2014 PERIODIC ENGINEER'S INSPECTION
CASTLE ROCK RESERVOIR
MAIN AND SADDLE DAMS
COLSTRIP, MONTANA

Prepared For:

PPL MONTANA, LLC
Colstrip, Montana

Hydrometrics, Inc.
Consulting Scientists and Engineers

SEPTEMBER 2014

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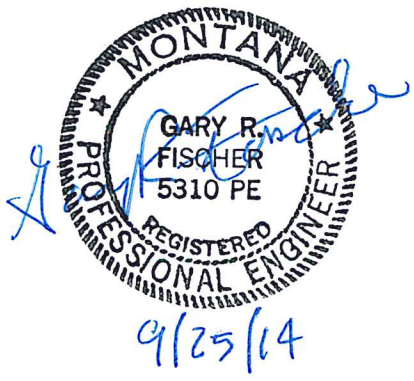

September 2014

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2014 PERIODIC ENGINEER'S INSPECTION
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1.0 PURPOSE AND SCOPE OF STUDY

This report presents the results of a Periodic Engineer's Inspection of the Castle Rock Reservoir Main and Saddle Dams near Colstrip, Montana. The dams at Colstrip fall under the regulation of the Major Facilities Siting Act (MCA, 2007). Although they are exempt from the Montana Dam Safety Rules, PPL Montana has agreed to have them inspected in accordance with these rules (ARM, 1988).

This report has been prepared in accordance with Montana Dam Safety Rules. In general terms, a Periodic Inspection includes:

(a) Review and analysis of previous inspection reports and available data on the design, construction, operation, and maintenance of the dam and its appurtenances;

(b) Visual inspection of the dam, its appurtenances, the downstream area, and all other areas affected by the structure;

(c) Evaluation or plan for a full evaluation over no more than a 5-year period of the general conditions of the dam, spillways, and other appurtenances, including an assessment of the hydrologic and hydraulic capabilities, structural stability, and any other conditions that constitute or could constitute a hazard to the integrity of the structure;

(d) Evaluation of operation, maintenance, emergency, and inspection procedures employed by the owner;

(e) Analysis of piezometric levels or other data from any instrumentation or monitoring of the dam;

(f) Review and analysis of the rate and volume of seepage and condition and maximum flow capability of any seepage collection system;

(g) Review and documentation of the condition of surfaces and vegetation on the crest and slopes of the dam and area beyond the downstream toe of the dam;

(h) Review of maximum operating water surface elevation and amount of freeboard;

(i) Review and documentation of the condition of spillways and water level control structures, including all conduits exiting the dams; and

(j) Other items the engineer determines are necessary to document and determine the safety of the dam (ARM Rule 36.14.602).

The purpose of the Periodic Engineer's Inspection is to identify current and physical operational conditions of the dam and appurtenances and to determine if emergency measures and/or additional studies, investigations and analyses are needed, so that corrections can be made by the owner in a timely manner.

The following tasks were completed by Hydrometrics, Inc.:

1. Review of previous engineering, design and construction data to verify completeness of information in characterizing the general safety of the Castle Rock Reservoir Main and Saddle Dams (*Section 5*).

2. Engineering analysis of seepage and piezometer data to determine if internal seepage affects the integrity of the dam (*Section 5*).

3. Visual observations of the Main and Saddle Dams, appurtenant structures, and downstream areas for evidence of seepage, unstable slopes and erosion characteristics *(Section 6).*

4. Review of the previous inspection reports and comparison of existing conditions with conditions and recommendations noted in those reports *(Section 7).*

5. A summary of conclusions and recommendations *(Section 8).*

2.0 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

Castle Rock Reservoir is intended for use as a surge pond and a reserve storage facility supplying cooling and make-up water for the coal-fired power generating plants at Colstrip, Montana. Although not initially planned as a recreational facility, it has become a local fishing and recreational attraction.

The reservoir is located less than half a mile northwest of Colstrip in Sections 28 and 33, Township 2 North, Range 41 East, in Rosebud County, Montana. It consists of two zoned earth dams having a common spillway and outlet works. The Main Dam is about 67 feet high and is located in the SE¼ of Section 28. The Saddle Dam is about 19 feet high and located in the NE¼ of Section 33. Water is pumped to the reservoir through two pipelines from the Yellowstone River near Forsyth, Montana, about 35 miles away. The project location is shown on Figure 2-1.

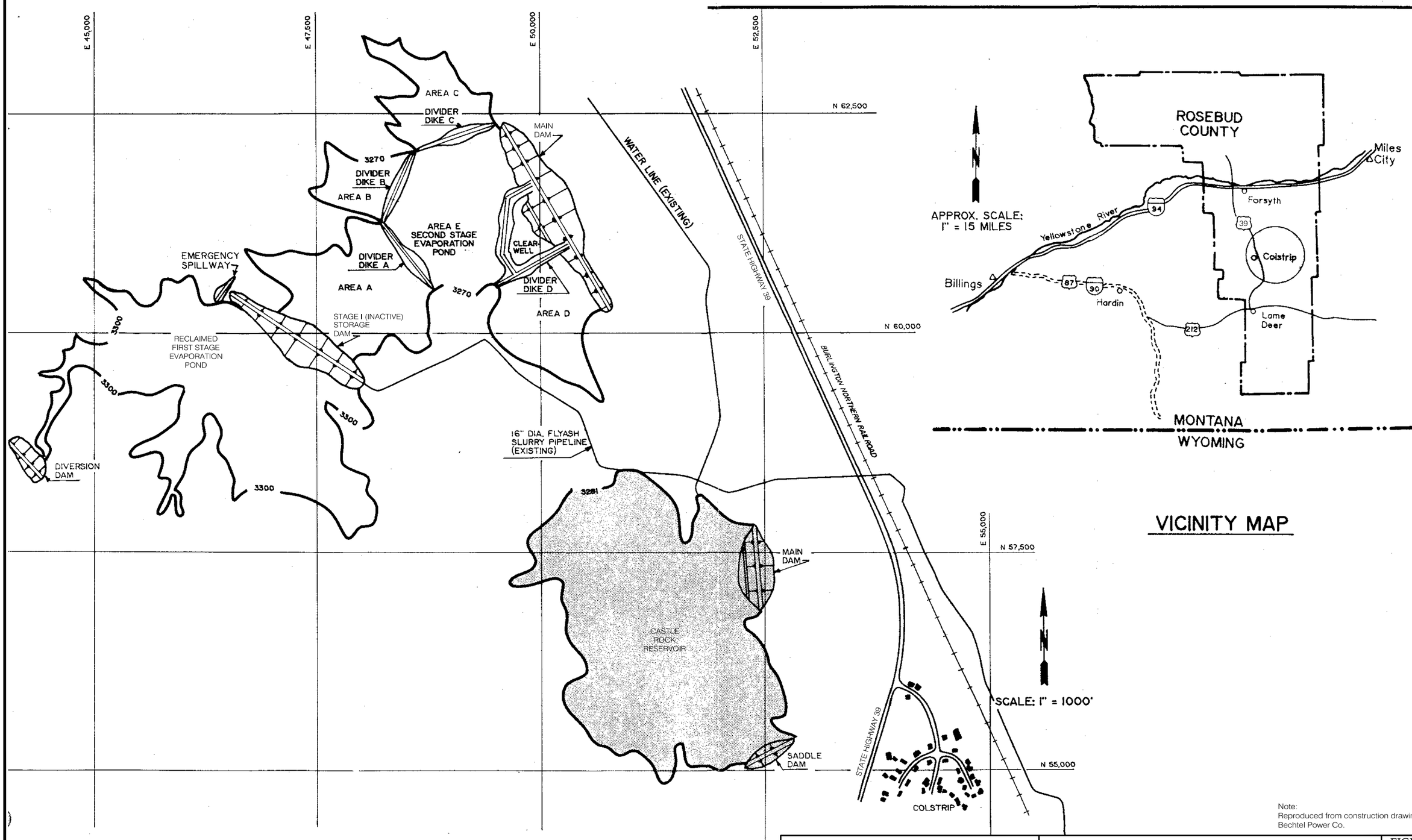
The federal identification number for the Main Dam is MT-1982 and for the Saddle Dam, MT-3146. Both dams are listed as having a high downstream hazard potential.

2.2 DESIGN AND CONSTRUCTION

The reservoir storage capacity is normally maintained between 2280 and 2930 acre-feet. The variation in storage capacity is dependent upon the use of flashboards in the emergency spillway.

The Main Dam has a grout curtain and slurry wall installed to control seepage. The surface area of the reservoir with water at the spillway crest elevation is about 140 acres. The total drainage area, including reservoir surface, is 0.89 square miles.

The emergency spillway is a reinforced concrete chute with a 36-foot wide uncontrolled ogee crest, located about 200 feet northwest of the left (north) abutment of the Main Dam. It has an unlined stilling basin and exit channel. A cast-in-place concrete tower, located about



VICINITY MAP

Note:
Reproduced from construction drawings by Bechtel Power Co.

PPL MONTANA COLSTRIP DAM SAFETY INSPECTION COLSTRIP, MONTANA	**PROJECT LOCATION MAP**	FIGURE **2-1**

150 feet into the reservoir near the right abutment, serves as a drop inlet for transmitting water to the power plant units and to the town water system via a 48-inch diameter steel pipe. The first 160 feet of the steel pipe is encased in concrete. After the first 160 feet, the steel pipe rests inside of an open 8-foot diameter concrete pipe.

Information presented in Table 2-1 was obtained from the design report and construction drawings (Bechtel Power Corporation). Figures 2-2 and 2-3 present the plan view and typical cross sections of the dams.

TABLE 2-1. CASTLE ROCK RESERVOIR MAIN AND SADDLE DAMS DESIGN SUMMARY

GENERAL INFORMATION

• Federal I.D. No. (Main Dam)	MT-1982
• Federal I.D. No. (Saddle Dam)	MT-3146
• Owner/Operator:	PPL Montana (formerly Montana Power Company)
• Date Constructed:	1975
• Purpose:	To provide reserve cooling and make-up water storage (18 days in summer, 24 days in winter) for 4 coal fired power generating units. Also to act as a surge pond for cooling and make-up water pumped from the Yellowstone River some 35 miles to the north.
• Location:	Sections 28 and 33, Township 2 North, Range 41 East, Rosebud County, Montana.
• Watershed:	Offstream of Armell's Creek, a tributary of the Yellowstone River.
• Drainage Area:	0.89 square miles
• Size Classification:	Intermediate
• Downstream Hazard Classification:	Category I (High)

RESERVOIR DATA

• Storage at summer normal/maximum pool and emergency spillway crest elevation 3281.0 NGVD:	2280 acre-feet
• Surface area at normal pool:	140 acres

TABLE 2-1. CASTLE ROCK RESERVOIR MAIN AND SADDLE DAMS DESIGN SUMMARY (continued)

- Storage at winter maximum pool and emergency spillway with flashboards at elevation 3285.0 NGVD: 2930 acre-feet

- Storage at Saddle Dam crest elevation 3288.5 feet NGVD: 3540 acre-feet

EMERGENCY SPILLWAY DATA

- Type: Uncontrolled, Reinforced Concrete Chute

- Crest Elevation: 3281.0 feet NGVD

- Width at Crest Elevation: 36 feet

- Discharge capacity at Saddle Dam Crest elevation 3288.5 feet NGVD: 2820 cfs.

SPILLWAY WINTER MODIFICATIONS

- Type: 4-foot high flashboards installed on top of ogee crest.

- Crest Elevation: 3285.0 feet NGVD

- Width at Crest Elevation: 36 feet

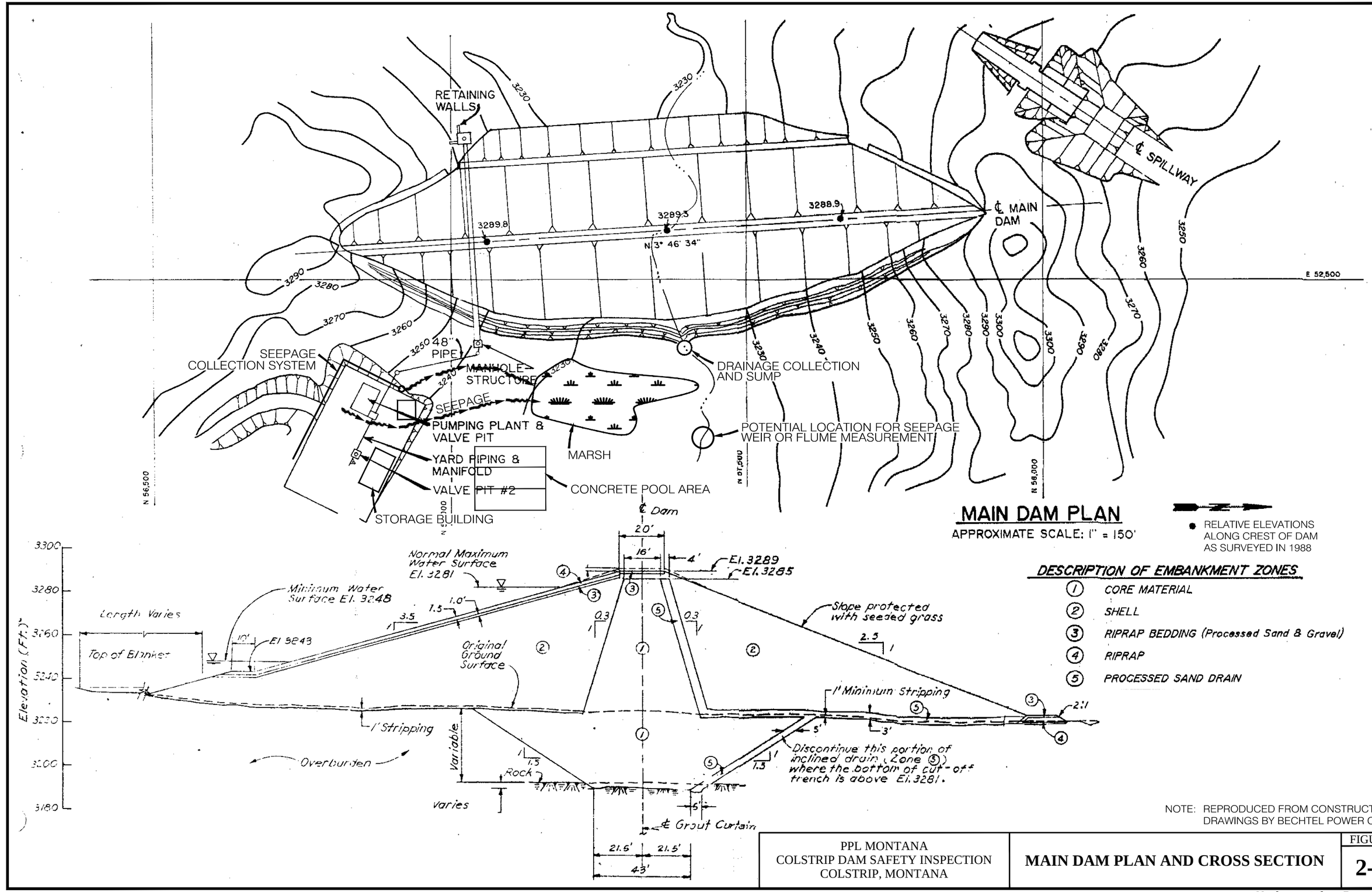
- Discharge capacity at Saddle Dam Crest elevation 3288.5 feet NGVD: 850 cfs.

OUTLET STRUCTURE

A reinforced concrete tower houses the inlet and controls for the 48-inch steel conduit to the power station cooling system. The conduit is encased in concrete as far as the downstream toe of the dam.

TABLE 2-1. CASTLE ROCK RESERVOIR MAIN AND SADDLE DAMS DESIGN SUMMARY (continued)

Embankments Data	Main Dam	Saddle Dam
• Type:	Zoned earth with grout curtain and concrete slurry wall	Zoned earth
• Height, feet:	67 feet	19 feet
• Crest Elevation, feet NGVD:	3289.0	3288.5
• Crest Length, feet:	1095	800
• Crest Width, feet:	20	20
• Upstream Slope, H:V:	3.5:1	2.5:1
• Downstream Slope, H:V:	2.5:1	2.5:1
• Wave Protection:	Riprap	Riprap



NOTE: REPRODUCED FROM CONSTRUCTION DRAWINGS BY BECHTEL POWER CO.

PPL MONTANA COLSTRIP DAM SAFETY INSPECTION COLSTRIP, MONTANA	**MAIN DAM PLAN AND CROSS SECTION**	FIGURE **2-2**

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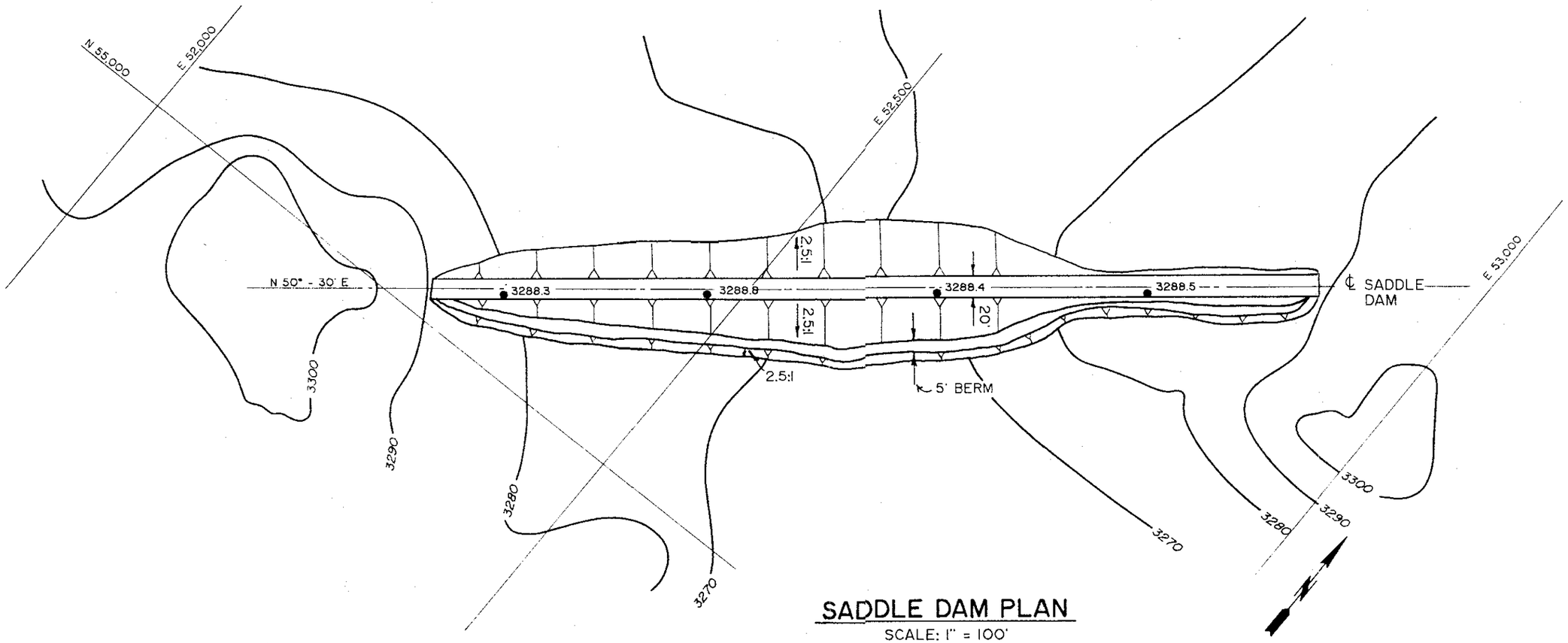
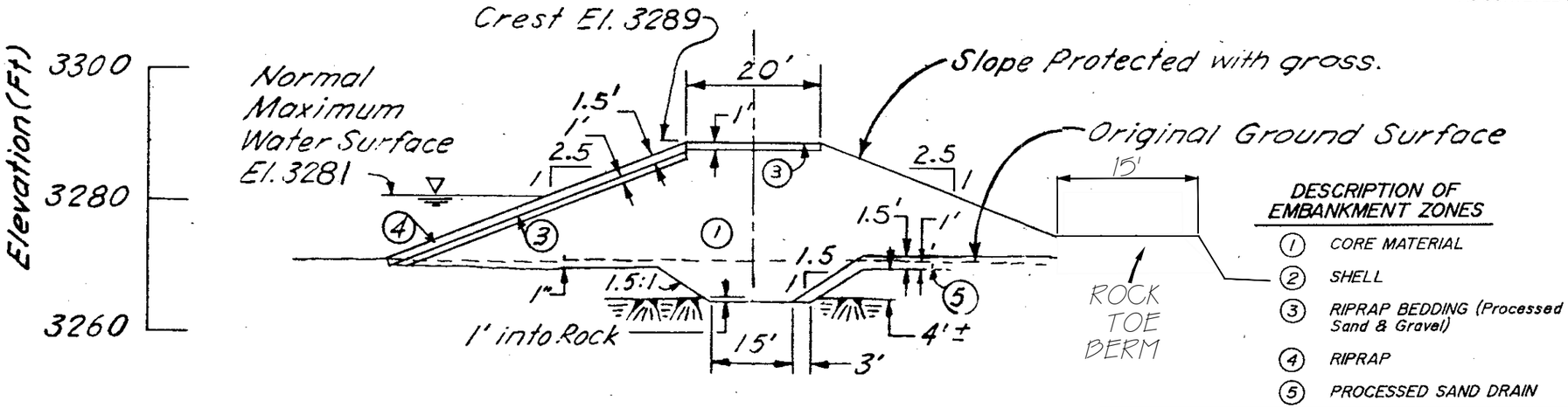


SADDLE DAM PLAN

SCALE: 1" = 100'

● RELATIVE ELEVATIONS ALONG CREST OF DAM AS SURVEYED IN 1988



DESCRIPTION OF EMBANKMENT ZONES

1. CORE MATERIAL
2. SHELL
3. RIPRAP BEDDING (Processed Sand & Gravel)
4. RIPRAP
5. PROCESSED SAND DRAIN

NOTE: REPRODUCED FROM CONSTRUCTION DRAWINGS BY BECHTEL POWER CO.

PPL MONTANA COLSTRIP DAM SAFETY INSPECTION COLSTRIP, MONTANA	**SADDLE DAM PLAN AND CROSS SECTIONS**	FIGURE **2-3**

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3.0 HAZARD POTENTIAL

Within a short distance downstream of the dams, development includes residences, businesses, a primary state highway and railroad. Sudden failure of each structure would likely result in extensive property damage and a high potential for loss of lives. This project is therefore assigned a high hazard potential.

As required by the Montana Dam Safety Program, an emergency action plan (EAP) for the Castle Rock Surge Pond dams (Hydrometrics, 2009a) is to be updated annually. The most recent update was completed in December 2013 and the EAP is on file in the Colstrip plant offices.

4.0 REVIEW OF ENGINEERING DATA

A review of the design report and construction drawings (Bechtel Power Corporation) was performed as part of the original U.S. Army Corps of Engineers Phase I Inspection report (Christian, Spring, Sielbach & Associates, 1981). The following conclusions were presented in that report:

- The dam meets or exceeds Corps of Engineers' requirements for seepage, settlement, and slope stability;
- The spillway analysis meets Corps of Engineers' requirements for routing the probable maximum flood, except in the case when the flashboards are in place; and
- The probability of a probable maximum flood occurring during the time the flashboards are in place (November – March) was remote.

The 2009 inspection report (Hydrometrics, 2009b) presented a series of recommendations. The status of each of those recommendations is summarized below.

Recommendation 1: Repair the small puddle area on the crest of the Main Dam, identified approximately 300 feet from the left abutment.

Status: Crest appeared to be free of ruts or low spots.

Recommendation 2: Remove trees and woody vegetation from both the Main Dam and Saddle Dam upstream slopes.

Status: Many trees have been removed from the upstream slopes of both dams since the 2009 inspection, but several willows and small cottonwood trees are emerging between the riprap on both embankments and should be removed before the next periodic inspection.

Recommendation 3: Monitor the condition of riprap on upstream slopes of both the Main Dam and Saddle Dam. Repair or replace riprap in areas indicative of beaching and sparseness should conditions worsen.

Status: A few gaps in the Saddle Dam riprap were noted but no beaching was evident. The open areas need to be monitored annually.

Recommendation 4: Initiate control of rodents on downstream slope of the Main Dam. Backfill and compact rodent holes on the downstream slope of the Main Dam.

Status: PPL Montana has reported to have engaged the services of a rodent control firm on all embankments in the past. Several rodent holes were found during the 2014 inspection but it was not known if they were active. It is recommended to have the rodent control program renewed plus it is recommended that all rodent holes are backfilled in order to identify if rodents return in the future.

Recommendation 5: Establish a weed control program to eradicate weeds along the downstream slope of the Main Dam.

Status: Weeds were evident mainly near identified rodent holes. Weed control measures should be conducted in conjunction with rodent control.

Recommendation 6: Measure and monitor seepage in the toe area below the Main Dam. Install a surface measuring device such as a weir or flume to measure flow in the flowing seepage channel in the center part of the toe area. The flow in the channel should be monitored monthly, accompanied by corresponding reservoir water surface elevations.

Status: Seepage is collected and pumped to a surface drainage ditch to direct the flow downstream but no direct measurements are taken. The recommendation from the 2009 report still stands.

Recommendation 7: Monitor the Main Dam spillway sidewall repairs and repair if necessary.

Status: The sidewalls were in good condition with the exception of one spall area at the top of the right wall and some missing joint filler in the left wall/floor joint just above the flip bucket. Both features require repair.

Recommendation 8: Monitor the spillway approach channel slopes for erosion and repair if necessary.

Status: The approach channel appeared in good condition.

Recommendation 9: Conduct monthly monitoring of PZ-29, GW-3 and GW-11 in conjunction with reservoir level readings. Have data evaluated annually by an engineer.

Status: Piezometer and Surge Pond level readings are measured on a regular basis.

Recommendation 10: Consider installation of an additional piezometer near the crest of the dam in order to verify that the dam seepage barriers and drains are performing as designed.

Status: A vibrating wire piezometer, SURGE-09-1P, was “installed in 2009 in the downstream shell, just above the chimney drain, to detect embankment seepage or potentially adverse pore-water pressure conditions that would indicate a malfunctioning drain (Womack,

2010). The piezometer has not detected groundwater since installation." (Womack, 2013)

4.1 SURGE POND – CASTLE ROCK LAKE

4.1.1 Seepage Analysis

An engineering evaluation of the piezometer data available for the Main Dam was conducted. A map of the piezometers and seepage collection systems for the Castle Rock Dam are shown on Figure 4-1. Only piezometers installed on or near the Main Dam and which provided data useful in evaluating seepage in the embankment were analyzed. The list of useful piezometers, based on the analyses conducted in 2009, includes GW-2, GW-3, PZ-29, PZ-30, PZ31, and SURGE-09-1P (a vibrating wire piezometer installed in 2009 in the downstream shell just above the chimney drain (Womack, 2010)). The SURGE-09-1P piezometer has not detected groundwater since installation; the piezometer installation depth is approximately elevation 3222.7.

Internal erosion from uncontrolled seepage is a major safety concern in older dams and should be monitored during periodic inspections. Previous inspections for Castle Rock Reservoir noted evidence of seepage downstream of the Main Dam. The following is an excerpt from the 2005 inspection report (Tetra Tech, 2006):

> "The downstream area of the Main Dam has evidence of seepage, such as cattails and marshy areas, but it appears that most of it is being controlled. On the south and west side of the Pumping Plant Building, there is a trench carrying flowing seepage from the toe of the right abutment to the area near the outlet manhole structure. The seepage in the trench is approximately 10 gpm. This seepage should be monitored and we recommend installing a surface measuring device such as a weir or flume in the trench. The flow in the trench should be monitored monthly, accompanied by corresponding reservoir water surface elevations.
>
> The seepage identified in the 1993 and 1999 inspection reports east of the Pumping Plant Building is still present but appeared to be similar to what was observed during the 1999 inspection, and less severe than the 1993 inspection. There is still an area of

FIGURE 4-1. PIEZOMETERS NEAR THE CASTLE RESERVOIR

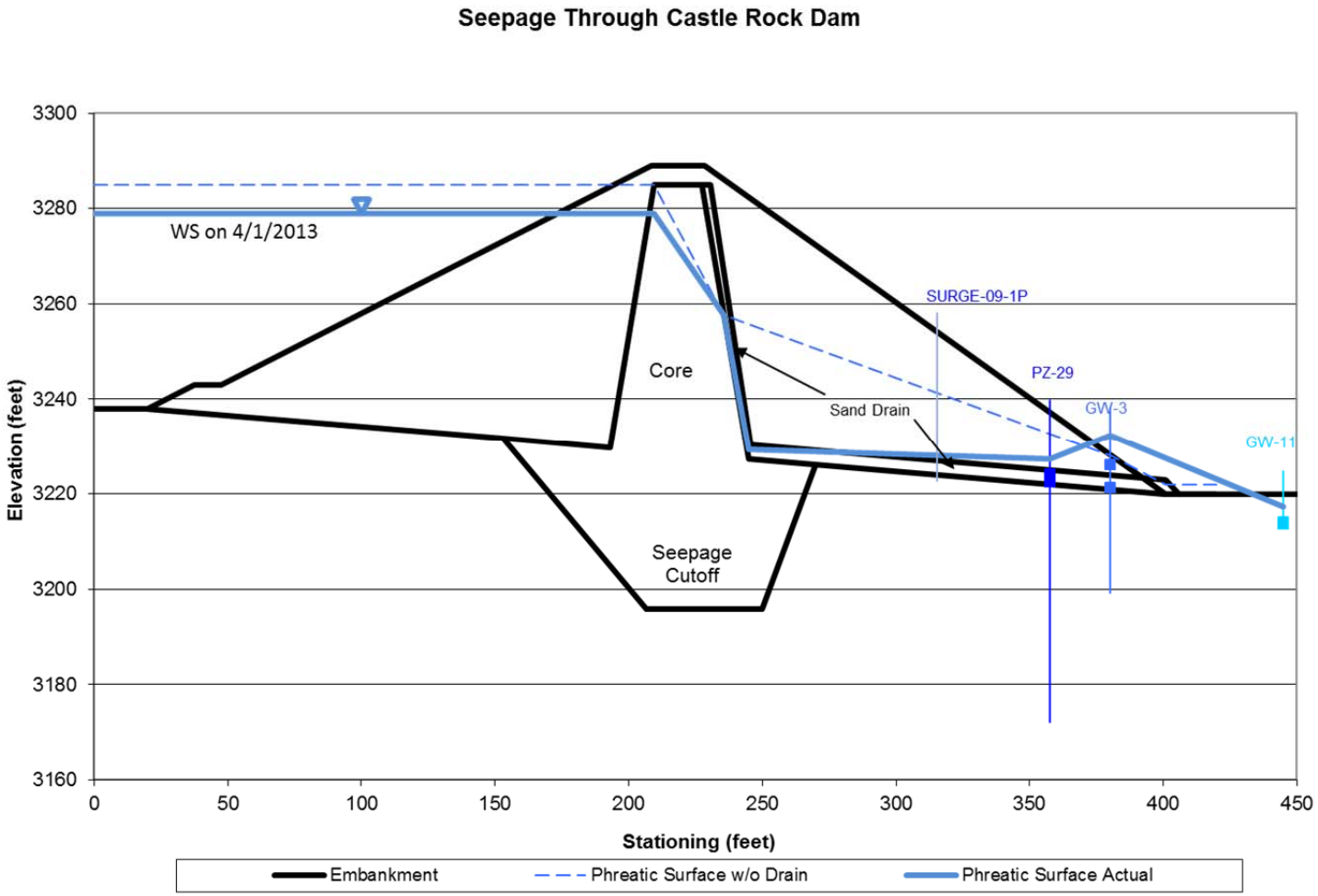
standing water with marsh grass and cattails located just east of the dam access road, across from the Pumping Plant Building. This location is also shown on Figure 2[1]. The road material was moist but not muddy and there were no sand boils observed in the standing water. Installation of a trench drain to dry up the wet surface conditions and installation of either a surface water measuring device, such as a weir or flume, or a monitoring well to monitor future seepage are recommended at this location."

Prior to the 2009 inspection, a perforated drainpipe surrounded by clean gravel was installed in the drainage trench east of the Pump Plant Building. Intercepted seepage is drained to a sump and pumped into the drain channel that runs along the downstream area below the dam and to the north of the Pump Plant Building. During the 2014 inspection, the drain system was operating and was in good working order. The seepage discharge was not measured.

As part of this inspection, piezometer data was analyzed to determine how well the dam is controlling the effects of seepage. As shown in Figure 4-2, Castle Rock Main Dam was designed with a seepage cutoff trench located under the dam's central core that extends to bedrock. Downstream of the core, a sand drain was constructed to control seepage and improve stability by lowering the phreatic surface, or water table, in the downstream portion of the dam. As shown in Figure 4-2, the core of the dam appears to be effective in lowering the phreatic surface, but the internal drain at times allows the phreatic surface to rise above the drain elevation, as measured at SURGE-09-1P, PZ-29 and GW-3. While not observed during this inspection, surface seepage has been reported during monitoring events in the area near GW-3. The dashed blue line in the figure represents where the phreatic surface would likely be without the drain at the maximum pond level and the solid blue line shows where it is based on water level readings on April 1, 2013 in the pond and piezometers SURGE-09-1P, PZ-29, GW-3 and GW-11. The area near GW-3 should be monitored regularly for high phreatic surface readings in GW-3 and for surface seepage in the toe area.

[1] Figure from 2005 Inspection Report not included in this report.

FIGURE 4-2. SEEPAGE THROUGH CASTLE ROCK DAM



Figures 4-3, 4-4 and 4-5 show piezometer levels verses reservoir levels for piezometers PZ-29, GW-3 and GW-11. The data period for each figure spans from May 2012 to August 2013. Some general observations about Figures 4-3 through 4-5 are:

- Although each of the piezometers measures a different water level, all three react in a similar manner to changes in reservoir level. This consistency suggests that they are primarily being influenced by seepage from the reservoir and not some other source of groundwater that might influence one piezometer more than the others. The arrows on Figures 4-3 to 4-5 indicate the direction of data change over the 15 months represented.
- All three piezometers appear to follow the same trend in reacting to changes in the pond level, each to a different degree of variation. Each has a delayed reaction in water levels as the pond level changes, both up and down. This delay, or hysteresis, in piezometer data suggests that during filling the phreatic surface takes time to rise within the dam, and during draining the phreatic surface takes time to fall within the dam. These are signs that the dam is providing a good barrier to seepage flow. Piezometers that have a direct hydraulic connection to the reservoir do not exhibit this behavior.

We recommend that the surface seepage, which is collected from the interior drain and discharged along the downstream toe, should be measured and monitored along with corresponding pond levels and on the same schedule as the piezometers. The monitoring recommendations for both surface seepage and piezometers will provide effective methods for detecting signs of developing problems. By plotting seepage flow (or piezometer level) versus reservoir level, relationships can be derived which represent current normal seepage conditions and provides a basis for determining if future seepage flows suggest that problems may be developing as the embankment ages. Surface seepage monitoring is important because, unlike piezometers that only reflect seepage effects at one point in the dam, it provides a picture of how the entire dam is functioning. A good surface seepage monitoring program reduces the reliance on piezometer monitoring.

FIGURE 4-3. RELATIONSHIP BETWEEN POOL LEVEL AND PIEZOMETER LEVELS FOR CASTLE ROCK MAIN DAM, PZ-29

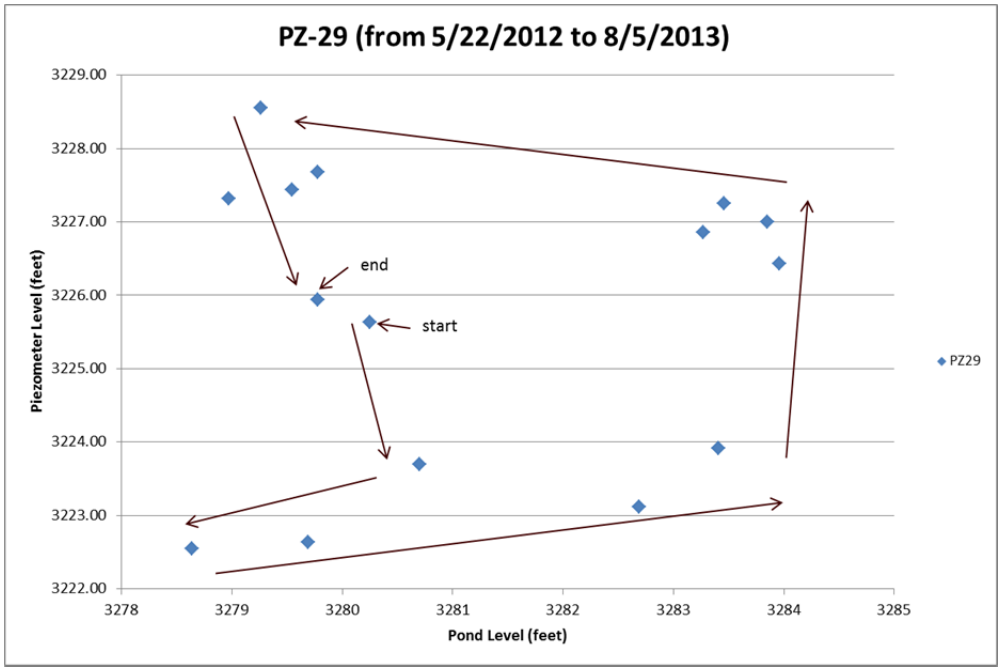


FIGURE 4-4. RELATIONSHIP BETWEEN POOL LEVEL AND PIEZOMETER LEVELS FOR CASTLE ROCK MAIN DAM, GW-3

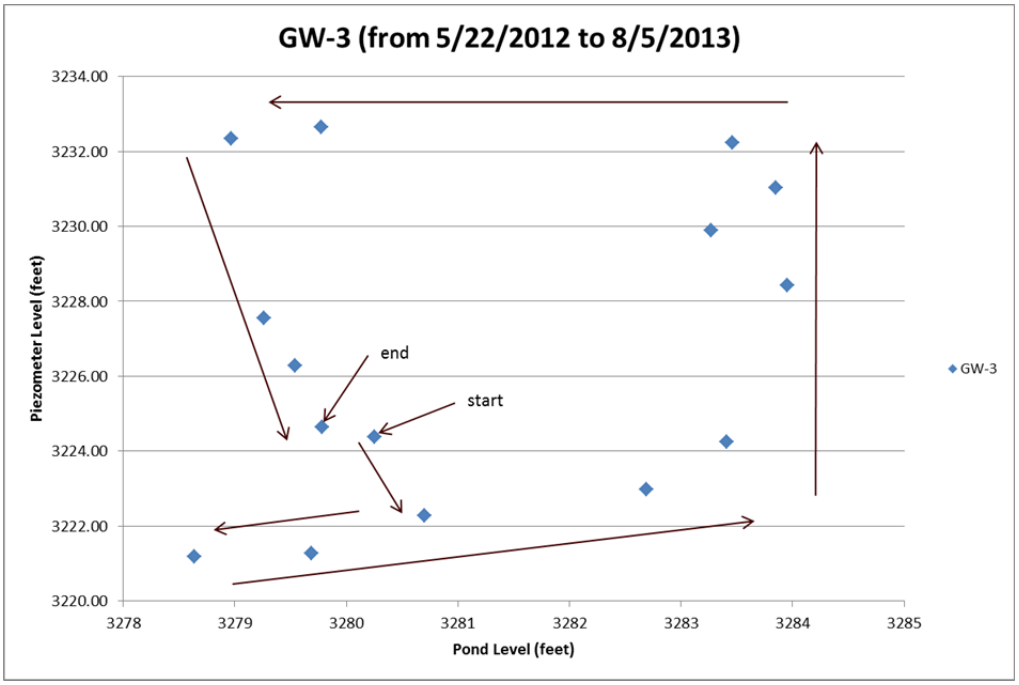
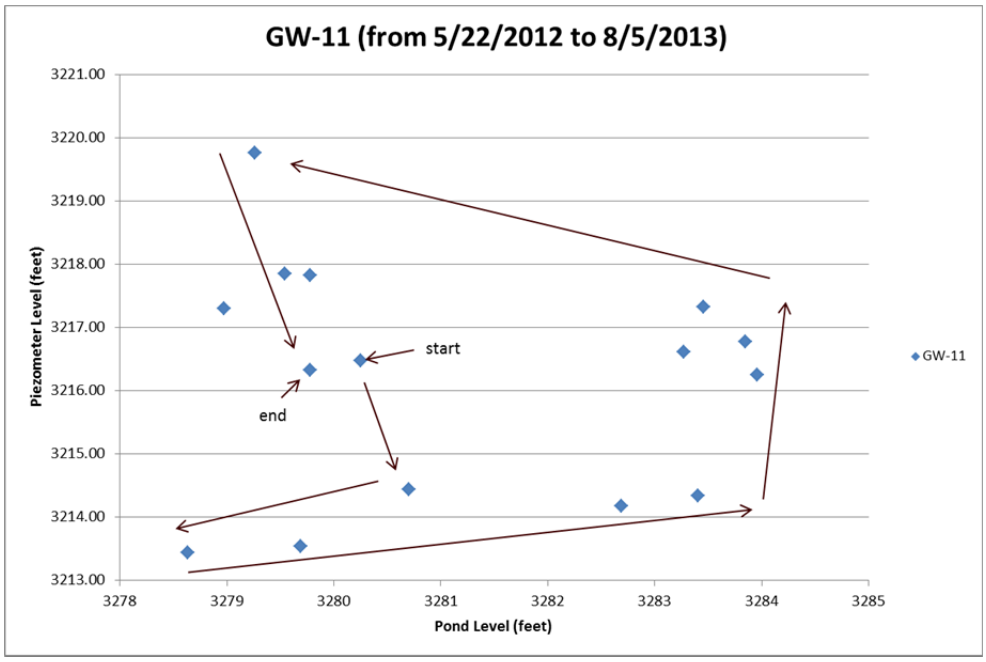


FIGURE 4-5. RELATIONSHIP BETWEEN POOL LEVEL AND PIEZOMETER LEVELS FOR CASTLE ROCK MAIN DAM, GW-11



We recommend the following actions be taken before the next inspection in order to improve seepage monitoring for Castle Rock Dam:

1. Collect data from PZ-29, GW-3, GW-11 and SURGE-09-1P at the same time that pond levels are measured at intervals no longer than monthly and ideally twice a month for at least a year in order to establish a baseline for the piezometers' behaviors.
2. Install measurement devices to monitor the flow from the Main Dam's internal drain and from the interception ditch adjacent to the Pumping Plant Building. A recommended location for a measuring device is shown on Figure 2-2.

4.1.2 Flood Routing

As a result of the spillway capacity concerns expressed in the Phase I Inspection Report (1981) as mentioned in Section 4.0, page 4-1 of this report, PPL commissioned a study (Hydrometrics, Inc., 2004) to determine if the Castle Rock Reservoir spillway meets current spillway requirements of the Montana Dam Safety Program. Current State of Montana

standards are probability-based and are driven by the potential for downstream loss of life from a dam failure flood. Based on these standards, a hydrologic routing of the inflow design flood with the flashboards in place resulted in a maximum reservoir level that is 1.2 feet below the low point on the dam. However, because Highway 39 lacks effective flow conveyance for spillway discharge, the 2004 report recommended that the normal operating reservoir level be maintained at no higher than 0.8 feet below the top of the 4-foot tall flashboards which would allow retention of the 100-year, 24-hour inflow event.

4.1.3 Slope Stability

The dam's design (Bechtel Power) meets current criteria for embankment stability, as verified by the Corps of Engineers' Phase I report (Christian, Spring, Sielbach & Associates, 1981).

The project lies in a Seismic Zone 0 (UBC, 1994), which is characterized by minor seismic risk. The original design report selected a seismic coefficient of 0.05 g for use in slope stability analysis, which is a conservative assumption for this seismic zone.

5.0 FIELD INSPECTION

5.1 METHODOLOGY

Gary Fischer, P.E., conducted a detailed field inspection of Castle Rock Reservoir Main and Saddle dams on July 15, 2014. Mr. Fischer was accompanied by Mike Holzwarth of PPL Montana, Charles Freshman of the Montana Department of Environmental Quality, and Sam Johnson of the Montana Department of Natural Resources and Conservation. Observations were made for surface evidence of potential problems relating to settlement, seepage, slope stability, erosion and general condition of appurtenant structures. Inspection photographs document both general conditions and specific items which merit remedial action (Appendix A for the both the Main Dam and the Saddle Dam). Copies of the field inspection forms are contained in Appendix B.

The dams may be accessed by either a road or a walkway on PPL property. Roads approach the Main Dam from both the northwest and the east and both are gated at the entrance to PPL property. Access is limited to authorized personnel only. The walkway over the spillway provides public access to the dams from the public recreation area northwest of the spillway.

Notation in the following text is referenced as “right” or “left” looking downstream of the dam.

5.2 MAIN DAM

5.2.1 Crest

The crest of the Main Dam was in good condition (Photo 2). An elevation survey along the crest was not conducted during this inspection. Surveys conducted in 1988 and 1993 indicated no unusual settlement of the crest. The vegetation along the shoulders of the road was in good condition. The horizontal alignment of the crest appears to be good with no surface cracking, low areas, or animal burrows. The tire rut identified in 2009 appears to have been repaired.

5.2.2 Upstream Slope

The upstream slope did not exhibit any signs of sliding, sloughing, escarpment, erosion, or unusual movement (Photos 3 and 6). The contact between the embankment and abutments was in good condition (Photo 4). Riprap slope protection was in good condition. Periodic monitoring of the riprap is recommended, with maintenance as needed. Scattered small willows and trees are growing within the riprap and need to be removed.

5.2.3 Downstream Slope

The downstream slope was in good condition with minor items identified that require attention. No signs of slope instability, wet areas, or seepage were observed. There was no erosion or unusual movement (Photos 5 and 9). The vegetative cover was good except for some scattered sagebrush growing near the crest. Some weeds were identified that should be controlled, and the weeds typically were present near identified rodent holes (Photos 12 and 13). It is not known if the rodent holes were active. We recommend backfilling rodent holes and monitoring to identify if rodents are present. PPL Montana reported that a rodent control program was enacted several years ago. A similar program will have to be used if rodents are still active. A large rodent or fox hole was found in the left downstream groin that needs to be backfilled and treated similar to the other rodent holes (Photo 14).

5.2.4 Downstream Area

The downstream area of the Main Dam showed no signs of surface seepage except in the toe drain of the dam and in the interception trench near the Pumping Plant Building (Photos 17 through 22). Installation of a weir or other type of flow measuring device is recommended in the drainage channel in the center toe area (see Figure 2-3 for potential weir location). Once a measuring device is installed, flow in the trench should be monitored monthly, accompanied by corresponding reservoir water surface elevations.

5.2.5 Instrumentation

Numerous piezometers and monitoring wells exist along the downstream slope and toe area (see Figure 4-1). PPL Montana collects well data monthly to determine the phreatic surface in and near the Main Dam and to monitor seepage downgradient of the reservoir. Changes in

the dam phreatic surface may indicate piping or stability problems in the dam. As discussed above, the installation of a drainage channel flow measuring device is recommended. A new drain comprised of slotted pipe within a gravel bed was installed since 2005 in the channel below the right abutment next to the Pumping Plant Building and across the access road to the east of the Pumping Plant to collect seepage. Flow is collected in a sump and then pumped to the toe drainage channel (Photos 21 and 22). Seepage flow is not measured at this point.

5.2.6 Emergency Spillway

The spillway is an uncontrolled reinforced concrete ogee, with a flip bucket and unlined stilling basin. At the top of the ogee section, slots in the concrete sidewalls allow for placement of steel flashboards to maintain reservoir levels higher than the ogee crest. Flashboards were in place at the time of this inspection. The 2004 Hydrometrics spillway report indicated the steel flashboards can remain in place and still route the inflow design flood. Past inspections where the reservoir water level was higher than at the time of this inspection indicated a minor amount of leakage occurs through the flashboards, keeping part of the spillway wet, the flip bucket full, and a trickle of water feeding into the stilling basin area. The reservoir level was below the crest of the ogee section and there was no leakage (Photo 25).

The spillway channel floor appears to be in good condition (Photos 28 and 33). There was no indication of displacement or unusual movement within the channel. The sidewalls appear to be in good condition except for spalling at the top of the right wall at a joint on the lower part of the spillway that needs repair (Photo 31). Some filler material is missing in the floor-wall joint on the left side near the flip bucket, which requires repair (Photo 35). The discharge area was in good condition with established vegetation.

5.2.7 Outlet Works and Inlet Structure

The outlet works, which are below ground, are located near the right abutment of the Main Dam and which feed cooling water to the power plant via the Pumping Plant. The inlet structure is a concrete tower located in the reservoir, accessible only by boat. It serves as an

inlet structure for the outlet works. The outlet works and inlet structure were not inspected during this site visit and have not been inspected for the last several periodic inspections. While the guidelines for embankment dam outlet inspections vary according to purpose, size and site conditions, we recommend inspecting the outlet tunnel and intake tower of the Main Dam at or before the next periodic inspection. Inspection guidelines are available from FEMA (2005). Photo 37 shows the intake tower.

5.3 SADDLE DAM

During the 2009 inspection of the Saddle Dam, the only deficiencies noted was slight beaching of the riprap on the upstream slope and several trees that need to be removed near the abutments. During the 2014 inspection the riprap appeared to be in good condition and trees near the abutments were removed.

5.3.1 Crest

An elevation survey along the crest was not conducted during this inspection. Surveys conducted in 1988 and 1993 by Tetra Tech, Inc., dba Maxim Technologies, Inc. (Tetra Tech, 1988 and 1993) indicated no unusual settlement of the crest. During this inspection, no surface cracking, animal burrows, or low areas were evident along the crest. The horizontal alignment of the crest was good with no ruts or puddles evident. A bike/running path along the crest was in good condition and the vegetation cover on the shoulders was well established (Photo 44).

5.3.2 Upstream Slope

The upstream slope of Saddle Dam was in good condition. The slope is protected with generally well-distributed rock. No erosion, sinkholes or animal burrows were observed. The contact between the embankment and abutment was in good condition. Trees near the abutments have been removed but some young willows and cottonwood trees are starting to grow in between riprap on the upstream slope and the abutment areas that needs to be cut down (Photos 45 and 46).

5.3.3 Downstream Slope

The downstream slope showed no evidence of slides, sloughs, scarps, erosion, or unusual movement. Several rodent burrows were found; treatment should be the same as for the Main Dam. No seepage or wet areas were observed. The contact between the embankment and abutment was good and vegetation control was good.

5.3.4 Downstream Area

Inspection of the downstream area of Saddle Dam showed the area to be in good condition (Photo 40). The abutment and foundation showed no leakage, seepage, or evidence of instability. The Saddle Dam does not have a drainage system.

5.3.5 Emergency Spillway, Inlet Structure and Outlet Works

Castle Rock Saddle Dam and Main Dam are served by the same spillway, inlet and outlet structures. The condition of the spillway observed during this inspection was discussed in sections 5.2.6 and 5.2.7 of this report. The outlet works and inlet structure were not inspected during this site visit.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon review of the previous inspection reports and recent field observations, Castle Rock Reservoir Main and Saddle Dams presently conform to the Montana Dam Safety guidelines. We recommend that another periodic engineer's inspection be conducted in five years or the year 2019. Several items were identified which merit remedial action and/or monitoring. These items lead us to provide the following recommendations, which are to be accomplished within the next five years:

1. Main Dam:
    a. Collect data from piezometers PZ-29, GW-3, GW-11 and SURGE-09-1P at the same time that pond levels are measured at intervals no longer than monthly and ideally twice a month for at least a year in order to establish a baseline for the piezometers' behaviors. Special attention should be paid to the area near GW-3 for evidence of surface seepage and for high levels in GW-3.
    b. Install surface flow measurement devices to monitor the flow from the Main Dam's internal drain and from the interception ditch adjacent to the Pumping Plant Building. A recommended location for a measuring device is shown on Figure 2-2.
    c. Remove willows and small trees among the riprap on the upstream slope.
    d. Remove sagebrush and spray for weeds on the downstream slope.
    e. Backfill rodent holes on downstream slope and monitor for rodent activity. Start a rodent control program if rodents return.
    f. Repair concrete spalling on right spillway wall and joint filler in the left wall-floor joint near the flip bucket.
    g. Have an engineer inspect the outlet pipe access tunnel and the intake tower.

2. Saddle Dam:
    a. Remove willows and small trees among the riprap on the upstream slope.
    b. Backfill rodent holes on downstream slope and monitor for rodent activity. Start a rodent control program if rodents return.

7.0 REFERENCES

Administrative Rules of Montana (ARM), 1988. Chapter 36, Natural Resources and Conservation, Rule 14, Dam Safety. Enacted 1988.

Bechtel Power Corporation, (Date Unknown). Design Report and Construction Drawings.

Christian, Spring, Sielbach & Associates, 1981. U.S. Army Corps of Engineers Phase I Inspection Report for Castle Rock Reservoir Main and Saddle Dams.

Federal Emergency Management Agency (FEMA), 2005. Conduits through Embankment Dams, Best Practices for Design, Construction, Problem Identification and Evaluation, Inspection, Maintenance, Renovation, and Repair. September.

Hydrometrics, Inc., 2004. Castle Rock Reservoir (Colstrip Surge Pond) Spillway Capacity and Reservoir Retention Analysis. July 29, 2004.

Hydrometrics, Inc., 2009a. Emergency Action Plan, Stage II Dam, Castle Rock Lake Main Dam, Castle Rock Lake Saddle Dam, 3&4 EHP Main Dam, And 3&4 EHP Saddle Dam for PPL Montana, LLC. May 2009.

Hydrometrics, Inc., 2009b. 2009 Periodic Engineer's Inspection, Castle Rock Reservoir Main and Saddle Dams, Colstrip, Montana, for PPL Montana, LLC. October 2009.

Montana Code Annotated (MCA), 2007. Major Facility Siting Act: Title 75, Environmental Protection, Chapter 20, Major Facility Siting. Law enacted 1973.

Tetra Tech, Inc. dba Maxim Technologies, 1988. 1988 Phase I Inspection Castle Rock Reservoir Main Dam and Saddle Dam, Colstrip, Montana.

Tetra Tech, Inc. dba Maxim Technologies, 1993. 1993 Phase I Inspection Castle Rock Reservoir Main Dam and Saddle Dam, Colstrip, Montana.

Tetra Tech, Inc. dba Maxim Technologies, 2006. 2005 Phase I Inspection Castle Rock Reservoir Main and Saddle Dams, Colstrip, Montana. January 2006.

Uniform Building Code (UBC), 1994. Structural Engineering Design Provisions, Volume 2. May 1, 1994.

Womack & Associates, 2010. Geotechnical Investigation & Analyses Memo for the Surge Pond Dam Inspection Issue.

Womack & Associates, 2013. Annual Report for Instrumentation Measurements and Assessment for PPLM's Colstrip Effluent Holding Ponds (EHP) (for 2012). January 29.

APPENDIX A

FIELD INSPECTION PHOTOGRAPHS
OF THE MAIN AND SADDLE DAMS

Photo 1. Castle Rock Surge Pond Main Dam, July 15, 2014.
Crest and downstream slope from right abutment.

Photo 2. Castle Rock Surge Pond Main Dam, July 15, 2014.
Crest and upstream slope from right abutment.

Photo 3. Castle Rock Surge Pond Main Dam, July 15, 2014.
Upstream slope from right abutment.

Photo 4. Castle Rock Surge Pond Main Dam, July 15, 2014.
Upstream slope and right abutment area.

Photo 5. Castle Rock Surge Pond Main Dam, July 15, 2014. Downstream slope, mid-dam.

Photo 6. Castle Rock Surge Pond Main Dam, July 15, 2014. Upstream slope from left abutment.

Photo 7. Castle Rock Surge Pond Main Dam, July 15, 2014. Crest from left abutment.

Photo 8. Castle Rock Surge Pond Main Dam, July 15, 2014. Downstream groin along left abutment.

Photo 9. Castle Rock Surge Pond Main Dam, July 15, 2014.
Crest and downstream slope from left abutment.

Photo 10. Castle Rock Surge Pond Main Dam, July 15, 2014.
Crest from left abutment.

Photo 11. Castle Rock Surge Pond Main Dam, July 15, 2014.
Rodent hole, mid-dam on downstream slope.

Photo 12. Castle Rock Surge Pond Main Dam, July 15, 2014.
Rodent holes and dried grass and weeds near mid-dam on downstream slope.

Photo 13. Castle Rock Surge Pond Main Dam, July 15, 2014.
Rodent holes and dried grass and weeds near mid-dam on downstream slope.

Photo 14. Castle Rock Surge Pond Main Dam, July 15, 2014.
Large rodent/fox hole in left downstream groin area.

Photo 15. Castle Rock Surge Pond Main Dam, July 15, 2014.
Downstream slope and toe area, left side.

Photo 16. Castle Rock Surge Pond Main Dam, July 15, 2014.
Seepage channel, toe of main dam.

Photo 17. Castle Rock Surge Pond Main Dam, July 15, 2014. Seepage channel, toe of main dam.

Photo 18. Castle Rock Surge Pond Main Dam, July 15, 2014. Downstream toe area.

Photo 19. Castle Rock Surge Pond Main Dam, July 15, 2014. Seepage collection vault and access manhole to main outlet pipe.

Photo 20. Castle Rock Surge Pond Main Dam, July 15, 2014. Manhole access to main outlet pipe leading from intake tower to pump plant.

Photo 21. Castle Rock Surge Pond Main Dam, July 15, 2014.
Seepage interception trench with drain gravel and perforated pipe.

Photo 22. Castle Rock Surge Pond Main Dam, July 15, 2014.
Seepage flow pipes discharging from collection vault to drainage ditch.

Photo 23. Castle Rock Surge Pond Main Dam, July 15, 2014.
Downstream toe area looking to the left.

Photo 24. Castle Rock Surge Pond Main Dam, July 15, 2014.
Spillway approach area.

Photo 25. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway approach area and reservoir.

Photo 26. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway approach area.

Photo 27. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway approach channel looking at left bank.

Photo 28. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway concrete channel looking downstream.

Photo 29. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway right wall.

Photo 30. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway right wall and downstream area.

Photo 31. Castle Rock Surge Pond Main Dam, July 15, 2014. Spalling on top of spillway right wall.

Photo 32. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway flip bucket.

Photo 33. Castle Rock Surge Pond Main Dam, July 15, 2014. Looking upstream at spillway channel and walkway.

Photo 34. Castle Rock Surge Pond Main Dam, July 15, 2014. Spillway left wall near flip bucket.

Photo 35. Castle Rock Surge Pond Main Dam, July 15, 2014. Missing joint filler along wall-floor joint, left spillway wall.

Photo 36. Castle Rock Surge Pond Main Dam, July 15, 2014. Intake tower.

Photo 37. Castle Rock Surge Pond Main Dam, July 15, 2014. Intake tower.

Photo 38. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Downstream slope from left abutment.

Photo 39. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Small drain channel in downstream toe, mid-dam.

Photo 40. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Downstream toe, mid-dam.

Photo 41. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Downstream toe and slope, looking at right abutment.

Photo 42. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Rodent hole, downstream slope.

Photo 43. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Downstream slope from right abutment.

Photo 44. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Crest and downstream slope from right abutment.

Photo 45. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Crest and upstream slope from right abutment.

Photo 46. Castle Rock Surge Pond Saddle Dam, July 15, 2014. Right upstream groin area.

APPENDIX B

FIELD INSPECTION NOTES

NAME OF DAM: Castle Rock Surge Pond Main Dam INSPECTION DATE: 7/15/2014

EMBANKMENT
1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
CREST	1	SURFACE CRACKING	none			
	2	CAVE IN, ANIMAL BURROW	none			
	3	LOW AREA(S)	none			
	4	HORIZONTAL ALIGNMENT	OK			
	5	RUTS AND/OR PUDDLES	none	✓		
	6	VEGETATION CONDITION	bare - used as road			
	7					
	8					
UPSTREAM SLOPE	9	SLIDE, SLOUGH, SCARP	none			
	10	SLOPE PROTECTION	good			
	11	SINKHOLE, ANIMAL BURROW	none			
	12	EMB.-ABUT. CONTACT	OK			
	13	EROSION	none			
	14	VEGETATION CONDITION	isolated willows and woody brush need to be removed			✓
	15					
	16					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Surge Pond & Main Dam

INSPECTION DATE: 7/15/2014

EMBANKMENT
2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATION	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
DOWNSTREAM SLOPE	17	WET AREA(S) (NO FLOW)	none			
	18	SEEPAGE	none			
	19	SLIDE, SLOUGH, SCARP	none			
	20	EMB.-ABUT. CONTACT	good			
	21	CAVE IN, ANIMAL BURROW	rodent holes on slope - near dead weedy patches		✓	✓
	22	EROSION	none			
	23	UNUSUAL MOVEMENT	none			
	24	VEGETATION CONTROL	veg ok except for a few sagebrush near crest			✓
	25					
	26					
INSTRUMENTATION	27	PIEZOMETERS/OBSERV. WELLS	measured by PPL or Womack staff			
	28	STAFF GAUGE AND RECORDER	pond level measured by PPL or contractor			
	29	WEIRS	NA			
	30	SURVEY MONUMENTS	↓			
	31	DRAINS	toe drains flowing - measured by PPL or contractor			
	32	FREQUENCY OF READINGS	monthly or quarterly			
	33	LOCATION OF RECORDS	PPL offices			
	34					
	35					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

24. that needs to be removed. (near mid-dam)

NAME OF DAM: Castle Rock Surge Pond Main Dam

INSPECTION DATE: 7/15/2014

OUTLET WORKS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
OUTLET WORKS	70	INTAKE STRUCTURE	Not inspected - needs inspection		✓	
	71	TRASHRACK	NA			
	72	STILLING BASIN	NA			
	73	PRIMARY CLOSURE	Part of intake tower			
	74	SECONDARY CLOSURE	NA			
	75	CONTROL MECHANISM	Part of intake tower			
	76	OUTLET PIPE	Not inspected - needs inspection		✓	
	77	OUTLET TOWER	see # 70			
	78	EROSION ALONG DAM TOE	NA - water flows in pipe to pump house			
	79	SEEPAGE	none observed			
	80	UNUSUAL MOVEMENT	none			
	81					
	82					
	83					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Surge Pond Main Dam INSPECTION DATE: 7/15/2014

SPILLWAYS
1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTI-GATE	REPAIR
ERODIBLE CHANNEL	51	SLIDE, SLOUGH, SCARP	NA			
	52	EROSION	↓			
	53	VEGETATION CONDITION				
	54	DEBRIS				
	55					
	56					
NON-ERODIBLE CHANNEL	57	SIDEWALLS	good except for spalling at joint on right side			✓
	58	CHANNEL FLOOR	good except joint filler missing at wall joint, left side			
	59	UNUSUAL MOVEMENT	none			
	60	APPROACH AREA	good			
	61	WEIR OR CONTROL	good - flash boards permanently installed			
	62	DISCHARGE AREA	good			
	63					
	64					
DROP INLET	65	INTAKE STRUCTURE	See #70-80			
	66	TRASHRACK	↓			
	67	STILLING BASIN				
	68					
	69					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

58. Investigate installing drain in flip bucket to prevent freeze thaw damage — INVESTIGATE: ✓

NAME OF DAM: Castle Rock Surge Pond Main Dam

INSPECTION DATE: 7/15/2014

DOWNSTREAM AREA AND MISC.

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTI-GATE	REPAIR
DOWNSTREAM AREA	36	ABUTMENT LEAKAGE	none			
	37	FOUNDATION SEEPAGE	none			
	38	SLIDE, SLOUGH, SCARP	none			
	39	DRAINAGE SYSTEM	working - flow in toe drain outlet channel			
	40					
	41					
	42	DOWNSTREAM HAZARD DESCRIPTION	see latest EAP			
	43	DATE OF LAST UPDATE OF EMERGENCY ACTION PLAN	2013			
MISCELLANEOUS	44	RESERVOIR SLOPES	good			
	45	ACCESS ROADS	gated only at night			
	46	SECURITY DEVICES	gates at night			
	47					
	48					
	49					
	50					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Surge Pond Saddle Dam INSPECTION DATE: 7/15/2014

EMBANKMENT
1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
CREST	1	SURFACE CRACKING	none			
	2	CAVE IN, ANIMAL BURROW	none			
	3	LOW AREA(S)	none			
	4	HORIZONTAL ALIGNMENT	OK			
	5	RUTS AND/OR PUDDLES	none			
	6	VEGETATION CONDITION	crest is bare - used as road			
	7					
	8					
UPSTREAM SLOPE	9	SLIDE, SLOUGH, SCARP	none			
	10	SLOPE PROTECTION	OK - some gaps in riprap but no erosion evident	✓		
	11	SINKHOLE, ANIMAL BURROW	none			
	12	EMB.-ABUT. CONTACT	OK			
	13	EROSION	none			
	14	VEGETATION CONDITION	some willows and small cottonwoods growing that need			✓
	15					
	16					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

14, to be removed.

NAME OF DAM: Castle Rock Sludge Pond Saddle Dam

INSPECTION DATE: 7/15/2014

EMBANKMENT
2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATION	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
DOWNSTREAM SLOPE	17	WET AREA(S) (NO FLOW)	none			
	18	SEEPAGE	none			
	19	SLIDE, SLOUGH, SCARP	none			
	20	EMB.-ABUT. CONTACT	OK			
	21	CAVE IN, ANIMAL BURROW	some rodent holes		✓	✓
	22	EROSION	none			
	23	UNUSUAL MOVEMENT	none			
	24	VEGETATION CONTROL	good veg condition			
	25					
	26					
INSTRUMENTATION	27	PIEZOMETERS/OBSERV. WELLS	read by PPL or Womack			
	28	STAFF GAUGE AND RECORDER	pond levels taken by PPL or contractors			
	29	WEIRS	NA			
	30	SURVEY MONUMENTS	↓			
	31	DRAINS	↓			
	32	FREQUENCY OF READINGS	monthly or quarterly			
	33	LOCATION OF RECORDS	PPL offices			
	34					
	35					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Surge Pond Saddle Dam INSPECTION DATE: 7/15/2014

OUTLET WORKS
1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTIGATE	REPAIR
OUTLET WORKS	70	INTAKE STRUCTURE	NA			
	71	TRASHRACK				
	72	STILLING BASIN				
	73	PRIMARY CLOSURE				
	74	SECONDARY CLOSURE				
	75	CONTROL MECHANISM				
	76	OUTLET PIPE				
	77	OUTLET TOWER				
	78	EROSION ALONG DAM TOE				
	79	SEEPAGE				
	80	UNUSUAL MOVEMENT				
	81					
	82					
	83					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Sewage Pond Saddle Dam INSPECTION DATE: 7/05/2014

SPILLWAYS
1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTI-GATE	REPAIR
ERODIBLE CHANNEL	51	SLIDE, SLOUGH, SCARP	NA			
	52	EROSION				
	53	VEGETATION CONDITION				
	54	DEBRIS				
	55					
	56					
NON-ERODIBLE CHANNEL	57	SIDEWALLS	see Main Dam			
	58	CHANNEL FLOOR				
	59	UNUSUAL MOVEMENT				
	60	APPROACH AREA				
	61	WEIR OR CONTROL				
	62	DISCHARGE AREA				
	63					
	64					
DROP INLET	65	INTAKE STRUCTURE				
	66	TRASHRACK				
	67	STILLING BASIN				
	68					
	69					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.

NAME OF DAM: Castle Rock Surge Pond Saddle Dam

INSPECTION DATE: 7/15/2014

DOWNSTREAM AREA AND MISC.

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED: MONITOR	INVESTI-GATE	REPAIR
DOWNSTREAM AREA	36	ABUTMENT LEAKAGE	none			
	37	FOUNDATION SEEPAGE	none			
	38	SLIDE, SLOUGH, SCARP	none			
	39	DRAINAGE SYSTEM	N/A			
	40					
	41					
	42	DOWNSTREAM HAZARD DESCRIPTION	see latest EAP			
	43	DATE OF LAST UPDATE OF EMERGENCY ACTION PLAN	2013			
MISCELLANEOUS	44	RESERVOIR SLOPES	none			
	45	ACCESS ROADS	secured by gate at night			
	46	SECURITY DEVICES	lock gate at night			
	47					
	48					
	49					
	50					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE.