPATCH CENTER****

NOTE:
FOR VOICE MAIL OR ANSWERING MACHINE MESSAGES, REFER TO SECTION E.2. NOTIFICATION PROCEDURES

THIS DIAGRAM IS CURRENT FOR 2020 AND REFLECTS ALL CHANGES PER THE 2019 ANNUAL REVIEW, 12/18/2019.

→ ***(1), ETC. INDICATES ORDER OF CALLS***

MADISON DEVELOPMENT

Revised 12/18/2019

MISSOURI-MADISON PROJECT NO. 2188-08

WARNING FLOWCHART/NOTIFICATION FLOWCHART

POTENTIAL FAILURE

THIS PROCEDURE TO BE IMPLEMENTED WHEN CONDITIONS EXIST AT THE DAM THAT COULD LEAD TO A FAILURE

OBSERVER/PLANT OPERATOR
(406) 533-[redacted] OR (406) 682-[redacted]

NWE PLANT FOREMAN
KURT KELLER
PLANT: (406) 533-[redacted] OR (406) 682-[redacted] OR
CELL: (406) 647-[redacted]

OPERATORS
DAN CELL: (406) 490-[redacted] DAVID CELL: (406) 490-[redacted]
MITCH CELL: (406) 490-[redacted]

BYPASS IF MADISON PLANT FOREMAN IS NOT AVAILABLE

NWE HYDRO OPERATIONS,
SUPERVISOR ON-CALL
REFER TO ON-CALL SCHEDULE **OR**
CALL NWE HYDRO SYSTEM OPERATOR (HSO)
FOR SUPERVISOR ON-CALL
(406) 268-[redacted] **(24 HR)**
CELL: (406) 241-[redacted]

(1)

NWE DIRECTOR HYDRO O&M
JEREMY [redacted]
OFFICE: (406) 268-[redacted]
CELL: (406) 868-[redacted]
HOME: (406) 467-[redacted]

CHIEF DAM SAFETY ENGINEER
CARRIE HARRIS
OFFICE: (406) 497-[redacted]
CELL: (406) 490-[redacted]
2nd CELL: (406) 225-[redacted]

(2)

MADISON COUNTY SHERIFF
PHIL FORTNER
LOCAL: DIAL 911 **(24 HR)**
DISPATCH: (406) 843-[redacted] **(24 HR)**

FERC - PORTLAND REGIONAL ENGINEER
DOUG JOHNSON
OFFICE: (503) 552-[redacted]
CELL: (253) 691-[redacted]
HOME: (503) 206-[redacted]
OR CALL
BRANCH CHIEF
KARL SWANSON
OFFICE: (503) 552-[redacted]
CELL: (503) 928-[redacted]

(3)

GALLATIN COUNTY SHERIFF - BRIAN GOOTKIN
BOZEMAN 911 DISPATCH CENTER
DISPATCH: (406) 585-[redacted] **(24 HR HIGH PRIORITY)**

WEST YELLOWSTONE POLICE DISPATCH
LOCAL: DIAL 911 or (406) 646-[redacted]

DEPUTY SHERIFF IN WEST YELLOWSTONE
MATT STUBBLEFIELD
CONTACT THRU POLICE DISPATCH 911 **OR**
(406) 585-[redacted] (BOZEMAN DISPATCH) or CELL: (406) 580-[redacted]

NOTE:
AN ASSESSMENT OF THE SITUATION WILL DETERMINE WHETHER A COORDINATED DRAFT OF DOWNSTREAM RESERVOIRS AND REDUCTION OF OUTFLOWS AT UPSTREAM RESERVOIRS IS REQUIRED, OR IF EMERGENCY OFFICIALS SHOULD BE NOTIFIED.

NOTE:
IF THE SITUATION WERE TO DEVELOP INTO A SITUATION OF IMMINENT FAILURE, THE "WARNING FLOWCHART" FOR IMMINENT FAILURE SHOULD BE IMPLEMENTED

NOTE:
FOR VOICE MAIL OR ANSWERING MACHINE MESSAGES, REFER TO SECTION E.2. NOTIFICATION PROCEDURES

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→ *(1), ETC. - INDICATES ORDER OF CALLS*

MADISON DEVELOPMENT

Revised 12/18/2019

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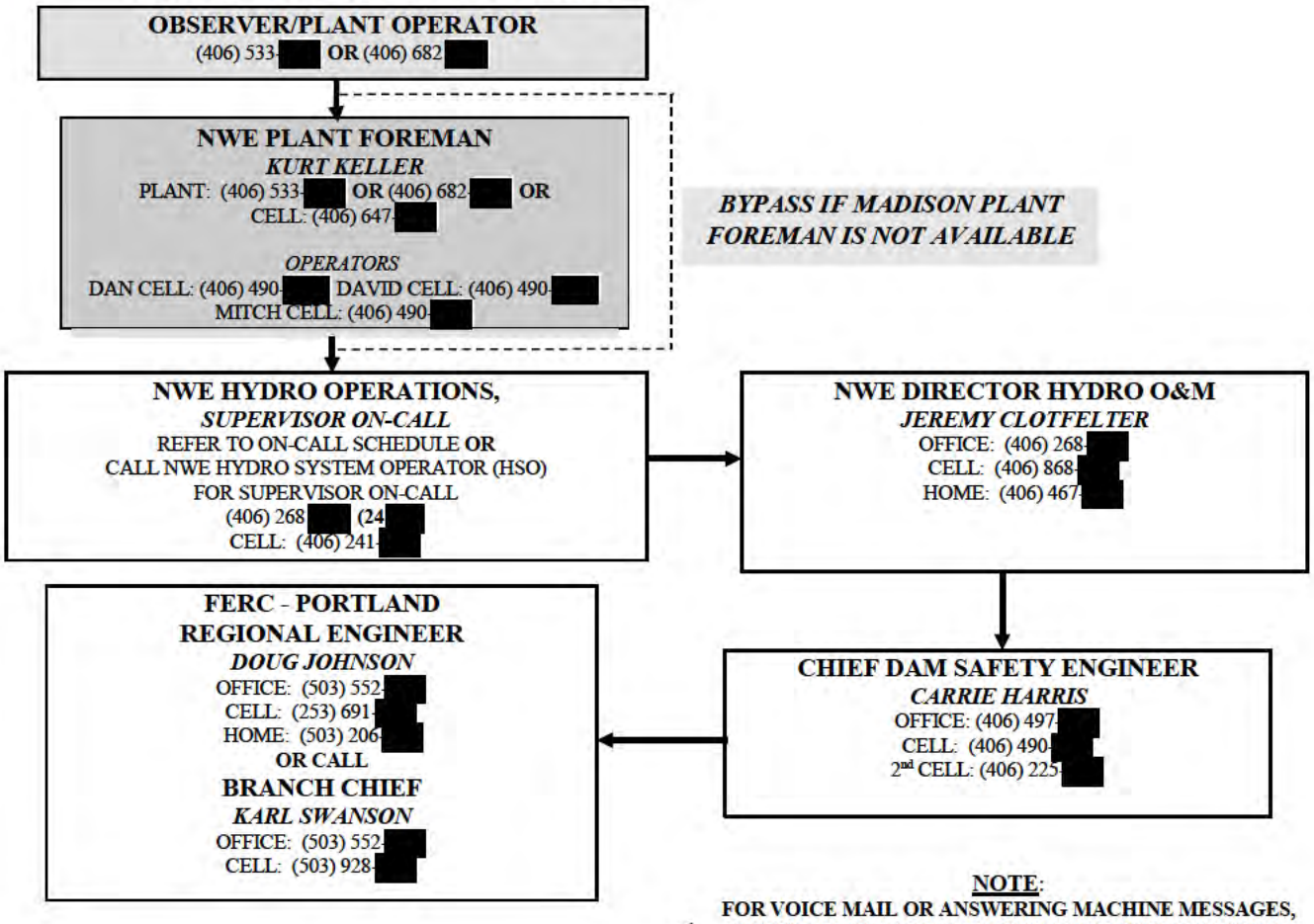
WARNING FLOWCHART/NOTIFICATION FLOWCHART

NON-FAILURE

THIS PROCEDURE TO BE IMPLEMENTED WHEN THERE IS AN INCIDENT AT THE DAM THAT WILL NOT BY ITSELF, LEAD TO A FAILURE, BUT REQUIRES INVESTIGATION



NOTE:
FOR VOICE MAIL OR ANSWERING MACHINE MESSAGES, REFER TO SECTION E.2. NOTIFICATION PROCEDURES

NOTE:
AN ASSESSMENT OF THE SITUATION WILL DETERMINE IF EMERGENCY OFFICIALS SHOULD BE NOTIFIED.

NOTE:
IF THE SITUATION WERE TO DEVELOP INTO A SITUATION OF POTENTIAL FAILURE OR IMMINENT FAILURE, THE "WARNING FLOWCHART" FOR POTENTIAL FAILURE OR IMMINENT FAILURE SHOULD BE IMPLEMENTED

THIS DIAGRAM IS CURRENT FOR 2020 AND REFLECTS ALL CHANGES PER THE 2019 ANNUAL REVIEW, 12/18/2019.

MADISON DEVELOPMENT

Revised 12/18/2019

MISSOURI-MADISON PROJECT NO. 2188-08

WARNING FLOWCHART/NOTIFICATION FLOWCHART

HIGH FLOW

*THIS PROCEDURE IS TO BE IMPLEMENTED WHEN **HIGH FLOWS** OR FLOODING WILL OCCUR DOWNSTREAM BECAUSE OF NWE OPERATING PROCEDURES DURING RIVER LEVELS THAT ARE ALREADY AT OR NEAR FLOOD STAGE. (10.5 FEET AS MEASURED AT TOSTON, MT ON THE MISSOURI RIVER.)*

NOTE:
IT IS IMPORTANT TO STRESS THAT THIS IS AN INFORMATION-CALL ONLY, AND THAT THE DAM IS NOT IN DANGER OF FAILURE.

NWE LEAD RESOURCE COORDINATOR
JAKE STAGNOLI
OFFICE: (406) 497-[redacted]
CELL: (406) 490-[redacted]

(1) → **NATIONAL WEATHER SERVICE**
GREAT FALLS, MONTANA
(406) 952-[redacted] **(24 HR)**

PUBLIC RELATIONS SPECIALIST
JO DEE BLACK
OFFICE: (406) 497-[redacted]
CELL: (406) 788-[redacted]
(866) 622-[redacted] **(24HR)**

(2) (3) → **US BUREAU OF LAND MANAGEMENT – ENNIS**
CHRIS McGRATH
CELL: (406) 531-[redacted] OFFICE: (406) 682-[redacted] **OR**
CORNIE HUDSON: CELL: (406) 865-[redacted]
*DILLON INTERAGENCY DISPATCH: (406) 683-[redacted]

GALLATIN COUNTY SHERIFF - BRIAN GOOTKIN
BOZEMAN 911 DISPATCH CENTER
DISPATCH: (406) 585-[redacted] **(24 HR HIGH PRIORITY)**

WEST YELLOWSTONE POLICE DISPATCH
LOCAL: DIAL 911 or (406) 646-[redacted]

DEPUTY SHERIFF IN WEST YELLOWSTONE
MATT STUBBLEFIELD
CONTACT THRU POLICE DISPATCH 911 **OR**
(406) 585-[redacted] (BOZEMAN DISPATCH) or CELL: (406) 580-[redacted]

(4) → **MADISON COUNTY SHERIFF**
PHIL FORTNER
LOCAL: DIAL 911 **(24 HR)**
DISPATCH: (406) 843-[redacted] **(24 HR)**

(5) → **BROADWATER COUNTY SHERIFF**
WYNN MEEHAN
OFFICE: (406) 266-[redacted] **OR**
(406) 266-[redacted] **(BOTH 24 HR)**

(6) → **FERC - PORTLAND REGIONAL ENGINEER**
DOUG JOHNSON
OFFICE: (503) 552-[redacted]
CELL: (253) 691-[redacted]
HOME: (503) 206-[redacted]
OR CALL
BRANCH CHIEF
KARL SWANSON
OFFICE: (503) 552-[redacted]
CELL: (503) 928-[redacted]

NWE HYDRO OPERATIONS,
SUPERVISOR ON-CALL
REFER TO ON-CALL SCHEDULE **OR**
CALL NWE HYDRO SYSTEM OPERATOR (HSO)
FOR SUPERVISOR ON-CALL
(406) 268-[redacted] **(24 HR)**
CELL: (406) 241-[redacted]

(7) → **CHIEF DAM SAFETY ENGINEER**
CARRIE HARRIS
OFFICE: (406) 497-[redacted]
CELL: (406) 490-[redacted]
2nd CELL: (406) 225-[redacted]

(8) →

→ ***(1), ETC. - INDICATES ORDER OF CALLS***

****NOTE: *DILLON INTERAGENCY DISPATCH IS NOT A 24/7 DISPATCH CENTER****

THIS DIAGRAM IS CURRENT FOR 2020 AND REFLECTS ALL CHANGES PER THE 2019 ANNUAL REVIEW, 12/18/2019.

C. Statement of Purpose

This EAP has been prepared in accordance with the requirements of the Federal Energy Regulatory Commission (FERC) Order Number 122, issued on January 21, 1981 (Federal Register/Volume 46, No. 18, January 28, 1981) and revised in accordance with the provisions of Section 12.22(a.)(1), on April 5, 1985 (issued February 22, 1988, with addendum issued September 9, 1988). Since that time, an initiative was developed to provide national (Federal, state, local) consistency in the content of Emergency Action Plans at dams throughout the country. As a result, the *ad hoc* Interagency Committee on Dam Safety (ICODS) prepared and approved Federal guidelines for emergency action planning at dams which was published by the Federal Emergency Management Agency (FEMA) in October 1998. The FEMA guidelines were again revised and published in July 2013. As a result of the latest Federal initiative revisions, the FERC Guidelines Chapter 6 – Emergency Action Plans were further revised and the final revisions were published in July 2015.

This EAP is submitted by NWE as Licensee for the Madison Development on the Missouri River, under Missouri-Madison FERC Licensed Project No. 2188(08), National Inventory of Dams Number (NATDAM) No. MT00561.

The purpose of this EAP is to provide maximum early warning to all persons involved in the unlikely event of a failure (catastrophic or otherwise) of the dam or other water retaining structures at the Madison Development. In addition to providing maximum early warning, our objective is to minimize or eliminate danger to all people and/or property downstream of the project.

Through consideration of both "fair weather" and "major flood" failure modes and their consequences, we have been able to identify areas which may be affected and have based this plan on notification of inhabitants, property owners and recreationists through various public safety agencies and authorities.

It is emphasized that the probability of an emergency of the magnitude considered in this plan is extremely remote and it does not imply that we have concerns about the integrity of the project. The dam is inspected regularly by NWE Operations and Engineering Personnel, annually by FERC engineers, and at five-year intervals by FERC approved independent engineering consultants.

D. Project Description

The Madison Hydroelectric Development of the Missouri-Madison Project FERC No. 2188(08), NATDAM No. MT00561 consists of the following basic components: a rock-filled timber-cribbed dam covered with reinforced concrete panels, a 13-feet diameter - 7,500-feet long flowline, a concrete surge chamber, four 9-feet diameter penstocks, and a powerhouse. The project was completed in 1906. The original woodstave flowline was completely rebuilt in 1956, and then replaced with welded steel pipe in 1991-92. Major rehabilitation work was done to the dam in 1965, 1970 and 1989-90.

The Madison Development is located on the Madison River about six miles southeast of Norris and ten miles north of Ennis in Madison County, Montana. The dam intercepts a drainage area of 2,181 square miles ranging in elevation from 4,900 to 11,300 feet, including the 905 square miles above Hebgen Dam. The dam is located 7,500 feet downstream of Ennis Lake in a steep-walled canyon only 200 to 300 feet wide at maximum pool level. The reservoir is about 2.6 square miles and has an active capacity of 27,200 acre-feet between spillway crest El. 4833.0 and maximum pool El. 4841 (see Figure D.1).

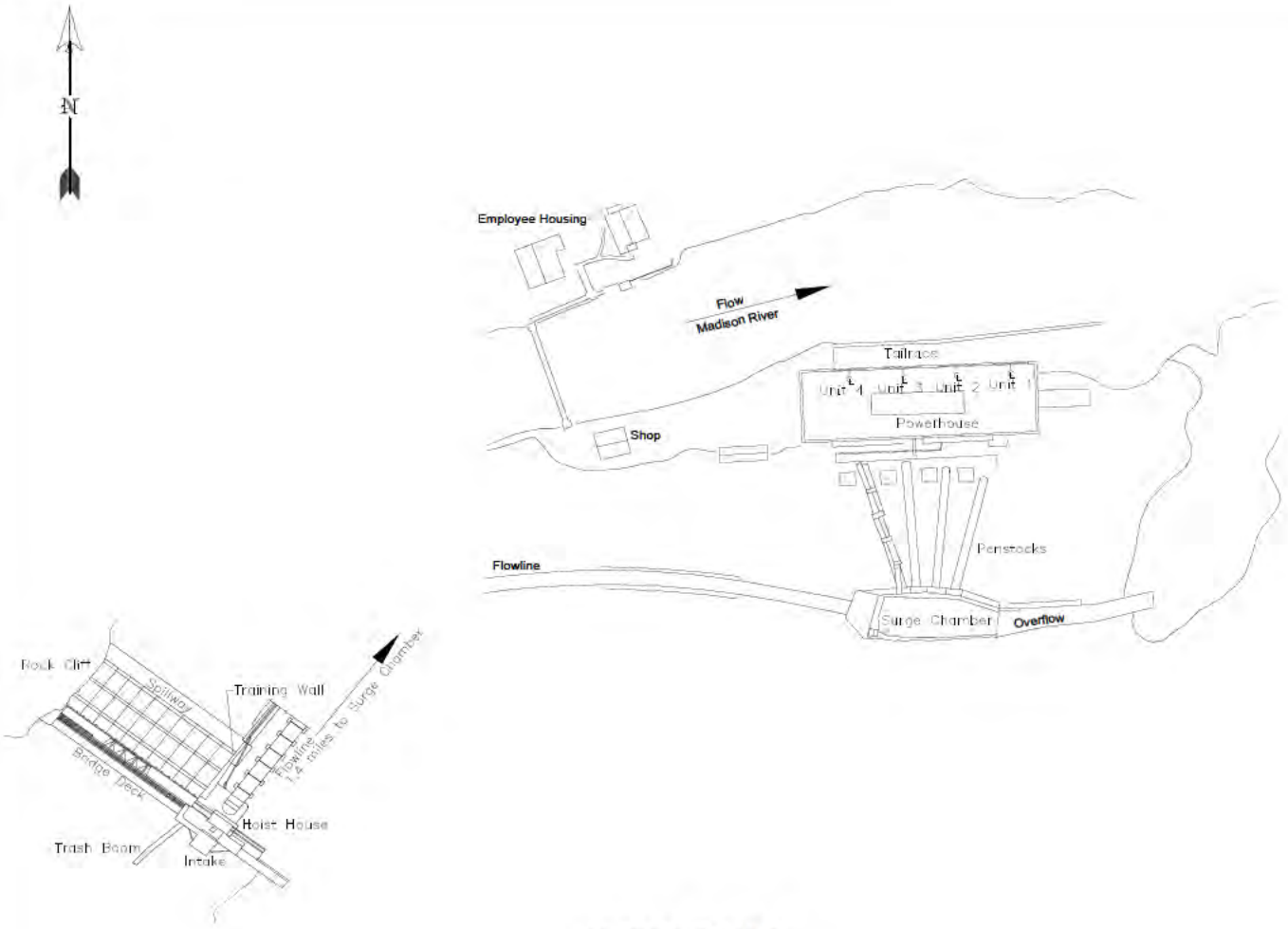
Dam: Madison Dam is an overflow rock-filled timber crib structure with vertical planked upstream face, stepped reinforced concrete downstream face, concrete headworks and abutments totaling 257 feet in length. The reinforced concrete panels on the spillway are tied to the dam's foundation by 60 post-tensioned anchors. The right abutment and intake contains 20 strand-type anchors. The spillway section is 140 feet wide and 38.5 feet high and is surmounted by a steel bridge that supports fixed wheel slide panels that can be removed by a small mobile crane. In cross-section, the timber crib measures about 92 feet from upstream face to downstream toe, and is stepped four times. A line of steel sheet piling exists on the upstream face of the dam.

To the right of the crib structure is a 40-feet concrete intake structure originally designed for two bays serving 10 and 12-feet diameter pipelines. These have been replaced by a 13-foot diameter steel conduit connected to a 14-foot diameter steel pipe imbedded in the bay farthest from the spillway. The unused bay has been plugged with concrete. A hydraulically-operated steel roller slide gate controls flow to the active conduit. Trash screens equipped with an automatic hydraulic trash rake and disposal system, as well as a log boom, keep debris out of the generating units. A 70’ concrete gravity wall extends from the intake into the right abutment and is backfilled on the downstream face (see Figure D.1).

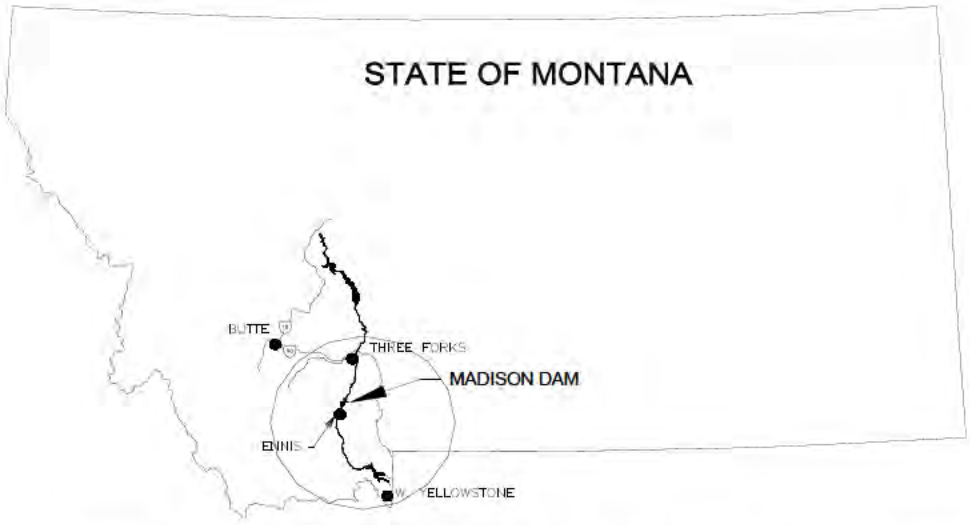
Flowline/Penstocks: A 13-foot inside diameter welded steel flowline snakes down the right side of the canyon for a distance of approximately 7,500 feet. The flowline connects the dam to a 38 ft. wide by 117 ft. long by 34 ft. high foot concrete surge chamber located above the powerhouse. From this structure, four 9-foot diameter riveted steel penstocks drop down the slope to the powerhouse.

Powerhouse: The powerhouse is built of rock masonry and. A substation and other electrical and mechanical facilities are also installed in the 203 ft. by 67 ft. by 36 ft. powerhouse. A 14-ton capacity traveling crane services the powerhouse.

Description of Upstream and Downstream Areas and Topography: Approximately 65 miles upstream of Madison Dam is Hebgen Dam that is also owned and operated by NWE. Hebgen Dam is an earthfill dam, with a concrete core. Approximately 1-1/2 miles below the dam, the river enters Quake Lake that was



NOT TO SCALE



Vicinity Map for Madison Dam

Figure 1

12-1-99

formed by a natural dam when a portion of the mountain slid to the valley floor during a 1959 earthquake. Quake Lake is approximately three miles long. A short distance below Quake Lake, the Madison River enters a wide valley. The Madison River flows in a well-defined channel along the left side of this valley. Much of the area on the right side of the valley floor is a bench, elevated above the river. Numerous small tributaries enter the Madison River between Quake Lake and Ennis Lake with the largest being the West Fork of the Madison River, which enters 17.8 miles downstream of Hebgen Dam. The Madison River flows into Ennis Lake near the town of Ennis, Montana, approximately 55 miles downstream of Hebgen Dam. The slopes surrounding Ennis Lake are generally low and gently sloping, and do not exhibit any evidence of instability, which could be expected to contribute to or aggravate a dam failure.

Madison Dam and powerhouse are located at the upper end of Bear Trap Canyon, a steep, rugged canyon for approximately 11 miles downstream. The canyon contains sections of whitewater that are highly regarded by floaters and kayakers. After the canyon, the river flows through a well-defined channel in a valley of moderate terrain until it joins the Gallatin and Jefferson Rivers to form the Missouri River, 37 miles downstream from Madison Dam, just beyond the town of Three Forks. The Missouri River flows for 22 miles to Broadwater (Toston) Dam, which is operated by the State of Montana, then for 16 more miles until it enters Canyon Ferry Reservoir, operated by the US Bureau of Reclamation. The upper end of Canyon Ferry Reservoir, which is a very large storage reservoir, is located approximately 78 miles downstream of Madison Dam. The dam itself lies approximately 110 miles downstream of Madison Dam. The two towns of significant size between Madison Dam and Canyon Ferry Reservoir are Three Forks and Townsend.

E. EAP Response Process

In general, when an unusual or emergency incident is detected at the dam there are four steps that should be followed, which make up the EAP response process:

- Step 1: Incident Detection, Evaluation, and Emergency Level Determination
- Step 2: Notification and communication
- Step 3: Emergency actions
- Step 4: Termination and follow-up

The following sections describe the procedures that will be followed during activation of this EAP.

1. Incident Detection, Evaluation, and Emergency Level Determination

A. Detection

Observations by the Operator to Assist in Detecting that a Potential Failure is Developing

1. Unusual increase in settlement or distortion of the concrete section of the dam or of the slide panel frames.
2. Cracks, offsets, settling of fill on the downstream side of the concrete section. Binding of gates.
3. Rock falls on the left abutment of the dam.
4. A noticeable increase or the appearance of dirty water in the leakage through and under the spillway section of the dam.
5. There are forebay and tailrace water level alarms that are monitored by the Plant Operator and Hydro System Operator. A dam failure alarm activates when the forebay water level drops more than two feet in five minutes and the tailrace rises more than two feet in five minutes.

The dam and appurtenant structures are inspected at regular intervals, but at a minimum, a visual walk-through inspection is conducted daily by plant personnel. There is no formal checklist for daily inspections; however, the following items are visually checked:

- Handrail and dam walkway alignment.
- Abnormal leakage.
- Debris against the dam.
- Cracks, offsets and evidence of settlement.
- Rock falls or evidence of movement.
- Abnormalities upstream and downstream of the dam.
- Security, storm damage, vandalism.
- Pipeline intake, condition and debris.
- Barrel boom condition.
- Stanchion condition and position.

NWE's personnel making the inspections will indicate any abnormalities under the "NOTES" section of the Plant Daily Operating Log Sheet, located in the operating room and immediately notify the Plant Foreman of the same. If everything was found to be normal, that is also noted and the individual who made the inspection signs the log sheet.

B. Evaluation

As discussed above, the dam and appurtenant structures will be visually inspected on a daily basis by plant personnel. The dam and appurtenant structures are also inspected periodically by NWE Engineering Personnel, annually by FERC engineers, and every five years by FERC-approved independent engineering consultants. Any detection of an abnormal condition such as those indicated above will be immediately reported to the Chief Dam Safety Engineer. The information received by the Chief Dam Safety Engineer will be evaluated and a determination will be made if remedial actions are needed. It is at this point in time a decision will be made to activate the appropriate EAP Notification. NWE Engineering Personnel will dictate what mitigating actions should be taken and if necessary, a team of Operations and/or Engineering Personnel will be dispatched to the site for further investigation. The time factor and means of transportation to the site will depend on the severity of the situation.

In the case of a slowly developing failure, regular inspections of the dam and appurtenant structures help minimize the time from the onset of the emergency to awareness of the emergency.

C. Emergency Level Determination

The four dam safety emergency level categories that could occur are defined as follows:

Imminent Failure – When time has run out and the dam has failed, is failing, or is about to fail.

Examples include failure caused by terrorism, sabotage, major earthquake, etc.

Potential Failure – A situation where a failure may develop, but preplanned actions taken during certain events (major flood, earthquake, evidence of piping, etc.) may prevent or mitigate failure. Time permits a qualified engineer to inspect the dam and assess the potential failure situation.

Examples include rising reservoir levels approaching the top of the non-overflow section of the dam, transverse cracking of an embankment, or a verified bomb threat.

Non-Failure – A situation where there is an event at the dam that WILL NOT, by itself, lead to a failure, but requires investigation and notification of internal and/or external personnel.

Examples include new or varied seepage/leakage on the downstream side of the dam, presence of unauthorized personnel at the dam, or malfunction of a gate.

High Flow – A situation where the waterway is at or near flood stage; however, there is no apparent threat to the integrity of the dam. The primary purpose of this emergency level is to provide information on NWE's operational procedures that may aggravate downstream flooding and to make sure all parties understand the dam is NOT in danger of failing.

D. High Flow Operations

Operations of all NWE Hydro projects are unique and vary from plant to plant. Furthermore, operations at any given plant vary based upon current plant conditions (power demands, maintenance schedules, etc.) and not solely upon river flows. A detailed description of standard operating conditions at the Madison Project can be found in the Operations & Maintenance folder on the NWE network shared drive. The following description of plant operations during high river flows is intended as a probable operation scenario for Madison Dam.

Communication with the Madison Operator and the Hydro System Operator in Great Falls will be maintained during periods of high flow or in the event of large outflow changes. The Madison Operator and the Hydro System Operator monitor the flow in the Madison River headwaters and main stem including gauging stations near West Yellowstone, below Hebgen dam, at the Madison River gauge at Kirby Ranch near Cameron, at the Madison Dam, and at the USGS Missouri River Toston gauge. The flow information from these gauging stations gives the Plant Operator at the Madison Development advanced notice of actual high flows and allows the Operator to make necessary adjustments.

As river flows increase Plant Operators follow standard operating procedures to maintain license requirements, meet generation needs, and above all, maintain the safety of the dam. A total of approximately 1,450 cfs can be passed through the Madison Plant turbines. Spill over the dams is controlled through a series of 24 bays with fixed wheel slide panels. Nine of the bays are equipped with hydraulically operated panels. Each bay will pass 350 cfs to 400 cfs with the panels removed. During high flow events every other panel is pulled as river flow increases to pass flood flows and help with debris build up. If water continues to rise and every other bay is open then the remaining bays are opened. With all panels removed capacity reaches approximately 8,090 cfs. Steel flash boards have never had to be removed but can be removed for an additional 745 cfs bringing total tripped flow to over 10,500 cfs (including flow through the turbines). Operation procedures, potential flooding impacts, and EAP notifications during high flow events are summarized in Table E.1 below.

Early and accurate warning of affected upstream and downstream inhabitants and property owners is important during high flow events. The National Weather Service (NWS) is tasked with issuing such warnings to aid property owners in protecting life and property. Furthermore, during major flooding events the NWS works with the local Sheriff's for the activation of the Emergency Alert System (EAS). While NWE has no jurisdictional authority to issue such warnings they do work closely with the NWS during high flow events to provide the most accurate flow information through each respective plant. Activation of the Madison Dam EAP is not solely dependent upon high river flows and NWE will not provide additional warnings and or notifications outside of the EAP notification flowcharts on pages 4-7, and discussed below, as they relate to high flow events.

High Flows: Flood stage at any given gauge location is determined by the NWS and USGS and is not established for all stream gauging locations. The term flood stage is defined as the river stage at which flows overtop the river banks and begin to cause damage to property within that reach of the river.

Once a river reaches flood stage, the flood severity categories used by the NWS include minor, moderate, and major flooding. Each category has a definition based on property damage and public threat. Further warning definitions, as well as current NWS issued warnings, can be found on the NWS Advanced Hydrologic Prediction Service website at: http://water.weather.gov/ahps2/index.php?wfo=tfx.

Flood Stage in the Madison River near the Madison project has not been determined. For the Madison project high flow notifications such as for the High Flow Flowchart occur when the Missouri River at the USGS Missouri River gauge near Toston is at flood stage (10.5ft).

Average Flows: NWE works in cooperation with the USGS to maintain the USGS 6041000 Madison River below the Madison Plant. The Madison project impounds roughly 27,200 acre-feet at the maximum

normal pool operating level of 4841 ft. Average daily river flows through Madison dam range from approximately 900 cfs to over 4500 cfs with the most recent high flow event reaching 6,900 cfs in 2011. Madison Dam is located approximately 7,500 feet downstream of Ennis Lake. The dam spillway section is 140-ft wide and is equipped with 24 fixed wheel panels that can be removed by a small mobile crane. The total maximum combined spillway and intake structure capacity with reservoir elevation at the maximum pool elevation of 4,841-ft (NWE Datum) is approximately 10,000 cfs.

High Flow EAP Notifications: During high flows, notifications will be made according to the EAP as follows:

1. High Flow – In the event flows in the Missouri River near Toston are at or near flood stage (USGS gauge 10.5ft), and it becomes necessary to operationally put additional flow into the waterway, that may increase flooding, the EAP requires the operator notify the NWE Lead Resource Coordinator who will notify first the National Weather Service (NWS) and then the appropriate downstream agencies (see page 7). It is important to stress to all parties notified that this is for their information only and the dam is NOT in danger of failing.

2. Non-Failure – The Plant Operator will activate the Non-Failure EAP Flowchart for any incident at the dam that will not by itself, lead to a failure, but requires investigation and notification of internal and/or external personnel. Examples include: with all gates open and stanchions tripped, the reservoir elevation approaches overtopping non-overflow sections of the dam; new or abnormally varied seepage/leakage on the downstream side of the dam; presence of unauthorized personnel at the dam; or malfunction of a gate. For these types of non-failure events, the operator will make the internal notifications as indicated on page 6. Once contacted, the Supervisor-on-Call will notify the Superintendent, Hydro O&M. The Chief Dam Safety Engineer after being notified by the Superintendent, Hydro O&M, will notify the FERC Regional Office (Portland) of the Non-Failure activation. The appropriate Operations and Engineering Personnel will promptly respond in assessing the situation.

3. Potential Failure – A potential failure situation occurs when a failure may develop, but preplanned actions taken during certain events (major flood, earthquake, evidence of piping, etc.) may prevent or mitigate failure. Time permits a qualified engineer to inspect the dam and assess the potential failure situation. Examples include: rising reservoir levels approaching the top of the non-overflow sections of the dam; transverse cracking of an embankment; or a verified bomb threat. The Plant Operator will consider this a Potential Failure situation as defined by the EAP.

The Plant Operator will immediately notify the NWE Plant Foreman of the situation. The NWE Plant Foreman will make notifications according to the Potential Failure Flowchart (see page 5) (in the event the Plant Foreman is not readily available, the Plant Operator will be responsible for making this contact). Once notified, the Supervisor on Call will notify the Superintendent, Hydro O&M. The Chief Dam Safety Engineer after being notified by the Superintendent, Hydro O&M, will notify the FERC Regional Office (Portland) of the Potential Failure activation. The appropriate Operations and Engineering Personnel will promptly respond in assessing the situation and take appropriate action. If the assessment indicates the situation represents a Potential Failure, appropriate action may consist of correcting the problem by use of materials and equipment. In the event that the operator or other NWE personnel feels that a situation is developing such that failure is imminent, the Plant Foreman, or Plant

Operator in his absence, will immediately implement the notification flowchart for an Imminent Failure in accordance with the EAP.

4. Imminent Failure – The Imminent Failure flowchart will not be activated based upon river flows alone. This flowchart will be activated when time has run out and the dam has failed, is failing, or is about to fail. Examples include: failure caused by terrorism, sabotage, major earthquake; or flows or other conditions have led to the Imminent Failure of the dam.

The Plant Operator will immediately notify the NWE Plant Foreman of the situation. The NWE Plant Foreman will make notifications according to the Imminent Failure Flowchart (see page 4) (in the event the Plant Foreman is not readily available, the Plant Operator will be responsible for making this contact). Once notified, the Supervisor on Call will notify the Superintendent, Hydro O&M. The Chief Dam Safety Engineer after being notified by the Superintendent, Hydro O&M, will notify the FERC Regional Office (Portland) of the Imminent Failure activation.

Table E.1: SUMMARY OF HIGH FLOW OPERATIONS

Madison River Flow at Madison (cfs)	Operation Procedures	Potential Impacts	Notifications
< 1450	Low flow operations with all flows able to pass through intake structure. 80 cfs must be maintained in the river between the Dam and the Madison power plant at all times.	None	None
1,450 to 5,650	Normal operations. As River flow increases spill is increased by opening every other bay panel until every other panel is full open. Opening every other panel helps minimize debris buildup in front of each bay.	None	None
5,650 to 9,800	Remaining panels are removed starting from far side of dam as flow continues to increase. Operations try to maintain project boundary.	Minimal flooding of low lying areas on the Madison River.	Depending upon river conditions in the Missouri River at the Toston gauge, the "High Flow" flowchart may be activated. NWS will be consulted as operational releases may increase flooding impacts downstream.
9,800 to 10,500	With reservoir continuing to rise, all steel is tripped and or removed from dam to allow maximum spill capacity.	Minimal flooding of low lying areas on the Madison River.	Depending upon river conditions in the Missouri River at the Toston gauge, the "High Flow" flowchart may be activated.

>10,500	All panels open and spillway capacity of approximately 10,500 cfs with the reservoir at the Project Boundary and river levels rising. Operators to maintain flows by removing debris as much as possible.	Continued flooding in low-lying areas near the River.	As conditions reach max spill capacity the "Non-Failure" or "Potential Failure" flowcharts may be activated based on the ability to maintain the reservoir level behind the dam. Maintain open communication with plan holders on flowcharts.

2. Notification and Communication

All notifications will be made in accordance with this EAP's Notification Flowcharts found in Section B. This section provides additional details and procedures for reference that may be followed during activation of the EAP for the different emergency levels. **These procedures are applicable to hours of daylight and darkness.**

Sample Communications: In times of emergency, clear and concise exchange of information is essential. Individuals responsible for notifying others of implementation of the EAP for either the "Imminent Failure" or "Potential Failure" conditions should include the following information in their communication message:

- Caller's name, position, and company or agency
- Caller's location
- Initiating (or carrying out) Imminent Failure Flowchart for Madison Dam EAP
- "This is **NOT** a test! I repeat, **NOT** a test!"
- Brief description of the situation or potential problem
- The time of the situation or potential problem
- Intended preventive or follow-up actions to be taken

A typical communication from the Plant Operator to the Gallatin County Sheriff might be as follows:

> "This is John Doe, Foreman or Plant Operator for NorthWestern Energy at Madison Dam. I am calling to implement the Madison Dam Emergency Action Plan "Imminent Failure Flowchart" notification procedure on page four of the EAP. This is **NOT** a test! I repeat, this is **NOT** a test!"
>
> "Madison Dam failed at approximately 6:15 a.m. Immediately prior to the failure, we had a full reservoir and outflows were at 1,500 cubic feet per second - about normal for this time of year. I will try to evacuate any individuals in the proximity of the dam."
>
> **"Do you understand how to carry out your responsibilities according to the EAP?"**

NOTE: In order to be sure that the person receiving your message understands what you have told him/her, and know how to proceed with the activation of the EAP, have them repeat your message back to you.

NOTE: It is important to record date, times and individuals that you have spoken to for verification later.

If you receive a notification that the EAP is being implemented, and are unsure about the authenticity of the call, call the point of contact back at the phone number listed in the EAP prior to continuing down the Imminent Failure or Potential Failure Flowchart(s).

When You Receive Voice Mail or an Answering Machine:

1. **Leave a Message** that tells the person you are calling:
    - Who you are;
    - That you are calling to inform them as part of the EAP notification process (test or actual event);
    - That you are going to try contacting them through their secretary, receptionist, etc.; and
    - That if you cannot reach them you are going to contact the next person in the notification flowchart.
2. **Follow the guidance on the person's Voice Mail message and attempt to have the person contacted as appropriate.**
3. **If the person is not available or you cannot get the secretary, receptionist, etc., call the next person identified on the notification flowchart. Remember - TIME IS OF THE ESSENCE!!!**
4. **DO NOT let the EAP notification process fail because of voice mail or an answering machine.**

NOTE: In the event contact cannot be made, continue down the flowchart until direct contact has been made; then ensure that all bypassed points of contact are notified.

A. Imminent Failure

NWE Operator/Plant Foreman: In the event of imminent failure, the Plant Operator will go to the dam, assess the damage and verify the severity of the failure. Upon confirmation of imminent failure, the Plant Operator will immediately implement the Imminent Failure Flowchart (page 4) by contacting the Plant Foreman. For the sake of clarity, a statement such as "this is **NOT** a test, I repeat, **NOT** a test" should be used at the beginning of each contact. This will clearly distinguish an actual emergency from a "test" or "drill" situation (see the previous page for sample communication information).

The Plant Foreman will notify the following of the imminent or actual failure (listed in order of priority):

1. Hydro Operations Supervisor On-Call
2. Hydro System Operator (HSO) Generation Control Center, Great Falls (24 hours a day, 365 days a year)

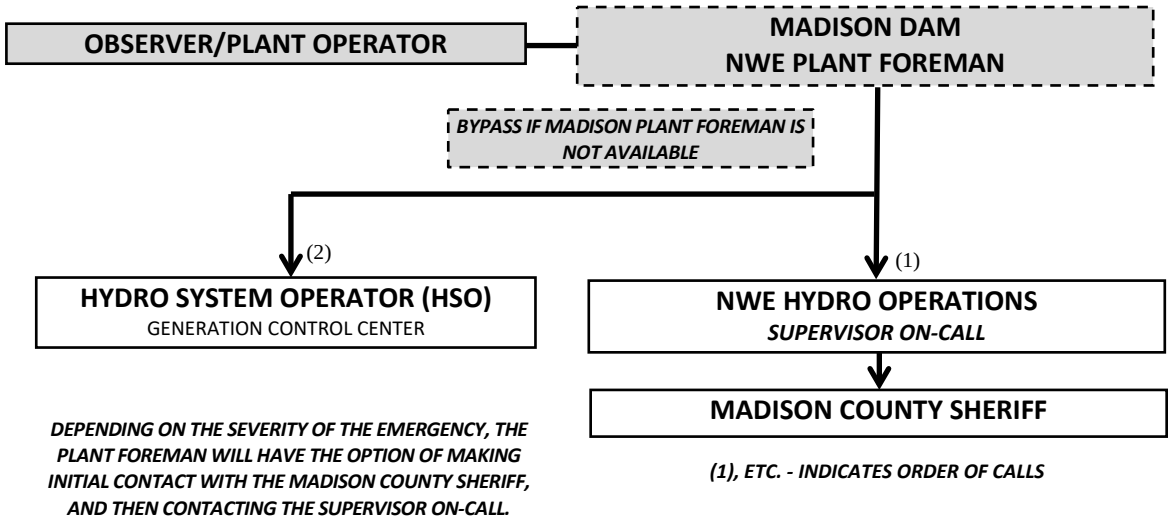
In the event that the Plant Foreman is not readily available the Plant Operator will be responsible for the two contacts above.

Depending on the severity of the emergency, the Plant Foreman, or Plant Operator in his absence, has the option of making his initial contact with the sheriff farthest upstream – Madison County Sheriff – and then contacting the Hydro Operations Supervisor On-Call.

The Plant Operator will alert and evacuate all camp residents in the two NWE-owned residences below the dam and then isolate and secure the power plant and transmission lines. The Plant Operator will then alert and evacuate all campers, fishermen and tourists, etc., in the vicinity of the powerhouse and dam to the safety of higher ground. Evacuation to higher ground will be by the quickest and most convenient route available depending on the circumstances and left to the good judgment of those involved.

The mode of communication will depend on the severity of the failure. The NWE radio may have to be used to relay information from the dam, to the Hydro System Operator (HSO) and to other supervisors. A portion of the Imminent Failure Flowchart on page 4 for this area of notifications follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Operator/Plant Foreman

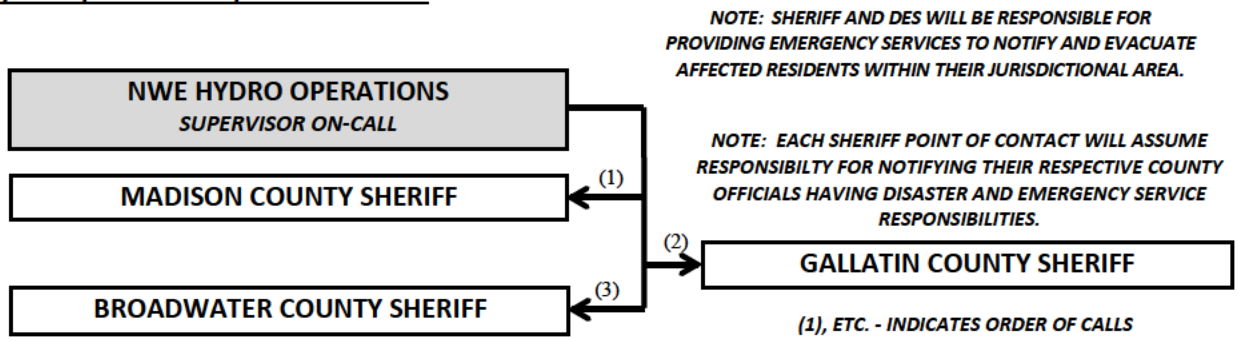


NWE Supervisor On-Call: Immediately after being notified of the failure or imminent failure, the NWE Hydro Operations Supervisor On-Call will notify the following county sheriffs:

1. Madison County Sheriff, Virginia City
2. Gallatin County Sheriff, Bozeman
3. Broadwater County Sheriff, Townsend

These respective county sheriffs will notify the Disaster and Emergency Services (DES) Coordinator for their respective county. A portion of the Imminent Failure Flowchart on page 4 for this area of notifications follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Hydro Operations Supervisor On-Call



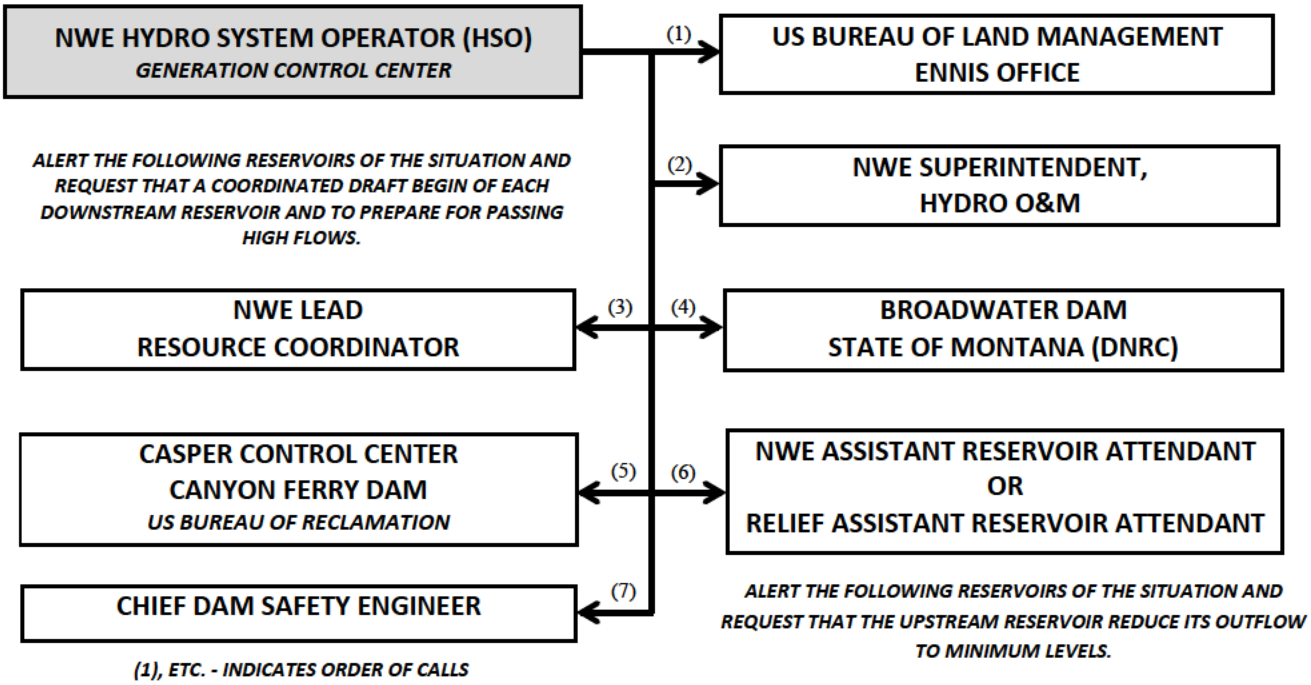
NWE Hydro System Operator (HSO): Immediately after being notified of the imminent failure or failure, the HSO at the Generation Control Center will begin to notify those in his/her area of the flowchart. The contacts in this area of notification responsibility follow in priority order:

1. US Bureau of Land Management
2. NWE Superintendent, Hydro O&M
3. NWE Lead Resource Coordinator
4. Broadwater Dam/Plant (State of Montana - DNRC)
5. Casper Control Center, Canyon Ferry Dam (US Bureau of Reclamation)
6. NWE Hebgen Dam
7. NWE Chief Dam Safety Engineer

At Madison Dam, a Plant Operator/maintenance person who resides at the development is "on duty" 24 hours a day. All information required to contact the operator/maintenance person on duty (annual schedule, home phone numbers, etc.) is distributed to the HSO and the Supervisor On-Call.

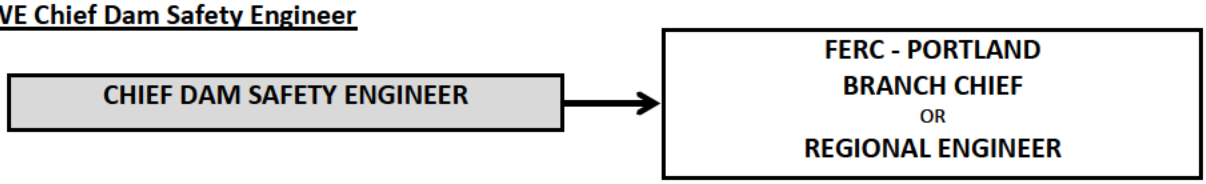
NOTE: In the event that the Plant Operator/Foreman is unable to make personal contact with the Hydro Operations Supervisor On-Call, he will request that the Hydro System Operator (HSO) dispatcher make the calls to the sheriff's departments listed in this plan after the dispatchers initial call duties. The reasoning is that in reality, the Plant Operator has immediate evacuation duties and cannot afford the time to make the sheriff's department calls. This portion of the Imminent Failure Flowchart on page 4 follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

Hydro System Operator (HSO), Generation Control Center (24 hours)



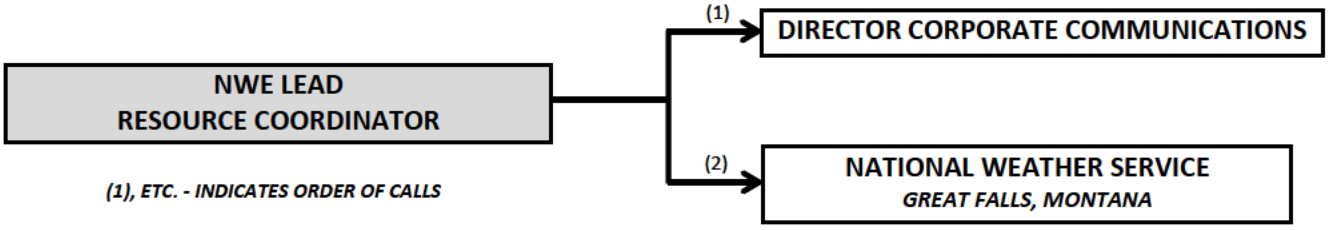
Chief Dam Safety Engineer: After being notified by the NWE Hydro System Operator (HSO), the Chief Dam Safety Engineer will notify the FERC Portland Regional Office – Branch Chief or Regional Engineer. This portion of the Imminent Failure Flowchart on page 4 follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Chief Dam Safety Engineer



Lead Resource Coordinator: After being notified by the Hydro System Operator (HSO), the Lead Resource Coordinator will notify the Director Corporate Communications and the National Weather Service, Great Falls. This portion of the Imminent Failure Flowchart on page 4 follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Lead Resource Coordinator

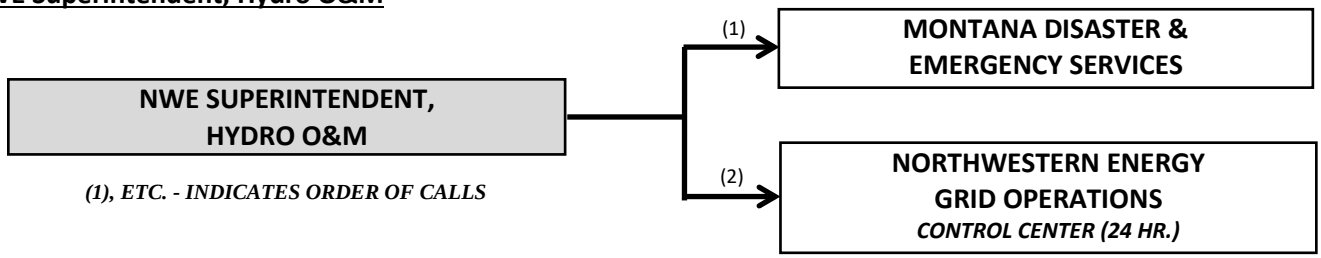


Superintendent, Hydro O&M: After being notified by the Hydro System Operator, the Superintendent, Hydro O&M will notify the following in order of priority:

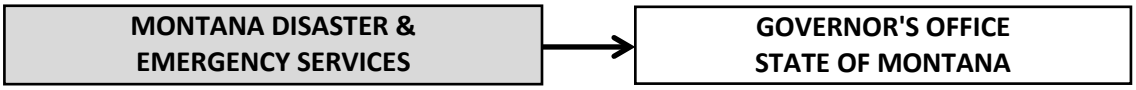
1. Montana Disaster and Emergency Services, Helena
2. NorthWestern Energy Grid Operations Control Center

The portion of the Imminent Failure Flowchart on page 4 for this area of notification responsibility follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

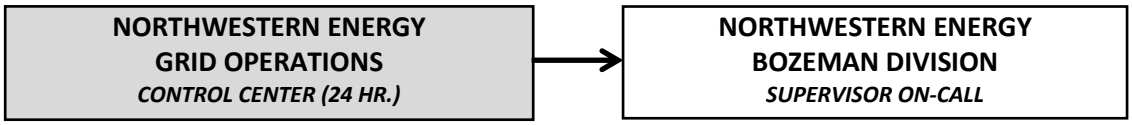
NWE Superintendent, Hydro O&M



Montana Disaster and Emergency Services: After being notified by the Superintendent, Hydro O&M, the Montana Disaster and Emergency Services (DES) will notify the Governor's Office of the situation. The portion of the Imminent Failure Flowchart on page 4 for this area of notification responsibility follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):



NorthWestern Energy Grid Operations Control Center: After being notified by the Superintendent, Hydro O&M, the NWE Grid Operations Control Center will notify the NWE Bozeman Division Supervisor-On-Call to inform them of the situation. The portion of the Imminent Failure Flowchart on page 4 for this area of notification responsibility follows (see page 4 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):



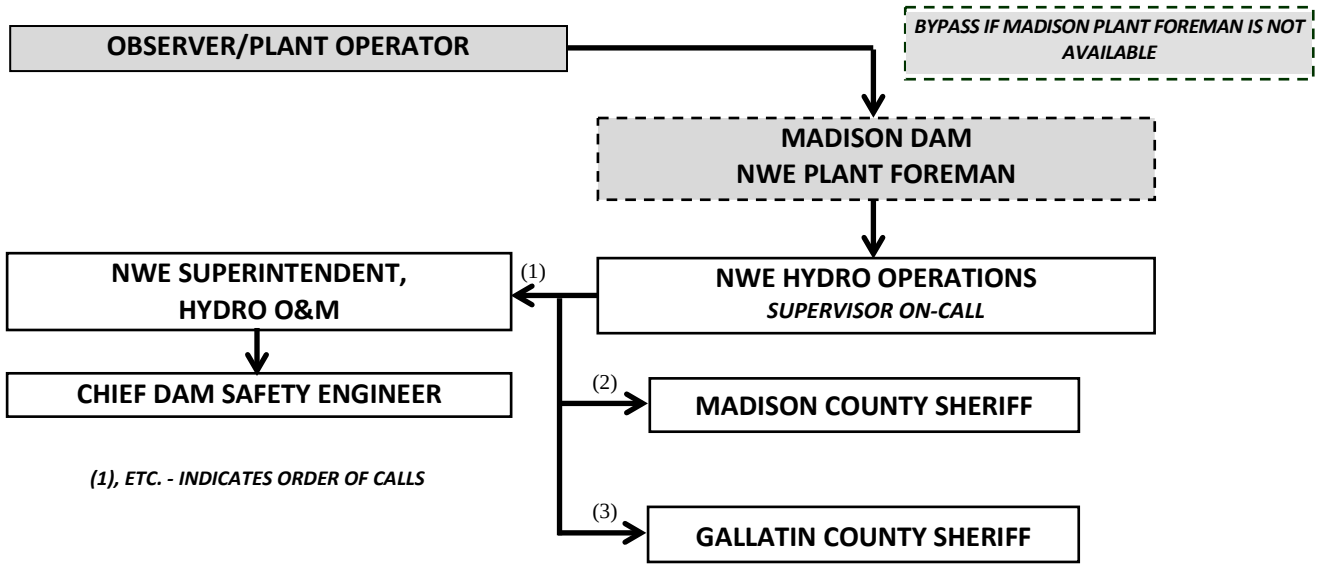
NWE Assistant Reservoir Attendant for Hebgen Dam: The Assistant Reservoir Attendant who lives near Hebgen Dam will be requested to take the appropriate actions to reduce outflows to a minimum (i.e., close slide gates, eliminate spill, close gates at the forebay intake, etc.).

Plant Operator(s) at Broadwater and Canyon Ferry Dams: The Plant Operator(s) at Broadwater and Canyon Ferry plants will be requested to take the appropriate actions in anticipation of high river flows (i.e., pull or trip slide panels, open spill gates, deflate rubber dams, open radial gates, etc.).

B. Potential Failure

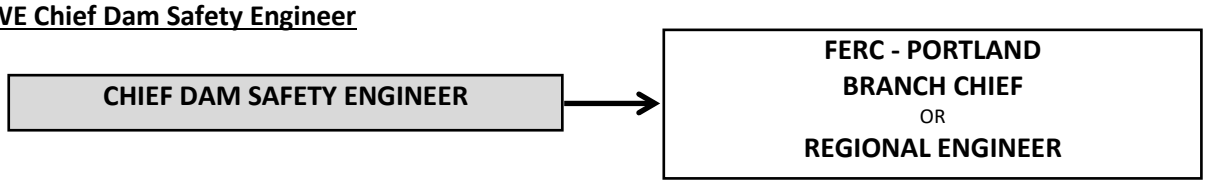
In the event that there are indications that a Potential Failure situation may be developing (Section E.1.C), the Plant Operator will immediately notify the Plant Foreman. The Plant Foreman will then notify the Supervisor On-Call and stand by for further instructions (in the event that the Plant Foreman is not readily available, the Plant Operator will notify the Supervisor On-Call). The Supervisor On-call will notify the Superintendent, Hydro O&M and the Madison County Sheriff. The Superintendent, Hydro O&M will contact the Chief Dam Safety Engineer, who will in turn notify the FERC Portland Regional Office and inform them of the problem. The portion of the Potential Failure Flowchart on page 5 for this area of notification follows (see page 5 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Plant Operator /Madison Plant Foreman



As mentioned, the Chief Dam Safety Engineer will notify the Portland Office of the FERC. The portion of the Potential Failure Flowchart on page 5 for this area of notification responsibility follows (see page 5 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Chief Dam Safety Engineer



After notification is complete, the appropriate NWE Operations and Engineering personnel will promptly respond in assessing the situation and recommending actions to correct the problem. An assessment of the situation will determine whether a coordinated draft of downstream reservoirs is required. If the use of materials and equipment is required, the appropriate contractor will be notified and the problem will be corrected.

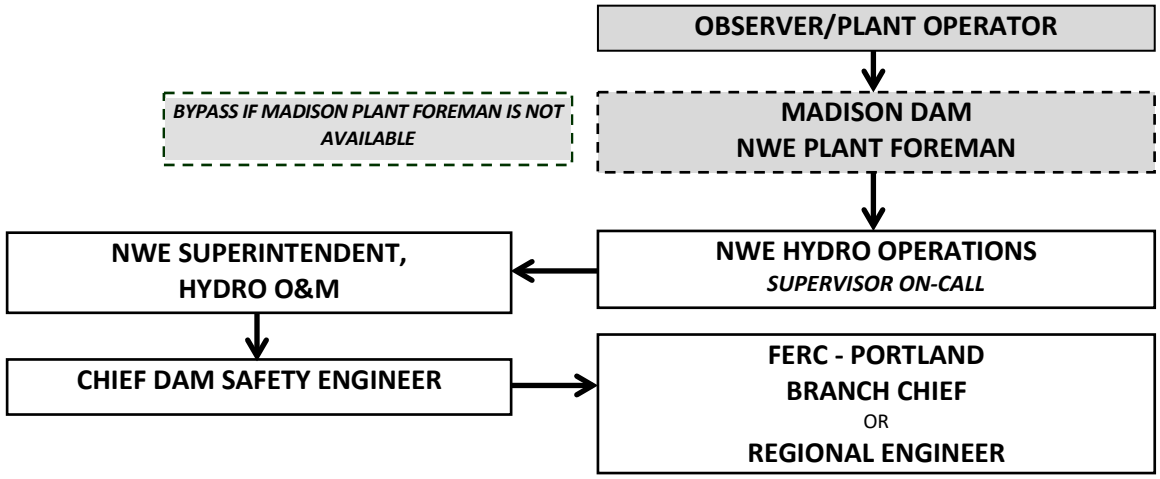
It should be noted that in the unlikely event the Plant Operator cannot contact the Plant Foreman or the Chief Dam Safety Engineer; he should contact the Superintendent, Hydro O&M.

In the event that the Plant Foreman, or Plant Operator in his absence, feels that the potential failure situation is escalating to a point of imminent failure, before NWE Operations and Engineering Personnel can respond, he/she will immediately initiate the warning flowchart for Imminent Failure (see page 4). The notification procedures for that emergency level are set forth in Section E.2.A.

C. Non-Failure

If a situation develops or incident occurs that is outside of typical conditions at the dam; however does not appear to affect the integrity of the dam or will not by itself result in a failure (Section E.1.C), the Plant Operator will immediately notify the Plant Foreman. The Plant Foreman will then notify the Supervisor On-Call and stand by for further instructions (in the event that the Plant Foreman is not readily available, the Plant Operator will notify the Supervisor On-Call). The Supervisor On-call will notify the Superintendent, Hydro O&M. The Superintendent, Hydro O&M will contact the Chief Dam Safety Engineer, who will in turn notify the FERC Portland Regional Office and inform them of the incident. The portion of the "Non-Failure" Flowchart on page 6 for this area of notification follows (see page 6 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Plant Operator /Madison Plant Foreman



As mentioned, the Chief Dam Safety Engineer will notify the Portland Office of the FERC. After notification is complete, the appropriate NWE Operations and Engineering personnel will promptly respond in assessing the situation and recommending actions to correct the problem. If the use of materials and equipment is required, the appropriate contractor will be notified and the problem will be corrected.

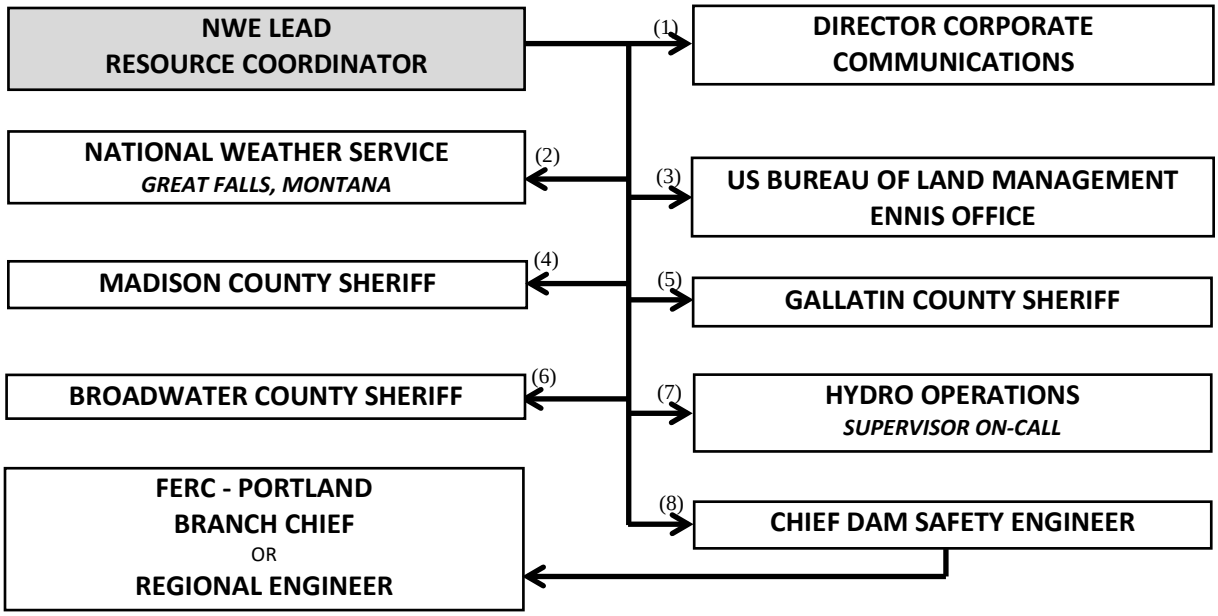
It should be noted that in the unlikely event the Plant Operator cannot contact the Plant Foreman or the Hydro Supervisor On-Call; he should contact the Superintendent, Hydro O&M.

In the event that the Plant Foreman, or Plant Operator in his absence, feels that the non-failure situation is escalating to a point of potential failure or imminent failure, before NWE Operations and Engineering personnel can respond, he/she will immediately initiate the warning flowchart for a Potential Failure (see page 5) or Imminent Failure (see page 4). The notification procedures for these emergency levels are set forth above in Parts E.2.A and E.2.B.

D. High Flow

In the event the waterway below Madison Dam is at or near flood stage (13.5 feet at the USGS Ulm gage) and it becomes necessary to operationally put additional flow into the waterway that may cause flooding, the Lead Resource Coordinator will notify the Director of Corporate Communications, the National Weather Service (NWS), the Madison, Gallatin, and Broadwater County Sheriffs, the NWE Supervisor On-Call and Chief Dam Safety Engineer. The Chief Dam Safety Engineer will notify the FERC Portland Regional Office. It is important to stress to these agencies that this is for their information only, and make sure all parties understand the dam is NOT in danger of failing. The portion of the notification flowchart on page 7 for this area of notification responsibility follows (see page 7 for complete flowchart information (i.e., names, office and home phone numbers, etc.)):

NWE Lead Resource Coordinator



3. Emergency Actions

After making notifications of a Potential Failure or Imminent Failure according to this EAP, NWE will make efforts to save the dam and minimize impacts to life, property, and the environment. During this step a continual process will occur of taking actions, assessing the situation, and providing status updates through the communication channels opened during initial notifications. The EAP will likely go through changes in emergency levels during this step and Step 2 as the situation improves or deteriorates.

Table E.2 below provides a tabulated reference of emergency actions that will be taken for various conditions or incidents at Madison Dam to mitigate impacts associated with the condition or incident.

Table E.2: EMERGENCY ACTIONS

Description of Condition	Action Priority	Action to be Taken
HIGH WATER LEVEL / LARGE SPILLWAY RELEASE / UPSTREAM DAM FAILURE		
Reservoir stage reaches maximum normal pool elevation and continues to rise	1	If not already complete, make notifications on the High Flow and Non-Failure Flowcharts
	2	Open spill gates and/or trip select stanchions to maintain reservoir level at or near normal pool elevation
	3	Open all spill gates full open and/or trip all stanchions to provide maximum spillway capacity if reservoir level cannot be maintained at normal pool elevation
	4	Make notifications on the Potential Failure Flowchart
	5	Check for signs of erosion at spillway apron/immediate downstream channel, flowline intake, and abutments
	6	Perform additional tasks as directed by HSO or Engineering Personnel
Operator is notified that the upstream dam, Hebgen Dam, has activated its Imminent Failure EAP and is already failing	1	Operator will immediately activate the Potential Failure EAP for Madison and make notifications according to the Potential Failure Flowchart
	2	The Operator will: shut down and secure the plant; open all spill gates full open; and trip all stanchions
	3	Evacuate people downstream of the dam and up to the bridge at the outlet of Ennis Lake
	4	Perform additional tasks as directed by HSO or Engineering Personnel as capable
STRUCTURAL DEFORMATION		
Development or evidence of new cracks, offsets, settlement, sliding, overturning, foundation piping, or abutment erosion.	1	During Daily Inspections: inspect handrails and dam walkways for alignment; identify new or abnormal leakage, cracks, or offsets; check for debris against dam; identify rock falls or evidence of movement; and identify other abnormalities up and downstream of the dam
	2	Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos, document location on a site plan and in daily inspection report
	3	Notify NWE Engineering Personnel and provide all data collected
	4	Inspect other areas of the dam; collect piezometer and water level data as instructed by Engineering Personnel. Record any changes in condition. Carefully observe dam for signs of settlement or other offsets, seepage, cracking or movement
	5	Engineering Personnel will review information collected by operator and provide additional instructions as necessary
	6	If prudent for the condition, initiate survey monitoring
	7	Make notifications on the Non-Failure, Potential Failure, or Imminent Failure Flowcharts as warranted by conditions

Earthquake or other seismic event occurs within the vicinity of the dam	1	Operator will immediately begin an inspection of the dam and surrounding areas as follows: inspect handrails and dam walkways for alignment; identify new or abnormal leakage, cracks, or offsets; identify rock falls or evidence of movement along shorelines; identify other abnormalities up and downstream of the dam; check stanchion condition and position; check for sinkholes; look for evidence of whirlpools in the reservoir
	2	Notify NWE Engineering Personnel and provide information about the situation and all data collected
	3	Inspect other areas of the dam; collect piezometer and water level data as instructed by Engineering Personnel. Record any changes in condition. Carefully observe dam for signs of settlement or other offsets, seepage, cracking or movement
	4	If deemed necessary by identified conditions, the Superintendent, Hydro O&M will coordinate with the Chief Dam Safety Engineer to dispatch Engineering Personnel to the site
	5	Continue to monitor and inspect the dam with Engineering Personnel and provide status reports to the Chief Dam Safety Engineer and the Superintendent, Hydro O&M
	6	Make notifications on the Non-Failure, Potential Failure, or Imminent Failure Flowcharts as warranted by conditions
GATE MALFUNCTION OR FAILURE		
Dam gates/valves structurally damaged by sabotage, debris, component failure resulting in an uncontrolled release of water	1	Close all other open gates, if necessary
	2	If possible, install flashboards to stop or slow flow through the damaged gate
	3	Make notifications on the Non-Failure Flowchart, Engineering Personnel may be dispatched to the site and evaluate the problem
	4	The Superintendent, Hydro O&M will coordinate with the Chief Dam Safety Engineer to determine if a remediation contractor should be dispatched to the dam to make necessary repairs
	5	Repair or replace the gate/valve as necessary
	6	Make notifications on the Potential Failure or Imminent Failure Flowcharts as warranted by conditions
SABATOGE AND OTHER SECURITY ISSUES		
Criminal action with significant damage to the dam structure where substantial repairs are required and the integrity of the facility is compromised	1	Contact law enforcement authorities and restrict access to the facility.
	2	Contact the NWE Superintendent, Hydro O&M, the Chief Dam Safety Engineer, and the Hydro Security Coordinator. Refer to the Madison Security Plan for additional procedures
	3	Evaluate damage and begin inspection of the entire dam to identify additional potential damage. Based on inspection determine if extent of damage warrants an activation of the EAP
	4	The Superintendent, Hydro O&M will coordinate with the Chief Dam Safety Engineer to dispatch Engineering Personnel to the site
	5	Perform additional tasks as directed by HSO or Engineering Personnel
	6	Make notifications on the Non-Failure, Potential Failure, or Imminent Failure Flowcharts as warranted by conditions

Additional details and information about operating procedures and emergency response actions/procedures are located in the Madison Dam Operations Manual and Standard Operating Procedures (SOPs).

Madison Plant Procedures to be followed in the Event of Imminent Failure of Hebgen Dam: In the event an Imminent Failure situation develops at NWE's Hebgen Dam, Madison Plant employees will need to react and prepare for the event. According to the Hebgen Dam DAMBRK flood wave forecasting model, it would take approximately 10 hours for a two-foot rise in river level to reach the Madison Powerhouse following a fair-weather Hebgen breach. The maximum rise would occur in approximately 19 hours following the breach. Time allows for Madison Plant employees to safely implement the following procedures:

1. Plant operators will shut down and secure the plant.
2. All spill gates on the dam will be opened.
3. Evacuate employee family members, fishermen and tourists from the area upstream of the powerhouse to the outlet of Ennis Lake. All persons should then be relocated to higher ground in anticipation of the flood wave.
4. The entrance to the Bear Trap Canyon will be blocked at the Ennis Lake outlet bridge to prevent individuals from entering the Canyon.

The Madison County Sheriff will be responsible for all other evacuation activities along the path of the flood wave.

After the area is secured, the Madison Plant Foreman will proceed to the Hebgen Dam area in the safest manner possible to assess the situation. It is anticipated that the Foreman would travel to Hebgen with Butte NWE Hydro supervisory personnel by helicopter or fixed-wing aircraft. Otherwise, the only safe road route to the Hebgen area by the Foreman would be via Highway 191 through Gallatin Canyon. This route would allow him to safely access the area upstream of the dam site.

4. Termination and Follow-up

A. Termination

The last step of the EAP response process is critical for disseminating information that the emergency has ended and for improving the response process for the future. Termination procedures are very streamlined because they primarily involve communication with the NWE Chief Dam Safety Engineer, which will be continuous and ongoing during the entire EAP response process.

The decision to terminate the EAP activation will be made through a coordinated effort and continuous communications between onsite personnel, particularly Engineering Personnel, the Superintendent, Hydro O&M, and the Chief Dam Safety Engineer. The constant back and forth flow of information on success and failure of emergency actions is the most important procedure so the best decisions can be made about continued remediation efforts or termination. The Chief Dam Safety Engineer, as the responsible authority for NWE, will ultimately decide that an emergency condition no longer exists at the dam once conditions have stabilized.

In some cases, the Chief Dam Safety Engineer may be onsite and will make determinations without cumbersome and potentially problematic information relays, which will likely result in higher confidence that termination by NWE is appropriate.

Once the decision has been made to terminate activation of the EAP by the Chief Dam Safety Engineer, the Chief Dam Safety Engineer will notify NWE's Director of Corporate Communications. Emergency management officials or incident command will then be notified by either the Chief Dam Safety Engineer or NWE's Director of Corporate Communications, as appropriate, that the emergency condition no longer exists at the dam.

It is important that NWE and emergency management officials agree on when it is appropriate to terminate the emergency.

Emergency management officials will terminate the public emergency response efforts and lift evacuation orders once it is safe for the public to return to their homes or areas affected by the emergency.

B. Follow-Up

After the incident has been terminated, NWE will conduct an evaluation of the incident with the participation of emergency management officials and other incident participants, as appropriate.

The following will be discussed and evaluated in an after-action review:

- Events prior to, during and following the emergency
- Significant actions taken by each participant, and what improvements would be practicable for future emergencies
- All strengths and deficiencies found in procedures, materials, equipment, staffing levels, and leadership
- Corrective actions identified to improve the plan and a defined course of action to implement the corrections

The results of the after-action review will be documented in an Evaluation Report or After Action Report (AAR) chaired by NEW, which will be used as a basis for revising the EAP.

F. General Responsibilities

1. Licensee Responsibilities

It is NWE's responsibility to initiate effective and timely warning to the designated responsible parties according to this plan in the event of a dam failure, potential failure, or release of waters that may exacerbate flooding with regards to the four classifications stated in Section E.1.C. In addition, the EAP response process procedures are included in Section E.1.A and B and will not be repeated in the following sections.

Plant Operator/Plant Foreman: The Plant Operator is responsible for detecting, evaluating, and confirming incidents at the dam as part of their day-to-day duties. In the event of an emergency, the Plant Operator is responsible for determining the emergency level and immediately implementing the appropriate flowchart by contacting the Plant Foreman.

The Plant Foreman is then responsible for contacting the Hydro Operations Supervisor On-Call and Hydro System Operator HSO). It should be noted that depending on the severity of the emergency, the Plant Foreman will have the option of making his initial contact with the sheriff farthest upstream (Madison County Sheriff), and then contacting the Hydro Operations Supervisor On-Call.

After making the designated notifications according to the appropriate flowchart, and in the event of imminent failure, the Plant Foreman and/or Plant Operator will alert and evacuate all camp residents in the two NWE-owned houses below the dam as well as all fishermen, tourists, and campers in the vicinity of the powerhouse and dam to the safety of higher ground.

Emergency operations/procedures will be coordinated with the HSO, Engineering Personnel, and the Plant Foreman and/or Plant Operator will implement them as directed.

It will continue to be the responsibility of the Plant Foreman and/or Plant Operator to maintain communications and provide status/situational updates to the HSO, Supervisor On-call, and Engineering throughout the emergency or until relieved after Engineering Personnel arrive onsite.

Hydro Operations Supervisor On-Call: The supervisor on-call is the first point of contact for the Plant Foreman and/or Plant Operator during an emergency at the dam. In the event of Imminent Failure or Potential Failure EAP activation, the Hydro Operations Supervisor On-Call is responsible for notifying the county sheriffs (see page 4).

The Hydro Operations Supervisor On-Call is responsible for maintaining communications with the Plant Foreman and/or Plant Operator, HSO, and Engineering Personnel, to receive and provide status updates as necessary. The Supervisor On-Call will continue to provide support as requested and will provide an alternate central point of contact for emergency managers if the Chief Dam Safety Engineer is not available.

Hydro System Operator (HSO): The Hydro System Operator (HSO) is located at the Generation Control Center (GCC) in Great Falls, Montana and is manned 24 hours a day, 365 days a year as a monitoring and dispatch center. Plant monitoring equipment installed at the Project is connected to the HSO, which

allows the HSO to see alarms at the dam remotely just as the Plant Operator gets them on-site. As a result, the HSO is also responsible for detecting, evaluating, and confirming incidents at the dam. If an incident is confirmed and the Plant Operator/Acting Foreman cannot be reached, the HSO will determine the emergency level and activate the appropriate EAP. The HSO will also dispatch an Operator or Engineering Personnel if no one is on-site.

If contacted by the Plant Foreman, the HSO will immediately begin to make notifications according to the flowchart for the EAP level activated. It should be noted, that the HSO will be asked to make the necessary contacts for the Hydro Operations Supervisor On-Call in the event the Plant Foreman cannot make contact with him.

After all notifications have been made, the HSO will begin to coordinate emergency operations/procedures with the Plant Foreman and Engineering Personnel as appropriate or directed. This includes coordinating operations with the upstream and downstream dams as outlined in Section E.3.

The HSO is responsible for maintaining communications with the Plant Foreman and/or Plant Operator, Hydro Operations Supervisor On-Call, and Engineering Personnel, to receive and provide status updates as necessary. The HSO will continue to provide support as practicable to all levels of NWE throughout the emergency.

Superintendent, Hydro O&M: The Superintendent, Hydro O&M is responsible for supporting the activated EAP level by making notifications according to the appropriate flowchart. After making the designated notifications, the Superintendent is responsible for determining the emergency operations and construction procedures that will be implemented in response to the emergency at the dam.

The Superintendent will begin coordination of the emergency operations/procedures at the dam with the HSO, the Plant Foreman and/or Plant Operator, and Engineering Personnel. This will likely include dispatching Engineering Personnel and construction crews/resources to the site depending on the EAP emergency level activated. If necessary, the Superintendent will also dispatch Engineering Personnel to the Emergency Operations Center, if established, to be a liaison to Emergency Managers.

The Superintendent, Hydro O&M will maintain communications by receiving and providing status updates between the HSO, Engineering Personnel, and Senior Management as appropriate. Management support for response efforts will also be an ongoing responsibility for the Superintendent until the end of the emergency.

Chief Dam Safety Engineer: In all cases, the Chief Dam Safety Engineer is responsible for contacting the FERC Regional Office in Portland, OR. In addition, the Chief Dam Safety Engineer will be the NWE contact for the sheriffs after the Hydro Operations Supervisor On-Call makes initial contact. If the Chief Dam Safety Engineer cannot be reached, the Supervisor On-Call will be the alternate NWE contact for emergency managers.

The Chief Dam Safety Engineer will initiate periodic status report conference calls with the dam site, HSO, Engineering Personnel, and Corporate Communications to continue to provide up to date information about the emergency to Senior Management. The Chief Dam Safety Engineer will be the

point of contact with the Emergency Operations Center, if established, to relay information to a designated liaison at the Emergency Operations Center.

The Chief Dam Safety Engineer is NWE's designated representative with authority to terminate activation of the EAP.

Lead Resource Coordinator: The Lead Resource Coordinator will be responsible for making notifications according to the EAP flowchart for the activated emergency level. In addition, the Lead Resource Coordinator is responsible for coordination of river flows and will contact and maintain communication with the National Weather Service (NWS) to keep them informed of the coordination efforts.

Director Corporate Communications: The Director of Corporate Communications is responsible for disseminating information to the media and the public on a periodic basis throughout the emergency. This may be accomplished by dispatching public relations staff and providing input to staff on emergency communications.

2. Notification and Communication Responsibilities

NWE Plant Operator/Plant Foreman: The Plant Operator is responsible for immediately contacting the Plant Foreman, if available. The Plant Foreman is then responsible for notifying the Hydro Operations Supervisor On-Call. However, depending on the severity of the emergency, the Plant Foreman will have the option of making his initial contact with the sheriff farthest upstream (Madison County Sheriff), and then contacting the Hydro Operations Supervisor On-Call.

The Supervisor "On-Call" rotation involves assigned NWE Hydro Operations Supervisors. Each Supervisor On-Call has a cell phone if he or she cannot be contacted at the office or at home.

After the Hydro Operations Supervisor On-Call has been notified, the Plant Foreman is responsible for notifying the Hydro System Operator (HSO) in Great Falls, Montana. (In the event that the Plant Foreman is not readily available, the Plant Operator will assume the Plant Foreman's notification responsibilities.)

The Plant Foreman, or Plant Operator in his absence, has the continued responsibility to keep local authorities and NWE personnel advised on conditions at the dam during an emergency or until relieved of this responsibility. Again, the mode of communication will depend on the severity of the failure. The NWE radio system may have to be used to relay information from the dam, to the Hydro System Operator (HSO) and to the Chief Dam Safety Engineer.

NWE Hydro Operations Supervisor On-Call: In the event of Imminent Failure or Potential Failure EAP activation, the Hydro Operations Supervisor On-Call is responsible for notifying the following County Sheriffs listed in priority order by county:

1. Madison County Sheriff, Virginia City
2. Gallatin County Sheriff, Bozeman
3. Broadwater County Sheriff, Townsend

After initial notification, the Chief Dam Safety Engineer will be the NWE contact for continued communications with the sheriffs. If the Chief Dam Safety Engineer cannot be reached, the Supervisor On-Call will be the alternate NWE contact.

NWE Hydro System Operator (HSO): Immediately after being notified of Imminent Failure or Potential Failure, the Hydro System Operator (HSO) in Great Falls, Montana, will initiate his/her contacts under the EAP. Those contacts are listed below in priority order.

1. US Bureau of Land Management
2. NWE Superintendent, Hydro O&M
3. NWE Lead Resource Coordinator
4. Broadwater Dam/Plant (State of Montana - DNRC)
5. Casper Control Center, Canyon Ferry Dam (US Bureau of Reclamation)
6. NWE Hebgen Dam
7. NWE Chief Dam Safety Engineer

The HSO will continue to operate as an internal communication hub in the event of an emergency to allow for continued communications between the Plant Foreman, Superintendent Hydro O&M, Chief Dam Safety Engineer, Engineering Personnel, and Senior Management.

NWE Superintendent, Hydro O&M: Immediately after being notified of the Imminent Failure or Potential Failure, the Superintendent, Hydro O&M will notify the following, which are listed in priority order:

1. Montana Disaster and Emergency Services, Helena, Montana
2. NorthWestern Energy Grid Operations Control Center

The Chief Dam Safety Engineer and the Superintendent, Hydro O&M will consult with the appropriate NWE Operations and Engineering Personnel to promptly respond in assessing the situation.

NWE Chief Dam Safety Engineer: The Chief Dam Safety Engineer is responsible for contacting the FERC Regional Office in Portland, OR. The Chief Engineer is responsible for initiating status report conference calls to maintain open communications and current status information.

After initial notification, the Chief Dam Safety Engineer will be the primary point of contact for continued communications with the Sheriff's departments.

NWE Lead Resource Coordinator and Director Corporate Communications: The Lead Resource Coordinator will be responsible for contacting and maintaining communications with the National Weather Service (NWS) to keep them updated on the emergency status. The Director of Corporate Communications is responsible for disseminating information to the media and the public on a periodic basis throughout the emergency.

County Sheriff's Offices/Dispatch Centers: Each sheriff's office is responsible for notifying and maintaining communications with the Disaster and Emergency Services (DES) Coordinator for their respective county. In addition, the county sheriff's and dispatch centers will likely serve as

communication hubs between emergency responders and the general public and will be responsible for coordinating evacuation activities.

The National Weather Service (NWS): The NWS has the responsibility for issuing flood warnings and will use its warning system to supplement the notification set in motion by the implementation of the Imminent Failure EAP Flowchart (page 4). In addition, as set forth above, the Lead Resource Coordinator will maintain communications with the NWS to keep them informed of river flow coordination efforts. This will enable the NWS to monitor the situation and provide additional advanced warning to areas downstream from the break.

Plant Operator(s) at Broadwater and Canyon Ferry Dams: The Plant Operator(s) will be responsible for notifying or alerting anyone within the vicinity of the dam to evacuate to higher ground.

Montana Disaster and Emergency Services: Montana Disaster and Emergency Services (DES) will contact the Governor's office and inform them of the situation. They will also stand by and be prepared to offer assistance to local and county officials having disaster and emergency responsibilities.

NWE Grid Operations Control Center: In the event of an activation of the Imminent Failure EAP, the NWE Grid Operations Control Center will contact the NWE Bozeman Division Supervisor-On-Call to inform them of the situation.

3. Evacuation Responsibilities

After the Supervisor On-call and Hydro System Operator (HSO) have been notified, the Plant Operator will evacuate all fishermen, tourists and campers in the vicinity of the powerhouse and dam to the safety of higher ground. This step may have already been taken in the case of a "Potential Failure" EAP activation.

All other evacuation activities will be coordinated by the Madison County Sheriff's office, which will be the local emergency management contact.

4. Monitoring, Security, Termination, and Follow-Up Responsibilities

A. Monitoring

In the event of Imminent Failure or Potential Failure EAP activation, NWE will dispatch Engineering Personnel to the dam site to provide technical evaluation and onsite response management during the emergency. Once onsite, an engineer will be designated as the Incident Monitor and will be the onsite contact for providing status updates to the Chief Dam Safety Engineer, the Superintendent, Hydro O&M, HSO, and others. The Incident Monitor will provide frequent updates as the situation changes, during the periodic status report conference calls, or as contacted by the NWE response team.

In some cases, the Hydro Supervisor On-Call may respond to the dam site; in this case, the Supervisor On-Call will assume the role of the onsite Incident Monitor.

B. Security

If an incident occurs at the dam that requires activation of this EAP, security efforts will be coordinated through the Superintendent, Hydro O&M and Hydro Security Coordinator.

NWE has developed security plans for its dams that provide guidance for security measures during emergency incidents. The security plan and this EAP have been further integrated by an Internal Emergency Response and Rapid Recovery Plan (IERRP). The IERRP is not intended to replace either plan; however, it ensures a coordinated and integrated response to an emergency whether natural or weather-related (e.g., storms, flooding) emergencies or man-made (e.g., security incident, threat) emergencies.

The Superintendent, Hydro O&M and Hydro Security Coordinator will determine the level of security necessary for the dam during an incident and will dispatch contracted security personnel and/or local law enforcement if resources are available to provide security at the site.

Local law enforcement agencies have the primary responsibility for conducting evacuations, if required. As a result, they may not have enough resources to also provide security at the site. They should only be used to provide security if requested and able as a secondary resource.

C. Emergency Termination

There are two conditions requiring a termination of the emergency. One has to do with emergency conditions at the dam and the other is related to the evacuation and disaster response. NWE will be responsible for making the decision that an emergency condition no longer exists at the dam. The designated party will be the Chief Dam Safety Engineer, who will disseminate that information to the Director of Corporate Communications.

The applicable state or local emergency management officials are responsible for termination of the evacuation or disaster response activities.

NWE, state, and local officials should agree on when it is appropriate to terminate an emergency. In addition, they should cooperate to determine if a news release is appropriate for media broadcast to the general public, notifying them the emergency condition has been terminated.

D. Follow-Up Evaluation

Following an emergency, NWE is responsible for conducting an evaluation and review of the incident that will include input from all participants. NWE is also responsible for documenting the evaluation and preparing an After Action Report (AAR). The AAR will be submitted to the FERC and will be used as a basis for revising the EAP.

5. EAP Coordinator Responsibilities

The EAP Coordinator for NWE is:

Dustin Kaste
11 East Park
Butte, Montana 59701
Phone: (406) 497-3421

The EAP coordinator is responsible for EAP related activities, including but not limited to, revising the EAP as needed, conducting training seminars/orientations, coordinating exercises, and to act as the

liaison between state and local agencies and NWE. The EAP Coordinator is also the contact for all stakeholders and involved entities if there are questions about the plan.

G. Preparedness

1. Surveillance and Monitoring

The Madison Project is staffed during working hours seven days a week. The operator on shift is available 24 hours a day. The Plant Foreman lives in the town of McAllister. One operator lives at the dam (House No. 37). One operator lives across from the Nunn Plant (House No. 9) and one operator lives across from the plant when on call. Each camp residence is provided with a plant alarm.

The Hydro System Operator (HSO) monitors the flow in the Madison River just below Hebgen Dam through the USBR Hydrometeorological Network computer in Boise, Idaho. The water flow information from this gaging station on the plant computer monitor gives the operator at the Madison plant advanced notice of actual high flows in the Madison River and allows him/her to make necessary adjustments (i.e., pull slide panels, increase generation, etc.).

A dam failure alarm is incorporated into the river controller, which will be activated if the pond elevation at Madison drops more than two feet in five minutes, and if the tailrace elevation rises more than two feet in 5 minutes. At the GCC this alarm would be audible, visual and also print out on hard copy.

2. Evaluation of Detection and Response Timing

As previously mentioned, The Madison Project is staffed seven days a week, with an operator available 24 hours a day, living adjacent to the dam and powerhouse. The operators conduct daily inspections of the dam and NWE Engineering Personnel conduct scheduled dam safety inspections or additional inspections as warranted due to operator surveillance and/or requests. As a result, detection of even a slowly developing potential issue with the dam would likely happen very quickly (i.e., potentially within 24 hours, but likely within less than a week). In addition, because the operators are onsite every day, a rapidly developing problem, like sabotage, would also be identified quickly (i.e., while it's occurring).

Response times will vary based on the severity of the issue, which correlates to the emergency level determination made for an incident or emergency and resulting EAP activation. For all emergency levels NWE will have personnel onsite since employees live at Madison Dam. Engineering Personnel and supervisors will also respond and be available onsite in the event of an EAP activation. For Madison, non-resident NWE personnel can be onsite within one to two hours to further evaluate conditions at the dam.

Phone drills have been conducted at Madison every other year from 1989 – present. Because the notification procedures for Madison and Hebgen are virtually identical; the plants rotate performing the annual phone drill.

The combination of rapid detection and notification provided by NWE personnel ensures maximum early warning to everyone involved and allows emergency managers to expedite their response to the maximum extent practicable.

3. Access to the Site

Access to the outlet of Ennis Lake can be from either side of the lake; however, once you reach the outlet and enter Bear Trap Canyon, the narrow dirt road that runs along the east side of the river is the only access to the dam and powerhouse.

Driving time for responders from Ennis is approximately 30 minutes.

4. Response during Periods of Darkness

The spillway deck is illuminated by four 150-watt high-pressure sodium lights. There are also two 150-watt high-pressure sodium lights at the intake and headworks area.

If the system experiences a major breakup and the plant is isolated, the No. 1, 2, 3 or 4 units could be used to supply station service to the powerhouse and dam. In this condition, the units are at synchronous speed carrying normal voltage but isolated from the transmission system through open oil circuit breakers. They remain tied to the auxiliary bus, and can be used to provide all auxiliary loads needed to operate the project.

The generator bus disconnects can also be opened to isolate the generator. The generator bus can then be back fed from the Bradley Creek 100 kV line, thus energizing the station service transformers and circuits. This would restore station service power to the plant and dam.

With an operator on duty seven days a week and employees living in close proximity to the project, the response time during hours of darkness is kept to a minimum. Any loss of power at the plant is noticed immediately by the Plant Operator or alarms in the operator's residence during off duty hours.

5. Response during Weekends and Holidays

At all times, there is a Hydro Supervisor On-Call. The Supervisor "On-Call" rotation involves assigned NWE Hydro Operations Supervisors. Each Supervisor has a cell phone that is to be used if he or she is not available at the office or at home.

The alarm system and callout system is virtually the same as that described in detail under Section G.1.

6. Response during Adverse Weather

As previously discussed, all employees at the Madison Development live in close proximity to the project, thus the plant is readily accessible by foot during periods of adverse weather. After any measurable snowfall, the access road to the project is plowed by the County and NWE.

The following list of special equipment is available at Madison:

- 1986 Chevy one ton, four-wheel drive truck with dump box, snowplow and winch
- 14 foot aluminum boat with 9.9hp Mercury motor.
- 2009 Ford F-250 Crew Cab
- 2011 Ford F-250 Crew Cab
- 6x6 Polaris

- Ford tractor with front bucket and rear blade

During periods of adverse weather when flooding could occur (heavy rainfall, prolonged rainfall, heavy runoff due to snowmelt, etc.), the Plant Operator will check the reservoir and dam as part of his routine rounds. If this is not possible, a relief operator will be called out to monitor the dam and reservoir during these periods.

The following types of incidents occurring along or near the reservoir can affect operation, performance and safety of the dam and its appurtenant facilities:

- Large landslides into the reservoir causing high waves at the dam and the possibility of overtopping, erosion and other damage at the dam.
- Landslides, rock falls and avalanches near the dam and structures.
- Large floating debris and ice, which could block spillways and intakes.

During periods of adverse weather, the Plant Operator or Relief Operator will examine the slopes along the reservoir rim and in the vicinity of the dam and facilities for potential instability including the following:

- Areas with history of previous slides.
- Evidence of incipient slides such as uphill cracks, heaves and dips, and tilted trees.
- Build-up of debris from higher slides or stream overflow above a slope.
- Substantial runoff draining and disappearing into large masses of soil and poor rock.
- Unfavorable geologic features such as steep dips towards the lake or the dam.

7. Alternative Sources of Power

Alternative power can be supplied via several station service reliability options including:

- Power feedback from the Bradley Creek 100 kV line.
- 100 kW 480 3-phase a.c. back up propane fueled generator at the dam.
- 100 kW 480 3-phase a.c. back up propane fueled generator at the powerhouse.

In the event of a loss of power, the head gate can be operated using the backup generator, making it possible to control pre-emergency releases from the dam. Six-volt lanterns, flashlights and a spotlight in the NWE vehicle can provide adequate light during hours of darkness if power sources for lighting fail.

8. Emergency Supplies and Information

The following area contractors have machinery that could be used in an emergency and are in close proximity to the project:

Hoe Construction
Box 936
Ennis, Montana 59729
Tim Hoe
(406) 682-[redacted] (W/H)

Matson Excavation
Box 533
Ennis, Montana 59729
Gordon Matson
(406) 682-[redacted] (W)
(406) 682-[redacted] (H)
(406) 580-[redacted] (Cell)
(406) 682-[redacted] (Shop)

Titan Construction
Ennis, Montana 59729
Contact: David Clark
Cell: (406) 599-[redacted]

These contractors can be contacted by phone and will be responsible for notifying their own operating engineers as needed, depending on the type of damage sustained and type of repair(s) required.

Depending on the magnitude of the emergency rapid transportation to the site may be warranted. While many NWE personnel can drive to the site in an hour or less, Table G.1 provides information on local air resources for transportation and reconnaissance.

Table G.1: AIR TRANSPORTATION SERVICES

Sunbird Aviation Gallatin Field – Belgrade (406) 388-[redacted] (24 hr) 1- Turboprop - 7 passenger 3 – Cessna 340's - 5 passenger Contact – Greg Fuller	Central Copters, Inc – Gallatin Field 206 Bell Ranger helicopter-4/5 passenger 6,000# heavy lift capabilities also Office: 586-[redacted] Cell: (406) 581-[redacted] Contact – Mark Duffy
Montana Aircraft Gallatin Field – Belgrade Two Cessna's – 3 & 5 passenger 1-pressurized turboprop-7 passengers (406) 581-[redacted] (24 hr) Contact - Doug Chapman	Carisch Helicopters Gallatin Field – Belgrade (406) 579-[redacted] (24 hr phone) (406) 556-[redacted] (24 hr pager) Bell 206-L4 six passenger helicopter Contact - Mike Carisch
Central Air Services, Inc (406) 350-[redacted] (24 hr) Lewistown, Montana Two, 4 & 6 passenger helicopters Contact – Charlie Rogers	Exec Air – Helena Airport Single and twin engine; up to 7 passenger Lear Jet – 5 passengers (406) 442-[redacted] (24 hr) Contacts: J. Maxness & D. Horhton
Minuteman Aviation, Inc. Missoula International Airport - Missoula (406) 728-[redacted] Helicopters and passenger aircraft	Billings Flying Service Billings (406) 252-[redacted] Heavy Lift and passenger helicopters
Billings Interagency Dispatch Center/USFS Info Line (406) 896-[redacted]	

9. Stockpiled Materials and Equipment

NWE cannot visualize a case in which stockpiling materials or use of equipment could reduce the effect of a dam failure. The processes involved in the sudden failure of a dam are too powerful to be mitigated by the emergency use of machinery or materials. In the event of a slowly developing situation such as leakage through the dam or abutment, or eroding downstream material; sources of material and contractors are available within about 15 to 30 miles of the dam.

10. Coordination of Information

NWE is extensively involved in advanced planning for water resource usage in the Madison-Missouri drainage. NWE cooperates with the Natural Resources Conservation Service (NRCS) snow survey and with the USGS in their stream flow gaging. The yearly operation of the project is based on projected forecasts. In addition, NWE communicates daily during the runoff season with the U.S. Army Corps of Engineers concerning flood control procedures and runoff forecasts.

Operators at NWE's Hebgen Dam, State of Montana's Broadwater (Toston) Dam, and BOR's Canyon Ferry – see page 22 for actions required to mitigate high river flows.

Actions can be taken to lower the reservoir water surface level. If the failure interval is long enough, it may be possible to lower Ennis Lake's level as long as the spill required to accomplish this does not accelerate the failure. Although the course of action includes requesting Hebgen Dam to reduce flows to a minimum, this should have a minimal impact unless the failure time is at least equal to the travel time of flows from Hebgen.

11. Training and Exercises

A. Training

NWE has developed a training program that is used to train all NWE personnel involved with the EAP at the Madison Development. The training is provided on a yearly basis and includes, but is not limited to:

- A general discussion on how to respond properly to an emergency situation
- Procedures to follow throughout an emergency
- Basic communications skills - how and when to use them
    - Samples of typical communications for implementation of the Imminent Failure EAP Flowchart (see page 4) are given to all personnel during this training
- Routine monitoring based on Potential Failure Modes is discussed
- Response plans are reviewed
- The Imminent Failure Flowchart (see page 4) and Potential Failure Flowchart (see page 5) are reviewed for each failure scenario.

This training is held once every calendar year at a time and date to be determined by the EAP Coordinator.

B. Exercises

NWE conducts exercises in accordance with the FERC's guidelines and recommended exercise schedule to maintain familiarity with EAP procedures. The exercises involve NWE employees, emergency managers, and other appropriate stakeholders involved with the implementation of the EAP.

Annual Drills: Annual drills are intended to test the readiness of all personnel involved with the EAP and are typically conducted once every calendar year in conjunction with the annual EAP training. However, the Madison and Hebgen developments rotate between annual drills because they have many of the same stakeholders and are within relatively close proximity to each other.

During annual drills, the following aspects of the EAP process are discussed, simulated, and/or tested:

1. Potential Failure Modes are discussed and followed through with enactment drills.
    i. Relative safety of camp citizenry and downstream inhabitants is weighed and tested, using hypothetical situations.
2. Response during daylight and nighttime conditions.
    i. Training and drills include familiarity and use of all emergency, safety, first aid and substitute equipment.
    ii. Inventory of emergency supplies and resources is verified and updated at training sessions/drills.
3. Communications channels:
    i. Land-line Telephone systems
    ii. Mobile phone systems
    iii. NWE-owned mobile and base station radios
4. Notification procedures are practiced during the training session, emphasizing "test only" conditions, to authenticate all listed phone numbers. The order in which notification is made is the same as that required by an actual emergency. In order to prevent a misunderstanding, no reference to a "dam failure" is made during a "test only" condition. For clarity, the following statements are made at the beginning of each telephone contact: **"This is a test of the Emergency Action Plan for the Madison Project. This test only condition is for the implementation of the EAP Warning Flowchart on page 4 of the plan. Again, this is only a test."** The person making the contact should always ask, **"Do you understand how to carry out your responsibility according to the EAP?**" before ending the call.

The success of the annual test of readiness is determined by the EAP Coordinator. A critique of the test and any revisions or updates to the plan (or statement that no revisions or updates were needed) will be included in the EAP Status Report that is submitted to the FERC Regional Engineer no later than December 31 of each year. The critique includes the following:

1. Concerns regarding telephone contacts.
2. Evaluation of the time required to implement the test.
3. Identify areas of improvement to shorten time required to implement the EAP.
4. Address the testing of emergency power sources and remote surveillance systems used to signal an emergency situation (e.g., dam failure alarm).

Immediately following the test, verification is garnered from all entities holding Madison EAP manuals so a determination can be made that all have the most up-to-date manual available. This information shall also be included in the critique and submitted in writing to the FERC Regional Engineer by December 31, of each year.

Review of the test procedure will be documented by dam personnel and supervisory personnel. All personnel and agencies identified on the Imminent Failure Flowchart on page 4 will report verification of their phone contacts to the EAP Coordinator.

Comprehensive Drills: The FERC mandates that Comprehensive Drills, such as the Tabletop and Functional Exercise take place at one of NWE's hydro sites annually. Historically, the drills alternated between the 5 different drainage basins. NWE typically combines the tabletop and functional exercises into back to back, two day events to improve stakeholder participation.

The **Tabletop** drill precedes the functional drill and involves a meeting of NWE officials and state and local emergency management officials in a conference room environment. This is usually considered the trial run of the more stress-induced functional exercise.

The **Functional** drill is the highest level exercise that **does not involve** the full activation of NWE and state and local emergency management agency field personnel and facilities or test the evacuation of residents downstream of the dam. What it **does involve** is all of the various levels of NWE and state and local emergency management personnel that would be involved in an actual emergency participating in an exercise of a stress-induced environment with time constraints that simulates a dam failure and other pertinent specified events. The participants "act-out" their actual roles. The exercise is designed to test the functionality of the EAP and evaluate the coordination activities between NWE and all other agencies.

12. Alternative Systems of Communication

There are various forms of communication systems available at Madison Dam. Four voice communication systems are available consisting of Leased Telephone System lines at the powerhouse, dam, pressure chamber, and operators' residences; NWE owned phone system lines in the powerhouse and at the dam; cellular phones; and there are radios in the powerhouse, at the dam, in NWE vehicles and with every employee. The likelihood of all four systems being inoperable simultaneously is extremely remote. All personnel at the plant are familiar with each system and use them on a regular basis. The Plant Operator shall base his selection of which system to use on the situation and on his own good judgment.

NWE has upgraded its radio system to a UHF-band trunked system; however, the original VHF high-band radio system will remain in use at the Madison Plant and Hebgen Dam. The VHF radios will continue to be used primarily because the new UHF-band trunked system does not currently provide coverage at Hebgen Dam itself. In addition, the VHF radios provide the ability to talk with local emergency responders and managers that improves notification and response times for emergencies at Hebgen Dam. The VHF high-band radios provide the following capabilities:

Table G.2: NWE RADIO SYSTEM

Radio Channel (Mode)	Description	Madison Dam - Group #3 NWE
1	Repeater	[redacted]
2	Talk Around	
3	Telephone	
4	Truck to Truck	
5	National Power	
6	Mutual Aid Silver (Law)	
7	Mutual Aid Gold (Government)	
8	Mutual Aid Red (Fire)	
9	Weather (NOAA)	
10	Weather (NOAA)	
11	Mutual Aid White (Ambulance)	
12	Mutual Aid Brown (DES)	
13	Gallatin Cty Sheriff - North	
14	Gallatin Cty Sheriff - South	
15	Madison Cty Sheriff – Norris Repeater	
16	Pager	
17	Madison R2	

The new UHF-band trunked radio system currently provides only internal NWE radio communications via zones and talk groups. Within each zone there are talk groups that allow for communications to be narrowed down to particular smaller groups or individuals.

All of NWE's hydro facilities are set up under the Generation Zone. There are 12 talk groups in the Generation Zone that provide radio communications between radios at any one of the dams individually, between one or more dams, or between all of the dams and the Generation Control Center (GCC) simultaneously. The GCC is set up to monitor all of the radio communications within the Generation Zone and associated talk groups.

In the event that all phone systems are down or unavailable a Plant Operator or Plant Foreman can communicate via radio directly with the GCC or any of the other dams if necessary to relay an EAP activation. The GCC can then activate an EAP for any of the dams and begin making the necessary notification phone calls if phone calls cannot be made from the dam experiencing the emergency.

The plant and operators' residences are equipped with internet connections providing the capability to send and receive company email and instant messages in the event that voice systems are not available.

With social media becoming a more prevalent method of communicating with large volumes of the general public, NWE's corporate communications department will likely utilize social media to communicate information about the incident, response, and follow-up. Emergency managers and the media have also started using social media to rapidly distribute warnings and information about emergency situations, which is anticipated for an incident involving Madison Dam.

13. Public Awareness and Communication

NWE has an active public awareness program to provide information related to safety around all of its facilities. Advertisements in the form of roadside billboards and television and radio commercials provide information to the public about typical warning signage and barriers used around NWE hydro facilities.

Due to the location of many of NWE's dams, recreationists frequent the areas immediately upstream and downstream of the dams for fishing, hiking, camping, and other outdoor activities. As a result, NWE posts safety information about recreation near its dams in parking areas, trailheads, or other locations where it is visible to the public.

There is public safety and warning information posted immediately up and downstream from the dam that indicates the types of warning signals used and the resulting actions that will occur at the dam or within the waterway if/when these signals are used. For example, warning signs might indicate, "sounding a wavering alarm tone will result in spill gates opening and downstream flows increasing as a result. Seek higher ground immediately upon hearing this tone."

H. Inundation Maps

The inundation maps contained in map pouches in this section of the plan depict flood wave information for two separate Madison Dam breach scenarios. Those scenarios are:

1. A "Fair Weather" breach of the dam, wherein "normal" full reservoir elevation and river flow conditions prevail prior to the dam failure. The "normal" channel is portrayed on the inundation maps, and is based on pre-breach base flows of 1,000 cfs at Hebgen Dam, 1,700 cfs in the Madison River below Quake Lake and 5,400 cfs in the Missouri River.

2. Failure during an "Inflow Design Flood (IDF)" condition. A peak flood inflow of 107,000 cfs into Hebgen Lake, and 9,700 cfs discharge from the dam were assumed to be occurring prior to the failure. The IDF without failure is not shown on the inundation maps. On the inundation maps, the IDF failure is referred to as the "major flood" failure, which is thought to be a more universally understood terminology.

The key map (sheet number one of eight) includes a map legend, which explains how the two inundation zones are portrayed on the inundation maps. It is standard on NWE EAP inundation maps to portray the "fair weather" failure inundation boundary by a yellow overlay outside of the normal riverbank, while the "major flood" failure inundation boundary is depicted by a red overlay. In the case of the Madison Dam EAP inundation maps, peak flood elevations and resultant inundation zones for the two different breach scenarios are too close to be shown separately, thus, the inundation zone boundary for either breach scenario is portrayed only by the "major flood" red overlay. Used in concert with the elevation contour lines on the maps, the inundation zone boundary lines clearly identify maximum flood wave elevations. A map sheet location index and tables of flood information for key locations are also included on the key map.

In 2015, all NWE inundation maps were re-prepared in the GIS-format in either photographic or topographic views. The photographic version of the maps were distributed to plan holders along with the five-year complete revision of the EAP text. Hard copies of the topographic versions of the maps were provided to any plan holder requesting a set. Both map versions are included on the EAP information DVD that is provided to all plan holders. The GIS-format inundation maps provide flood planning assistance to county emergency management personnel that was not available on the previous versions of the maps.

Caution should be used in interpretation of the inundation maps. Because antecedent flow conditions and breach scenarios can vary widely, actual flood characteristics could be quite different from either of the floods portrayed. Flood levels and flood wave travel times are approximate, and should only be used as a guideline for establishing evacuation zones. Actual areas inundated would depend on actual failure conditions, and might differ from areas shown on the maps.

PART II: APPENDICES

Appendix A – Investigation and Analyses of Dam Break Floods

1. Method Used to Identify Potentially Inundated Areas

Hypothetical inundation boundaries and flood wave travel times were determined through application of the U.S. National Weather Services' DAMBRK flood forecasting computer software. The DAMBRK model represents one methodology for modeling of dam failures and the use of hydrodynamic theory to predict dam-break flood wave formation and routing. For the Madison Project, the DAMBRK study was completed on 3/10/1997 for the Fair Weather model and on 3/20/1997 for the Major Flood model.

In the model, the Madison development's spillway section was administratively failed using conservative assumptions, and the resultant flood waves for both the "fair weather" breach and failure during the "inflow design flood" (IDF) were routed through the downstream river reach to Canyon Ferry Reservoir below Townsend, Montana, a distance of nearly 80 miles.

2. Assumptions Made in the Analyses

In the "fair weather" breach model, it was assumed that antecedent flows from the Madison River into Ennis Lake were 1,800 cubic feet per second (cfs). Thirty seven miles downstream from Madison Dam, where the Madison River joins the Jefferson and Gallatin Rivers to form the Missouri River, a total of 5,400 cfs was assumed. In the IDF breach model, the maximum inflow to Ennis Lake was assumed to peak at 97,000 cfs, with outflows at the dam having peaked at 71,500 cfs when the dam began to fail.

The reservoir was assumed to be full -- at the normal full pond elevation of 4816.0 feet MSL (USGS datum) -- in the "fair weather" breach model. For the IDF breach model, it was assumed that the reservoir water surface had peaked at elevation 4833.6 feet -- overtopping the non-overflow sections by 12.1 feet -- at the time the dam began to fail.

The assumptions made regarding the temporal and geometric description of the model's Madison Dam breach are within the range of suggested breach parameters outlined in the FERC Engineering Guidelines. The breach was assumed to be trapezoid-shaped, essentially corresponding to the entire concrete-reinforced, rock-filled timber crib spillway section of the dam. The dam was assumed to fail like an engineered, compacted earthfill dam, taking an hour for the breach to full develop and for the water to carry away all the spillway materials.

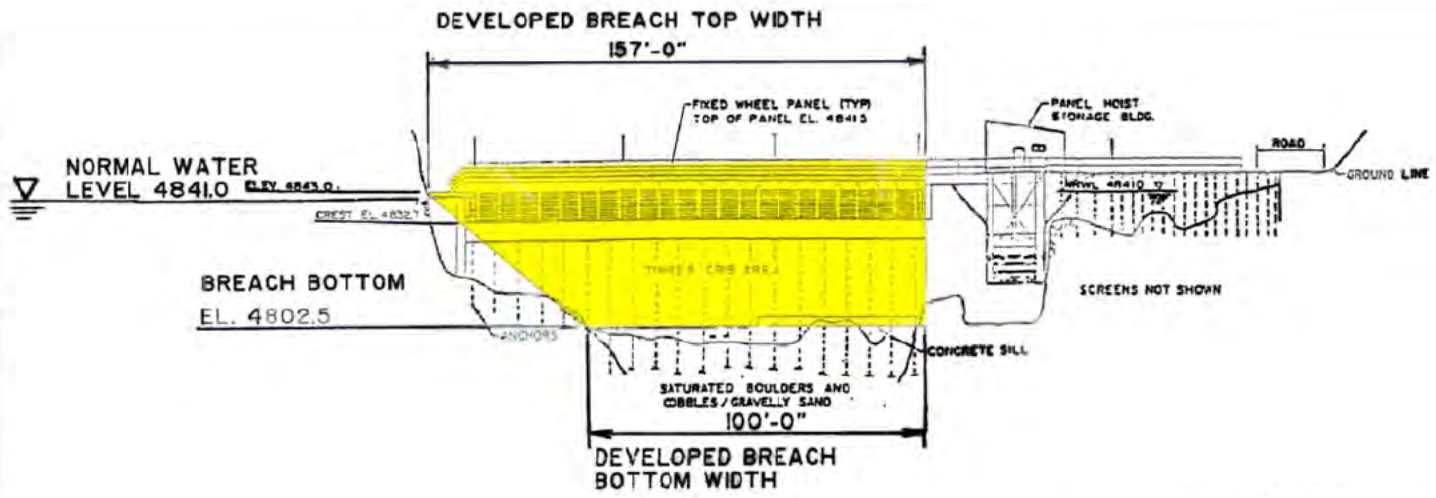
Figure A-1, on the next page, portrays elevation and section views of the dam, including dimensions, with the assumed breach indicated in yellow.

As a means of logically choosing Manning's n channel roughness values for application in the model, cross-sections at existing gaging stations below Madison Dam were analyzed using the Manning's equation, whereby the cross-section shape, water surface elevation, and slope were known, and the equation was solved for n. Data was available for gaging stations on the Madison River just below the

Figure A1

Madison EAP Assumed Breach

12-1-99



UPSTREAM ELEVATION

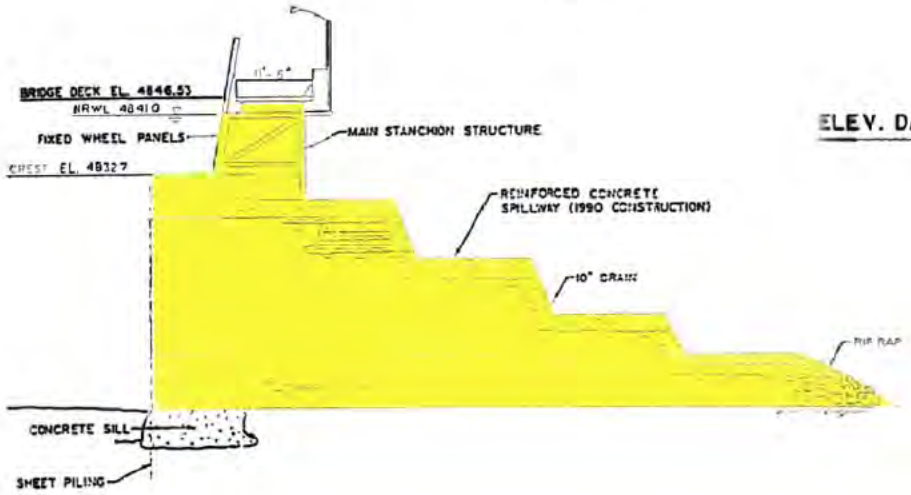
1" = 50'

SCALE = 1" = 50'

50 0 50 100 150 200 250 300

25 0 25 50 75 100 125 150

SCALE = 1" = 25'



SECTION THROUGH SPILLWAY

1" = 25'

ELEV. DATUM = MPC - 25'= USGS

NorthWestern Energy

EMERGENCY ACTION PLAN
MADISON DAM
ASSUMED BREACH
FIGURE A1

Madison development powerhouse, and on the Missouri River at Toston. While floods of a magnitude resulting from either an IDF flow or a dam failure caused flood have never been measured at these locations, it is thought that analysis of the highest recorded flows at these gaging stations would yield more accurate Manning's n values than those arbitrarily selected from reference books. A Manning's n channel roughness coefficient value of 0.054 was used in the Madison River from Ennis Lake to the Missouri River, and a value of 0.041 was used in the Missouri River from the headwaters to Canyon Ferry Reservoir.

The steady inflow hydrograph of 1,800 cfs used in the "fair weather" breach model is a typical summer flow for the Madison River at Madison Dam. The inflow design flood hydrograph used in the IDF breach model is equal to the Probable Maximum Flood (PMF) hydrograph, which was established for the 1968 FERC Part 12 Safety Inspection Report, and last reviewed in the October, 1994, Part 12 Report by Raytheon Infrastructure Services Incorporated. Relationships between reservoir water surface elevation, storage capacity, and total discharge capacity were taken from NWE's records and tables.

Cross-sections and channel slopes were developed from USGS topographical maps with 10, 20 and 40-foot contour intervals. The 43 cross-sections modeled for the analyses were located where significant changes in channel configuration occur and at sites of specific concern, such as towns, recreation sites, and highway bridges.

3. Consideration of the Domino Effect

The domino effect -- a sequential failure of downstream dams as a result of the failure of Madison Dam -- was considered in the analyses. As described in Section D, Broadwater Dam is built on the Missouri River approximately 59 miles downstream of Madison Dam, and Canyon Ferry Dam lies nearly 110 miles downstream.

In the "fair weather" breach model, the breach outflow -- with a peak of 44,700 cfs -- had attenuated to 30,400 cfs by the time it reached Broadwater Dam, over 16 hours after the breach had begun. According to spillway rating data supplied by the State of Montana, the dam could pass this flow without exceeding normal maximum pond elevation by deflating the project's rubber dam. This action could be performed by Broadwater project operators well in advance of the flood wave's arrival.

The entire volume of Ennis Lake at its normal full elevation can be contained in the top 1.2 feet of exclusive flood control storage space in Canyon Ferry Reservoir. Thus, it was judged that a "fair weather" failure of Madison Dam would pose no threat to Canyon Ferry.

In the IDF breach model, Madison Dam's peak breach outflow was 186,500 cfs. By the time the breach surge reached Broadwater Dam, the peak flow had attenuated to 146,600 cfs. This flow overtops Broadwater Dam and is far less than the established PMF of 495,000 cfs. However, Broadwater engineers state that the dam will fail at flows exceeding 69,000 cfs due to washout of the abutments.

The theoretical IDF (PMF) occurs at a time of year before substantial snowmelt has occurred. At that time of year, Canyon Ferry Reservoir would be drafted to a level close to the top of their active conservation storage elevation of 3770.0, in anticipation of refilling with run-off water. Even though the level of Ennis Lake would be 17 feet higher than normal at the time of the IDF breach, the entire volume

of the surcharged Ennis Lake equals less than 15 percent of the storage volume in Canyon Ferry Reservoir between the active conservation storage elevation and maximum full elevation. Therefore it was judged that the IDF failure of Madison Dam would not cause Canyon Ferry Dam to fail.

4. Special Considerations in Dam Breach Analyses

In addition to consideration of the domino effect, several other special considerations were accounted for in the Madison DAMBRK model.

One important consideration in development of the model was the 25 foot discrepancy between the USGS elevation datum and the elevation datum used on NWE drawings, flow rating curves, storage tables, etc. (USGS datum = NWE datum - 25.0 feet). In combining geometric data from USGS and NWE sources, all NWE elevations were converted to the equivalent USGS elevations.

Special care was taken to accurately model Ennis Lake and the canyon channel from the lake's outlet to the dam, so that DAMBRK's dynamic reservoir routing option could be used. The cross-sectional description of this reach was checked to ensure the modeled volumes matched accepted elevation/storage relationship data.

5. Results of the Analysis

Results of the DAMBRK study are summarized and plotted on the Madison Dam EAP inundation maps (contained in map pouches in H Inundation Maps). The key map (sheet number one of eight) contains tables of information, including flood wave heights and travel times, for key locations downstream of Madison Dam. The other inundation maps delineate potentially inundated areas on photographic maps of the affected region. Section VII in this plan further describes the inundation maps.

6. Termination of Flood Routing

As described above, the entire volume of Ennis Lake would be easily contained in Canyon Ferry Reservoir. Thus, routing of the flood wave was terminated at the upper end of Canyon Ferry Reservoir, approximately 78 river miles downstream from Madison Dam.

A natural flood event anywhere close to the magnitude of the IDF would provide substantial warning in itself. Many residents along the watercourse would already be experiencing flood conditions before the dam failed, and evacuation procedures would have already commenced.

Appendix B – Plans for Training, Exercising, Updating, and Posting the EAP

1. Training

Training will be provided on a yearly basis for all NWE personnel involved with the EAP at the Madison Development. This training will include, but is not limited to:

- A general discussion on how to respond properly to an emergency situation.
- Procedures to follow throughout an emergency.
- Basic communications skills - how and when to use them. Samples of typical communications during implementation of the EAP Imminent Failure Flowchart (see page 4) will be given to all personnel during this training.
- Potential Failure Modes will be discussed.
- Response plans will be reviewed.
- The Imminent Failure Flowchart (see page 4) and Potential Failure Flowchart (see page 5) will be reviewed for each failure scenario.

This training will be held once every 12 months at a time and date to be determined by the EAP coordinator and will be held in conjunction with the annual review of the EAP.

2. Exercise

A. Annual Drills

- Training of all personnel involved with the EAP will be conducted at least once every year. Testing the readiness of all personnel involved with the EAP will be conducted once every year.
- Potential Failure Modes will be discussed and followed through with enactment drills.
    - Relative safety of camp citizenry and downstream inhabitants will be weighed and tested, using hypothetical situations.
- Response plans will be enacted for daylight and nighttime conditions.
    - Training to include familiarity and use of all emergency, safety, first aid and substitute equipment.
    - Inventory of emergency supplies and resources to be maintained and updated at training sessions.
- Communications channels to be tested during training sessions will be:
    - Leased Telephone System phone.
    - NWE-owned phone system
    - NWE-owned mobile and base station radios.
- Notification procedures will be exercised during the training session, emphasize "test only" conditions, to authenticate all listed phone numbers. The order in which notification is made will be the same as that required by an actual emergency. In order to prevent a misunderstanding, no reference to a "dam failure" is to be made during a "test only" condition. For clarity, the following statements should be made at the beginning of each telephone contact: **"This is a test of the Emergency Action Plan for the Madison Project. This test only condition is for the implementation of the EAP Warning Flowchart on page 4 of the plan. Again, this is only a**

test." The person making the contact should always ask, **"Do you understand how to carry out your responsibility according to the EAP?"** before ending the call.

The success of the annual test of readiness will be determined by the EAP Coordinator. A critique of the test and any revisions or updates to the plan (or statement that no revisions or updates were needed) will be included in the Madison EAP Status Report that is submitted to the FERC Regional Engineer no later than December 31 of each year. The critique will include the following:

- Concerns regarding telephone contacts.
- Evaluation of the time required to implement the test.
- Identify areas of improvement to shorten time required to implement the EAP.
- Address the testing of emergency power sources and remote surveillance systems used to signal an emergency situation (e.g., dam failure alarm).

Immediately following the test, verification will be garnered from all entities holding Madison EAP manuals so determination can be made that all have the most up-to-date manual available. This information will also be included in the critique and submitted in writing to the FERC Regional Engineer by December 31, of each year.

Review of the annual test procedure will be documented by dam personnel and supervisory personnel. All personnel and agencies identified on the Imminent Failure flowchart on page 4 will report verification of their phone contacts to the EAP Coordinator.

B. Comprehensive Drills

FERC mandates that Comprehensive Drills, such as the Tabletop and the Functional Exercise, take place at one of NWE's hydro sites annually. Historically, the drills have alternated between five different drainages basins affected by NWE's eleven dams in Montana so that each drainage area has a comprehensive drill once every five years.

The Tabletop drill precedes the functional drill and involves a meeting of NWE officials and the state and local emergency management officials in a conference room environment. This is usually considered the trial run of the more stress-induced functional exercise.

The Functional drill is the highest level exercise that does not involve the full activation of NWE and state and local emergency management agency field personnel and facilities or test the evacuation of residents downstream of the dam. What it does involve is all of the various levels of NWE and state and local emergency management personnel that would be involved in an actual emergency. The exercise takes place in a stress-induced environment with time constraints and simulates a dam failure and other pertinent specified events. The participants "act-out" their actual roles. This exercise is designed to test the functionality of the EAP and evaluate the coordination activities between NWE and all other agencies.

3. Annual Updates

A review of the adequacy of the EAP will be conducted once a year. This review is to verify phone numbers, names, position titles, etc. A determination of any new developments or other changes

downstream or elsewhere will be made to determine whether any revisions to the current EAP are necessary. Revisions will be made immediately after any changes are discovered and updated pages to the EAP will be mailed to each person or entity holding a Madison EAP manual. A statement will be furnished to the Regional Engineer prior to December 31 that states the EAP has been thoroughly reviewed and includes the date it was last tested. Attached to this statement will be updated pages or a separate statement that no revisions or updates were needed.

4. Posting the EAP

The Madison Imminent Failure EAP Flowchart (see page 4) and Potential Failure Flowchart (see page 5) will be permanently posted in the Madison operator room, behind the operator's desk on the wall.

Copies of the Madison EAP will be maintained and readily available at the following locations:

- NWE Madison Powerhouse
- NWE Madison Foreman's House
- NWE Hydro Generation - Butte
- NWE Hydro Operations - Great Falls
- NWE Generation Control Center
- NWE Lead Resource Coordinator - Butte
- NWE Director Corporate Communications - Butte
- NWE Corporate Office - Butte
- NWE Grid Operations Control Center - Butte
- NWE Division Headquarters – Bozeman
- Sheriff's Office - Madison County
- Sheriff's Office - Gallatin County
- Sheriff's Office - Broadwater County
- Ennis Police Department – Ennis
- Madison Valley Rural Fire Department – Ennis
- West Yellowstone Police Department – West Yellowstone
- Montana Disaster and Emergency Services - Helena (DES)
- District 3 DES State Representative - Livingston
- DES Coordinator - Madison County
- DES Coordinator - Gallatin County
- DES Coordinator - Broadwater County
- Federal Energy Regulatory Commission - Portland
- Broadwater Dam (State of Montana)
- U.S. Bureau of Reclamation - Canyon Ferry Dam
- U.S. Bureau of Reclamation - Wyoming Area Office (Casper Control Center)
- U.S. Bureau of Reclamation - Montana Area Office
- U.S. Forest Service - Ennis
- National Weather Service (NWS) - Great Falls
- U.S. Bureau of Land Management (BLM) Dillon and Ennis Offices

Appendix C – Site Specific Concerns

Bear Trap Canyon below the powerhouse is heavily used by the public and licensed guide companies for whitewater float trips. Once the rafts leave the powerhouse area, there is no way to access or warn of an impending emergency until they are on the other side of the canyon.

Appendix D – Documentation

Descriptions of EAP plan holder orientation meetings and tabletop and functional exercises are located in Section 2 of the Madison EAP Status Report.

Additional forms and documents related to this EAP are provided on the following pages and include:

- Notification Response Form
- EAP Approval Statement
- Madison EAP Plan Holders List

NOTIFICATION RESPONSE FORM

MADISON PROJECT (FERC PROJECT NO. 2188(08)

Emergency Action Plan Drill

Please complete this form immediately after you are notified that an exercise or actual implementation of the Madison Emergency Action Plan (EAP) is in progress. You may wish to use the spaces provided on the 2nd page of this form to record the message(s) received and message(s) conveyed during the exercise.

Please mail the completed form to the person listed below within 24 hours, so that the exercise can be thoroughly documented. Your cooperation is greatly appreciated.

I, _____ (Name) _____ (title) was/was not notified at _____ a.m./p.m. on _____ (date) by _____ (name) via _____ that an exercise of the Madison EAP was in progress.

The Madison EAP on file with this agency has a revision date of _____ (see Title Page).

_____
(Signature)

_____
(Agency)

Mail form to:

Dustin Kaste
EAP Coordinator
NorthWestern Energy
11 East Park
Butte MT 59701

COMMENTS:

MESSAGE(S) RECEIVED:

1. Contacted by _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

2. Contacted by _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

MESSAGE(S) CONVEYED:

1. Contacted _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

2. Contacted _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

3. Contacted _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

4. Contacted _____
(name/agency)
via (phone #/radio) _____ _____ a.m./p.m.

MESSAGE:

Approval of the EAP

It is necessary that plan holders involved in emergency response acknowledge their roles and responsibilities in the Madison EAP. Once signed, copies of these forms are kept on file at NorthWestern Energy's Hydro Generation office in Butte. They are also sent to the Federal Energy Regulatory Commission (FERC). This form requires the signatures of EAP plan holders responsible for emergency response activities only when the entire Madison Development EAP is revised (at least once every five years) or when the agencies determine that changes should be made on their evacuation and/or emergency response designations.

I, _____ (name) _____ (title)

_____ (agency) approve of NWE's Madison Development Emergency Action Plan and of my responsibility set forth in the EAP.

Signature: _____

Date: _____

MADISON EAP PLAN HOLDERS LIST

FERC – Portland, Oregon Office
NorthWestern Energy O & M Supervisor – Bozeman, MT
NorthWestern Energy Madison Dam Foreman – Ennis, MT
NorthWestern Energy Hydro Generation – Butte, MT
NorthWestern Energy Superintendent, Hydro O&M – Great Falls, MT
NorthWestern Energy Hydro System Operators – Great Falls, MT
NorthWestern Energy Lead Resource Coordinator – Butte, MT
NorthWestern Energy Director Corporate Communications – Butte, MT
NorthWestern Energy Corporate Office – Butte, MT
NorthWestern Energy Grid Operations Control Center – Butte, MT
NorthWestern Energy Division Headquarters – Bozeman, MT
Sheriff's Office – Madison County
Sheriff's Office – Gallatin County
Sheriff's Office – Broadwater County
DES – Madison County
DES – Gallatin County
DES – Broadwater County
Ennis Police Department – Ennis, MT
Madison Valley Rural Fire Department – Ennis, MT
West Yellowstone Police Department – West Yellowstone, MT
Montana Disaster & Emergency Services – Helena, MT
Montana DES District 3 State Representative – Livingston, MT
US National Weather Service – Great Falls, MT
US Bureau of Land Management – Dillon, MT
US Bureau of Land Management – Ennis, MT
US Bureau of Reclamation Montana Area Office – Billings, MT
US Bureau of Reclamation Casper Control Center – Casper, WY
US Bureau of Reclamation – Canyon Ferry Dam Helena, MT
Montana Department of Natural Resources and Conservation – Helena, MT
US Forest Service Madison Ranger District – Ennis, MT

Madison Dam Emergency Action Plan

Sheet 1 of 8

"FAIR WEATHER" DAM FAILURE

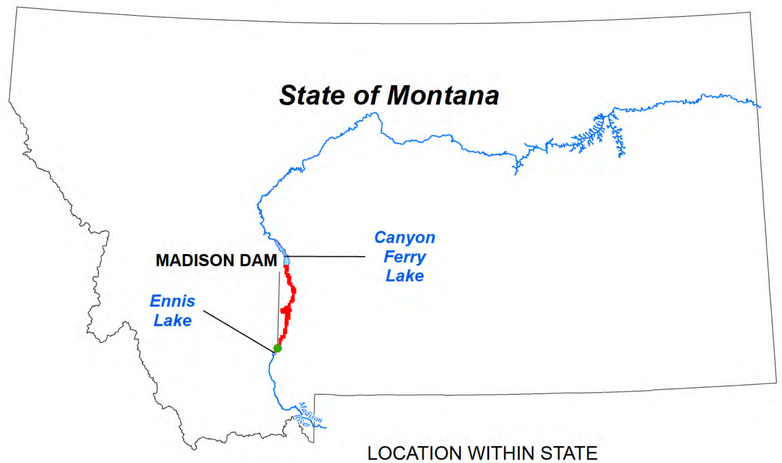
	LOCATION (MILES DOWNSTREAM OF DAM)		NORMAL RIVER ELEVATION (FEET MSL)	MAXIMUM FLOOD WAVE ELEVATION (FEET MSL)	MAXIMUM FLOW (CFS)	APPROXIMATE TIME FROM BEGINNING OF BREACH TO RISE OF TWO FEET (HOURS)	APPROXIMATE TIME FROM BEGINNING OF BREACH TO MAXIMUM RISE (HOURS)	APPROXIMATE AVERAGE RATE OF CHANGE IN WATER SURFACE ELEVATION BETWEEN RISE OF 2 FEET AND MAXIMUM RISE
1	1.1	POWERHOUSE	4700.2	4719.0	42,766	29 MINUTES	1 HR. 7 MIN.	0.4 FT/MIN.
2	13.6	RED MTN CAMPGROUND HWY 84 BRIDGE	4440.0	4448.2	36,476	2 HR.14 MIN.	3 HR.	8.2 FT/MIN.
3	20.8	GREY CLIFF	4303.7	4310.8	35,258	4 HR.19 MIN.	5 HR. 2 MIN.	7.1 FT/MIN.
4	26.2	DARLINGTON RANCH	4189.7	4197.7	34,531	5 HR.50 MIN.	6 HR.46 MIN.	6.5 FT/HR
5	34.2	THREE FORKS	4069.7	4074.4	32,841	8 HR.43 MIN.	9 HR.38 MIN.	2.9 FT/HR
6	39.9	TRIDENT	4025.2	4034.7	32,695	11 HR.12 MIN.	13 HR.41 MIN.	3.0 FT/HR
7	48.4	CLARKSTON	3981.6	3988.3	31,857	13 HR.31 MIN.	16 HR.22 MIN.	1.7 FT/HR
8	54.4	LOMBARD	3953.8	3962.5	30,833	15 HR.17 MIN.	18 HR.29 MIN.	2.1 FT/HR
9	58.8	BROADWATER DAM	3941.6	3948.6	30,447	16 HR.19 MIN.	19 HR.19 MIN.	1.7 FT/HR
10	64.0	TOSTON	3901.1	3906.9	30,307	17 HR.22 MIN.	20 HR.29 MIN.	1.2 FT/HR
11	70.3	HIGHWAY 287	3861.0	3866.4	29,865	20 HR.19 MIN.	23 HR.5 MIN.	1.3 FT/HR
12	74.1	DEEP CREEK	3840.0	3845.8	29,552	21 HR.46 MIN.	24 HR.41 MIN.	1.3 FT/HR
13	77.3	TOWNSEND	3813.7	3819.0	29,396	23 HR.12 MIN.	25 HR.48 MIN.	1.3 FT/HR

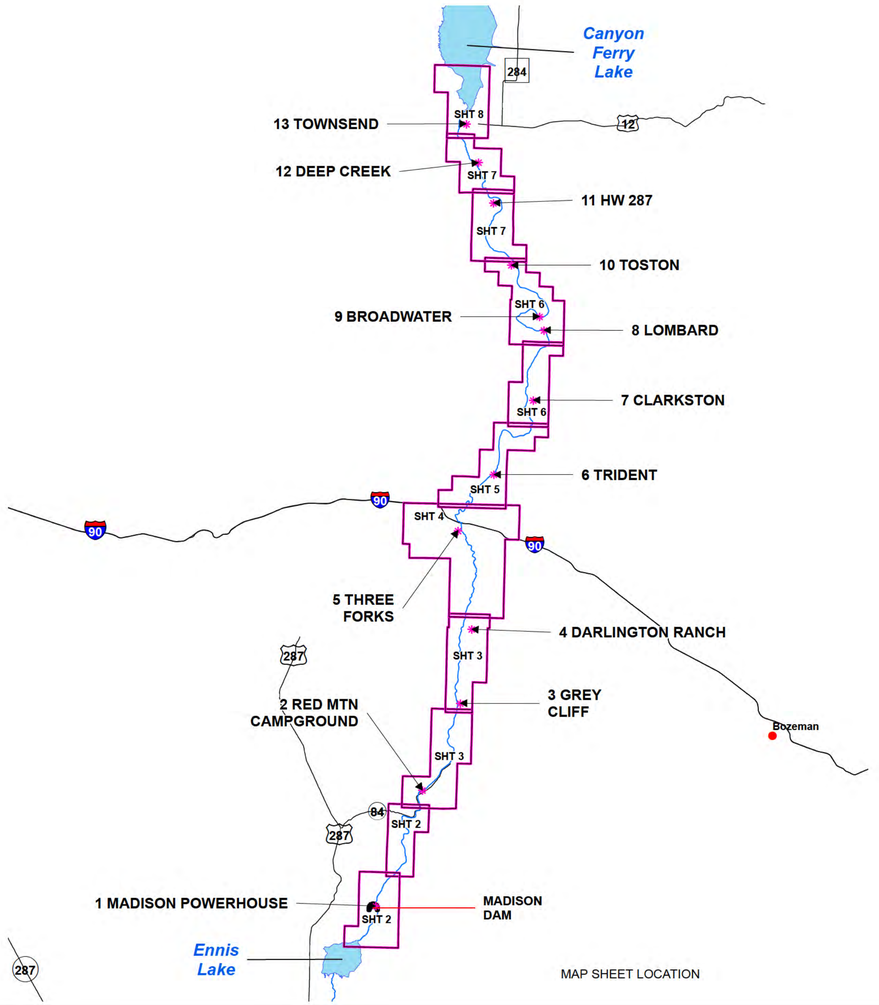
The "Fair Weather" Failure scenario is based on a hypothetical failure during normal summer flows and full reservoir conditions.

"MAJOR FLOOD" DAM FAILURE

	LOCATION (MILES DOWNSTREAM OF DAM)		PRE-BREACH RIVER ELEVATION (FEET MSL)	MAXIMUM FLOOD WAVE ELEVATION (FEET MSL)	MAXIMUM FLOW (CFS)	APPROXIMATE TIME FROM BEGINNING OF BREACH TO RISE OF TWO FEET (HOURS)	APPROXIMATE TIME FROM BEGINNING OF BREACH TO MAXIMUM RISE (HOURS)	APPROXIMATE AVERAGE RATE OF CHANGE IN WATER SURFACE ELEVATION BETWEEN RISE OF 2 FEET AND MAXIMUM RISE
1	1.1	POWERHOUSE	4726.1	4743.3	184,371	29 MINUTES	1 HR.14 MIN.	0.3 FT/MIN.
2	13.6	RED MTN CAMPGROUND HWY 84 BRIDGE	4451.3	4456.6	179,200	1 HR.41 MIN.	2 HR.29 MIN.	4.1 FT/HR
3	20.8	GREY CLIFF	4313.2	4317.9	176,093	2 HR.53 MIN.	3 HR.48 MIN.	2.9 FT/HR
4	26.2	DARLINGTON RANCH	4201.1	4206.3	174,379	3 HR.46 MIN.	4 HR.58 MIN.	2.7 FT/HR
5	34.2	THREE FORKS	4076.7	4079.9	170,276	5 HR.36 MIN.	6 HR.43 MIN.	1.1 FT/HR
6	39.9	TRIDENT	4041.8	4049.2	152,287	6 HR.43 MIN.	10 HR.31 MIN.	1.4 FT/HR
7	48.4	CLARKSTON	3993.3	3999.0	149,775	8 HR.38 MIN.	13 HR.10 MIN.	0.8 FT/HR
8	54.4	LOMBARD	3972.1	3981.2	146,945	9 HR. 2 MIN.	14 HR.14 MIN.	1.4 FT/HR
9	58.8	BROADWATER DAM	3958.3	3965.3	146,655	9 HR.46 MIN.	14 HR.36 MIN.	1.0 FT/HR
10	64.0	TOSTON	3910.6	3913.7	146,559	11 HR.36 MIN.	15 HR.12 MIN.	0.3 FT/HR
11	70.3	HIGHWAY 287	3870.0	3873.0	146,068	13 HR.22 MIN.	16 HR.50 MIN.	0.3 FT/HR
12	74.1	DEEP CREEK	3850.4	3853.2	145,699	14 HR.5 MIN.	17 HR.43 MIN.	0.2 FT/HR
13	77.3	TOWNSEND	3822.2	3824.8	145,535	15 HR.36 MIN.	18 HR.31 MIN.	0.2 FT/HR

The "Major Flood" scenario is based on a hypothetical dam failure during a "Probable Maximum Flood" (PMF) event.





LEGEND

1 Location	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation (Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins.)
Fair Weather	0.0	0000.0	0.0	0.0	Hr/Min	Hr/Min
Major Flood	0.0	0000.0	0.0	0.0	Hr/Min	Hr/Min

TYPICAL FLOOD ROUTING CROSS SECTION

ALL ELEVATIONS RELATE TO MEAN SEA LEVEL (MSL)

INDICATES AREA POTENTIALLY INUNDATED BY A "FAIR WEATHER" DAM FAILURE

INDICATES ADDITIONAL AREA POTENTIALLY INUNDATED DUE TO DAM FAILURE UNDER "MAJOR FLOOD" CONDITIONS

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

IMPROVED PRIMARY OR SECONDARY HIGHWAY/ROAD

UNIMPROVED ROAD

TRAIL

INTERSTATE ROUTE U.S. ROUTE STATE ROUTE

■ □ = BUILDING
(IF NOT SPECIFIED, NO DISTINCTION MADE BETWEEN HOUSES, BARNS, OR OTHER BUILDINGS)

THESE MAPS IDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED FOR EMERGENCY PLANNING AND MITIGATION PURPOSES BY AGENCIES RESPONSIBLE FOR EVACUATION, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSIONS REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAP IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.

NOTE: EMERGENCY SHELTER LOCATIONS IN THE INUNDATION ZONE ARE SHOWN ON SHEET #4 & #8

N
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ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS; ENG./TECH. HEI; DRAWN HEI	
		SIZE AS SHOWN; HYDRO DIVISION; REV.	
REV.	4	SIZE D; DWG. NO. 43674-C12; SHT 1 OF 8; 4	

D 22" x 34"

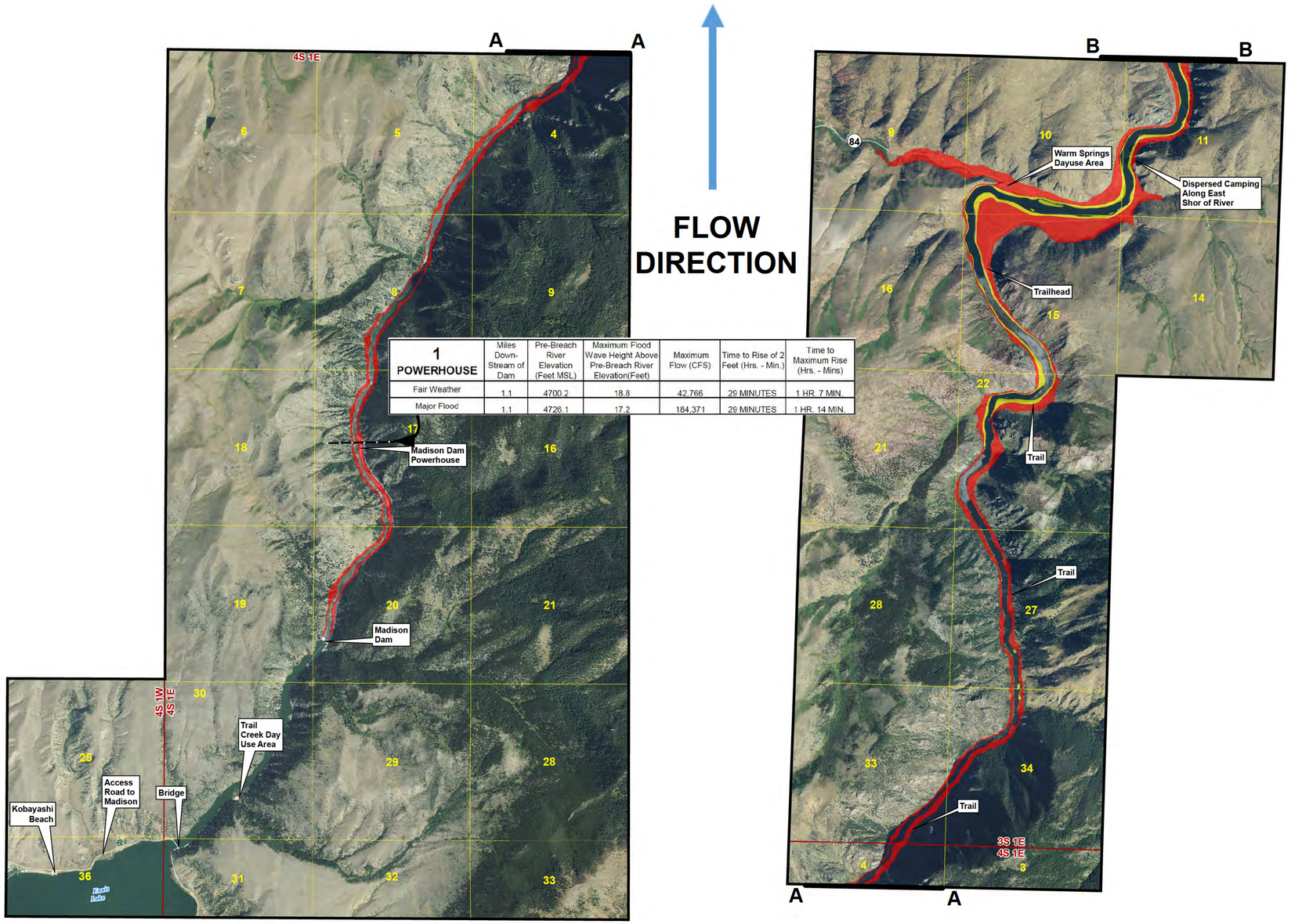
Madison Dam Emergency Action Plan

Sheet 2 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.



1 POWERHOUSE	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	1.1	4700.2	18.8	42,766	29 MINUTES	1 HR. 7 MIN.
Major Flood	1.1	4726.1	17.2	184,371	29 MINUTES	1 HR. 14 MIN.

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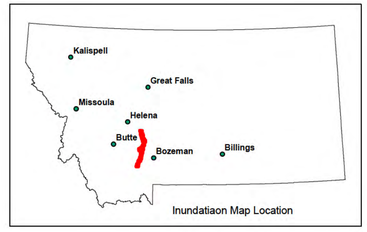
Miles

1,500 750 0 1,500
Meters

4,000 2,000 0 4,000
Feet

Aerial Photo: NAIP 2013



THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

REFERENCE DRAWING | DRAWING NUMBER

DATE 3/18/2016
DFT. CC
ENGR. RO
DESCRIPTION REV PER 2016 UPDATES
REV. 4

EMERGENCY ACTION PLAN
INUNDATION MAPS
MADISON DAM
F.E.R.C PROJECT 2188(08)

NorthWestern Energy

DEPT. MGR. C. HARRIS | ENG./TECH. HEI | DRAWN HEI
SIZE AS SHOWN | HYDRO DIVISION | REV.
SIZE D | DWG. NO. 43674-C12 | SHT 2 OF 8 | 4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 3 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

4 DARLINGTON RANCH	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	26.2	4189.7	8.0	34,534	5 HR. 50 MIN.	6 HR. 46 MIN.
Major Flood	26.2	4201.1	5.2	174,379	3 HR. 46 MIN.	4 HR. 58 MIN.

THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.

N W E S

1:24,000

1 0.5 0 1 Miles

1,500 750 0 1,500 Meters

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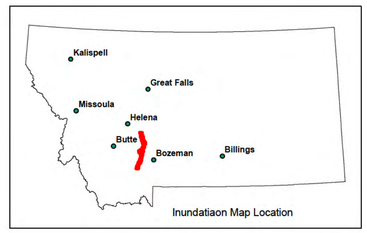
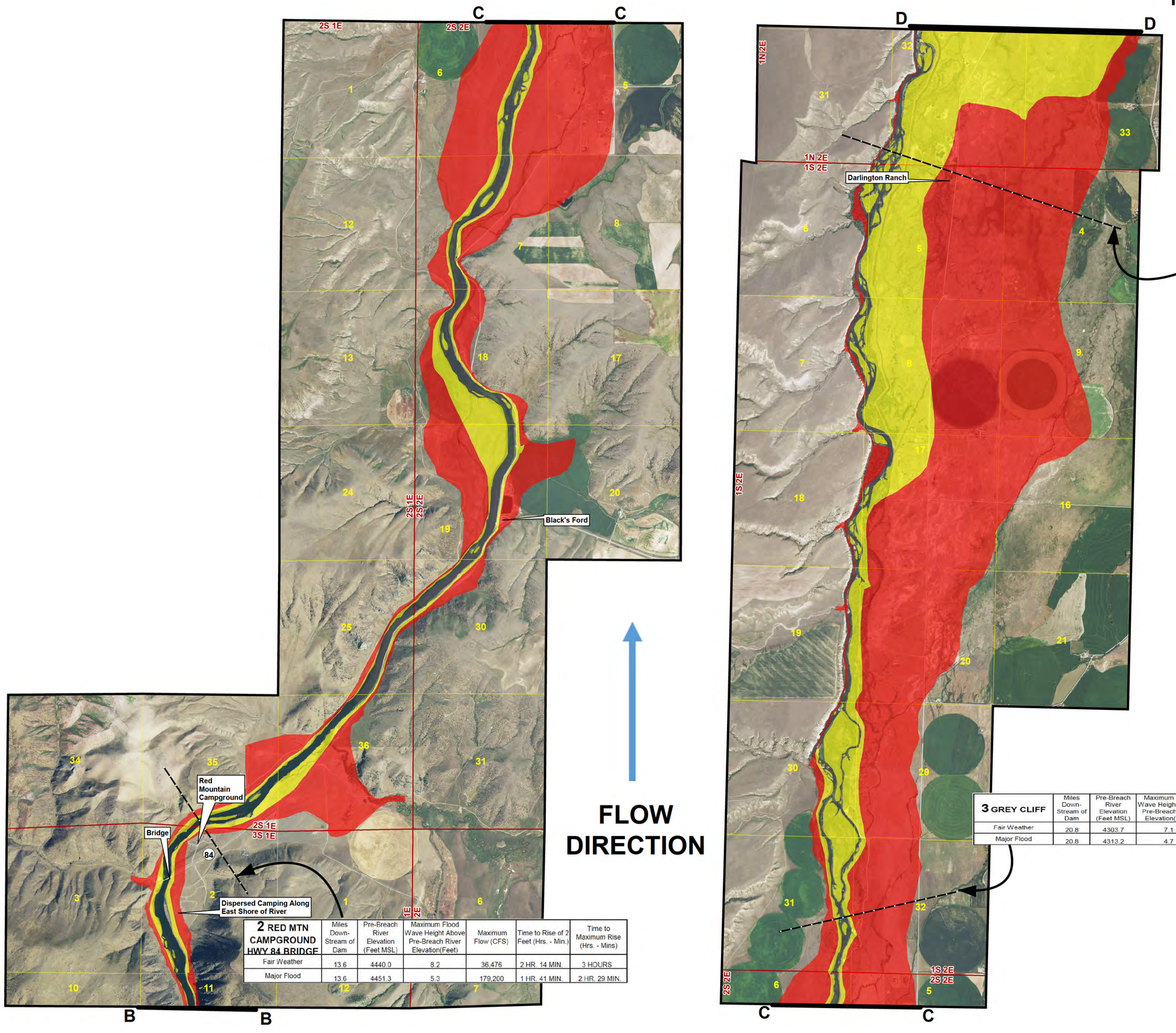
Aerial Photo: NAIP 2013



Inundataion Map Location



2 RED MTN CAMPGROUND HWY 84 BRIDGE	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	13.6	4440.0	8.2	36,476	2 HR. 14 MIN.	3 HOURS
Major Flood	13.6	4451.3	5.3	179,200	1 HR. 41 MIN.	2 HR. 29 MIN.

3 GREY CLIFF	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	20.8	4303.7	7.1	35,258	4 HR. 19 MIN.	5 HR. 2 MIN.
Major Flood	20.8	4313.2	4.7	176,093	2 HR. 53 MIN.	3 HR. 48 MIN.

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 3 OF 8	4

D 22" x 34"

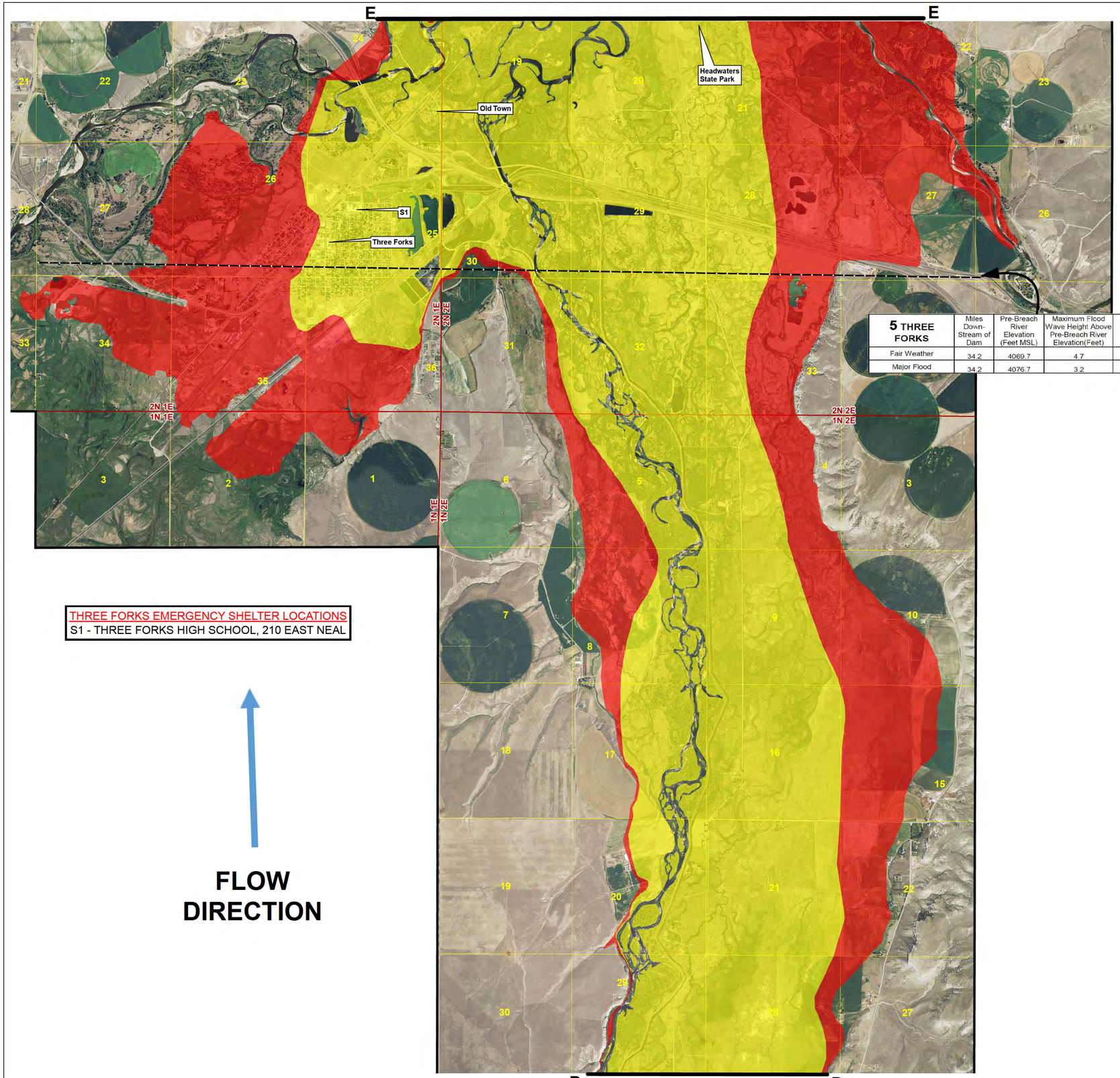
Madison Dam Emergency Action Plan

Sheet 4 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.



5 THREE FORKS	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	34.2	4069.7	4.7	32,841	8 HR. 43 MIN.	9 HR. 38 MIN.
Major Flood	34.2	4076.7	3.2	170,276	5 HR. 36 MIN.	6 HR. 43 MIN.

THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.

THREE FORKS EMERGENCY SHELTER LOCATIONS
S1 - THREE FORKS HIGH SCHOOL, 210 EAST NEAL

FLOW DIRECTION

N
W E
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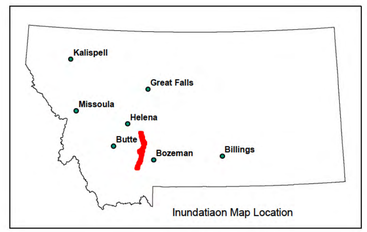
1:24,000

1 0.5 0 1
Miles

1,500 750 0 1,500
Meters

4,000 2,000 0 4,000
Feet

Aerial Photo: NAIP 2013



ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
REV.	4	SIZE AS SHOWN / HYDRO DIVISION / REV.	
		SIZE D / DWG. NO. 43674-C12 / SHT 4 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

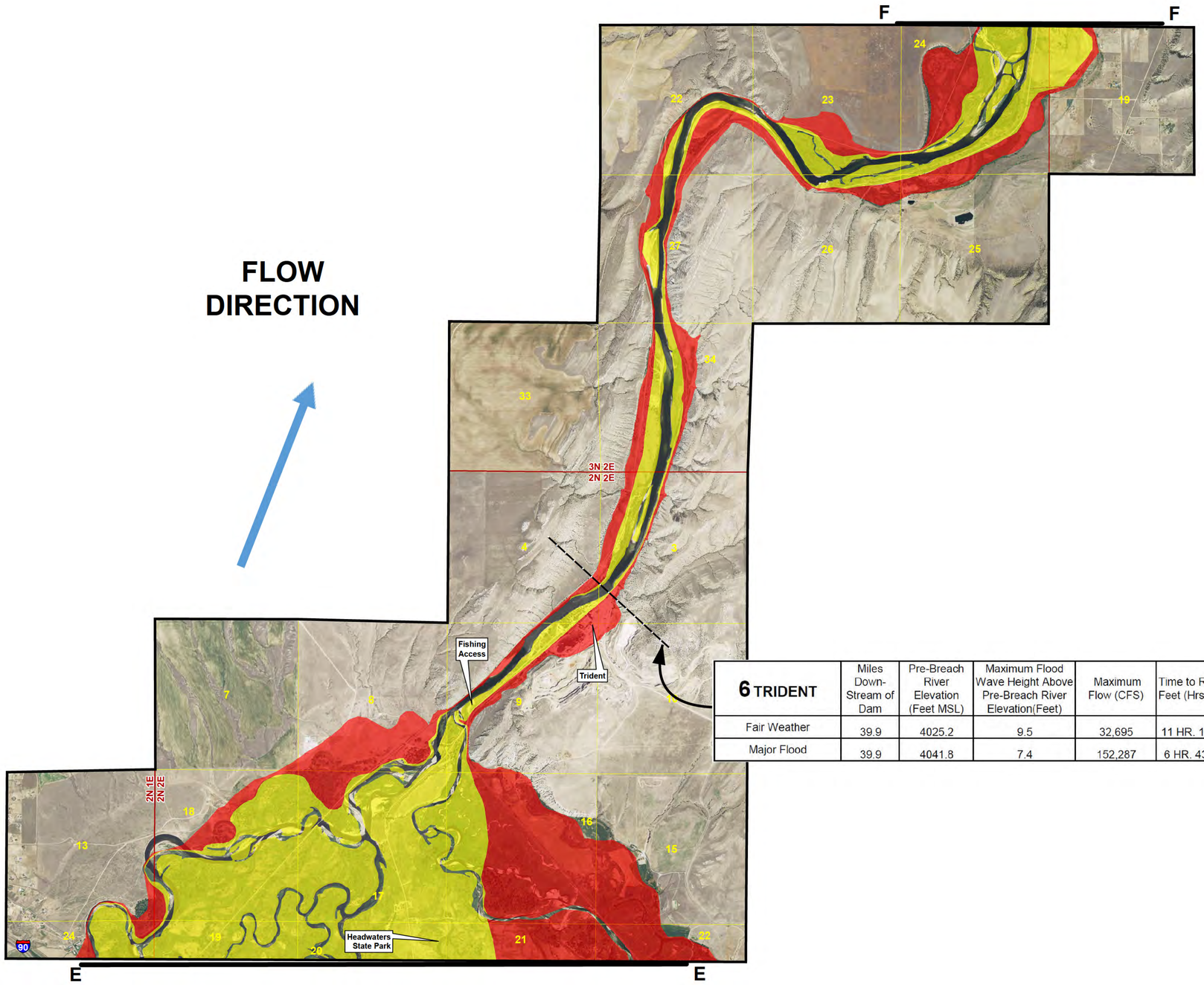
Sheet 5 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.



6 TRIDENT	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	39.9	4025.2	9.5	32,695	11 HR. 12 MIN.	13 HR. 41 MIN.
Major Flood	39.9	4041.8	7.4	152,287	6 HR. 43 MIN.	10 HR. 31 MIN.

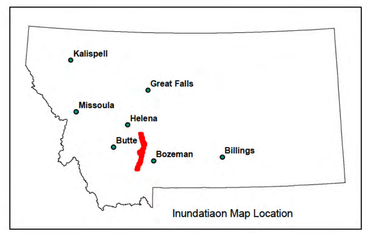
1:24,000

1 0.5 0 1 Miles

1,500 750 0 1,500 Meters

4,000 2,000 0 4,000 Feet

Aerial Photo: NAIP 2013



Inundatiaon Map Location

ADEPT ELECTRONIC MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 5 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

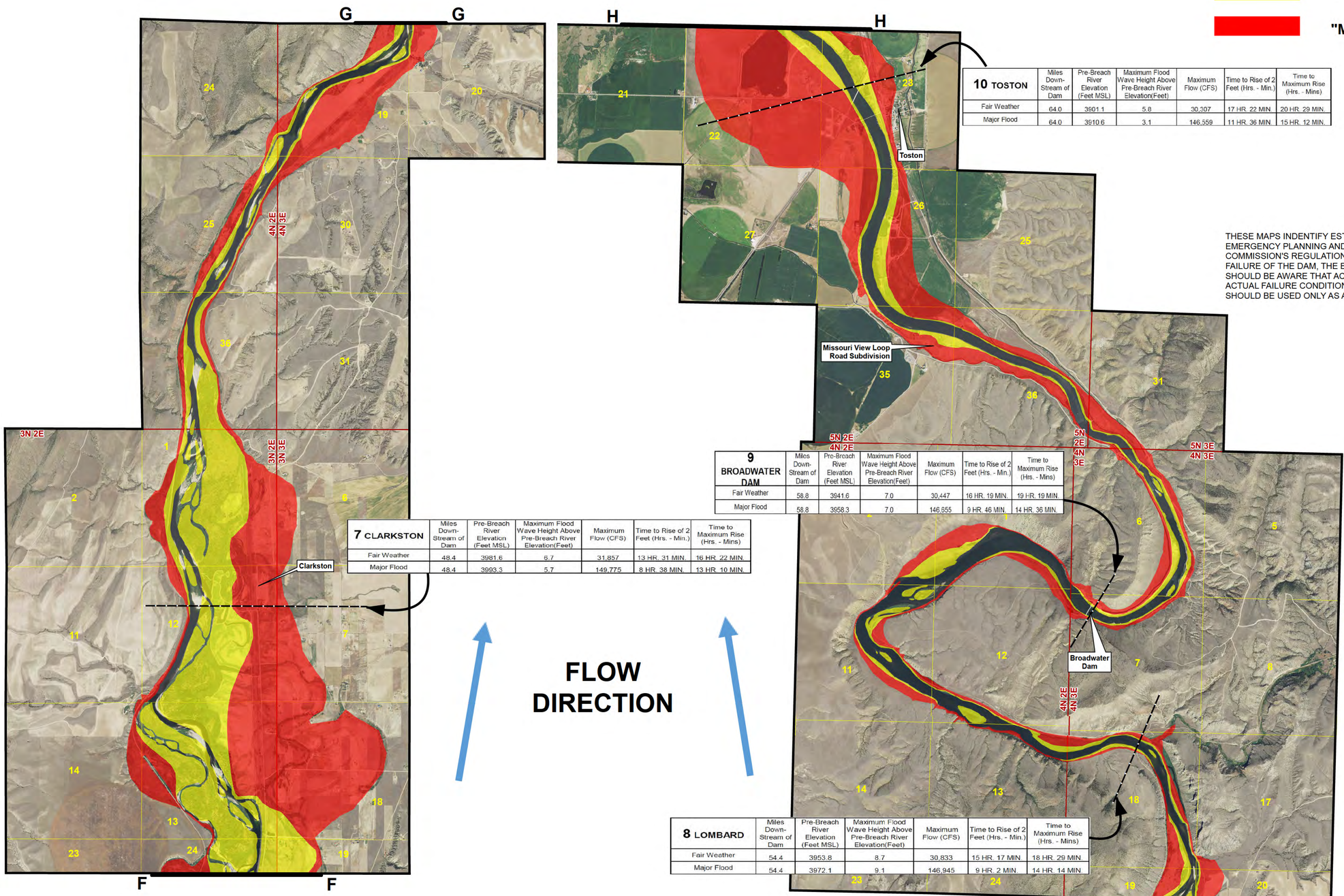
Sheet 6 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.



10 TOSTON	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	64.0	3901.1	5.8	30,307	17 HR. 22 MIN.	20 HR. 29 MIN.
Major Flood	64.0	3910.6	3.1	146,559	11 HR. 36 MIN.	15 HR. 12 MIN.

9 BROADWATER DAM	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	58.8	3941.6	7.0	30,447	16 HR. 19 MIN.	19 HR. 19 MIN.
Major Flood	58.8	3958.3	7.0	146,655	9 HR. 46 MIN.	14 HR. 36 MIN.

7 CLARKSTON	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	48.4	3981.6	6.7	31,857	13 HR. 31 MIN.	16 HR. 22 MIN.
Major Flood	48.4	3993.3	5.7	149,775	8 HR. 38 MIN.	13 HR. 10 MIN.

8 LOMBARD	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	54.4	3953.8	8.7	30,833	15 HR. 17 MIN.	18 HR. 29 MIN.
Major Flood	54.4	3972.1	9.1	146,945	9 HR. 2 MIN.	14 HR. 14 MIN.

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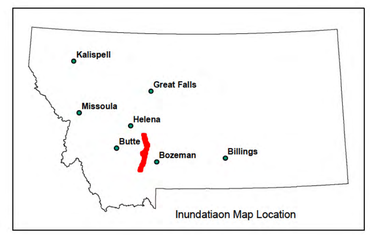
Aerial Photo: NAIP 2013



Inundatiaon Map Location

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO		
DESCRIPTION	REV PER 2016 UPDATES	NorthWestern Energy	
		DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 6 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 7 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

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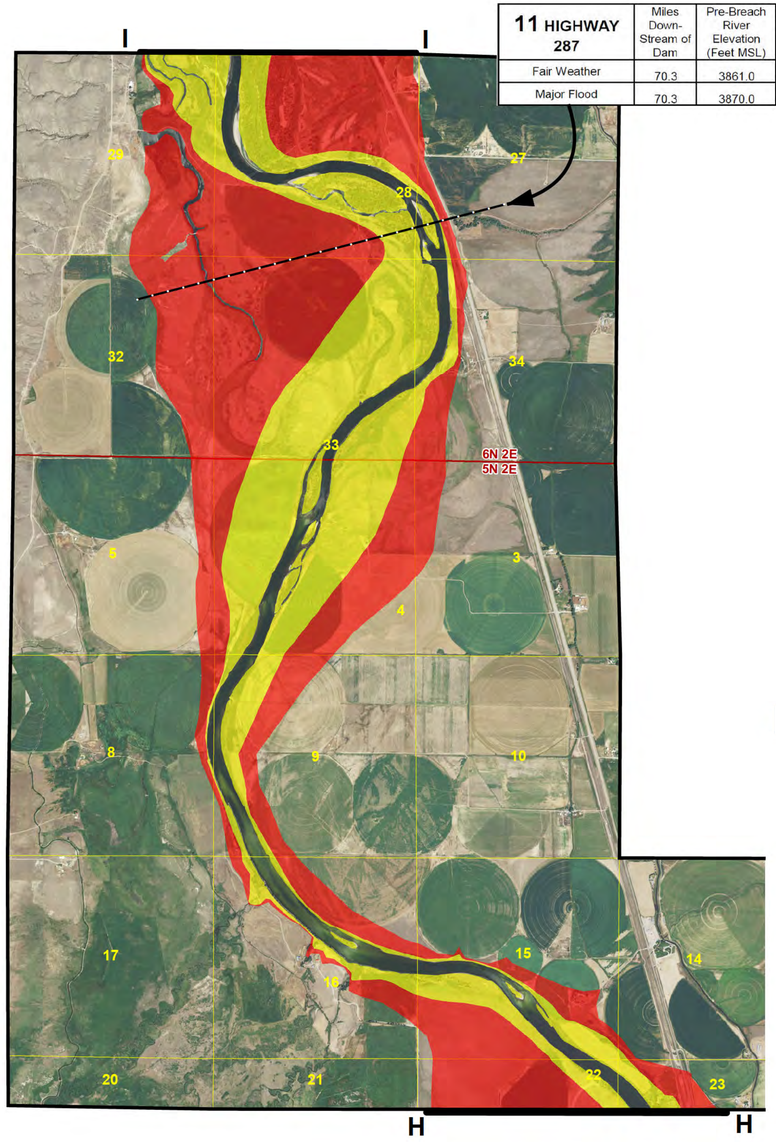
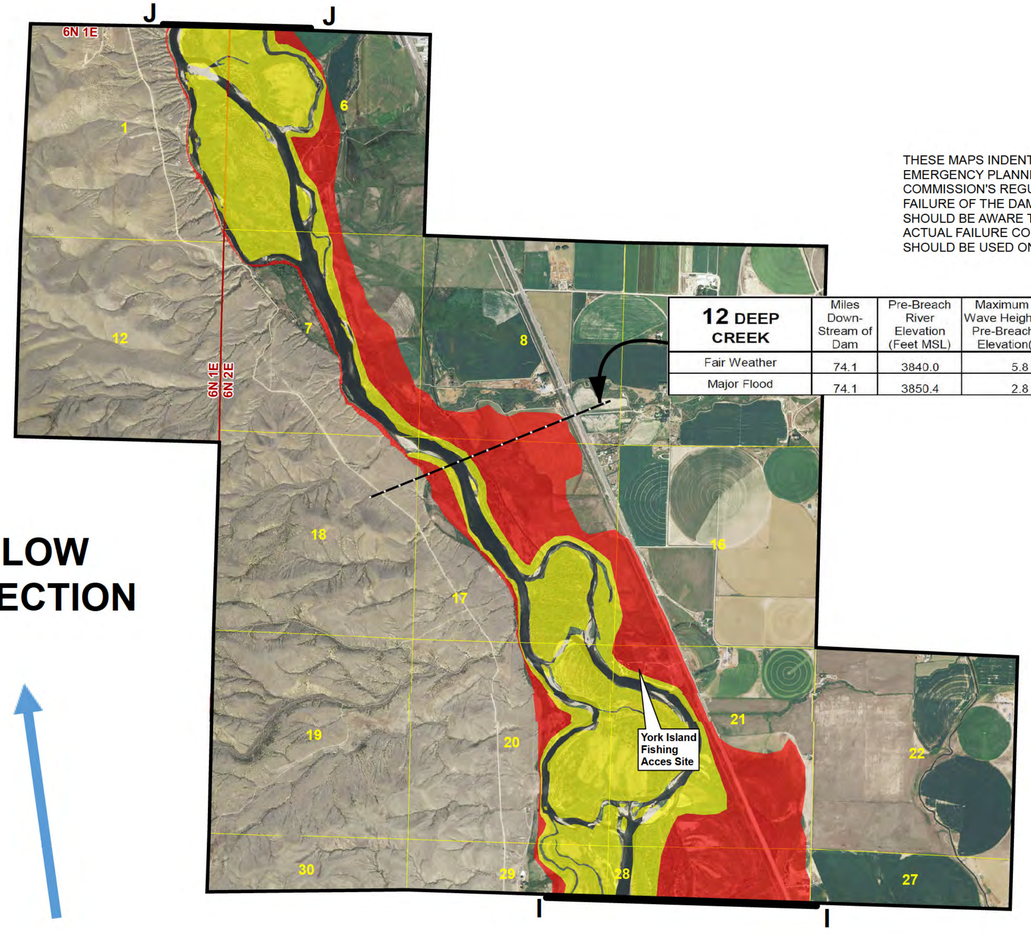
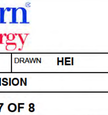
11 HIGHWAY 287	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	70.3	3861.0	5.4	29,865	20 HR. 19 MIN.	23 HR. 5 MIN.
Major Flood	70.3	3870.0	3.0	146,068	13 HR. 22 MIN.	16 HR. 50 MIN.

12 DEEP CREEK	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	74.1	3840.0	5.8	29,552	21 HR. 46 MIN.	24 HR. 41 MIN.
Major Flood	74.1	3850.4	2.8	145,699	14 HR. 5 MIN.	17 HR. 43 MIN.





FLOW DIRECTION



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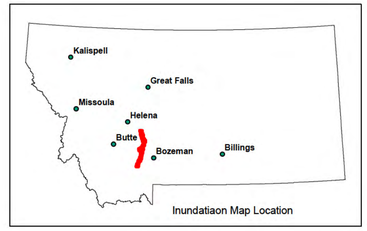
Aerial Photo: NAIP 2013



ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 7 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 8 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

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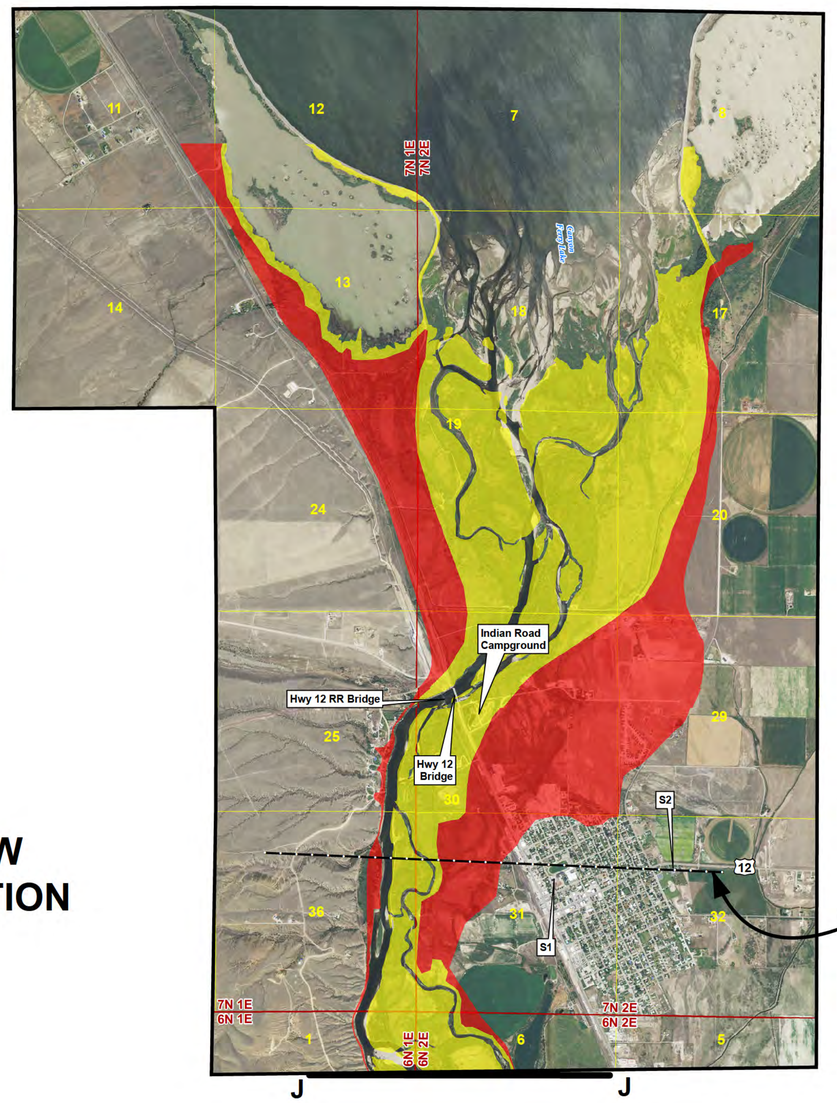

FLOW DIRECTION

13 TOWNSEND	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	77.3	3813.7	5.3	29,396	23 HR. 12 MIN.	25 HR. 48 MIN.
Major Flood	77.3	3822.2	2.6	145,535	15 HR. 36 MIN.	18 HR. 31 MIN.

TOWNSEND EMERGENCY SHELTER LOCATIONS

S1 - TOWNSEND HIGH SCHOOL, 210 NORTH SPRUCE
S2 - LDS CHURCH, 916 BROADWAY

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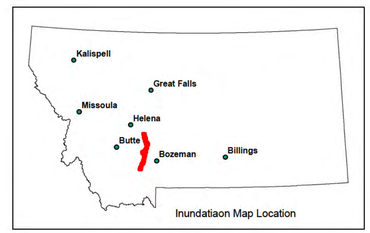
Aerial Photo: NAIP 2013



Inundatiaon Map Location

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 8 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 2 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

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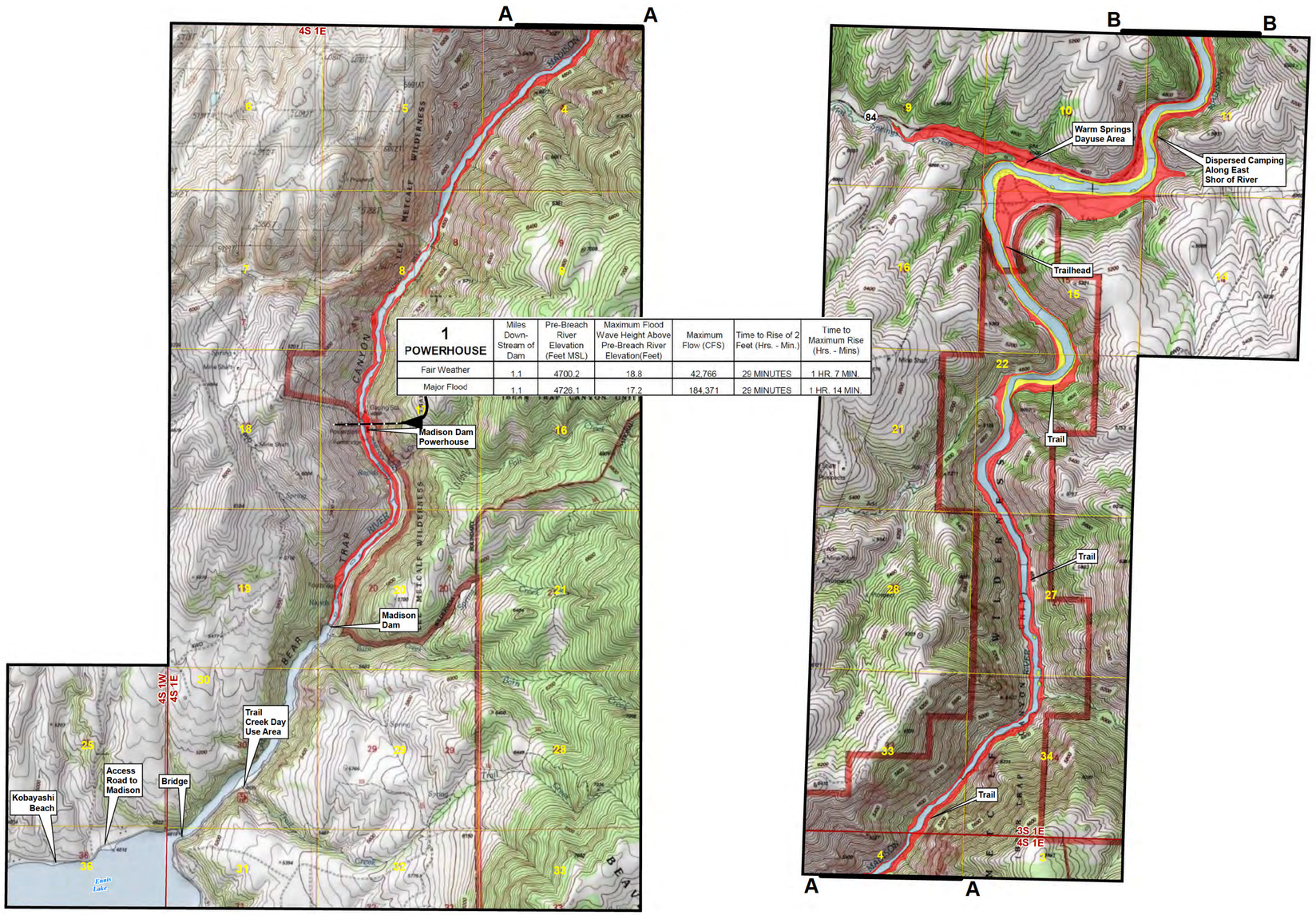

1 POWERHOUSE	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	1.1	4700.2	18.8	42,766	29 MINUTES	1 HR. 7 MIN.
Major Flood	1.1	4726.1	17.2	184,371	29 MINUTES	1 HR. 14 MIN.

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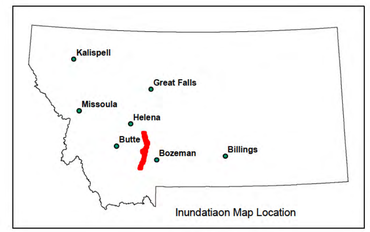
Aerial Photo: NAIP 2013



Inundatiaon Map Location

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ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

REFERENCE DRAWING | DRAWING NUMBER

DATE 3/18/2016

DFT. CC

ENGR. RO

DESCRIPTION: REV PER 2016 UPDATES

REV. 4

EMERGENCY ACTION PLAN
INUNDATION MAPS
MADISON DAM
F.E.R.C PROJECT 2188(08)

NorthWestern Energy

DEPT. MGR. C. HARRIS | ENG./TECH. HEI | DRAWN HEI

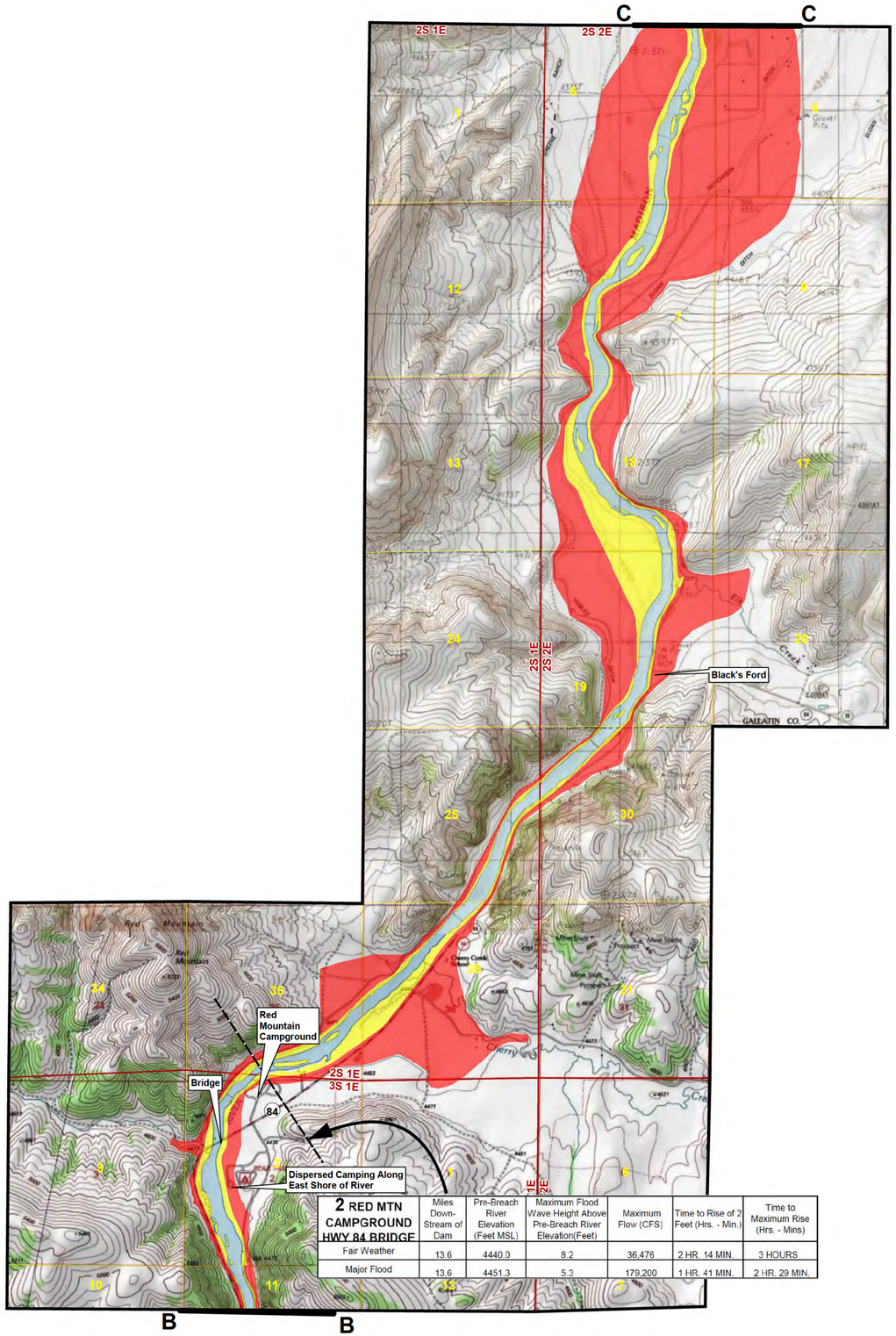
SIZE AS SHOWN | HYDRO DIVISION | REV.

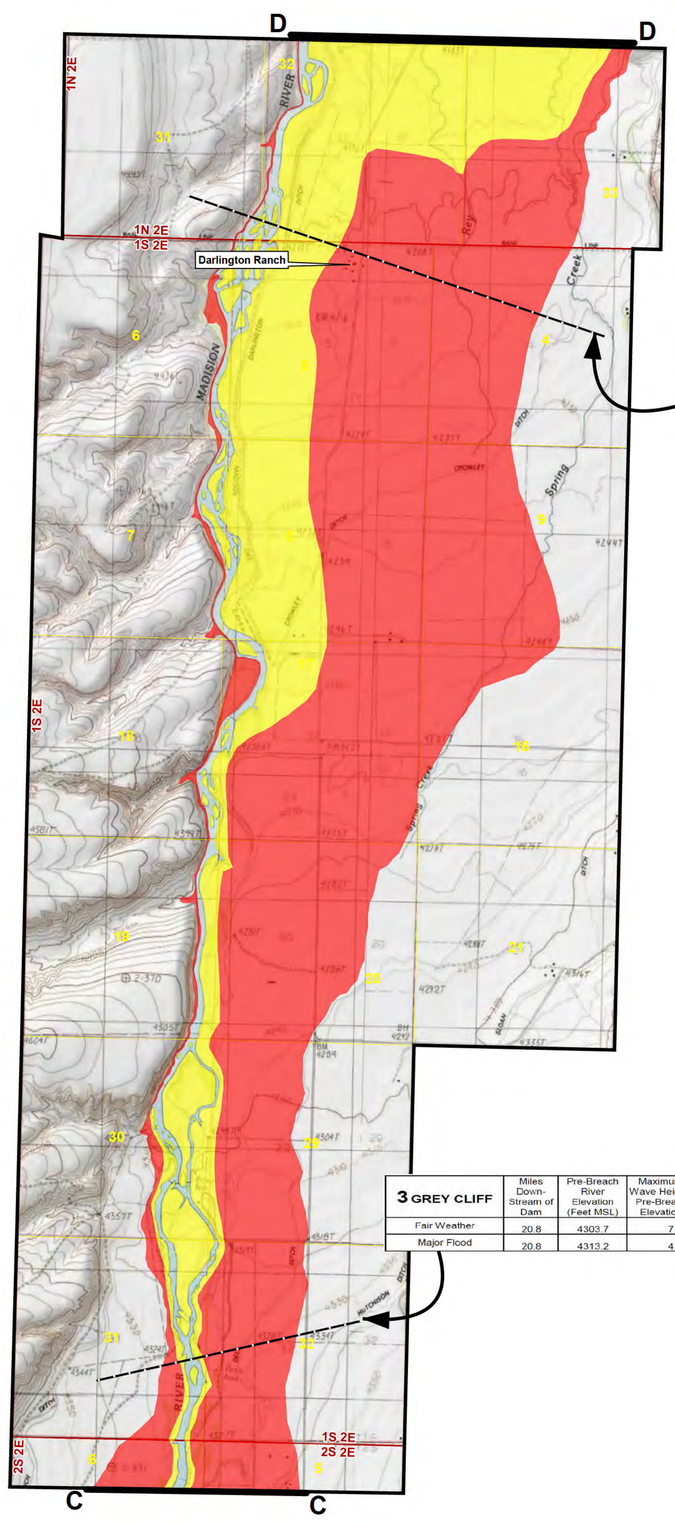
SIZE D | DWG. NO. 43674-C12 | SHT 2 OF 8 | 4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 3 of 8





"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

4 DARLINGTON RANCH	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	26.2	4189.7	8.0	34,534	5 HR. 50 MIN.	6 HR. 46 MIN.
Major Flood	26.2	4201.1	5.2	174,379	3 HR. 46 MIN.	4 HR. 58 MIN.

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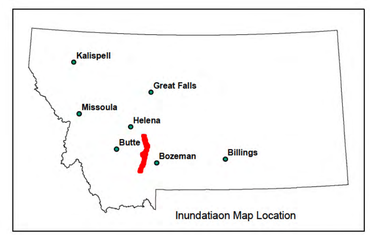
Aerial Photo: NAIP 2013

2 RED MTN CAMPGROUND HWY 84 BRIDGE	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	13.6	4440.0	8.2	36,476	2 HR. 14 MIN.	3 HOURS
Major Flood	13.6	4451.3	5.3	179,200	1 HR. 41 MIN.	2 HR. 29 MIN.

3 GREY CLIFF	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	20.8	4303.7	7.1	35,258	4 HR. 19 MIN.	5 HR. 2 MIN.
Major Flood	20.8	4313.2	4.7	176,093	2 HR. 53 MIN.	3 HR. 48 MIN.



Inundatiaon Map Location

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

REFERENCE DRAWING | DRAWING NUMBER

DATE 3/18/2016

DFT. CC

ENGR. RO

DESCRIPTION: REV PER 2016 UPDATES

REV. 4

EMERGENCY ACTION PLAN
INUNDATION MAPS
MADISON DAM
F.E.R.C PROJECT 2188(08)

NorthWestern Energy

DEPT. MGR. C. HARRIS | ENG./TECH. HEI | DRAWN HEI

SIZE AS SHOWN | HYDRO DIVISION | REV.

SIZE D | DWG. NO. 43674-C12 | SHT 3 OF 8 | 4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 4 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

5 THREE FORKS	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	34.2	4069.7	4.7	32,841	8 HR, 43 MIN.	9 HR, 38 MIN.
Major Flood	34.2	4076.7	3.2	170,276	5 HR, 36 MIN.	6 HR, 43 MIN.

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THREE FORKS EMERGENCY SHELTER LOCATIONS
S1 - THREE FORKS HIGH SCHOOL, 210 EAST NEAL

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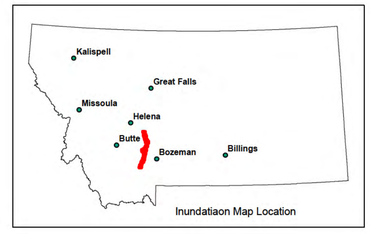
Aerial Photo: NAIP 2013



Inundatiaon Map Location

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DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO	NorthWestern Energy	
DESCRIPTION	REV PER 2016 UPDATES	DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 4 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 5 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

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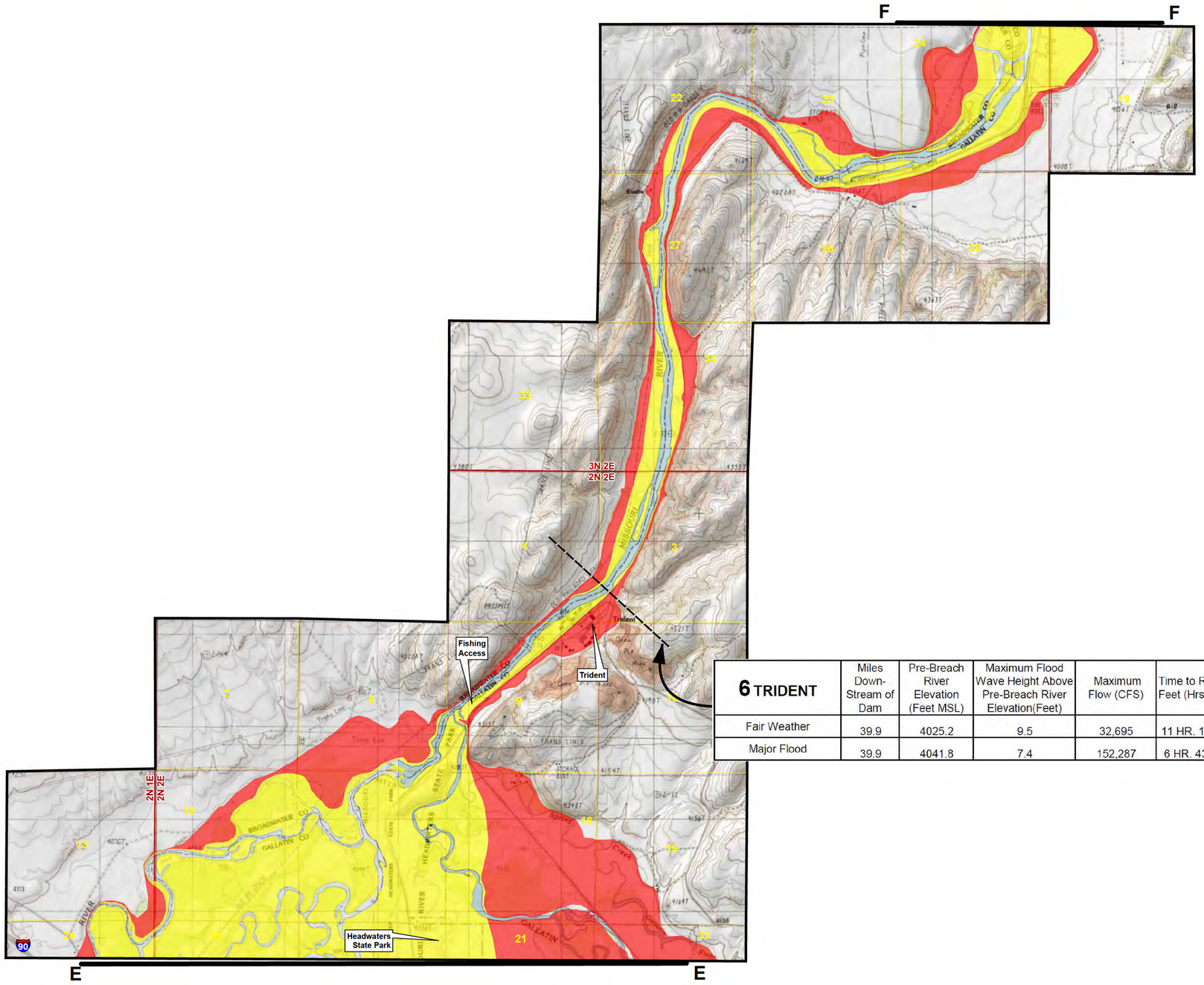

6 TRIDENT	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	39.9	4025.2	9.5	32,695	11 HR. 12 MIN.	13 HR. 41 MIN.
Major Flood	39.9	4041.8	7.4	152,287	6 HR. 43 MIN.	10 HR. 31 MIN.

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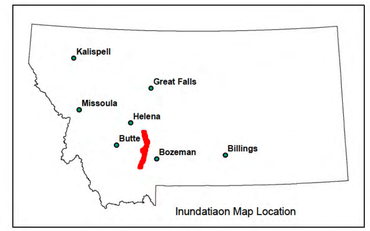
Aerial Photo: NAIP 2013



Inundatiaon Map Location

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DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO		
DESCRIPTION	REV PER 2016 UPDATES	NorthWestern Energy	
		DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 5 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 6 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

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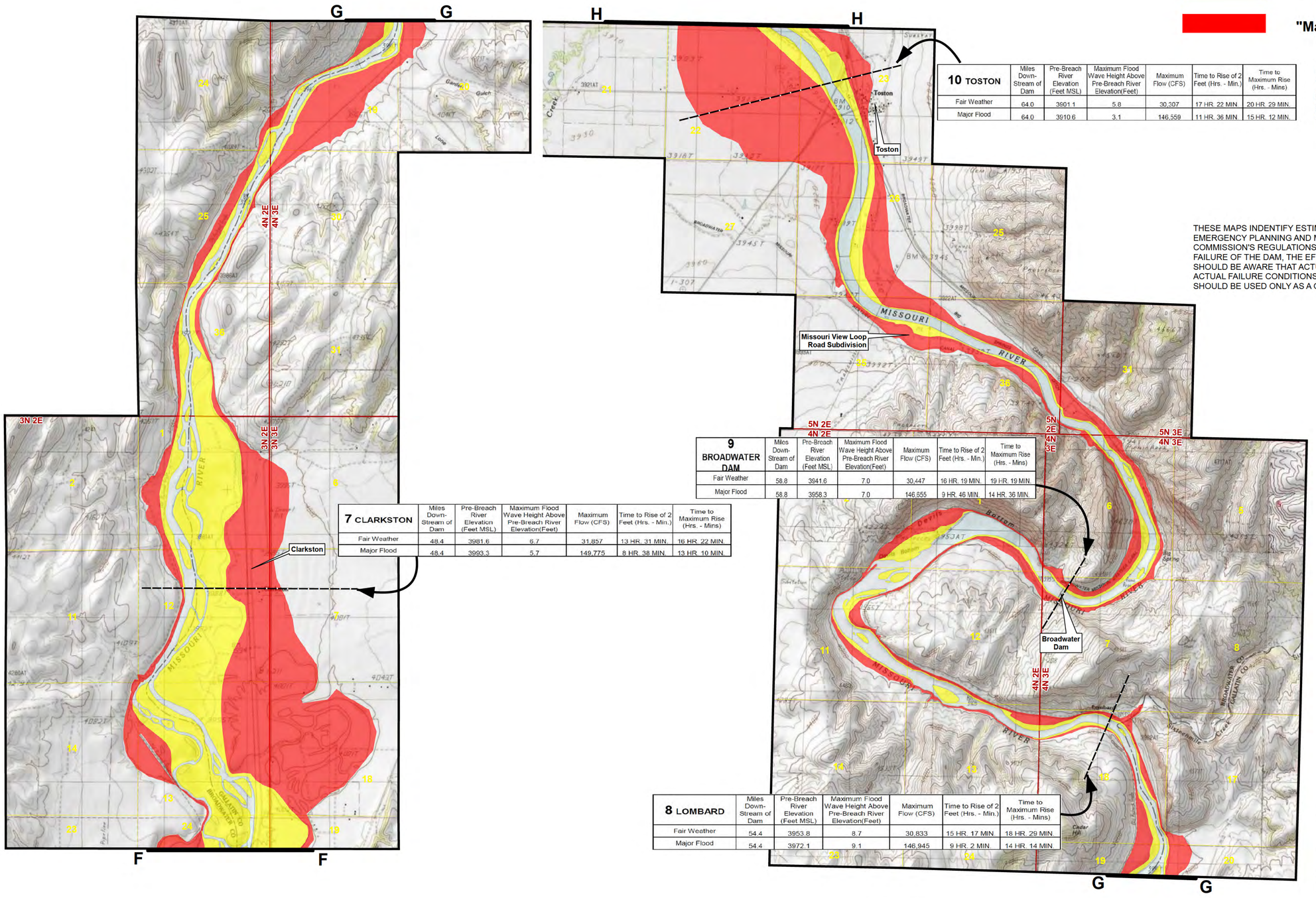

10 TOSTON	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	64.0	3901.1	5.8	30,307	17 HR. 22 MIN.	20 HR. 29 MIN.
Major Flood	64.0	3910.6	3.1	146,559	11 HR. 36 MIN.	15 HR. 12 MIN.

9 BROADWATER DAM	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	58.8	3941.6	7.0	30,447	16 HR. 19 MIN.	19 HR. 19 MIN.
Major Flood	58.8	3958.3	7.0	146,555	9 HR. 46 MIN.	14 HR. 36 MIN.

7 CLARKSTON	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	48.4	3981.6	6.7	31,857	13 HR. 31 MIN.	16 HR. 22 MIN.
Major Flood	48.4	3993.3	5.7	149,775	8 HR. 38 MIN.	13 HR. 10 MIN.

8 LOMBARD	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	54.4	3953.8	8.7	30,833	15 HR. 17 MIN.	18 HR. 29 MIN.
Major Flood	54.4	3972.1	9.1	146,945	9 HR. 2 MIN.	14 HR. 14 MIN.

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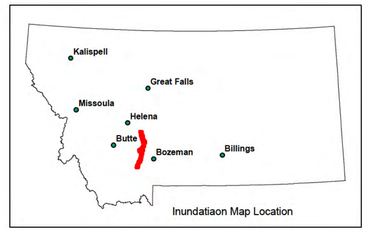
Aerial Photo: NAIP 2013



Inundataion Map Location

ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM			
		REFERENCE DRAWING	DRAWING NUMBER
DATE	3/18/2016	EMERGENCY ACTION PLAN INUNDATION MAPS MADISON DAM F.E.R.C PROJECT 2188(08)	
DFT.	CC		
ENGR.	RO		
DESCRIPTION	REV PER 2016 UPDATES	NorthWestern Energy	
		DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 6 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 7 of 8

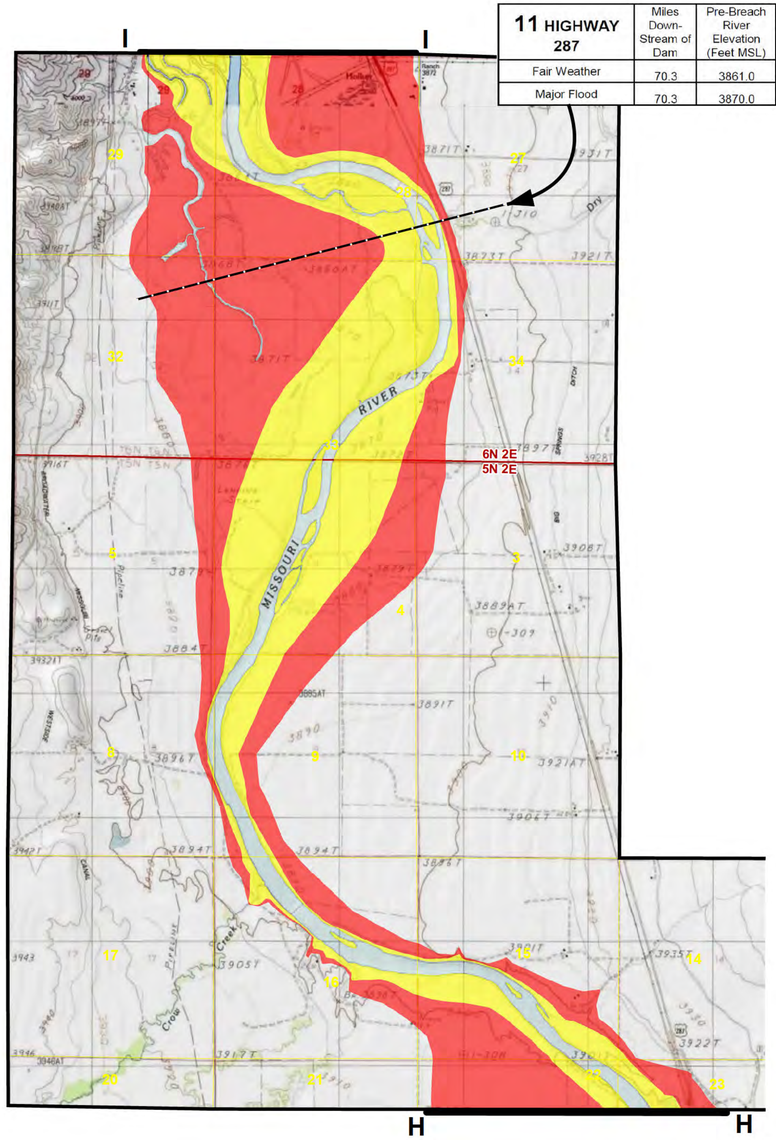
"Fair Weather" Dam Failure Inundation Boundary

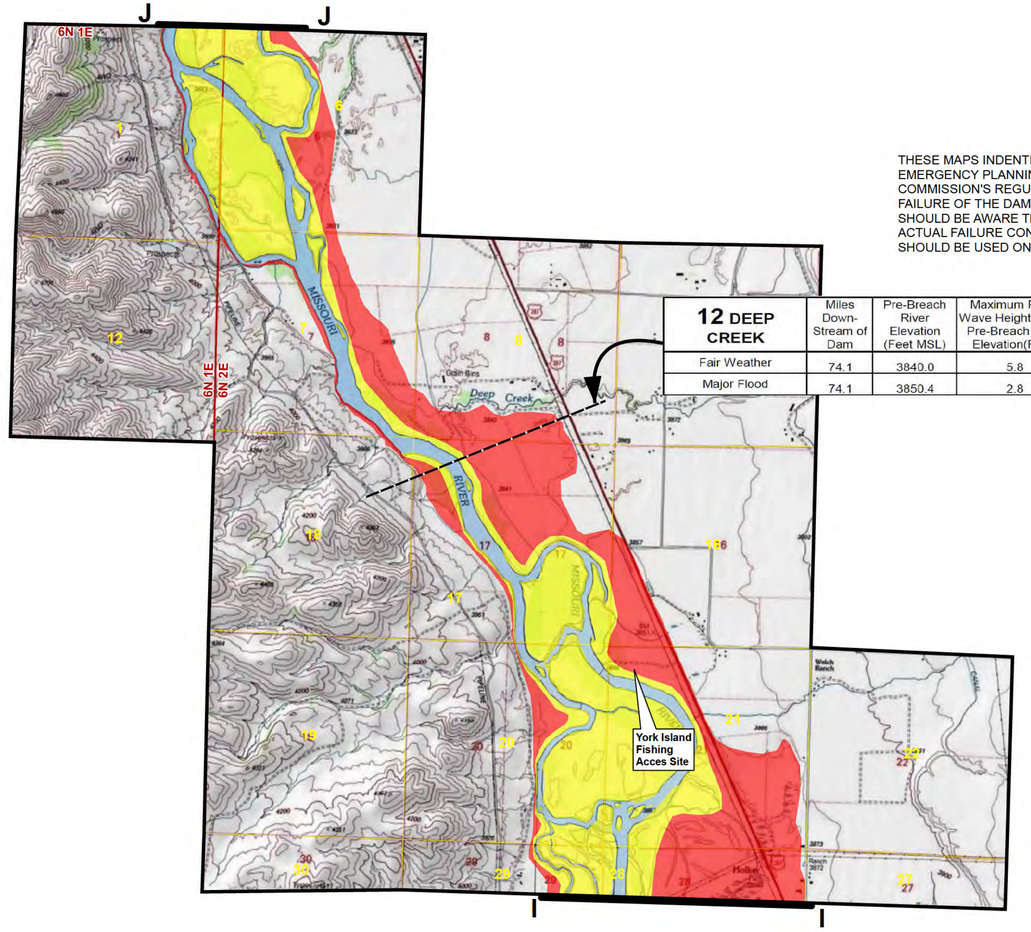
"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

11 HIGHWAY 287	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	70.3	3861.0	5.4	29,865	20 HR. 19 MIN.	23 HR. 5 MIN.
Major Flood	70.3	3870.0	3.0	146,068	13 HR. 22 MIN.	16 HR. 50 MIN.

12 DEEP CREEK	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	74.1	3840.0	5.8	29,552	21 HR. 46 MIN.	24 HR. 41 MIN.
Major Flood	74.1	3850.4	2.8	145,699	14 HR. 5 MIN.	17 HR. 43 MIN.





THESE MAPS INDENTIFY ESTIMATED NOTIFICATION ZONES TO BE USED BY EVACUATION AGENCIES FOR EMERGENCY PLANNING AND MITIGATION PURPOSES, AS REQUIRED UNDER THE FEDERAL ENERGY REGULATORY COMMISSION'S REGULATIONS. FLOOD INFORMATION DEPICTED ON THE MAPS IS BASED ON A HYPOTHETICAL FAILURE OF THE DAM, THE EFFECTS OF WHICH WERE MODELED USING CURRENT TECHNOLOGY. MAP USERS SHOULD BE AWARE THAT ACTUAL INUNDATED AREAS AND FLOOD WAVE TRAVEL TIMES WOULD DEPEND ON ACTUAL FAILURE CONDITIONS, AND MAY DIFFER FROM AREAS SHOWN ON THIS MAP. THE MAPS AND DATA SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.

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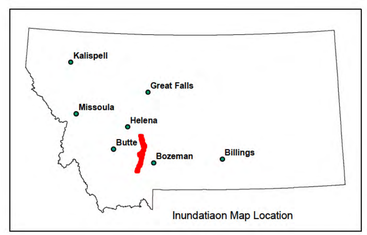
Aerial Photo: NAIP 2013



ADEPT ELECTRONIC DOCUMENT MANAGEMENT SYSTEM			
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DESCRIPTION	REV PER 2016 UPDATES	NorthWestern Energy	
		DEPT. MGR. C. HARRIS / ENG./TECH. HEI / DRAWN HEI	
		SIZE AS SHOWN / HYDRO DIVISION	REV.
REV.	4	SIZE D / DWG. NO. 43674-C12 / SHT 7 OF 8	4

D 22" x 34"

Madison Dam Emergency Action Plan

Sheet 8 of 8

"Fair Weather" Dam Failure Inundation Boundary

"Major Flood" Dam Failure Inundation Boundary

IN CASES WHERE INUNDATION ZONES FOR "FAIR WEATHER" BREACH AND "MAJOR FLOOD" BREACH ARE ESSENTIALLY THE SAME, THEN A SINGLE INUNDATION BOUNDARY IS DEPICTED BY THE RED SHADING.

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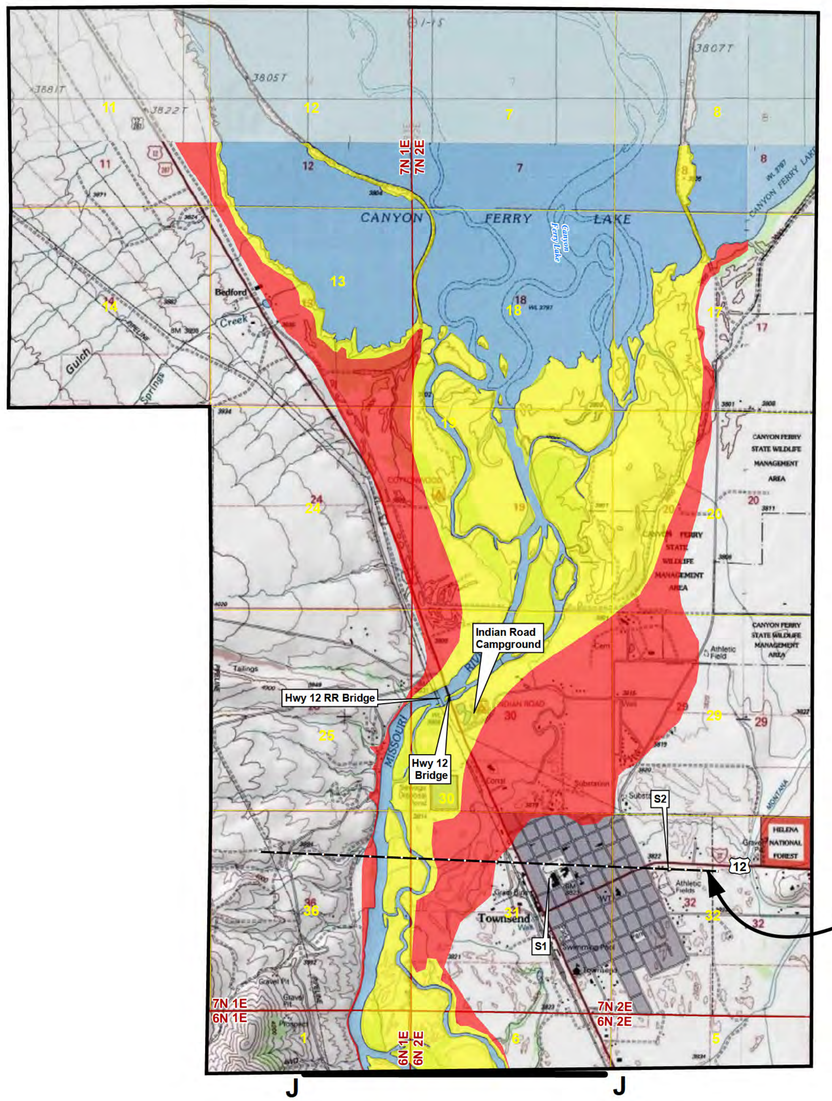

13 TOWNSEND	Miles Down-Stream of Dam	Pre-Breach River Elevation (Feet MSL)	Maximum Flood Wave Height Above Pre-Breach River Elevation(Feet)	Maximum Flow (CFS)	Time to Rise of 2 Feet (Hrs. - Min.)	Time to Maximum Rise (Hrs. - Mins)
Fair Weather	77.3	3813.7	5.3	29,396	23 HR. 12 MIN.	25 HR. 48 MIN.
Major Flood	77.3	3822.2	2.6	145,535	15 HR. 36 MIN.	18 HR. 31 MIN.

TOWNSEND EMERGENCY SHELTER LOCATIONS

S1 - TOWNSEND HIGH SCHOOL, 210 NORTH SPRUCE
S2 - LDS CHURCH, 916 BROADWAY

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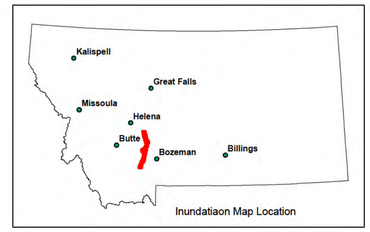
1,500 750 0 1,500 Meters

4,000 2,000 0 4,000 Feet

Aerial Photo: NAIP 2013



Inundatiaon Map Location

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	ENGR. RO		
REV. 4		DEPT. MGR. C. HARRIS ENG./TECH. HEI DRAWN HEI	
		SIZE AS SHOWN HYDRO DIVISION	REV.
		SIZE D DWG. NO. 43674-C12 SHT 8 OF 8	4

NorthWestern Energy

D 22" x 34"