COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety Branch

July 21, 2014

Mr. Philip Ceriani
President, Overland Ditch & Reservoir Company
28444 Redlands Mesa Rd.
Hotchkiss, CO 81419
pceriani@paonia.com

VIA EMAIL

When replying, please refer to:
OVERLAND #1 DAM, DAMID: 400422
Water Division 4, Water District 40

SUBJECT: Engineer's Inspection Report

Dear Mr. Ceriani:

On June 27, 2014, our office inspected Overland #1 Dam in accordance with Section 37-87-107 of the Colorado Revised Statutes, which assigns the State Engineer responsibility to determine the amount of water which is safe to impound in the reservoirs of all dams in the state of Colorado. Enclosed is a copy of the Engineer's Inspection Report for your use, which includes an owner's signature block on page 3 to acknowledge your receipt of the report. Please sign the signature page and return a copy to the Division 4 office via mail or email.

Conditions observed during the dam safety inspection resulted in a recommended safe storage level of *Conditional Full Storage*, indicating that the dam may be used to full capacity provided certain conditions are met. Specifically, the maintenance, repair, and/or monitoring items listed on page 3 of the inspection report are actions required by the owner to improve the safety of the dam.

If you have any questions concerning this inspection report or any other dam safety related matters, please do not hesitate to contact me in the Montrose office at (970) 249-6622.

Sincerely,

Jason P. Ward, P.E.
Dam Safety Engineer

Encl: Engineer's Inspection Report
ec: Bill McCormick, Chief, Dam Safety Branch
Doug Christner, District 40 Water Commissioner
Linda Bledsoe, US Forest Service

ENGINEER'S INSPECTION REPORT

INSPECTOR: JPW

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME:	OVERLAND #1	T:	110S	R:	0920W	S:	23	COUNTY:	DELTA
DAM ID:	400422	YRCompl:	1987	DAM HEIGHT(FT):	60.0	SPILLWAY WIDTH(FT):	75.0	DATE OF INSPECTION:	6/27/2014
CLASS:	High hazard			DAM LENGTH(FT):	3200.0	SPILLWAY CAPACITY(CFS):	4367.0	PREVIOUS INSPECTION:	7/19/2013
DIV:	4	WD:	40	CRESTWIDTH(FT):	20.0	FREEBOARD (FT):	6.0	NORMAL STORAGE (AF):	5828.0
EAP:	8/4/2012			CRESTELEV(FT):	9897.0	DRAINAGE AREA (AC.):	6200.0	SURFACE AREA(AC):	252.0
								OUTLET INSPECTED:	9/4/2009

CURRENT RESTRICTION: -- NONE --

OWNER:	OVERLAND DITCH & RESERVOIR COMPANY	OWNER REP.:	PHILIP CERIANI
ADDRESS:	28444 REDLANDS MESA RD.	CONTACT NAME:	PHILIP CERIANI
	HOTCHKISS CO 81419-0000	CONTACT PHONE:	(970) 260-2057X

INSPECTION PARTY :	Jason Ward	Doug Christner	Robert Stephenson
REPRESENTING :	Dam Safety Engineer	Water Commissioner	Ditch Manager

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST 6.5 FT. Below Spillway 0.5 FT. GAGE ROD READING 41.5

GROUND MOISTURE CONDITION: [x] DRY [ ] WET [ ] SNOWCOVER OTHER

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

UPSTREAM SLOPE

PROBLEMS NOTED [ ] (0)NONE [x] (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED [x] (2) WAVE EROSION - WITH SCARPS

[ ] (3) CRACKS WITH DISPLACEMENT [ ] (4) SINKHOLE [ ] (5) APPEARS TOO STEEP [ ] (6) DEPRESSION OR BULGES [ ] (7) SLIDES

[ ] (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED [ ] (9) OTHER

Main Dam: Only freeboard portion of slope exposed at this reservoir level. Full riprap coverage along waterline. No wave erosion or slope instability observed.

Auxiliary Dam: (1) Sparse riprap coverage at this reservoir level. (2) Historic localized areas of wave erosion with scarps, but no indications of recent or active erosion. Slope appears stable.

CONDITIONS OBSERVED: [X] Good [ ] Acceptable [ ] Poor

CREST

PROBLEMS NOTED [ ] (10) NONE [x] (11 RUTS OR PUDDLES [ ] (12) EROSION [ ] (13) CRACKS - WITH DISPLACEMENT [ ] (14) SINKHOLES

[ ] (15) NOT WIDE ENOUGH [ ] (16) LOW AREA [ ] (17) MISALIGNMENT [x] (18) IMPROPER SURFACE DRAINAGE [x] (19) OTHER rodent activity

Main Dam: Crest receives moderate vehicular traffic. (11) Few puddles observed on main portions of dam, but crest from left end near spillway to bend in dam at right end is considered in good condition. (11) Remaining approximately 750-ft of crest at far south (right) end of dam is deeply rutted with poor drainage.

Auxiliary Dam: Surface is rough with (18) varied drainage. Shallow desiccation cracking observed along full length. (19) Few small diameter rodent holes and collapsed tunnels observed, but all probed shallow.

CONDITIONS RATING: GOOD for crest along Main Dam. POOR for crest at far south end of Main Dam. ACCEPTABLE for Auxiliary Dam.

CONDITIONS OBSERVED: [X] Good [X] Acceptable [X] Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED [ ] (20) NONE [ ] (21) LIVESTOCK DAMAGE [ ] (22) EROSION OR GULLIES [ ] (23) CRACKS - WITH DISPLACEMENT [ ] (24) SINKHOLE

[ ] (25) APPEARS TOO STEEP [x] (26) DEPRESSION OR BULGES [ ] (27) SLIDE [ ] (28) SOFT AREAS [ ] (29) OTHER

Main Dam: Minor erosion locally along right half of dam. Overall appearance of slope is uniform and stable. No problems observed and slope rated in GOOD condition.

Auxiliary Dam: Slope varies with (26) several areas of bulges and depressions. Generally good grass cover, except for localized bare area near top of slope at the maximum section. All conditions appear historic with no indication of slope displacement or movement. Conditions of slope are rated ACCEPTABLE.

CONDITIONS OBSERVED: [X] Good [X] Acceptable [ ] Poor

SEEPAGE

PROBLEMS NOTED ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT

☐ (33) SEEPAGE EXITS AT POINT SOURCE ☑ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED / MUDDY

DRAIN OUTFALLS SEEN ☐ No ☑ Yes Show location of drains on sketch and indicate amount and quality of discharge. ☐ (37) FLOW INCREASED / MUDDY ☐ (38) DRAIN DRY / OBSTRUCTED

☐ (39) OTHER

Main Dam:
(34) Damp all along toe of 500+ feet long section at far left end of dam adjacent to spillway. Condition similar to past years observations at this reservoir level. Remainder of embankment toe observed dry. All toe drain outfalls found and observed, but not measured during inspection.

Drain outfall observations:
Gate chamber drain: dry
Conduit drains: submerged by outlet tailwater
10-inch PVC drain: 8.0 gpm (per ditch manager)
Drain B left and right outfalls: Running clear, no measurement (see photos)
Drain A outfall: drip

Auxiliary Dam: (34) Damp to saturated ground conditions all along right toe and groin. Dryer conditions along left toe. No embankment seepage and conditions appear similar to past observations at this reservoir level.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

OUTLET

PROBLEMS NOTED ☑ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE

☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☑ NO

INTERIOR INSPECTED ☑ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE

☐ (49) OTHER

Current operating procedure by design is to use the downstream gate as the safety (guard) gate in the fully open or closed position and use the upstream gate for flow control. Outlet discharging 48 cfs at time of inspection.

Automated gate operating system installed since last inspection, but not operational at current inspection (anticipated startup on 6/28/2014). Full manual operation with ability to visually monitor controls all retained.

No known problems or reported concerns from owner.

CONDITIONS OBSERVED: ☒ Good ☐ Acceptable ☐ Poor

SPILLWAY

PROBLEMS NOTED ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT

☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED

☐ (58) CONCRETE DETERIORATED / UNDERMINED ☑ (59) OTHER Possible drain obstruction.

Spillway activated this spring for first time in over 5-years. Uniform flow conditions observed over weir, per Ditch Manager.
Few driftwood stumps at crest, but not an obstruction at this time.
Water pooled in stilling basin and channel to approximately 1-foot over downstream sill in stilling basin. See drain discussion below.

Per C-576C, the stilling basin has two drains; an underdrain system and a floor drain. Looking downstream, the left drain outfall (floor drain) was flowing 10-15 gpm during inspection and the right drain outfall (underdrain) had a small steady drip.
(59) Based on the available head from the pool elevation in the stilling basin, flow from the floor drain would be expected to be significantly greater; possibly indicating the drain is partially obstructed.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☑ (111) GAGE ROD ☑ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS / FLUMES

☑ (114) SURVEY MONUMENTS ☑ (115) OTHER Drain outfalls

MONITORING OF INSTRUMENTATION ☐ (116) NO ☑ (117) YES PERIODIC INSPECTIONS BY: ☑ (118) OWNER ☐ (119) ENGINEER

(111) Gage rod recently painted.

All monitoring data received as up to date with the following observations from the past two years of measurements:
- Only 2 readings were taken in 2012 due to a short water year and limited reservoir storage.
- Three (3) reading taken in 2013.
- PZ-F3A and B were recently found by Ditch Manager.
- Piezometer readings are taken to the top of the steel casing, not the PVC pipe.

The monitoring program is acceptable at this time, but needs a full evaluation by the owner's engineer to optimize the quality and quantity of data collected. See Action Item (95) on Page 3 for additional comment.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) LIVESTOCK DAMAGE

☑ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☑ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE

☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET SPILLWAY

☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☑ (68) OTHER Stilling basin floor drain.

(63)(64) Small trees and brush becoming locally dense on upstream slope of Auxiliary Dam.
Investigate possible partial obstruction of spillway stilling basin floor drain.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

OVERALL CONDITIONS

Conditions at the dam remain in generally acceptable to good condition and the dam appears to be performing well under all reservoir loadings, based mainly on visual observation during the inspection. An important performance indicator for this dam is instrumentation monitoring. The current monitoring and instrumentation program is acceptable, but is in need of evaluation to optimize time spent collecting data and ready interpretation of results. Emphasis should be placed on retaining an engineer to inventory existing instrumentation and evaluate the monitoring program prior to the next irrigation season.

Additional action items listed below should be considered as part of routine operations and maintenance of the dam.

Consideration of outstanding action items and the importance of critical monitoring warrants a Conditionally Satisfactory rating for this dam.

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ (71) SATISFACTORY ☑ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

MAINTENANCE - MINOR REPAIR - MONITORING

- ☐ (80) PROVIDE ADDITIONAL RIPRAP:
- ☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE
- ☑ (82) CLEAR TREES AND/OR BRUSH FROM: **as needed from all embankment surfaces, particularly on upstream slope of Auxiliary dam.**
- ☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES:
- ☑ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: **at far right (south) end of dam.**
- ☐ (85) PROVIDE SURFACE DRAINAGE FOR:
- ☑ (86) MONITOR: **Drain outfall and piezometer monitoring with annual submittal of data to the Dam Safety Engineer (also see (95) below).**
- ☐ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN:
- ☑ (88) OTHER **investigate repair or cleaning of poorly draining spillway stilling basin floor drain.**
- ☐ (89) OTHER

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction.)

- ☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM:
- ☑ (91) PREPARE AS -BUILT DRAWINGS OF: **automated outlet control system and submit to the Dam Safety Engineer (only if available from recent project)**
- ☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM:
- ☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE:
- ☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY:
- ☑ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: **Inventory and evaluate to the condition of all instruments and develop long-term monitoring program, including interpretation of results.**
- ☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET:
- ☐ (97) OTHER:
- ☐ (98) OTHER:
- ☐ (99) OTHER:

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

- ☐ (101) FULL STORAGE
- ☑ (102) CONDITIONAL FULL STORAGE
- ☐ (103) RECOMMENDED RESTRICTION →
- ☐ (104) CONTINUE EXISTING RESTRICTION

FT. BELOW DAM CREST
FT. BELOW SPILLWAY CREST
FT. GAGE HEIGHT
☐ NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE ~~OR CONTINUED STORAGE AT THE RESTRICTED LEVEL~~:

Complete all maintenance, minor repair, and monitoring items listed above. Item (95) should begin prior to start of the 2015 monitoring season.

Engineer's Signature _____ INSPECTED BY

Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE DATE: ___/___/___

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE
Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR
Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE
Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR
Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased withou increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for High hazard dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE
Monitoring includes movement surveys and leakage measurements for High and Significant hazard dams; leakage measurements for Low hazard dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR
All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE
Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR
Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY
The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY
The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure o the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE
Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE
Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION
Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

HAZARD CLASSIFICATION OF DAMS

High hazard
Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

Low hazard
Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

Looking across spillway stilling basin from right wingwall.

Note: Left and right are referenced as looking in the downstream direction.

Spillway abutment drain outfall

Looking upstream at right side of stilling basin

Approximate location of floor drain penetration through downstream sill (submerged with this pool level)

Looking across pool in stilling basin with submerged downstream sill (assumed due to poor drainage of stilling basin through floor drain)

Looking downstream in spillway channel below stilling basin.

View of assumed outfall from spillway stilling basin floor drain

View of outfall from spillway stilling basin underdrain.

Overall view of downstream slope of left portion of dam.

Toe along left portion of dam.

Outlet discharge structure with outfalls from left and right toe drains, conduit drain, and gate chamber drain.

Drain ‘B’ left and right drain outfalls.

Drain ‘A’ outfall.

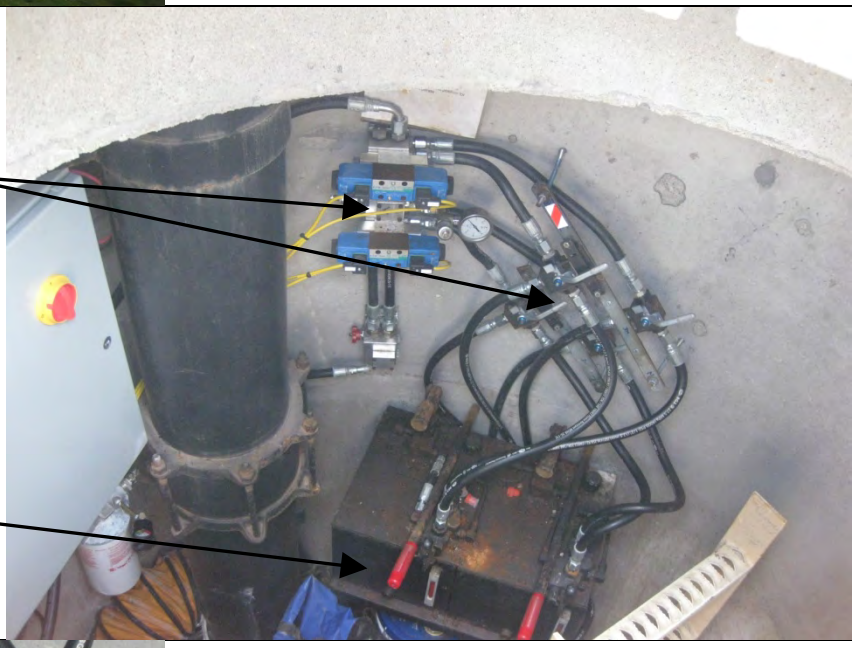
View along top of buttress on right portion of dam.

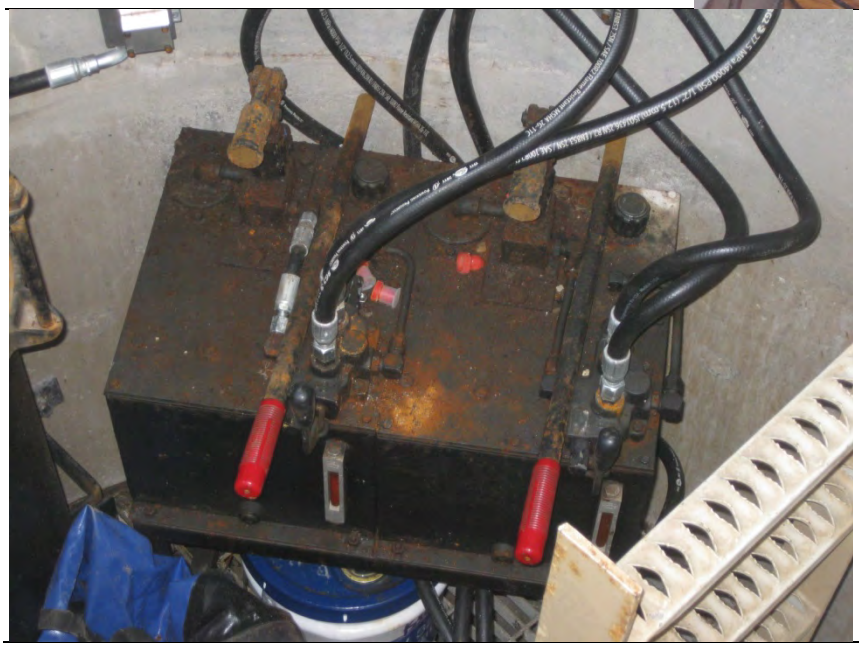
Outlet gate chamber access manhole located in dam crest at the maximum section.

Newly installed automated control components

View of hydraulically operated outlet gate controls with recent retrofit of automated controls.

Manual operation controls (fully functioning)





Close-up of manual hydraulically operated valve controls.

General view along dam crest of main dam.

General view along upstream slope waterline.

View of gage rod with newly painted numbers. Reservoir at gage height 41.5 ft during inspection.

View along dam crest and upstream slope of Auxiliary dam.

Close-up of typical rodent hole/collapsed tunnels on dam crest of Auxiliary dam.

Overall view along downstream slope of Auxiliary dam.