COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety

October 27, 2015

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 September 16, 2015, our office inspected Overland #1 Dam in accordance with Section 37-87-107 of the Colorado Revised Statutes that 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 and reference. Please sign the signature block on page 3 to acknowledge your receipt of report and return a copy to the Division 4 office via mail or email.

Conditions observed during the dam safety inspection resulted in an overall rating of *Conditionally Satisfactory* with 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 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, Forest Service, Grand Valley Ranger District, lbledsoe@fs.fed.us

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:	9/16/2015
CLASS:	High hazard			DAM LENGTH(FT):	3200.0	SPILLWAY CAPACITY(CFS):	4367.0	PREVIOUS INSPECTION:	6/27/2014
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	Phil Ceriani
REPRESENTING :	CO Dam Safety	Water Commissioner	Owner

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST empty FT. Below Spillway FT. GAGE ROD READING 0.0

GROUND MOISTURE CONDITION: ☐ DRY ☑ WET ☐ SNOWCOVER OTHER rain during inspection.

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

UPSTREAM SLOPE

PROBLEMS NOTED ☐ (0)NONE ☑ (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☑ (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: Full slope exposed at this low reservoir level. Generally full riprap coverage with no evidence of displacement or erosion. Slope appears in good condition.

Auxiliary Dam: (1) Riprap coverage varies along slope from full coverage to areas of sparse protection. (2) Wave erosion with scarps along high waterline, but condition appears stable.

CONDITIONS OBSERVED: ☒ Good ☐ Acceptable ☐ Poor

CREST

PROBLEMS NOTED ☐ (10) NONE ☑ (11 RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES

☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) IMPROPER SURFACE DRAINAGE ☐ (19) OTHER

Main Dam: (11) Rain during inspection reveals numerous puddles along main portion of dam. Most considered shallow and minor at this time, but condition could be improved with grading. ACCEPTABLE rating for this portion of crest only.
(11) More significant ruts and puddles along dam crest right of maximum section between main dam and right freeboard dike. Could hinder access to Auxiliary dam if condition worsens. POOR rating for this section of crest.

Auxiliary Dam: Rough surface with varied drainage. Elevation and width appear generally uniform. Blocking vehicular access several years ago has stabilized condition of crest.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☒ Poor

DOWNSTREAM SLOPE

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

☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSION OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☑ (29) OTHER rodent activity

Main Dam: Few areas of (22) drainage erosion and (21) livestock damage along slope as noted in past years inspection. However, majority of damage appears localized and overall slope appears stable. Slope varies by design and appears uniform. No stability problems observed.

Auxiliary Dam: Slope varies with historic bulges and depressions. No evidence of structural instability at this time. Overall good grass cover appears to prevent drainage erosion of uneven surfaces. (29) Numerous pocket gopher type rodent activity, but all appear shallow with minimal slope damage. All condition acceptable at this time.

CONDITIONS OBSERVED: ☒ Good ☒ Acceptable ☐ Poor

ENGINEER'S INSPECTION REPORT DATE. 9/16/2015

DAM NAME: OVERLAND #1 DAM I.D.: 400422

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: No evidence of areas of uncontrolled seepage. All drain outfalls observed with minimal or no flow.
Spillway drains: Left drain outfall as looking downstream (floor drain) running < 1 gpm.
Right drain (stilling basin underdrain) running steady trickle flow.

Auxiliary Dam: None observed with empty reservoir, but known saturated boggy conditions along toe of dam at full reservoir storage.

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

Outlet controls not observed during inspection, but no known problems with gate operator. However, reported malfunction with automated valve control system since last inspection. Manual override not impacted and problem as described judged as not a dam safety concern at this time.

Upstream intake structure exposed with no problems observed.

Outlet passing reservoir inflows through to downstream baffled structure. No problems observed.

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 plugged drains

Spillway activated through this years spring runoff for several weeks.
Numerous small rock and cobble in stilling basin floor, but spillway entrance, crest and channel generally clear and unobstructed.
All concrete structures appear in acceptable condition. (58) Top edge of several baffle blocks deteriorated, but appear structurally stable.
(59) Six plus inches of standing water in stilling basin. Water level pooled above invert of floor drain indicating drain is possibly plugged.
(59) Most wall weep holes appear to have significant moss buildup. Floor drain water prevented close observation during the inspection.

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 disconnected at pipe joint just above outlet intake structure.
(112) Current monitoring program includes piezometer reading, but a condition inventory of each instrument is needed.
(114) Date of last survey unknown.
(115) All drain outfalls appear acceptable for monitoring.

Current monitoring program is in need of review to ensure acceptable conditions of each instrument. Engineering review of data should be

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

See Page 3 Action Items for Maintenance Needs.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

ENGINEER'S INSPECTION REPORT DATE. 9/16/2015

DAM NAME: OVERLAND #1 DAM I.D.: 400422

OVERALL CONDITIONS

Conditions observed at the dam are generally unchanged since the last inspection and the dam appears to have performed well through a full cycle of reservoir filling and draining. The main concern for this High Hazard dam is ensuring that an acceptable instrumentation and monitoring program is in place. The existing monitoring program should be reviewed by the Owner's Engineer. The review should include, but not be limited to, an evaluation of the condition of all existing instruments, the means and methods of instrument reading, frequency of monitoring, and evaluation of existing data. Completion of this review was requested in the 2014 inspection report to be completed prior to the 2015 monitoring season and no known action has been taken. Therefore, the OWNER MUST SHOW DILIGENCE TOWARDS COMPLETING A REVIEW OF THE INSTRUMENTATION AND MONITORING PROGRAM PRIOR TO THE 2016 SEASON or additional actions and requirements may be imposed.

A Conditionally Satisfactory rating is provided with full storage conditional on completing all Action Items listed below.

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 **and report any future automation problems to CO Dam Safety.**
- ☑ (82) CLEAR TREES AND/OR BRUSH FROM: **as needed for clear embankment surfaces on 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: **along crest of Main dam and routinely grade or provide imported granular material for portion of crest along right freeboard dike.**
- ☐ (85) PROVIDE SURFACE DRAINAGE FOR:
- ☑ (86) MONITOR: **All instrumentation and submit data to CO Dam Safety annually (See item (95) below).**
- ☐ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN:
- ☑ (88) OTHER **repair gage rod broken section.**
- ☑ (89) OTHER **Investigate cleaning of all stilling basin wall weep drains. Investigate condition of floor drain and inability to fully drain stilling basin.**

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:
- ☐ (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 CONDITION OF ALL INSTRUMENTATION. EVALUATE AND INTERPET RESULTS OF CURRENT DATA. DEVELOP LONG-TERM MONITORING PROGRAM.**
- ☐ (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 and monitoring items listed above.
DILIGENCE TOWARDS COMPLETING ITEM (95) MUST OCCUR PRIOR TO THE 2016 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.

Spillway Stilling Basin
UNDERDRAIN

Spillway Stilling Basin
FLOOR DRAIN

Overall view of dam and downstream slope from left of maximum section.

Looking downstream at outlet structure, stilling basin, and discharge channel.

Downstream baffled outlet structure with toe drain, conduit filter drain, and gate chamber outfalls through windgwalls (See C-576C for as-constructed drain details).

Buttress drain outfalls.

“Drain A” (per C-576C) outfall.

Piezometer on buttress right of maximum section. Note leaning condition of casing.

Ruts and puddles in unsurfaced portion of dam crest between main dam and right freeboard dike.

Ruts and puddles in crest along maximum section of dam.

Typical view along upstream slope.

View along upstream slope near outlet alignment.

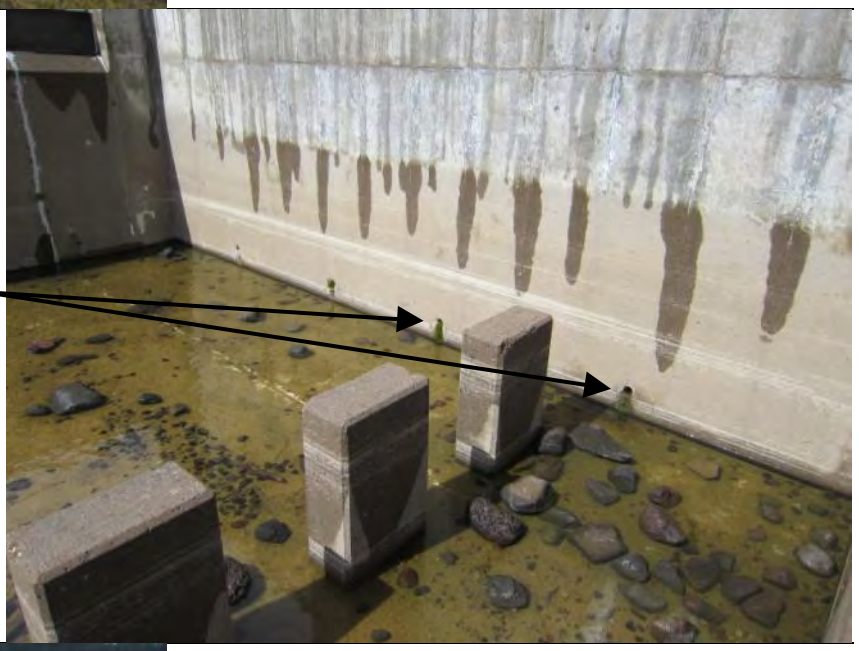
Gage rod disconnected at pipe joint.

Outlet intake structure.

Close-up of outlet intake structure.

Spillway stilling basin.

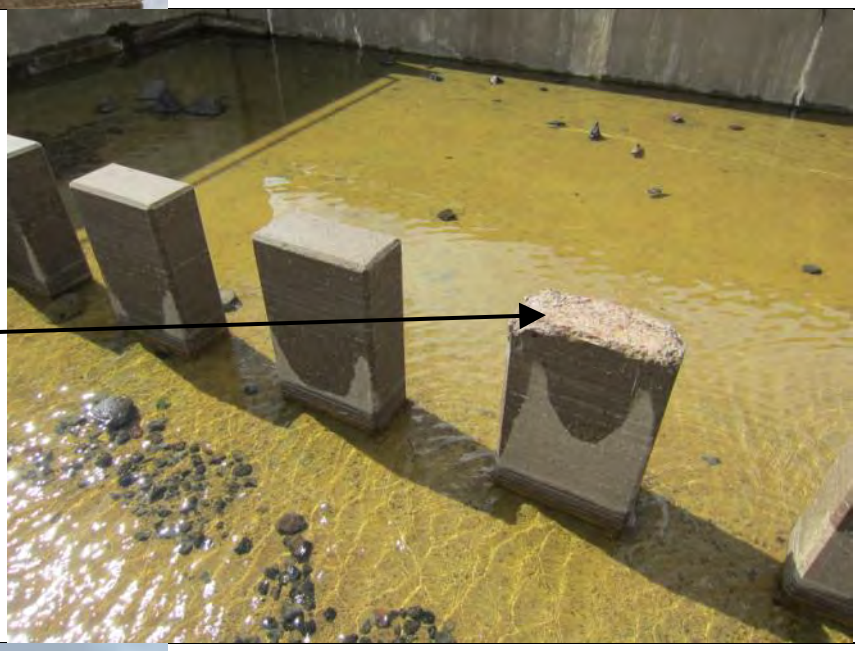
View of left stilling basin wall.
Note moss build-up in weep holes.



View across stilling basin from left abutment.

Stilling basin floor drain intake

Close-up of baffle blocks.
Note minor deterioration of single baffle block.



View along dam crest from left end of dam.

View along upstream slope of Auxiliary Dam from left abutment.

Viwe along dam crest of Auxiliary Dam from right abutment.

Overall view along downstream slope of Auxiliary Dam.