Licence No	WR Map/ Point Code	Stream Name	Purpose	Quantity	Units	Qty Flag	Rediv Flag	Licensee	Licence Status	Process Status	Priority Date	Appurtenant Land	Licence Comments	File No	PCL No
C050407	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	24669.6	MY	T	N	s.22	Current	N/A	19671012	STOR FOR C 50406 CHUTE CR	STOR IN CHUTE LK	277218	8090
C055456	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	20562.11	MY	T	N	YENNADON HOLDINGS LTD PO BOX 18028 1215C - 56 ST DELTA BC V4L2M4	Current	N/A	19531203	STOR FOR C 55455 CHUTE CR	STOR IN CHUTE LK	367598	12801
C055458	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	49339.2	MY	T	N	s.22	Current	N/A	19531203	STOR FOR C 55457 CHUTE CR	STOR IN CHUTE LK	367599	12802
C055462	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	14851.1	MY	T	N	YENNADON HOLDINGS LTD PO BOX 18028 1215C - 56 ST DELTA BC V4L2M4	Current	N/A	19531203	STOR FOR C 55461 CHUTE CR	STOR IN CHUTE LK	368201	12806
C055464	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	1973.568	MY	T	N		Current	Sec. 18 Amendment	19531203	STOR FOR C 55463 CHUTE CR	STOR IN CHUTE LK	368202	12807
C055597	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	20562.11	MY	T	N		Current	N/A	19531203	STOR FOR C 55596 CHUTE CR	STOR IN CHUTE LK	201942	12861
C059633	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	24669.6	MY	T	N	s.22	Current	N/A	19680130	STOR FOR C 59632 CHUTE CR	STOR IN CHUTE LK	277541	14000
C059637	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	22202.64	MY	T	N		Current	N/A	19680130	STOR FOR C 59636 CHUTE CR	STOR IN CHUTE LK	8000368	14002
C059639	82E/12h C (PD55513)	Ratnip Creek	Storage-Non Power	19735.68	MY	T	N		Current	N/A	19680130	STOR FOR C 59638 CHUTE CR	STOR IN CHUTE LK	8000369	14003
C105820	82E/12h C (PD55513)	Ratnip Creek	Irrigation	111013.2	MY	T	N	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	Current	N/A	19660613	LOT 86S OF LOT 2711 SDYD	THE WATER IS STORED IN CHUTE LAKE BY THE DAM,	270042	20568
"	"	Ratnip Creek	Storage-Non Power	111013.2	MY	T	N	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	Current	N/A	19660613	LOT 86S OF LOT 2711 SDYD	THE WATER IS STORED IN CHUTE LAKE BY THE DAM,	270042	20568
C105821	82E/12h C (PD55513)	Ratnip Creek	Irrigation	222026.4	MY	D	N	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	Current	N/A	19531203	LOT 86S OF LOT 2711; PARCEL A OF PLAN B3420 LOT 2 PLAN 3432		202356	20569
"	"	Ratnip Creek	Storage-Non Power	222026.4	MY	M	N	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	Current	N/A	19531203	LOT 86S OF LOT 2711; PARCEL A OF PLAN B3420 LOT 2 PLAN 3432		202356	20569
								s.22				14.4 ACRES OF	STOR AT C		

C118786	82E/12h C (PD55513)	Ratnip Creek	Irrigation	44405.28	MY	T	N
"	"	Ratnip Creek	Storage-Non Power	44405.28	MY	T	N
C123001	82E/12h C (PD55513)	Ratnip Creek	Irrigation	19365.64	MY	T	N
"	"	Ratnip Creek	Storage-Non Power	19365.64	MY	T	N

s.22

Current	Sec. 18 Amendment	19680130	LOT 1 DL 212 SDYD PLAN	59635 RATNIP CR	8000367	24634
Current	Sec. 18 Amendment	19680130	14.4 ACRES OF LOT 1 DL 212 SDYD PLAN	STOR AT C 59635 RATNIP CR	8000367	24634
Current	N/A	19671012	3.93 AC L A DL 391 SDYD PL 26535 EX P L KAP83741		8002005	25873
Current	N/A	19671012	3.93 AC L A DL 391 SDYD PL 26535 EX P L KAP83741		8002005	25873

Chute Lake - Notes

Watershed Area = 11 3/4 Mi² Say 12 Mi²

20%	5000 - 5500	2.4 Mi²
30%	4500 - 5000	3.6 "
35%	4000 - 4500	4.2 "
15%	below 4000	1.8 "

Median Elev. 4500'

> 50% of Shed incl almost all above 5000'
≠ 4/5 of Shed above 4500' drain thro Ratnip Lake
75% of balance drains through other sloughs & swamps

Therefore peak inflow of (39 cfs/Mi²) seems too high.
Try 30 above 4500' & 25 below - 6 x 30 = 180
6 x 25 = 150
Est. Peak inflow 330 cfs

$Q = C L H^{3/2}$ C = 3.3 present L = 52

$330 = 3.3 \times 52 \times H^{3/2}$

$\frac{330}{3.3 \times 52} = H^{3/2}$

$H = 2^{2/3} = 1.58'$ surcharge

For Proposed 100' wide Spillway

$H = \left(\frac{330}{3.3 \times 100}\right)^{2/3} = 1$ foot

For 15 foot ± extension each side, Say 80' width

$H = \left(\frac{330}{3.3 \times 80}\right)^{2/3} = 1.25^{2/3} = 1.09'$ - Say 13" surcharge

(*) How did we derive 39 cfs? (Cox)

s.22 – Licenced 10 ac
Dev. 4 ac

5 times a year for 10 days
with 6 sprinklers #30.

Gained 1½ ft = 135 ac ft
on old Proportion @ 90-90-40

% share	s.22		Former	TOTAL
36		55.35	92	147.35
58		55.35	180	235.35
6		24.30	0.67	25.07
		135.00		

Naramata ID cc to licensee

Letter re operation of Chute Dr.
advise Chute Lake people when closing
(resulting in more water in Chute Cr).

Costs of operation – Same Ratio
~~Major~~ work party - equal share.

Retro-actively - s.22 wing-walls to be
included in Cost of new dam to be shared.

Total 3036
1249
4285.00

~~135~~

270
45

261

Chute Lake Dam – Notes

— Reservoir plan by Harrington in 1913, for proposed dam.
— Geodetic datum was in error at that time.
— Lake levels, old datum — May 31/1913 3901.00
(We have no accurate tie) Sept 18/1914 3899.8
✓ True Elevations — BM 387J (Any track N of line) 3914.907
✓ by closed levels TBM - FB402 p12 (base of watertower) 3892.82
(±0.05) { Bottom of rail at trestle over outlet channel ≒ 3891.0
Underside of trestle ≒ 3888.5
Crest of former spill-dam ≒ 3885.0
Crest of full development as agreed by CPR : 3886.0 (2½' clearance)
This is considered ≒ Contour 3905 on plan.
Volume required for all storage licences = 492 ac ft ≒ 5' depth
or to Elev. 3881.0
To improve hydraulics, Talbot urged lowering
of outlet pipe & channel 0.5' more to 3880.5
Former storage was 3½' depth ≒ Elev. 3881.5 - 3885

s.22

" Levels don't agree with the above (+0.23)
" new depth of storage of 5' is 0.25 more than Gilmore's

In any case, the critical points are:
① Clearance under the trestle
② 5' depth of storage to satisfy licences
③ The invert is now established, and either provides improved hydraulics or descent, give Sara!

Since the outlet was dropped a foot, we should assume that we are at the proposed depth and can raise the crest to give 5.5' depth. This means raising the crest either 6" (Talbot levels) or 9" (Gilmore estimation) but with no less than 30" clearance under the trestle.

s.22

I feel we should retain the bottom 6" unbreached, available under short-term approval in an emergency.
Fisheries would like a maximum 1 inch mesh screen at the intake to control large fish.

REF: Top of CPR Rail opposite dam = Elev 3891.00', GSC.

100.0' (Suggested Crest Width)

Gate Control Handwheel

WING WALL Elev 3888.50'

SPILLWAY CREST Elev 3886.00'

A

DESIGN FLOOD, 470 cfs (39 cfs/sq mi) Elev 3887.25'

Normal freshet estimated approx 240 cfs (20 cfs/sq mi) Elev 3886.8'

MIN. WL Elev 3881.00'

Vertical construction joints as required

Invert of discharge pipe set at Elev 3880.50

A

ELEVATION

Concrete entry to gate

Gate and stem

WING WALL

WEIR CREST

RIP RAP SLOPED TO LIP OF SPILLWAY

spillway training wall

outlet Pipe

FLOW

Spillway training wall (May be stepped or sloped)

PLAN

outlet pipe

Ground level

stream bed

Flow

Rip rap to lip of spill

spillway trainin (24 ft ±

SECTION ON A-

SCALE 5 FT

SKETCH TO ACCOMPANY

CHUTE LAKE & RAILWAY

TEMPORARY REPAIRS

from EAST ABUTMENT

POND BEHIND DAM

OUTLET WORKS

Temporary Structure

May 1971

GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO.....

FROM Jack Botham

May 13 19 71

SUBJECT.....

OUR FILE 0201942

YOUR FILE D-9

MEMO TO FILE

An inspection of Chute Creek and the outlet works from Chute Lake was conducted the morning of May 5th, 1971 by E.D. Anthony and J. Botham, accompanied by Gene Franko representing R.C. Wannop & Associates, Consulting Engineers, and s.22 s.22 one of the licensees.

Near s.22 the creek flow was estimated to be 75 cfs while at the road crossing one mile below Chute Lake it contained about 35 cfs, therefore, approximately ½ the runoff was from the Gemmill Lake Tributary.

In the fall of 1970, the licensees on Chute Lake were instructed to obtain engineering advice on temporary improvements to be made to the old dam to provide storage for the 1971 irrigation season, at the end of which a new, permanent structure was to be constructed before freeze-up, 1971. Wannop & Assoc. were retained to design both structures, but were apparently not contacted last fall when s.22 hired men and equipment and proceeded to construct the log crib, earth filled abutments shown in the photographs attached.

OBSERVATIONS

1. The fill area was not stripped, although previous test holes had indicated 2 - 3 feet of boggy peat and vegetable material.

2. The borrow pits were apparently not stripped, so we can assume that more vegetable material was deposited on the peat as a base.

3. The material forming the east abutment varies considerably from a fairly coarse gravelly sand containing some large rocks to a silty clay material apparently from the deepest part of the borrow area, hence largely on top of the fill.

4. The fill forming the west abutment was apparently borrowed from the road cut to the west and appears to be of quite homogeneos sandy material with some silt but no sign of clay.

5. The concrete section was backfilled with boulders but is fractured, topsy-turvy and permits considerable seepage at several points. s.22 stated that the cribs were constructed to overlap 12 - 18" of the concrete at each end, although seepage was apparent at the west abutment.

...../2

6. The control section will not carry the expected peak flow, therefore, it is likely that sections of the concrete wall will overturn creating several channels, which was the condition before the attempted repairs.

CONCLUSIONS

1. The additions are unstable, but may survive the freshet to provide some storage for this year.

2. They do not appear to consititute any additional hazard at this time and may be of some use to control the flow during construction of a dam if it is downstream, this fall, after which they should be removed.

3. It should be impressed on s.22 that any further work, on Chute Lake or Ratnip or Gemmill Lakes, must be designed and supervised by a registered professional engineer in close co-operation with this office and the Forestry Department.

Jack Botham,
Technician.

JB:mea

Repro

C-9&10

C Culvert under Forest Access Road

← Note spillage over gate & on west abutment

S Slight flow over east side bet. C-joints

C-8

Repaired Dam crest
Note Const.-joint forms.

B.C. WATER RESOURCES SERVICE

RESERVOIR DATA SHEET

KELOWNA OFFICE

C22673 0202356
C22675 0201942

NAME: CHUTE LAKE RESERVOIR D-9 FILE NO.

SOURCE: ~~CHUTE CR.~~ RATNIP CR TRIBUTARY TO:

ACCESS: SEE MAP. MAP NO. 82E 12H

LICENCEE:

LICENCED QUANTITY: 272 ac ft PERIOD APR. 1 - JUN 15 PURPOSE STOR - IRR

OTHER USES:

PLAN NO.: NA MICROFILM NO. NA

WATERSHED

AREA LATITUDE LONGITUDE

ELEVATION RANGE 4000 - 5400' ASL. MEDIAN 4600' ASL EST.

SOIL TYPE COVER EXPOSURE

MET. RECORDS

RUNOFF RECORDS

RESERVOIR

CAPACITY: LIVE DEAD TOTAL

AREA: SILL LEVEL OUTLET LEVEL

ELEVATION: SILL LEVEL OUTLET LEVEL

INFLOW: DIVERSIONS CAPACITY

RECOR FILE

RELEASES: RECORDS FILE

STRUCTURE NO. OF

LOCATION TYPE

FIRST CONSTRUCTED IN 19 DESIGNED BY

RAISED IN 19 DESIGNED BY

CONTRACTOR

FOUNDATION CORE MATERIAL

COMPACTION PROCTOR DENSITY

OTHER ZONES

DRAINS

SEEPAGE RECORDS FILE

MONUMENTS

BENCH MARKS

STRUCTURE NO. _____ OF _____ TYPE _____

EMBANKMENT

CREST: LENGTH _____ ELEVATION _____

WIDTH _____ PROTECTION _____

BASE: WIDTH _____ HEIGHT _____

SLOPES: UPSTREAM _____ PROTECTION _____

DOWNSTREAM _____ PROTECTION _____

SLUICE

TYPE ARMCO 101-C SLIDE GATE VERTICAL LIFT ELEVATION 3880.50' ASL.

CONTROLS _____

COLLARS _____ SIZE _____

OUTLET 18"Ø C.M.P. 14GA. GALV. ASBESTOS WEIR _____

SPILLWAY

TYPE _____ SILL ELEVATION 3886.00' ASL

WIDTH: BOTTOM _____ FLOOD _____ TOP _____

DESIGN CAPACITY _____ FLOOD ELEVATION _____

GROSS FREEBOARD 3.25 NET FREEBOARD _____

PROTECTION: ENTRANCE _____ APRON _____

REMARKS: _____

DAM INSPECTION REPORT
WATER RESOURCES SERVICE

DATE Sept. 26, 1973

...CHUTE LAKE.....Reservoir D- ....9.....
C.W.L.
F.W.L...SEVERAL..... File No. ...201942....

Licensee ... s.22 .....

WATERSHED

1.	Snow Cover	.....0...inches
2.	Snow Patches	.....
3.	Saturated	.....
4.	Wet	.....
5.	Dry	.....X...

RESERVOIR

6.	Freeboard	....4..feet
7.	Water Level	..-.0.2feet
8.	Outlet Discharge	...0.75cfs
9.	Spillway Discharge	....0..cfs

(Note: Items marked X require attention - See Remarks)

EMBANKMENTS

10.	Growth	.....
11.	Upstream Slope	.....
12.	Crest	.....
13.	Downstream Slope	.....
14.	Downstream Toe	.....
15.	Rip Rap	.....
16.	Seepage	.....
17.	Erosion	.....
18.	Sloughing	.....
19.	Boils	.....

OUTLET WORKS

30.	Gate	...X..
31.	Sluice	.....
32.	Submerged	.....
33.	Walls	.....
34.	Stilling Basin	.....
35.	Toe Drain	.....
36.	Channel	.....
37.	Weir	.....
38.	Erosion	.....
39.	Seepage	.....

GATE WORKS

20.	Accessibility	.....
21.	Wheel	.....
22.	Threads	.....
23.	Pedestal	.....
24.	Stem Guides	.....
25.	Stem	.....
26.	Gate	.....
27.	Grill	.....
28.	Boom	.....
29.	Gauge	.....

SPILLWAY

40.	Boom	.....
41.	Entrance	.....
42.	Walls	...X...
43.	Sill	.....
44.	Apron	.....
45.	Channel	.....
46.	Growth	.....
47.	Erosion	.....
48.	Seepage	...X...
49.	Debris	.....

REMARKS: (Refer above)

30. Concrete has broken away below the gate frame.

42. Concrete has broken away from the footing of the spillway on both sides of the gate.

48. Seepage also occurred during high water at other points along the wall. The area of the control gate must be repaired this fall. Excavation of the area is urgently required to determine how much of the footing needs replacement and may indicate that complete replacement is required this year.

Signed: Jack Bolton

NOTE TO LICENSEE: - Section 18(1) of the Water Act states "Every licensee and person who has obtained approval under section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use or operation of the licensee's works."

DEPT. FILE No.

LOCAL FILE No. D-9

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

OFFICE OF THE DISTRICT ENGINEER
DEPARTMENT OF LANDS, FORESTS, AND WATER RESOURCES
WATER RESOURCES SERVICE
WATER RIGHTS BRANCH

Court House,
Kelowna, B.C.
September 25, 1973

s.22

s.22

Dear Sirs:

Re: Chute Lake Dam

On September 21st, 1973 a member of my staff inspected your storage works at the outlet of Chute Lake. The lake is now very low and the dam is completely exposed. This condition has enabled us to do a complete inspection of the exposed parts of the dam for the first time.

The concrete portion of the dam has completely broken away from the gate frame and from the footing of the spillway on both sides of the gate. Several other sections of the concrete wall are also in a poor condition. Some excavation adjacent to the known cavity is required to determine how much of the footing urgently needs replacement. It is possible that such an excavation will conclude that the structure requires immediate replacement.

I, therefore, request that the licencees involved immediately authorize the necessary exploratory work to determine the nature and extent of the repairs urgently required. I shall prepare to have my staff on hand to assist you in this assessment. Would you please advise me when you have made the suitable arrangements.

Yours truly,

E.D. Anthony, P.Eng.,
District Engineer.

EDA:mea

Court House,
Kelowna
October 23,1972

Correct
1973 Oct.

s.22

Dear Sir:

In response to your letter of October 3rd, 1972, concerning Chute Lake Dam, this is to confirm that your proposed maintenance is satisfactory. My comment regarding the outlet channel was in part referring to the forestry road crossing and they have been contacted in this regard. They are installing two additional 48" diameter culverts at a suitable elevation, this week. The other part of the channel which will need attention is downstream of the forestry road, where the grade is quite flat. If your new outlet is lowered as proposed it will be imperative to lower the grade of the channel at that time. Under present conditions it appears likely that some work would be necessary to utilize the last foot of storage.

Yours truly,

E.D. Anthony, P.Eng.,
District Engineer.

per: J. Botham,
Technician.

JB:mea

October 3, 1972

s.22

Office of the District Engineer
Water Rights Branch
Department of Lands, Forests, &
Water Resources
Kelowna, B. C.

DEPT. OF LANDS, FORESTS & WATER RESOURCES
OCT 12 1972
WATER RIGHTS
KELOWNA, B.C.

Attention Mr. E. Anthony

Dear Sir:

SUBJECT: CHUTE CREEK DAM

Please refer to your Local File No. D-9 and your letter of 25 August 1972. On September 24, 1972, s.22 and I visited our storage dam on Chute Creek to check on those items which your office indicated as requiring attention. Accordingly, we will attend to your Report Items No.:

14. Downstream toe . . . rock placement.

16. Seepage . . . concrete/earth filler.

17. Erosion . . . rock and/or concrete.

I do not understand what Mr. Bottom means insofar as Item 36 (Channel) is concerned, unless he is referring to the Forestry road, and would appreciate clarification as soon as possible.

During our inspection trip we also examined the forestry structure, just below our dam, and have considerable concern about it. First, the road is positioned much closer to our dam than I would like it to be, lying on the edge of turbulent zone (hydraulic jump) associated with our spillway during high flow periods; second, the road is not revetted anywhere - not even around the two culverts; third, the two culverts have their upstream inverts well above our gate invert, which essentially means that our full storage delivery is interfered with; fourth, two 48-inch culverts cannot possibly carry the design flow volume - which I am told has been set at 300 cfs.

With respect to the last two points mentioned above, the cure is simple, involving the placement of either two larger culverts, or more than two 48-inch culverts at "optimum" spacing and correct invert elevations. These optimum spacings should be such that erosion due to streamline

convergence and backeddies, etc. will be minimized. With respect to the second point, we, personally, are not concerned over the lack of upstream protection on the forestry road since that is forestry's responsibility and our works cannot be held responsible for any potential high flow damage to it. However, it would appear prudent to me that their structure be protected - particularly the culverts.

Insofar as refurbishing or reconstruction of the dam is concerned, we consider Mr. Wannop's proposal to be too expensive, and in fact over designed, and are assessing several structural configurations which will satisfy both your office, so far as safety is concerned, and our own economic constraints. Accordingly, it is planned that sometime during the next 12 months we will present our conceptual proposals on the dam to your office. Following such submittals, along with appropriate discussions thereof, we hope to reach a mutual agreement with you concerning the nature of the structure and its erection.

It is my understanding that Water Rights would like us to start reconstruction by 1974. In this regard, would you please advise me on your position on the not unlikely event that we wish to delay our efforts until 1975 or 1976, when the fields and orchards belonging to s.22 start producing income with which to help pay for the reconstructed dam.

Very truly yours,

s.22

cc: s.22

D-9

s.22

DEPT. OF LANDS, FORESTS & WATER RESOURCES
OCT 12 1972
WATER RIGHTS
KELOWNA, B.C.

OCT 6/72

Dear Earl:

Hope you are well and not working too hard.
I was in Penticton the other week to look at the Chute Dam, but just couldn't make it up to Kelowna because of an unexpected meeting.
I'd appreciate your advising Fairley, of any objections - particularly their culvert invert heights. Perhaps I'm missing the boat about protecting the upstream face of their road, but don't think so.
Per the letter, we'll take care of the items indicated on Jack's check list.
How's your record on picking winners — the races don't look too good to me at the moment. Green Boy appears strong.

Regards,

s.22

PLEASE ADDRESS CORRESPONDENCE TO
THE DISTRICT FORESTER

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

FOREST SERVICE

~~D-11~~ D-9

OFFICE OF DISTRICT FOREST ER

Kamloops, B.C.

September 15, 1972

File: O.I. Project 4766
Victoria File: 0203718

DEPT. OF LANDS, FORESTS & WATER RESOURCES
SEP 18 1972
WATER RIGHTS
KELOWNA, B.C.

The District Engineer,
Water Resources Service,
Water Rights Branch,
Court House,
Kelowna, B.C.

Attention: Mr. E.D. Anthony, P. Eng.

Dear Sir:

This is to acknowledge receipt of your letter dated August 25, 1972 regarding the need for additional culverts in the Forest Service road fill across the outlet of Chute Lake.

During the spring runoff of 1972, we kept a close watch on the water level at the road fill crossing the outlet of Chute Lake. As a result of our observations we came to the conclusion that two additional 48" diameter culverts should be installed at this crossing and we have programmed this installation for the fall of 1972.

Yours truly,

for A.H. Dixon
District Forester

Return to Jack.

W-9

Naramata B.C.

5 SEP 1972.

DEPT. OF LANDS, FORESTS & WATER RESOURCES
SEP - 6 1972
WATER RIGHTS
KELOWNA, B.C.

The District Engineer-
Water Rights Branch-
Lands Forests and Water Resources,
1420 Water Street KELOWNA. B.C.

Dear Sir:

Thank you for your letter regarding Chute Lake dam.

I shall approach the members regarding the points you raise.

Yours faithfully ,

s.22

D-9

Court House,
Kelowna
August 25, 1972

Mr. A.H. Dixon,
District Forester,
Forest Service,
523 Columbia Street,
Kamloops, B.C.

Dear Sir:

Re: Chute Creek Crossing
Near Chute Lake

On August 18th, 1972 a member of my staff inspected the storage dam at the outlet of Chute Lake. During this inspection it was noted that the entrance of the two 48" diameter culverts under your road crossing were submerged by the 1972 freshet. Would you please advise if you have any plans to increase the capacity under this road section.

Yours truly,

E.D. Anthony, P.Eng.,
District Engineer.

EDA:mea

D-9

Court House,
Kelowna
August 25, 1972

s.22

Dear Sirs:

Re: Chute Lake Dam

On August 18th, 1972 a member of my staff inspected the existing storage dam on Chute Lake. Attached is a copy of his Inspection Report.

With regard to the culverts under the forestry road, I shall be writing to them directly regarding this matter.

During the last twelve months I have had no correspondence from you regarding the reconstruction of the dam on the outlet of Chute Lake. Would you please advise me of your plans in this regard.

Yours truly,

E.D. Anthony, P.Eng.,
District Engineer.

EDA:cma
Encl.

DAM INSPECTION REPORT
WATER RESOURCES SERVICE

DATE Aug. 18, 1972

Chute Lake .....Reservoir D- ...9.....
C.W.L.
F.W.L. Several ..... File No. .0201942....

Licensees..... s.22 .....

WATERSHED

1.	Snow Cover	....0....inches
2.	Snow Patches	.....
3.	Saturated	.....
4.	Wet	.....
5.	Dry	....X....

RESERVOIR

6.	Freeboard	.....4.feet
7.	Water Level	.....3.feet
8.	Outlet Discharge	.....2.cfs
9.	Spillway Discharge	....0.cfs

(Note: Items marked X require attention - See Remarks)

EMBANKMENTS

10.	Growth	.....
11.	Upstream Slope	.....
12.	Crest	.....
13.	Downstream Slope	.....
14.	Downstream Toe	...X...
15.	Rip Rap	.....
16.	Seepage	...X...
17.	Erosion	...X...
18.	Sloughing	.....
19.	Boils	.....

OUTLET WORKS

30.	Gate	.....
31.	Sluice	.....
32.	Submerged	.....
33.	Walls	.....
34.	Stilling Basin	.....
35.	Toe Drain	.....
36.	Channel	...X...
37.	Weir	.....
38.	Erosion	.....
39.	Seepage	.....

GATE WORKS

20.	Accessibility	.....
21.	Wheel	.....
22.	Threads	.....
23.	Pedestal	.....
24.	Stem Guides	.....
25.	Stem	.....
26.	Gate	.....
27.	Grill	.....
28.	Boom	.....
29.	Gauge	.....

SPILLWAY

40.	Boom	.....
41.	Entrance	.....
42.	Walls	.....
43.	Sill	.....
44.	Apron	.....
45.	Channel	.....
46.	Growth	.....
47.	Erosion	.....
48.	Seepage	.....
49.	Debris	.....

REMARKS (Refer above)

14/16 Seepage is still occurring under and through the cracked concrete wall - not appreciably worse than in 1971.

17 There are some small signs of erosion on the new abutments and seepage near the west abutment.

36 The Forestry have started a road across the channel below the dam with 2 - 48" culverts to pass the flow. Last years freshet indicated 3 - 48" culverts are required.

Signed: Jack Botta

NOTE TO LICENSEE: - Section 18(1) of the Water Act states:
"Every licensee and person who has obtained approval under section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use or operation of the licensee's works."

ADDRESS ALL COMMUNICATIONS TO:
COMPTROLLER OF WATER RIGHTS
PARLIAMENT BUILDINGS, VICTORIA, B.C.

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

PLEASE REFER TO FILE No. 0201942
0202356
0270042
0277218
0277541
0270042

DEPT. OF LANDS, FORESTS & WATER RESOURCES
AUG 31 1971
WATER RIGHTS
KELOWNA, B.C.

DEPARTMENT OF LANDS, FORESTS, AND WATER RESOURCES
WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
VICTORIA, B.C.

Your File # 1596

August 30, 1971

Mr. R. C. Wannop, P.Eng.,
R. C. Wannop and Associates Ltd.,
Consulting Engineers,
P.O. Box 420,
Kelowna, British Columbia.

Dear Sir:

Re: Chute Lake Storage Dam -
Messrs. Hindson, Kent, Wilson.

Receipt is acknowledged of copy of your letter of August 25, 1971 to District Forester, Kamloops, with copy of your Drwg. No. 1596.01B dated August 25, 1971 showing general design proposals for the water storage dam for construction at the outlet of Chute Lake under water licences issued or in process of being issued to s.22 s.22

You are advised that, subject to the following one requirement and one suggestion, the general concepts presented in the design are found acceptable and that preparation of detailed construction drawings and site preparation may proceed on this basis.

We will require that thickness of spillway riprap protection be maintained until water is brought down to creek bottom elevation, and the protection be extended along the creek bottom sufficient distance to include the hydraulic jump which will occur near the spillway toe.

It is strongly recommended but not made a condition for acceptance of the design, that the right bank spillway training wall be moved inwards to a position immediately adjacent to the right end of the spillway (at chainage 1 + 23)

..... 2

1971 MARKS THE 100TH ANNIVERSARY OF THE ENTRY OF BRITISH COLUMBIA INTO CANADIAN CONFEDERATION ON JULY 20, 1871 1871 1971

and that the outlet sluice be moved to the shoreward side of this training wall rather than being contained under the spillway. I think that placing the outlet sluice outside of the spillway is important enough that we would consent to narrowing the spillway up to six feet from as shown in order to achieve this if you consider it necessary or desirable to leave the outlet sluice in approximately the location shown.

Copies of this letter are being forwarded to the three licensees concerned, in order to advise them of our general acceptance of the plans submitted.

Yours truly,

H. D. DeBeck,
Comptroller of Water Rights.

per:

cc: District Engineer, Kelowna.

cc:

cc: s.22

cc:

Comptroller, Water Rights Branch,

Parliament Buildings,

Victoria, B.C.

District Engineer, Kelowna, B.C.

July 14 71

Preliminary Design - Chute Lake Dam

0270042
0202356

I have received the revised copy of the proposed dam prepared by R.C. Wannop & Associates. I met recently with the licencees and applicants involved in the reconstruction of these storage works. They requested more time to consider Mr. Wannop's proposal and since the existing structure does not impose any hazard I agreed to their suggested delay.

I have no comments regarding their revised dam proposal.

Yours truly,

Earle Anthony

E.D. Anthony, P.Eng.,
District Engineer.

EDA:mea

Dist Eng - Kelowna

R. C. WANNOP & ASSOCIATES LTD.
CONSULTING ENGINEERS
CIVIL & STRUCTURAL

1135 Sutherland Ave.
~~60 MANDOSY STREET~~
KELOWNA, B. C.
PHONE 762-2745

DEPT. OF LANDS, FORESTS & WATER RESOURCES
JUL 16 1971
WATER RIGHTS
KELOWNA, B.C.

PLEASE REPLY TO:
P. O. BOX 520
KELOWNA, B. C.

July 9, 1971

OUR FILE #1596

YOUR FILES 0202356
0270042 approx

Water Rights Branch
Parliament Buildings
Victoria, B.C.

DEPT. OF LANDS FORESTS
AND WATER RESOURCES
WATER RES.

JUL 15 1971

MAIL ROOM
VICTORIA, B. C.

Attn. Mr. M.L. Zirul,
District Engineers Division

Re: Chute Lake Dam
Preliminary

Dear Mr. Zirul:

We enclose 4 prints of our revised drawing on the Chute Lake Dam for your perusal, showing, we think enough information to make the intention clear, and retaining a spillway crest elevation at 3886.0.

The time and attention you have given to this subject is very much appreciated.

Mr. Anthony has been provided with 2 prints.

Yours very truly,

R.C. WANNOP & ASSOCIATES LTD.

R C Wannop

R.C. Wannop P. Eng.

RCW/rjd

Encl.

Mr Anthony.
Le page 2. , please. MD.

R.C. WANNOP & ASSOCIATES LTD.

Chute Lake Dam — July 7, 1971

OUR FILE #1596

⊛ To estimate safe length of spillway for a design flood of 470 c.f.s.

based on: $\frac{39 \text{ C.F.S.}}{\text{sq. mi.}}$ X 12 sq. mi.

Francis Formula: $Q = 3.33 (L - 0.2H) H^{1.5}$

Where H = 1.0 ft.
Q = 470 c.f.s.

$$L = \frac{470}{3.33} - 0.2 = 140.94$$

. . Use length of spillway 150' top of crest at EL. 3886.00 with max. flood at EL. 3887.00 producing not more than 12" of water over the crest.

H = 1.25
Q = 470

*
NOTE

$$L = \frac{Q}{3.33H^{1.5}} + 0.2H$$

$$= 100.99 + 0.25$$

or say 100 feet required length for 15" depth of floodwater.

*
We are therefore assured that the above formula was used in Mr. Zirul's calculations.

Mr Anthony: Since 470 cfs probably represents the extreme condition not occurring more often than 1 in 25 years, the 100 ft width of spillway should be entirely adequate, retaining sill elevation at 3886.00 ft. and will avoid several difficulties that will occur with use of the wider spillway. It will permit placement of sluice outside of the spillway section (without changing sluice location as shown on Mr Wannop's drawing), will reduce rip-rap requirement, require less channel work downstream and reduce interference with downstream F.S. bridge. Will you please discuss this with Mr Wannop. await your advice before replying to him. WMZ 16 July 71

Part 1 Page 29
FNR-2012-00301

DEPARTMENT OF LANDS, FORESTS, AND WATER RESOURCES
WATER RESOURCES SERVICE
PARLIAMENT BUILDINGS, VICTORIA, BRITISH COLUMBIA

DEPT. OF LANDS, FORESTS & WATER RESOURCES
JUN 21 1971
WATER RIGHTS
KELOWNA, B.C.

0202356
0270042

18 June 1971

R. C. Wannop & Associates Ltd.,
Consulting Engineers,
1460 Pandosy Street,
Kelowna, British Columbia.

Dear Sirs:

As discussed with you by telephone today, I am enclosing an Xerox copy of literature on the ARMCO Model 101-C Slide Gate.

I also enclose an Xerox copy of a sketch which, I believe, contains the features discussed with you yesterday in connection with the proposed storage dam for Messrs. Kent, Hindson and Wilson, on Chute Lake. The features are suggested only, as it is not intended to dictate to you how the structure should be designed. For instance, you may elect, for construction considerations, to narrow the spillway to 80 ft. width instead of the 100 ft. suggested. In this case surcharge at the design flood of 470 cfs (39 cfs/sq.mi.) would be 1.50 feet approximately and this may require lowering the spillway crest 0.25 ft., to elevation 3885.75 ft. In order to arrive at the same top-water elevation.

When you submit your revised plans will you please include two extra prints so that I may forward these to Fish and Game Branch and to B.C. Forest Service (for S.U.P. considerations). In the meantime I will forward these agencies a print of the sketch I have prepared since it gives the information on control of water levels in which they will be interested.

Yours very truly,

M. L. Zirul, Chief,
District Engineers Division.

Enclosures (2)

cc: E.D. Anthony, D.E., Kelowna

Comptroller, Water Rights Branch,

Parliament Buildings,

Victoria, B.C.

District Engineer, Kelowna, B.C.

June 9 71

Proposed Chute Lake Dam

D-9

0201942
0277218
0285037
0270042
0277541

On June 3rd, 1971 I received a copy of the attached plan from R.C. Wannop and Associates Limited. This proposal is a tentative one to outline the nature and extent of the proposed dam in order that the Comptroller might receive comments from the Forestry Department, Department of Recreation and Conservation, and the C.P.R., regarding the proposed storage works.

Recognizing that these drawings are not design drawings the following comments are offered for your consideration.

1. The proposed storage works do not include a log boom.

2. The elevation plan has several incorrect elevations.

3. It is recommended that heavy rip rap be placed on the downstream side of the concrete spillway section up to the height of the spillway lip. The slope of the rip rap should be perhaps 5 to 1 and the rip rap should be sized to withstand a velocity of 5' per second.

4. The downstream drainage area to this dam is approximately 12 square miles. The estimated peak runoff from this watershed is 39 cfs per square mile or a total of 470 cfs. This quantity of water will pass over the spillway at a depth of approximately 10".

5. Therefore, the maximum reservoir level during the maximum flood period will be approximately 3886.83 feet A.M.S.L. The full pool level will be 3886.00 feet A.M.S.L. and the minimum reservoir level will be 3881.00 feet A.M.S.L.

6. I have inspected the site and I concur with Mr. Wannop's proposal to remove entirely the existing structure prior to the construction of the new works.

...../2

7. It is recommended that the control gate be located adjacent to one of the abutments to facilitate operation of the sluice works during a flood period.

Yours truly,

E.D. Anthony, P.Eng.,
District Engineer.

EDA:mea
Encl.

CHUTE LAKE D-9

STORAGE CAPACITY TABLE

ELEVATION Geodetic Datum	ELEVATION Local Datum	Depth of Storage In feet	Area In Acres	Storage In Acre-Feet		Remarks
				Net	Gross	
3880	100	0	87.2		0	New Invert equiv.3899 Pl. 63
	101	1	89.9	88.5	88.5	Old Invert.
	102	2	92.6	91.2	179.7	
	103	3	95.3	94.0	273.7	
	104	4	98.1	96.7	370.4	
3884.75	104.75	4.75	100.3	74.6	445.0	Crest of Spillway
3885	105	5.0	101.0	25.2	470	Crest of Spillway
	106					
	107					
3888	108					Crest of Dam.

Compiled by: ..... Date: November 20, 1973

Derived from: Plan No.631 and approximate levels of repaired structure supplied by [redacted] of Pardise Ranch.

Accuracy: Good ..... Fair ..X.. Poor .....

Gauge Established by ..... Date ..... Gauge Zero= .....

Close-up of W. Abutment
Note additional old Section

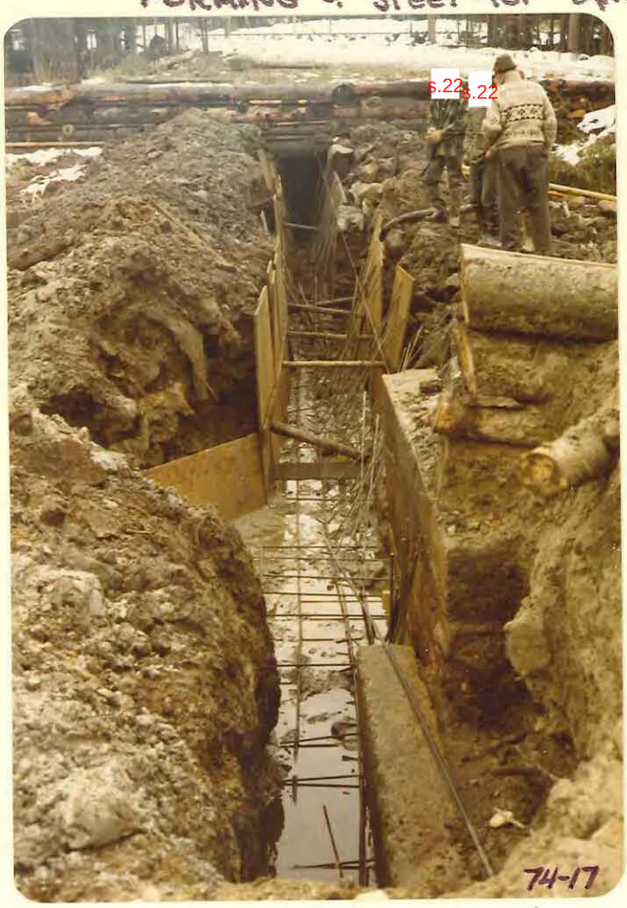
Pouring West Abutment

Pouring Intake Floor Quickly
Note Speeding Operator

Wall Undercut (in Several Places)

Gate Structure Undercut Approx. 1 foot.

FORMING & Steel for Spillway Repairs



Facing East Abutment

Facing West Abutment.

s.22

11 MAY 1974.

Dist ct Engineer-
Lands, Forests and Water Resources-
Water Resources Service-
WATER RIGHTS BRANCH-
COURT HOUSE
KELOWNA. B.C.

DEPT. OF LANDS, FORESTS & WATER RESOURCES
MAY 14 1974
WATER RIGHTS
KELOWNA, B.C.

Attention please- Mr Botham.

Dear Sir- CHUTE LAKE DAM

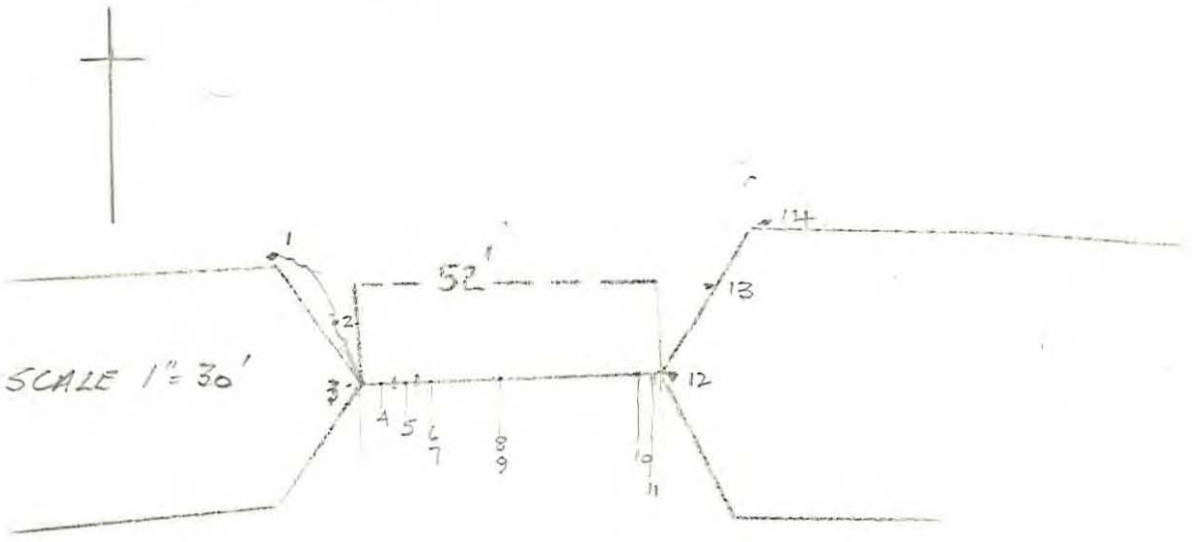
They have(Forestry) graded the road to Chute Lake and it is much imoroved. From s.22 Cabin North it appeared badly washed out.

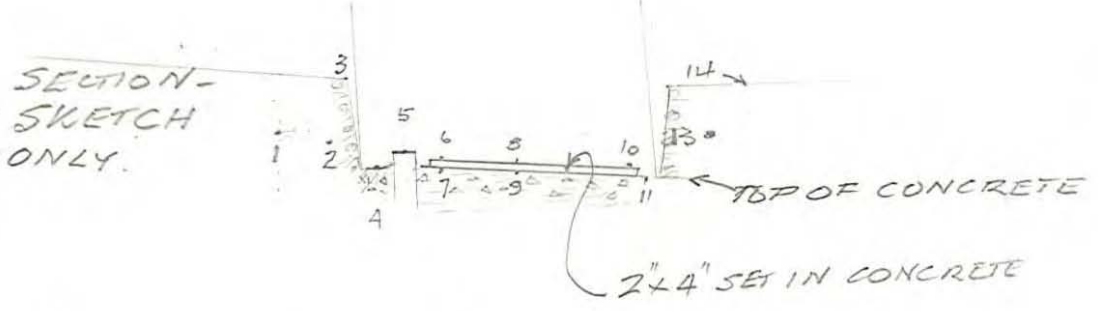
I enclose some levels taken on Friday 10 when we found everything in order- no ~~new~~ seepage leaks etc.. Water flow appeared similer to that ~~xx~~ a week earlier, and was surprisingly low- about an average of 3" over the top...- above the spillway itself. The enclosed water levels were 10 to 25' upstream from the wall where the water surface was unaffected by the falling curve to the spillway. They will give some idea of the volume.

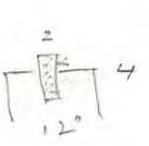
Yours faithfully-

s.22

CHUTE LAKE DAM







(EX HE 53 P60 10 MAY 74)

1	85.76	WATER LEVEL 25' FROM SPILLWAY
2	85.73	WATER LEVEL ± 10' DO
3	88.42	TOP LOG WALL
4	85.27	TOP CONCRETE - NO BOARD
5	85.40	TOP STEEL GATE FRAME.
6	85.56	TOP BOARD SET IN CONC SPILLWAY
7	85.42	TOP CONCRETE 12" WALL
8	85.46	TOP BOARD
9	85.35	TOP CONCRETE
10	85.09	TOP BOARD
11	84.92	TOP CONCRETE
12	88.31	TOP LOG WALL
13	85.80	WATER LEVEL ABOUT 12' FROM SPILLWAY
14	85.80	WATER LEVEL 25'

s.22

DEPT. OF LANDS, FORESTS & WATER RESOURCES
MAY - 7 1974
WATER RIGHTS
KELOWNA, B.C.

nl-9

3 MAY 1974

CHUTE LAKE DAM TODAY

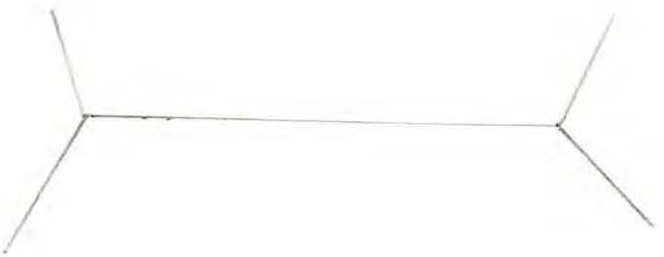
The road is badly washed out but very passable. Snow alongside in the upper part .

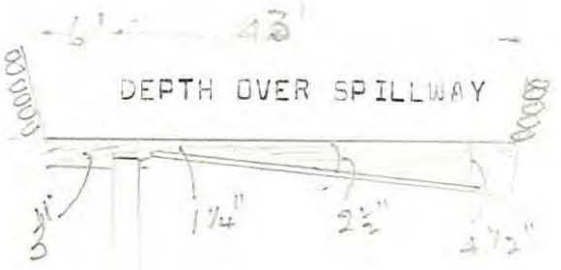
The Creek is a bit lower than recently- we have noticed this at the road crossing on D L 391, and a fellow at Chute Lake told us it had gone down since yesterday exposing part of the culvert.

We measured the water coming over the spillway- but hadn't a level to take the level further back where the water is still.

The wall is doing well, and there was no evidence of scouring around the ends; earth at the west end behind the log retaining wall had subsided and shd be attended to.

AJB





Copies to

s.22

s.22

Jack

Part 1 Page 38
FNR-2012-00301

GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO.....

.....

.....

FROM

.....

December 7 19 73

SUBJECT. Chute Creek & Lake

OUR FILE. D-9
0270042

YOUR FILE.....

MEMO TO FILES:

On December 4th, 1973 I chaired a meeting of the Chute Lake Waterusers, held at 10:00 A.M. in the Conference Room of the Court House Annex in Penticton. Present were s.22

I opened the meeting by drawing the attached chart of comparative elevations on the black board and advising them that Water Rights and Fish and Game Departments were prepared to experiment with the full use of the present 5 foot range. If winter kill of fish develops following years of full draw-down or if the licensees find that they need additional head at low water levels, then it would be necessary to prohibit the release of the bottom foot of developed storage and the licensees would have to reconsider raising the spillway level. I advised them that we were prepared to accept the present spillway width because the estimated maximum surcharge elevation would be lower than that proposed on the Wannop drawings. However, I stated, if it became necessary to raise the spillway level, the width would have to be increased correspondingly to maintain a safe maximum flood level under the railway trestle. It was unanimously agreed that the licensees would test the adequacy of operating the present works over the next five years, asfull development of their authorized irrigated areas proceeds. In this respect, it was noted that some areas proposed for development may prove unsatisfactory and the demand may reduce, for example, s.22 has determined that some of his soil is too shallow and his full development will likely be 4 - 5 acres rather than the licenced 10 acres.

They then discussed the cost-sharing formula and all agreed to the following proposition by s.22

1. The previously developed storage consisted of 3 ft. licenced storage (3X90 ≐ 272 ac.ft.) plus 6 inches for hydraulic drive, all shared by s.22 only.

2. The present storage of 5 feet, therefore, represents an increase of 1.5 X 90 ac. = 135 acre feet.

...../2

3. Divided on the new licence formula of 90 - 90 - 40 the new developed storage ratio and percentage of cost becomes:

Developed Storage

Licensee	Previous	Present	Total	%
s.22	180	55.35	235.35	58
	92	55.35	147.35	36
	.067 (Dom.)	24.30	24.97	6
Totals	272 (0.67)	135.0	407 (67)	100

This formula was agreed to by all licensees, with the understanding that in any given year, the actual storage impounded, if less than full, would be shared in the above ratio, regardless of priorities of the licences. It was also recognized that s.22 share is adequate for his full development, and he will not be likely to share in any future increase in storage.

The licensees also agreed that under the circumstances, the abutments constructed by s.22 represent a part of the increased storage structure and that cost should be included in the amount to be shared, as follows:

Abutments	$1249.00
1973 Repairs	3036.00
Total	$4275.00

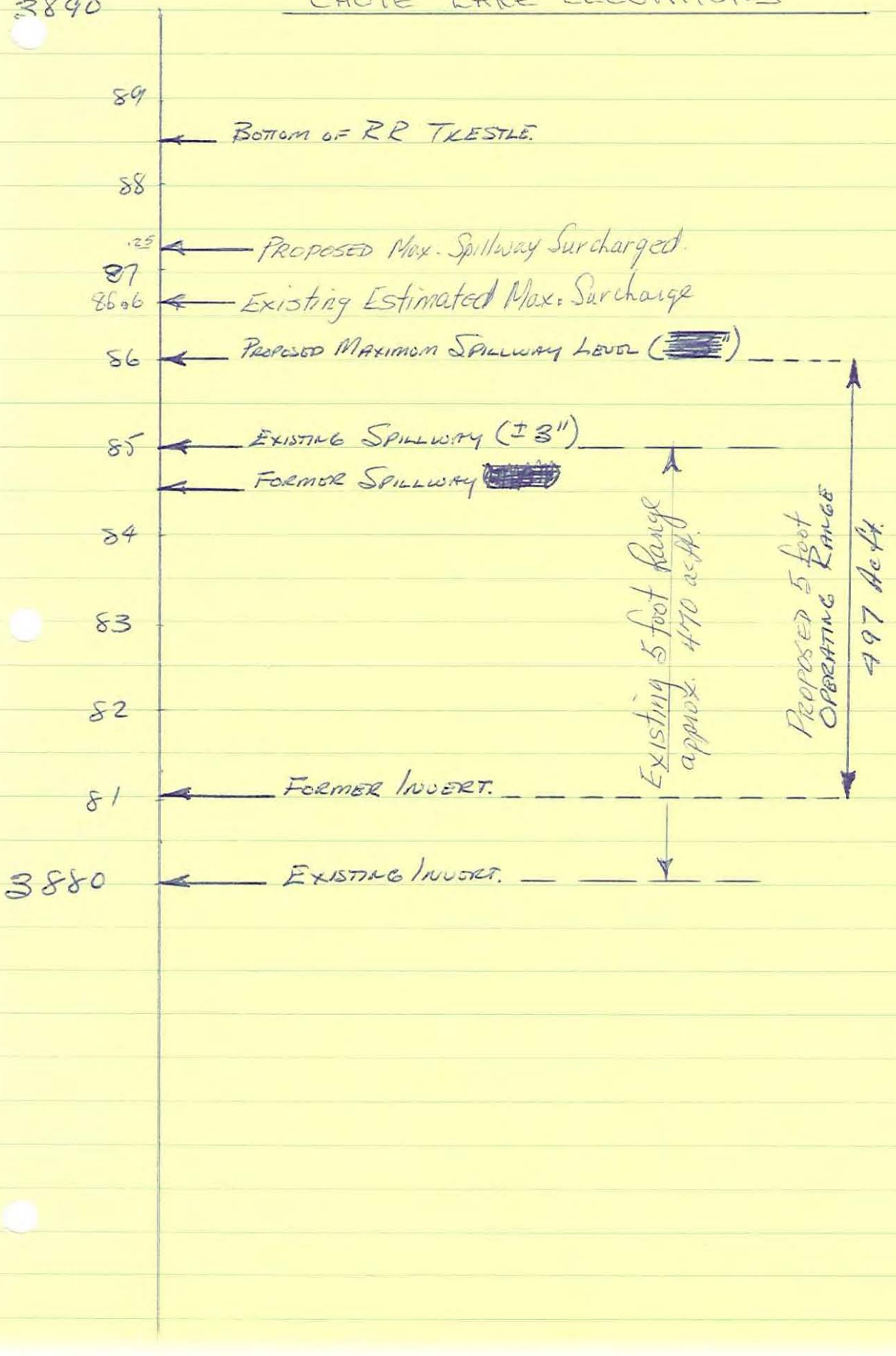
The licensees also agreed to share all costs of operation and maintenance on the same formula, except that when a work party is required for routine work, (Such as clearing brush and debris or digging out the channel), all licensees will participate or provide a participant. Routine trips for water regulation are to be charged at $10.00/trip. Bailiff for 1974 is to be s.22 or his agent, with s.22 to prepare to take over the duty, perhaps in 1975.

I left them to complete their financial arrangements and bookkeeping at 11.30 A.M.

JB:mea

J. Botham,
Technician.

Chute Lake Elevations



0270042
Dam file D-9
(Chute Lake)

1905 Kent Road
Kelowna
September 29, 1976

Hidden Bar Ranch Ltd.
1418 - 10025 Jasper Avenue
Edmonton, Alberta

Attention: Mr. Hu Harries

Dear Sir:

With reference to your letter of September 21, 1976 concerning extensions of time for Conditional Water Licences on Chute Lake to permit you to complete the re-construction of Chute Lake Dam to the maximum water level allowable, I have seatched our files and enclose copies of our notes concerning the maximum lefel to which Chute Lake Dam could be raised.

You will note that there appeared to be descrepencies in the elevation of the present structure on Chute Lake, however the controlling factor is the underside of the railway bridge at the arm of Chute Lake leading to the control dam.

We would request that you advise us when your work crew may be proceeding to the Chute Lake area so we may have a survey crew present to provide you with a bench mark so that you can complete the construction of the dam to its maximum allowable level.

Yours truly,

E. D. Anthony, P. Eng.
Regional Engineer

per: J. A. Botham
Technician

JAB/ls
Encl.

0202336

HIDDEN BAR RANCH LTD.

HEAD OFFICE:
1418-10025 Jasper Avenue
Edmonton Alberta
403-429-4317

RANCHES:
Uncas, Alberta
Naramata, B.C.
Stavely, Alberta

September 21, 1976

DEPARTMENT OF ENVIRONMENT
WATER RESOURCES SERVICE
SEP 29 1976
WATER RIGHTS BRANCH
KELOWNA, B.C.

Water Resources Service
Water Rights Branch
Department of Environment
KELOWNA, B.C.

ATTENTION: Mr. Botham

Dear Sirs:

RE: Conditional Water Licences 22672, 22673, 37424/5
Final Water Licences 10339 & 15978

On September 2nd, I dropped into your office and left the Applications for Extension of Time for the Conditional Licences respecting our property at Naramata.

At that time I indicated our desire to amend the Chute Lake Dam in accordance with what you indicated would be an acceptable standard.

I understood you wished to do some checking with respect to elevations. My neighbour, s.22 , indicated that the fall was a good time to fix the dam and I would be pleased to hear from you at your convenience.

Yours truly,

Hu Harries

HH/pf

cc: s.22

"JUST GOOD HORSES AND CATTLE"

ORDER

(Water Act, Sec. 15)

File No. [illegible]

The provisions of the British Columbia *Water Act* having been complied with and being satisfied that no person's rights will be affected, I hereby extend the time for the completion of the works and for making beneficial use of the water authorized under Conditional Water Licence No. [illegible] to the 31st day of December, 19[illegible].

A.K. Sutherland

[illegible]

Deputy Comptroller of Water Rights

O R D E R

W A T E R A C T

Section 15

WRB No. 0302856

In the matter of Conditional Water Licence 22673 which authorizes the storage of water from Chute Creek and the reservoir is Chute Lake for use as set out in Conditional Water Licence 22672.

Having determined the source of the water-supply was erroneously renamed in our Order of 21st September, 1972, and being satisfied that no person's rights will be injuriously affected I hereby amend Clause (a) of Conditional Water Licence 22673 to read as follows:

(a) The source of the water-supply is Ratnip Creek and the reservoir is Chute Lake.

Dated at Victoria, B.C. this 14th day of May, 1974.

A.K. Sutherland

A.K. Sutherland,
Deputy Comptroller of Water Rights.

WATER ACT

Section 13

File No. 0202356

The provisions of the B. C. Water Act having been complied with and being satisfied that no person's rights will be affected, I hereby extend the time for the completion of the works and for making beneficial use of the water authorized under Conditional Water Licence No. 22673, Chute (Lequime) Creek, to the 31st day of December, 19[illegible].

V. Rendell

V. Rendell,
Deputy Comptroller of Water Rights.

DATED at Victoria, B. C.,
this 30th day of December, 1958.

WATER RIGHTS BRANCH
LANDS DEPT.
JAN 12 1959
ENGINEER
KELOWNA, B. C.

W.R.B. 42

W.R.B. 13—5M-353-2622 (2)

PROVINCE OF BRITISH COLUMBIA

Water Rights

CONDITIONAL WATER LICENCE

s.22 of s.22

is hereby authorized to store water as follows:—

(*a*) The source of the water-supply is (Chute) Lake, in headwaters of (Chute) Creek.

(*c*) The date from which this licence shall have precedence is 3rd December, 1953.

(*d*) The purpose for which the water is to be used is as set out in Conditional Water Licence No. 22672

(*e*) The maximum quantity of water which may be stored is 150 acre feet per annum,

and such additional quantity as the Engineer may from time to time determine should be allowed for losses.

(*f*) The period of the year during which the water may be stored is 1st April to 15th June.

(*g*) The land upon which the water is to be used and to which this licence is appurtenant is as set out in Conditional Water Licence No. 22672

(*h*) The works authorized to be constructed are dam,

and they shall be located approximately as shown on the attached plan.

(*i*) The construction of the said works has already been commenced on or before the xday of , 19 , and shall be completed and the water beneficially used on or before the 31st day of December , 19 57 .

WATER RIGHTS BRANCH
LANDS DEPT.
OCT 5 1955
ENGINEER
KELOWNA, B.C.

I, A. G. Sargent, being a person appointed by the Minister to exercise the authority by Section 12 of the Water Act, stated in the Comptroller's hereby certify the foregoing to be a true copy of Conditional Licence No. 22673 issued under the hand of the Comptroller on the 1st day of September 1955

A. G. Sargent

A. . Paget.
Comptroller of Water Rights.

File No. 0207356 Date issued September 1st, 1955 Licence No. 22673

COPY FOR ENGINEER

ORDER

WATER ACT

Section 35

FILE NO. 0202356

IN THE MATTER of Conditional Water Licence 22673 which authorizes the storage of water in Lequine (Chute) Lake, the headwaters of Lequine (Chute) Creek for use as set out in the said licence, Water Licence 22672.

Having determined that the source of the water-supply has been renamed, and that an error was made on the plan attached to the said licence, in that works not authorized and improvement not specified have been shown, and being satisfied that no person's rights will be injuriously affected, I hereby amend the said plan to conform with the licence and clause (a) of Conditional Water Licence 22673 to read as follows:-

(a) The source of the water-supply is Chute Creek and the reservoir is Chute Lake.

Dated at Victoria, B.C., this 21st day of September, 1972.

A. K. Sutherland,
Deputy Comptroller of Water Rights.

Signature A K Sutherland

Date 21st Sept. 1972

Amended C.L. 22673
File 0202356

EXHIBIT "A"

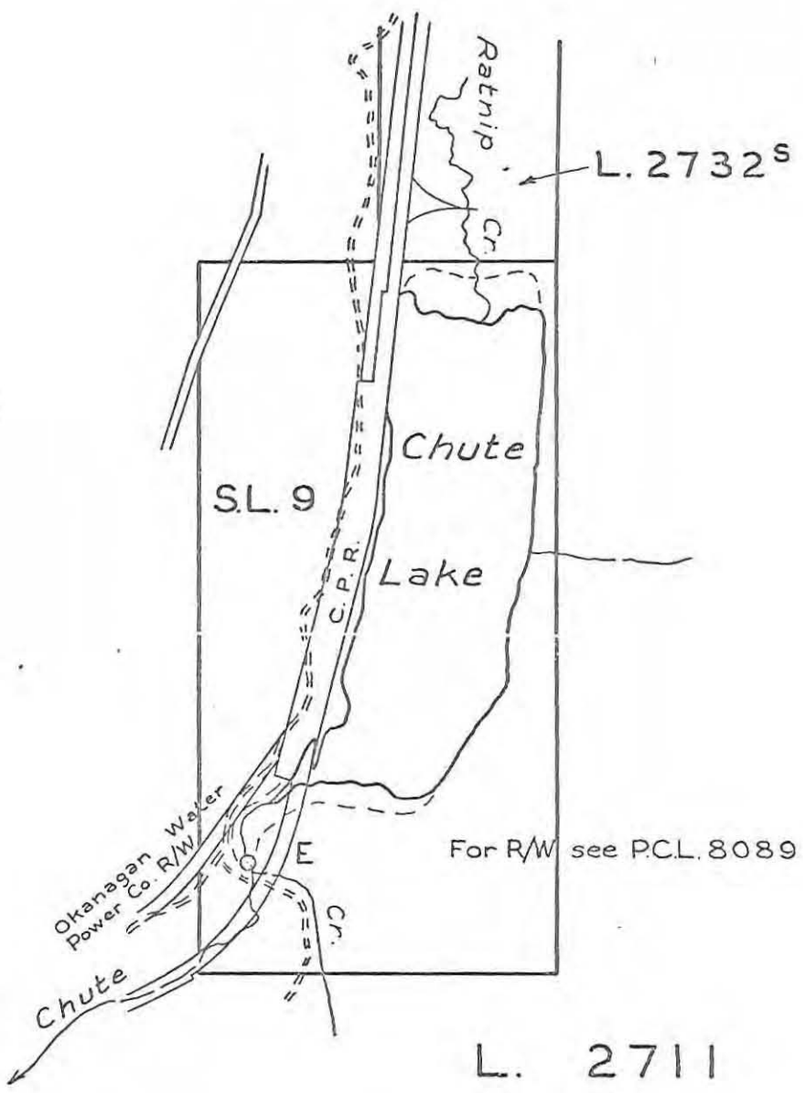
Penticton Precinct
For Diversion see Amended C.L. 22672

British Columbia

FAIRVIEW WATER DISTRICT

SIMILKAMEEN DIVISION OF YALE DISTRICT

Scale: 20 Chains to 1 Inch



LEGEND

Dam
W.R. Map 1562

Signature A K Sutherland

Date 21st Sept. 1972
Amended C.L. 22673
File 0202356

EXHIBIT "A"

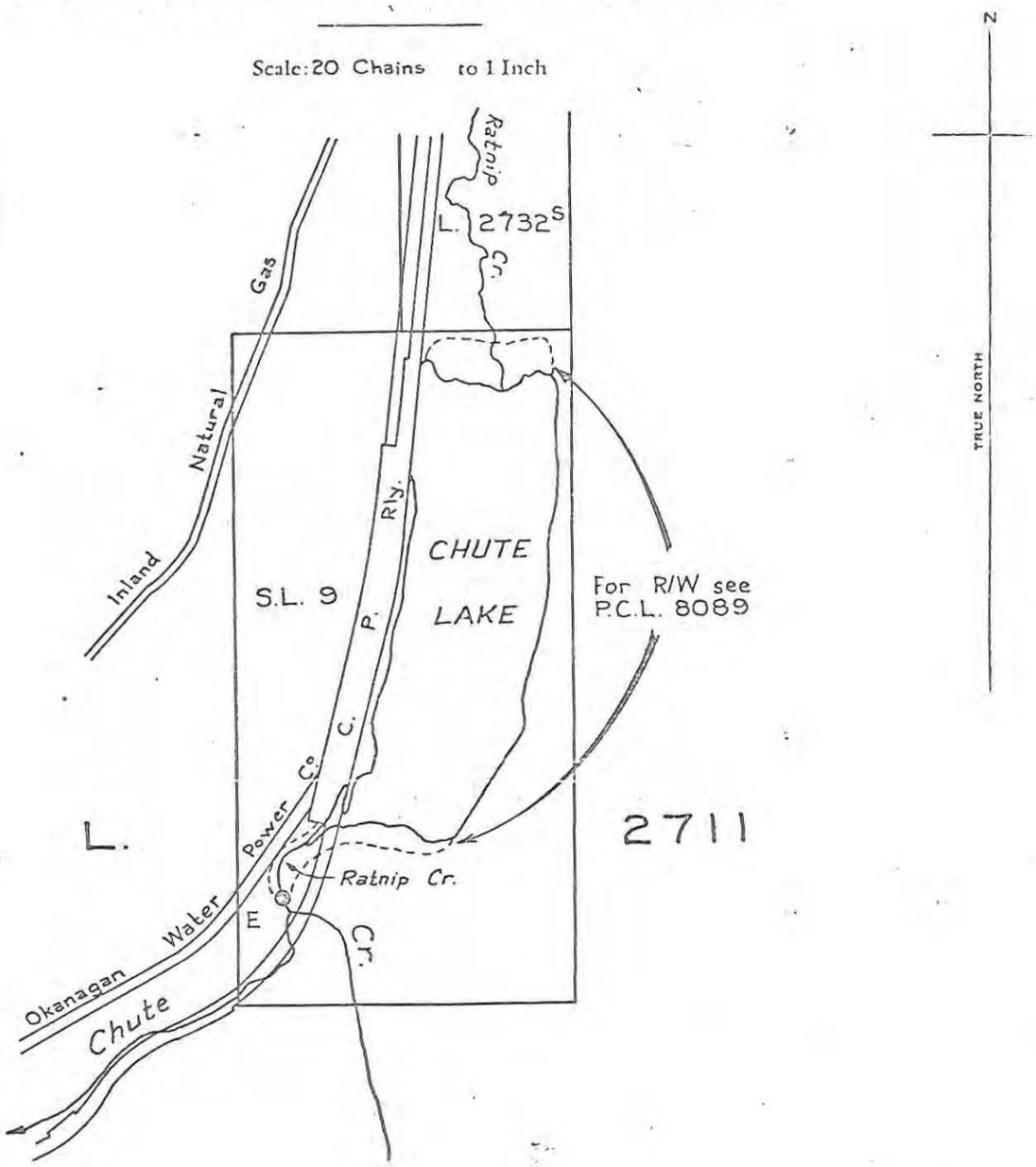
Penticton Precinct
For Diversion see Amended C.L. 22672

British Columbia

FAIRVIEW WATER DISTRICT

SIMILKAMEEN DIVISION OF YALE DISTRICT

Scale: 20 Chains to 1 Inch



LEGEND

Dam

W.R. Map 1562

Signature A K Sutherland

Date 14th May 1974.

Amended C.L. 22673

File 0202356

Precinct Penticton

300-273-1007

For Diversion see C.L. 22672

W.R.B. 13—5M-353-2622 (2)

PROVINCE OF BRITISH COLUMBIA

Water Rights Branch

DEPARTMENT OF LANDS AND FORESTS

CONDITIONAL WATER LICENCE

Roland E. Wresser of R.R. #1, Kamloops, B.C.

ORDER

WATER ACT

Section 15

FILE NO. 0202942

In the matter of Conditional Water Licence 22675, which authorizes the storage of water in Lequime (Chute) Lake, in headwaters of Lequime (Chute) Creek for use as set out in Conditional Water Licence 22674.

Having determined that the source of the water-supply has been renamed, and that an error was made on the plan attached to the said licence, in that works not authorized and appurtenant land not specified have been shown, and being satisfied that no person's rights will be injuriously affected, I hereby amend the said plan to conform with the licence, and clause (a) of Conditional Water Licence 22675 to read as follows:-

(a) The source of the water-supply is Ratnip Creek and the reservoir is Chute Lake.

Dated at Victoria, B.C., this 5th day of April, 1974.

A.K. Sutherland

A.K. Sutherland,
Deputy Comptroller of Water Rights.

Comptroller of Water Rights.

File No. 0202942 Date issued September 1st, 1955 Licence No. 22675

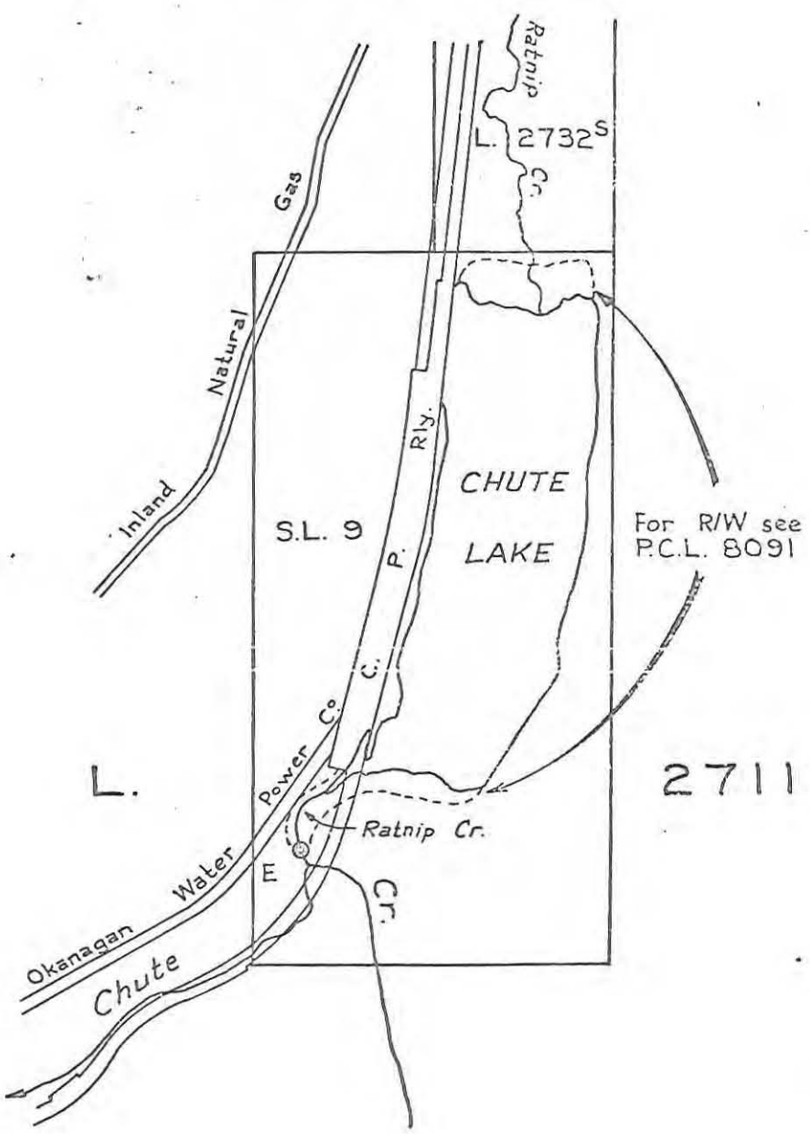
COPY FOR ENGINEER

British Columbia

FAIRVIEW WATER DISTRICT

SIMILKAMEEN DIVISION OF YALE DISTRICT

Scale: 20 Chains to 1 Inch



N

TRUE NORTH

LEGEND

Dam

W.R. Map 1562

Signature A.V. Sutherland

Date 5th Apr. 1974.

Amended C.L. 22675

File 0201942

Precinct Penticton

For Diversion see C.L. 22674

66-273-1007

WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
OFFICE OF THE REGIONAL ENGINEER

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

DEPT. FILE No.

LOCAL FILE No. D-9

DEPARTMENT OF ENVIRONMENT

1905 Kent Road
Kelowna , B.C.
V1Y 7S6
October 15, 1976

Mr. Hu Harries
Hidden Bar Ranch Ltd.
1418 - 10025 Jasper Avenue
EDMONTON, ALTA.

Dear Sir:

Re: Reservoir on Chute Lake

This letter is written to you with respect to your status and responsibilities as the holder of a water licence authorizing the construction and maintenance of control works for the purpose of storing water in a lake or reservoir.

As you know record precipitation occurred during this past summer. One of the results is that upon completion of the irrigation season many of the reservoirs in this region are still full. Groundwater levels in the higher elevations are also above normal. The potential, therefore, exists for serious flood conditions, if above average runoff occurs. Consideration should be given to drawing down the following reservoirs to that level below the full level which will still ensure the reservoir filling in the event of a below average snowpack this winter.

Chute Lake reservoir

If you require further advice or assistance, please do not hesitate to contact this office.

Yours truly,

E. D. Anthony, P. Eng.
Regional Engineer.

D. B. Lovdahl

DBL/jc

Per: D. B. Lovdahl, P. Eng.
Assistant Regional Engineer.

WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
OFFICE OF THE REGIONAL ENGINEER

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

DEPT. FILE No.

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1905 Kent Road
Kelowna . B.C.
V1Y 7S6
October 15, 1976

s.22

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E. D. Anthony, P. Eng.
Regional Engineer.

D. B. Lovdahl

DBL/jc

Per: D. B. Lovdahl, P. Eng.
Assistant Regional Engineer.

WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
OFFICE OF THE REGIONAL ENGINEER

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

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Yours truly,

E. D. Anthony, P. Eng.
Regional Engineer.

D. B. Lovdahl.

DBL/jc

Per: D. B. Lovdahl, P. Eng.
Assistant Regional Engineer.

D-7

s.22

26 OCT 1976.

Regional Engineer,
Dept: Lands, Forests and Water Resources
Water Resources Service
Water Rights Branch
1905 Kent Road KELOWNA B.C.
V1Y 7S6

Sir: CHUTE LAKE.

Pleased be advised that we opened the sluice and removed the beavers' building materials last Thursday.

Yours faithfully-

s.22

DEPT. FILE No. 0201942

LOCAL FILE No. Dam9

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

OFFICE OF THE DISTRICT ENGINEER
DEPARTMENT OF LANDS, FORESTS, AND WATER RESOURCES
WATER RESOURCES SERVICE
WATER RIGHTS BRANCH

1905 Kent Road,
Kelowna, B.C.
V1Y 7S6
August 6, 1974

s.22

s.22

s.22

Dear Sirs:

Re: Chute Lake Dam

On July 24th, 1974 a member of my staff inspected your storage dam on Chute Lake. Attached is a copy of the Inspection Report.

It is requested that consideration be given to the modifications requested in the remarks section of this report. It is anticipated that we will install a gauge plate on your storage dam some time this fall.

Yours truly,

E.D. Anthony, P.Eng.,
Regional Engineer.

EDA:mcc
Encl.

C.C. Comptroller, Water Rights Branch,
Victoria, B.C.

DAM INSPECTION REPORT
WATER RESOURCES SERVICE

CHUTE LAKE .....Reservoir D- 9..... DATE July 24, 1974

C.W.L.
F.W.L. MANY ..... File No. 0201942...

Licensee .. s.22 .....

WATERSHED			RESERVOIR		
1.	Snow Cover	.....inches	6.	Freeboard	3.25...feet
2.	Snow Patches	.....	7.	Water Level	5.2...feet
3.	Saturated	.....	8.	Outlet Discharge	0.....cfs
4.	Wet	.....	9.	Spillway Discharge	1....cfs est.
5.	Dry	X.....			

(Note: Items marked X require attention - See Remarks)

EMBANKMENTS Good			OUTLET WORKS Good		
10.	Growth	.....	30.	Gate	.....
11.	Upstream Slope	.....	31.	Sluice	.....
12.	Crest	.....	32.	Submerged	.....
13.	Downstream Slope	.....	33.	Walls	.....
14.	Downstream Toe	.....	34.	Stilling Basin	.....
15.	Rip Rap	.....	35.	Toe Drain	.....
16.	Seepage	.....	36.	Channel	.....
17.	Erosion	.....	37.	Weir	.....
18.	Sloughing	.....	38.	Erosion	.....
19.	Boils	.....	39.	Seepage	.....
GATE WORKS			SPILLWAY OK		
20.	Accessibility	X.....	40.	Boom	.....
21.	Wheel	.....	41.	Entrance	.....
22.	Threads	.....	42.	Walls	.....
23.	Pedestal	.....	43.	Sill	.....
24.	Stem Guides	.....	44.	Apron	.....
25.	Stem	.....	45.	Channel	.....
26.	Gate	.....	46.	Growth	.....
27.	Grill	.....	47.	Erosion	.....
28.	Boom	.....	48.	Seepage	.....
29.	Gauge	...X...	49.	Debris	.....

REMARKS: (Refer above)

20. West concrete abutment is the lowest section - should be raised to provide easy access to gate during high water time.

29. We should provide and install a gauge plate.

Signed: [signature]

NOTE TO LICENSEE:-Section 18(1) of the Water Act states: "Every licensee and person who has obtained approval under Section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use, or operation of the licensee's works."

Jack D.
Ole.

340 333

FILE NO. 340 333

DATE

TIME

TELEPHONE/OFFICE INQUIRY

CALLING PARTY s.22 PHONE NO. s.22

SUBJECT Chute Lake Dam.
Proposed diversion at Chute Lake.

both have S.U.P cabins near lake which will be flooded if the dam 6-8 inches. s.22 s.22 s.11 Dated. s.7. 1961. raises

Please advise them of proposal

ACTION TAKEN by letter — After Survey

Have elevation of cabins

SIGNED

s.22

18 MAR 1977.

The Regional Engineer,
Water Resources Service,
Dept., of the Environment,
1905 Kent Road,
KELOWNA B.C.

Dear Sir: Local file - Dam file D-9 (Chute Lake)

Regarding your letter to Dr Harries and dated Sept 29, it is a pleasure to have to report that we are unable at the moment to proceed with the fieldwork owing to the snow. However, Mr Podsun has promised to come down when circumstances permit and advise- after doing some fielwork- on the proposed heightening of the dam wall.

Yours faithfully-

s.22

c.c. s.22

Dr Hu Harries
1418- 10025 Jasper Avenue
Edmonton, ALBERTA

s.22

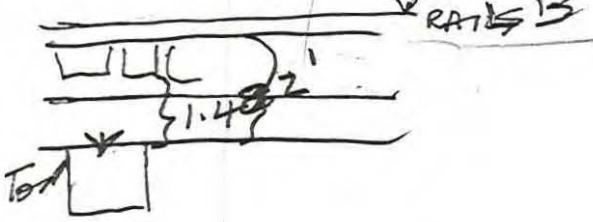
NOTE: This set of notes is derived from B.M. on TRESTLE

May 30 '97

s.22

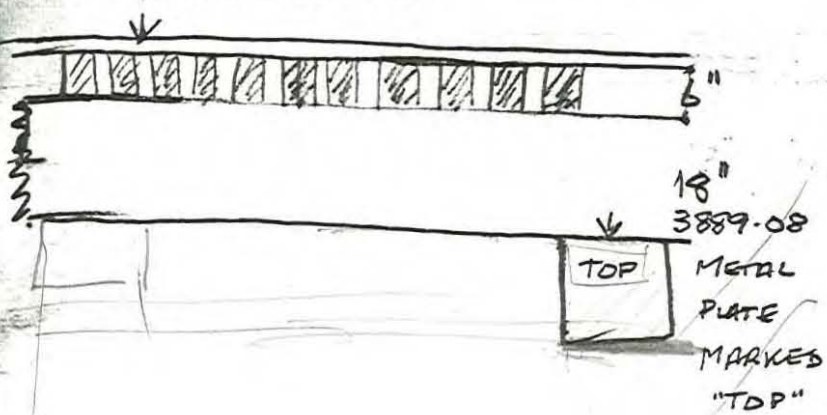
	1.66	92.66		3891.01	B.M. Bottom of Spike on Log
			1.98	90.78	El. of Top of West Rail @ X-ing @ L.C.F.S. Road
			3.75	88.91	Bottom of TRESTLE
			1.78	90.66	Top of East Rail @ X-ing of B.C. F.S. Road
			7.80	84.86	Top of East Abutment
			3.52	89.14	Shot on Top of East Abut. Wall
			6.4	86.25	R. Set Nail in 12" Fir 50 Feet East of C.L. near East
			4.01	85.65	High Point on Large Boulder Abutment
			7.57	85.09	Top of West Abutment
	6.04	96.82		3890.78	Top of West Rail @ F.S. Road
P	2.59	94.41	5.00	91.82	
P	2.96	92.66	4.71	89.70	
			2.25	90.41	Shot on Wood (Wedge)
			4.42	86.24	Set on Wood (East)
			7.31	85.35	El. of Water

BRIDGE 106.85



VIEW OF BRIDGE 106-85 FROM W

RAIL "B". 3891.54.



2.41

VICTORS THEORY – (ON WAY HOME)

THAT W/R REALISED HOW UNNECESSARY A 150' SPILLWAY WOULD BE & ACCEPT THE ~~150~~ 50' SPILLWAY UP TO NEW LEVEL OF 3886.00.

SPILLWAY → 3886.00

INVERT → 3880.50

RANGE 5.50' x 90 495 ACFT

[RAIL A → RAIL B = 450' Δ LEVEL .54.
∴ OVER 50' Δ LEVEL WD BE .06']

MAR 7 1977 1350 → 1550 HRS

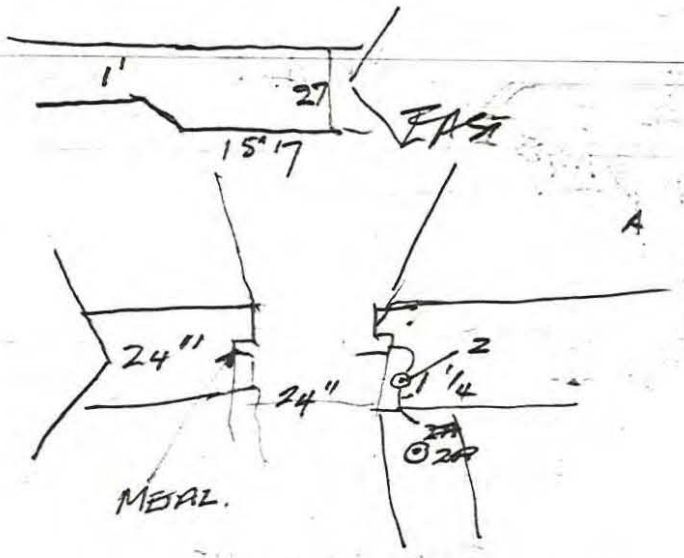
(NEW 25) (16" OF SNOW.)

28 → 29 50'

NEW 3" NR TREE (33-34 48)

1.	7.30				3885.06	
2	6.95		0.35		3885.41	.44
3	7.46			.51	3884.90	.92
4	4.04		3.42		3885.32	.34
CP	7.23	5.40		1.36	3885.96	.99
RAIL	5.10	3.19	4.04		3891.00	
TOP	7.02			1.92	3889.08	
RAIL B	4.98	4.56	2.46		3891.54	
TOP	7.48			2.50	3889.04	
R A	3.21	5.51	1.97		3891.01	.00
CP	5.78	7.20		3.98	3887.03	6.99
4	4.45		1.33		3888.36	
3	7.88			3.43	3884.93	
2	7.34		.54		3885.47	
WATER	10.27			2.93	3882.54	
METAL	7.35		2.92		3885.46	
2A	7.37			.02	3885.44	
0	4.99		2.38		3887.82	
1		7.74		2.75	3885.07	.06
			19.41	19.40		

50' 43'85 41'8"



-4.96 TO INVERT 3880.50

2A

C 103.6

FINAL 3886.00

Z. 85.44

Δ. .56

6.72"

CHUTE LAKE DAM -

(B.M. REFERENCE: TOP OF ~~WESTERN~~ 1977 C.P.R. RAIL AND CENTRE LINE OF FORESTRY ROAD WHICH PASSES IMMEDIATELY BELOW THE DAM)

ELEVATIONS. 1977.
MAR 7 '77 OBSERVATIONS ON C.P.R. TOP RAIL AS B.M.

9 ← BOTTOM RR TRESTLE 89.04

8 -

7 ← PROPOSED MAX SPILLWAY SURCHARGE 87.25

6 -

5 ← 1973 WALL - WEST END 85.06 85
← 1973 EAST END 84.92

4 -

3 -

2 -

1 -

← 1973 INVERT 80.50

30 -

ELEVATIONS 1973

90 -

89 - ← BOTTOM OF RR TRESTLE 88.5

88 -

87 -

86 - PROPOSED MAXIMUM SPILLWAY LEVEL 86

85 - EXISTING SPILLWAY

84 -

83 -

82 -

81 -

80 - EXISTING INVERT.

CHUTE CREEK RANCH:

IRRIGABLE LANDS (JUNE 1974)

APPLES	15 Ac
PASTURES	17
GRAZING	66
OTHER	21
	119 Ac.

AT 48" / ACRE WE REQUIRE 452 AC FT

LICENCE NO	PRIORITY	SOURCE	QUANTITY	PUR	DIVERSION / STORAGE
22674	1953	CH CREEK	115 AC FT	DL 212 46 Ac.	
22675	1953	CH LAKE			92 A/F
37427	1968	CH CREEK	90 A.F.	DL 212	90 A/F
34428	1968				
	SEP. 1976	APPLIC'N FOR	200 AC FT.		
			405		

D-9
0277541
0340333

1905 Kent Road,
KELOWNA
V1Y 7S6

May 20, 1977

s.22 & s.22

Dear Sirs:

Re: Proposed raising of Chute Lake Dam

This letter is in response to your telephone call expressing concern at the proposed raising of Chute Lake Dam, by s.22 et. al.

Licences were issued in 1971 authorizing an increase in storage level to an elevation equal to 30 inches below the underside of the railway bridge across the outlet channel, with the consent of the Canadian Pacific Railway and following a field inspection which determined that none of the existing nore Special Use Permits around the Lake would be flooded. The Dam was partially reconstructed during the fall of 1973 to an elevation about 6 inches below the Licenced level, with a construction joint to permit a later increase to that maximum level.

These Licences are still valid and the proposed increase is thereby authorized, however we have requested our Dam Inspector, Mr. U.O. Podzun to contact you during his next inspection trip to Chute Lake Dam, when he will check the relative elevations of the existing dam, proposed water level and your cabins and Special Use Permits.

s.22 has filed a further Application #0340333 for an additional 200 acre-feet (which represents about 2 feet increase in Lake elevation) to establish his priority in case the Canadian Pacific Railway abandon the Railway right-of-way. This Application may be held in abeyance for a time but we would suggest that you forward written comments for that File.

.....2

s.22 & s.22

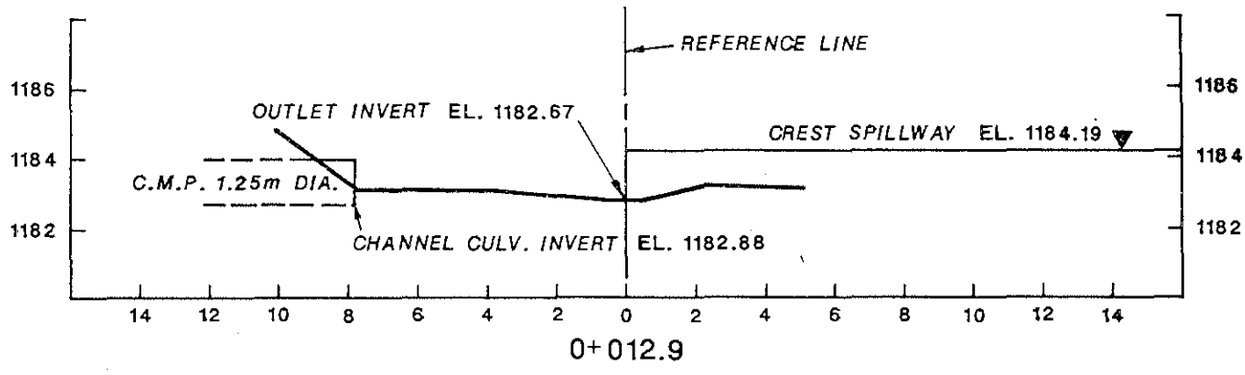
If we can be of further assistance, please do not hesitate to contact this Office.

Yours truly,

J.E. Farrell, P. Eng.,
REGIONAL ENGINEER.

JAB/mk

per: J.A. Botham,
Technician.



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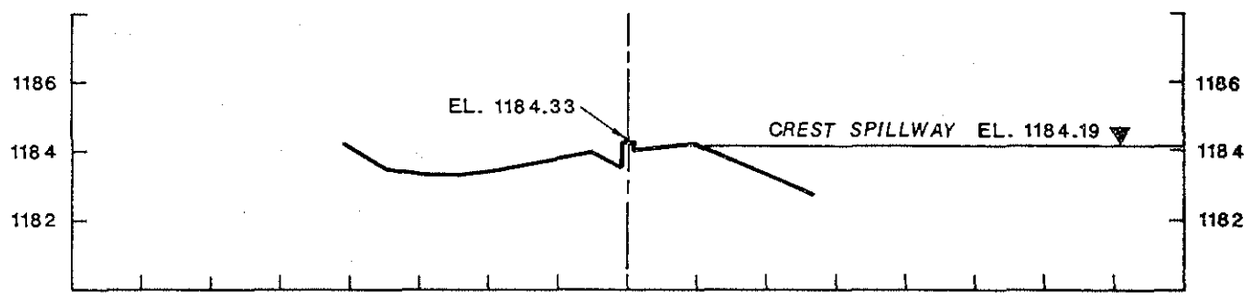

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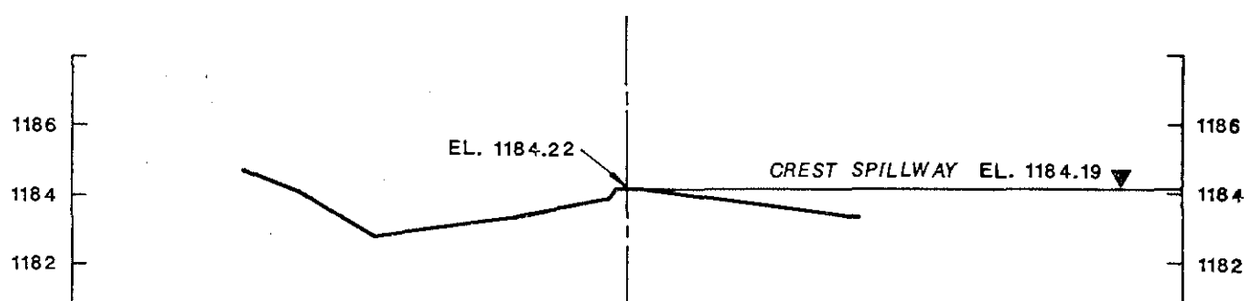

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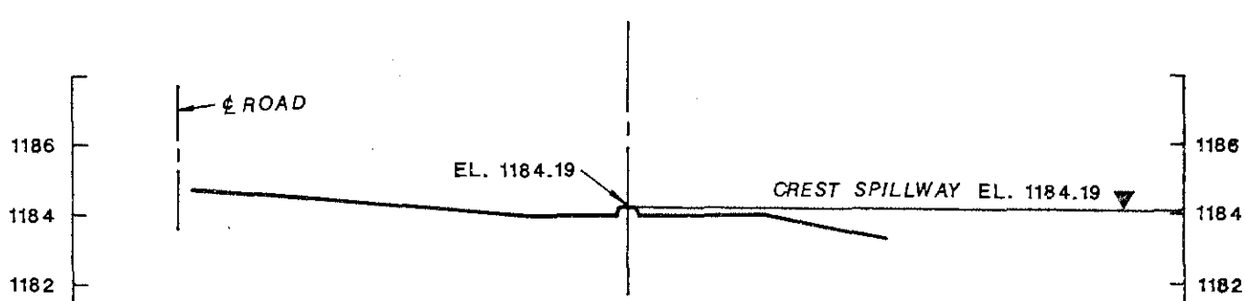

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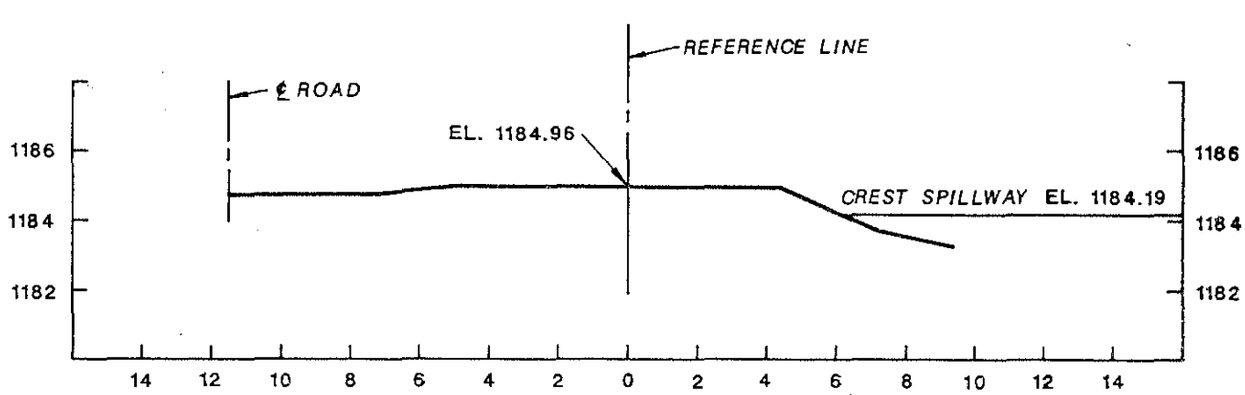


−0+004.7

CHUTE LAKE
CROSS SECTIONS OF DAM

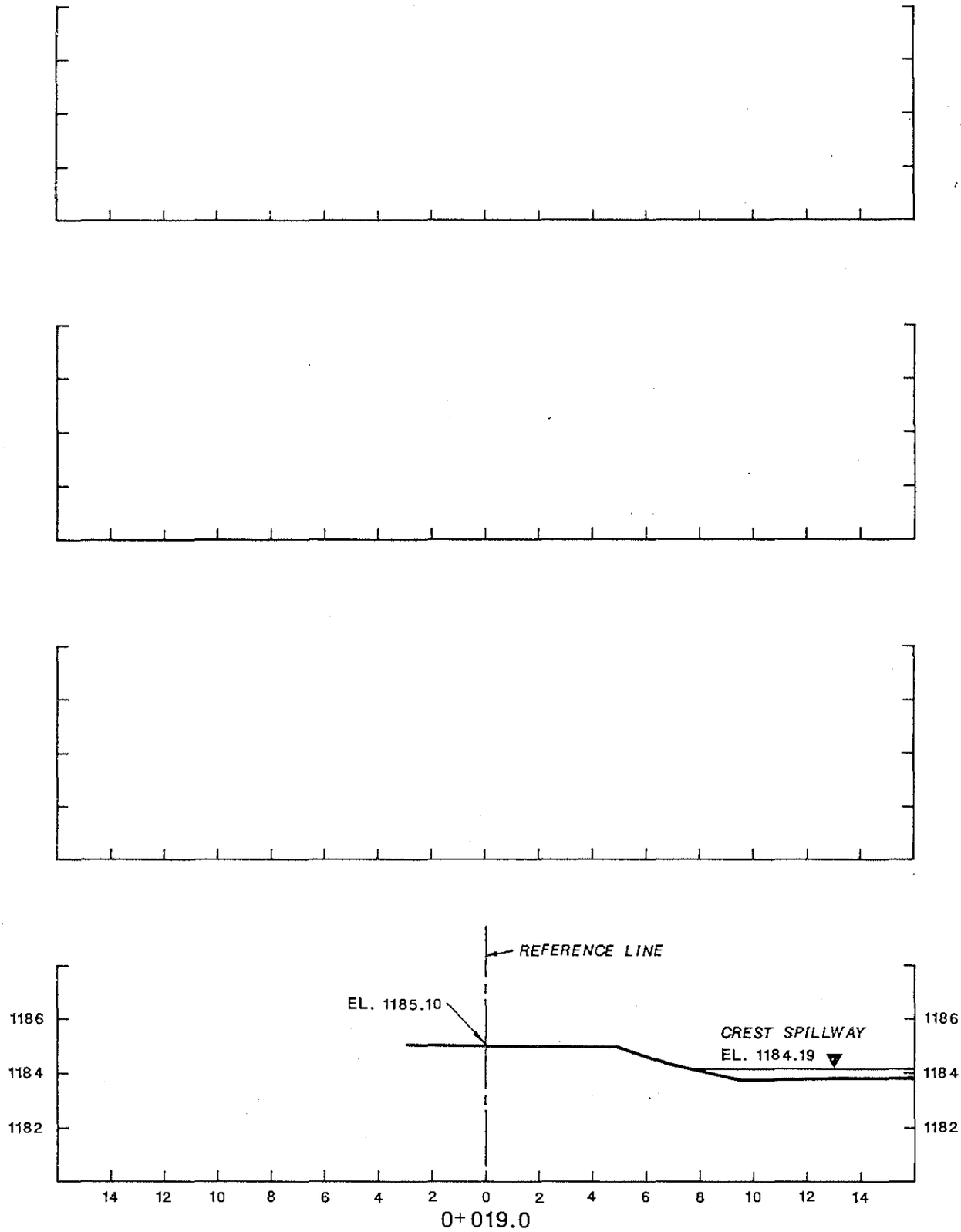
SCALE HORIZONTAL 1:200
VERTICAL 1:200

ELEVATION IN METRES – GEODETIC DATUM

DATE : FEB.1988 PAGE 1 OF 2

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION



CHUTE LAKE
CROSS SECTIONS OF
DAM

SCALE HORIZONTAL 1:200
VERTICAL 1:200

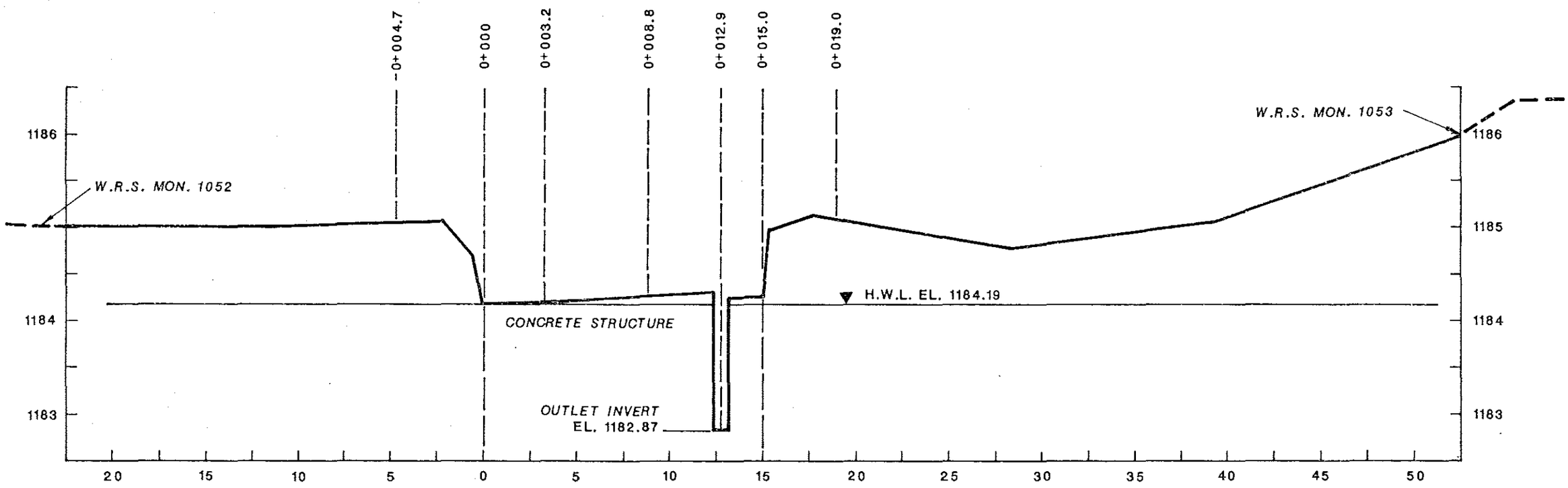
ELEVATION IN METRES - GEODETIC DATUM

DATE : FEB.1988 PAGE 2 OF 2

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION

Part 1 Page 69
FNR-2012-00301



CHUTE LAKE
LONGITUDINAL SECTION
OF
DAM AND SPILLWAY

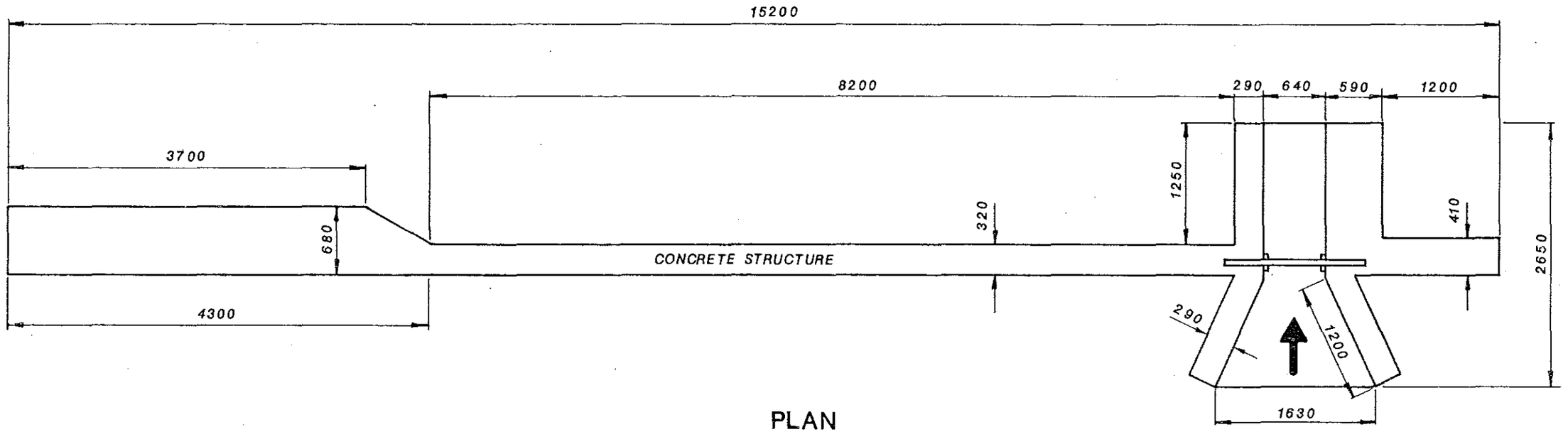
SCALE
HORIZONTAL 1:250 VERTICAL 1:50

ELEVATION IN METRES — GEODETIC DATUM

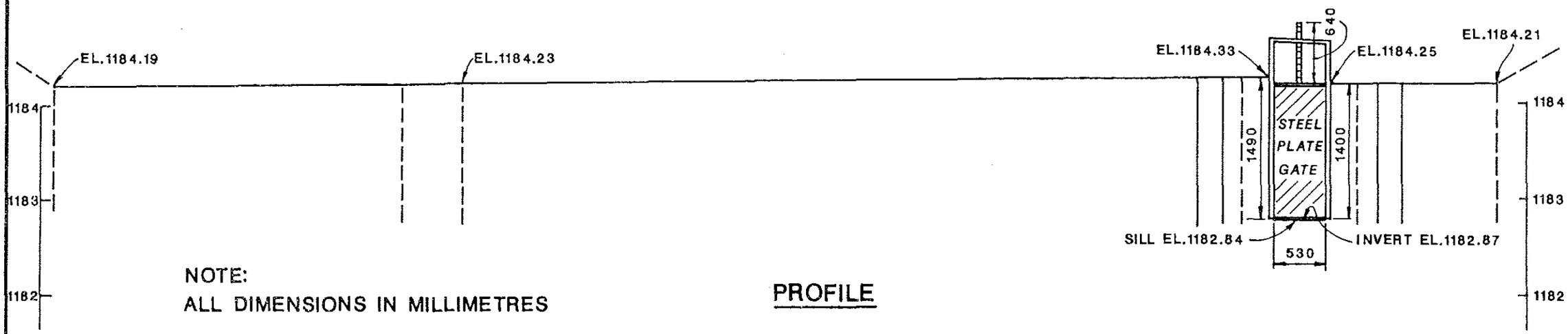
DATE : FEB.1988

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

G. P. Schubert
HEAD, SURVEYS SECTION



PLAN



NOTE:
ALL DIMENSIONS IN MILLIMETRES

PROFILE

Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

CHUTE LAKE RESERVOIR
DAM AND SPILLWAY STRUCTURE

SCALE: VERT. 1 : 50
HOR. 1 : 50

DATE
APR. 1988

R. R. Schubert

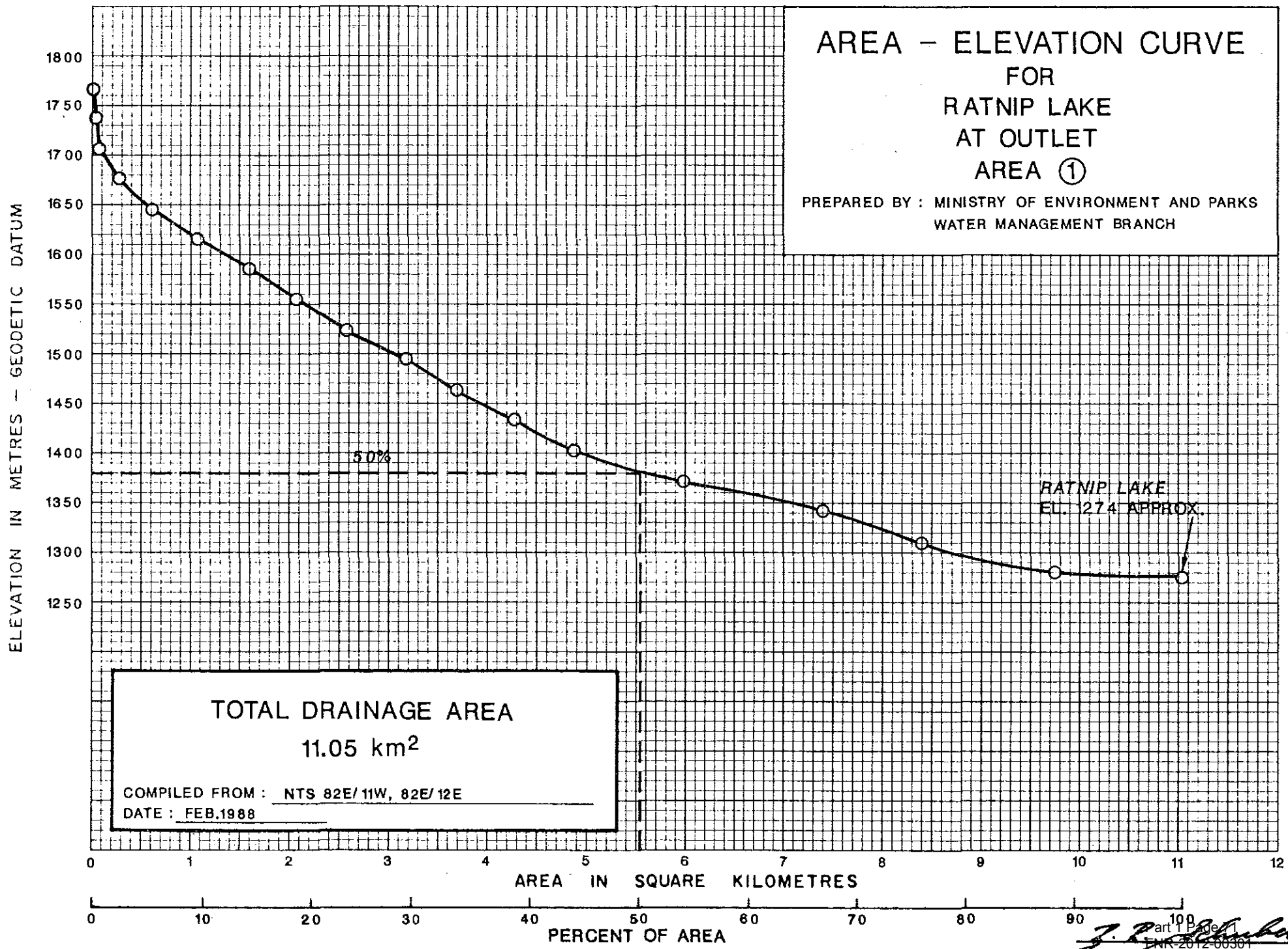
FILE No. _____ DWG No. NR-2012000601

4567 9C

VANCAL - 10283

AREA – ELEVATION CURVE
FOR
RATNIP LAKE
AT OUTLET
AREA ①

PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH



TOTAL DRAINAGE AREA
11.05 km²

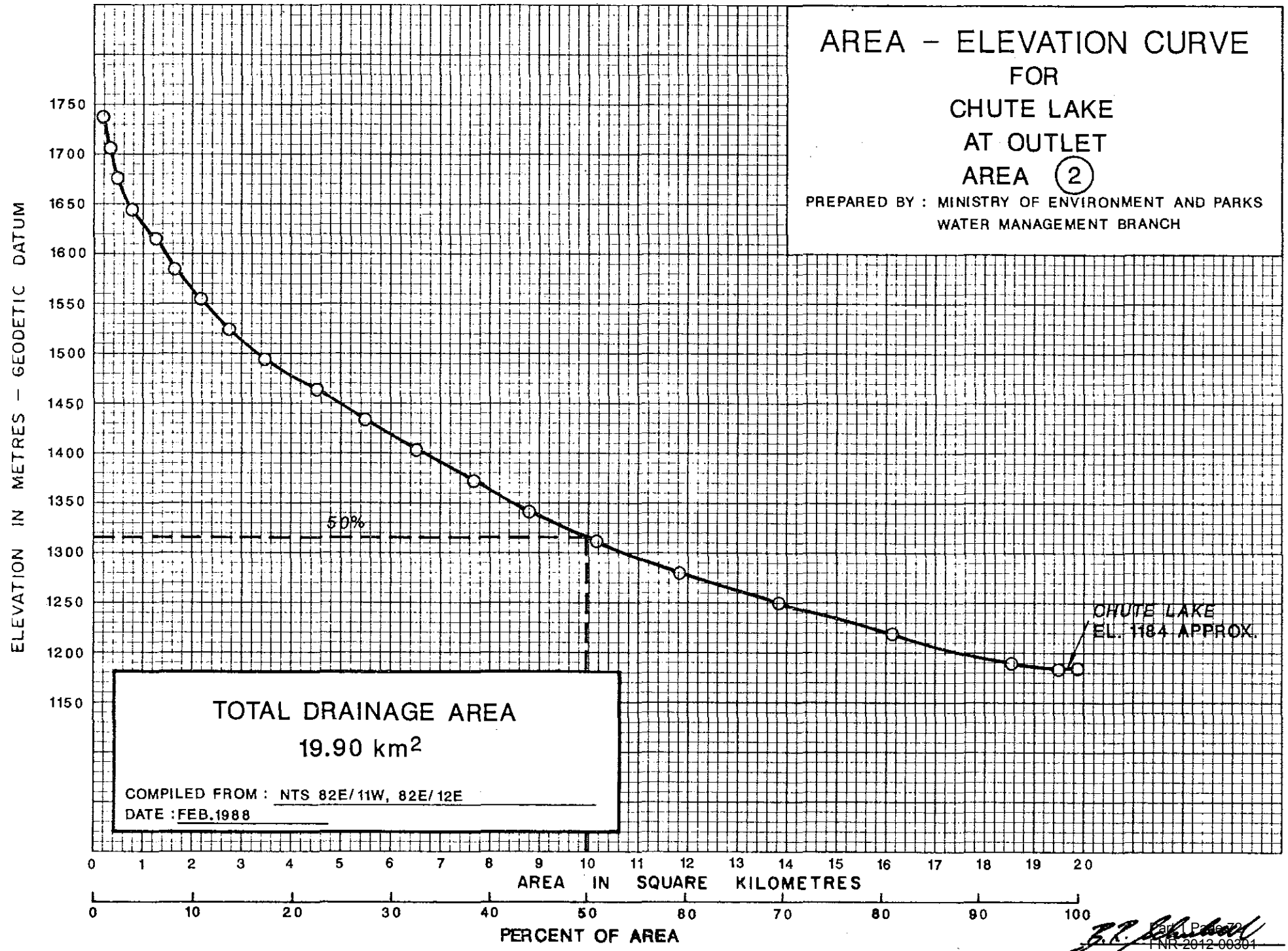
COMPILED FROM : NTS 82E/11W, 82E/12E
DATE : FEB.1988

HEAD, SURVEYS SECTION

Part 1 Page 1
ENR-2012-00301

AREA – ELEVATION CURVE
FOR
CHUTE LAKE
AT OUTLET
AREA (2)

PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

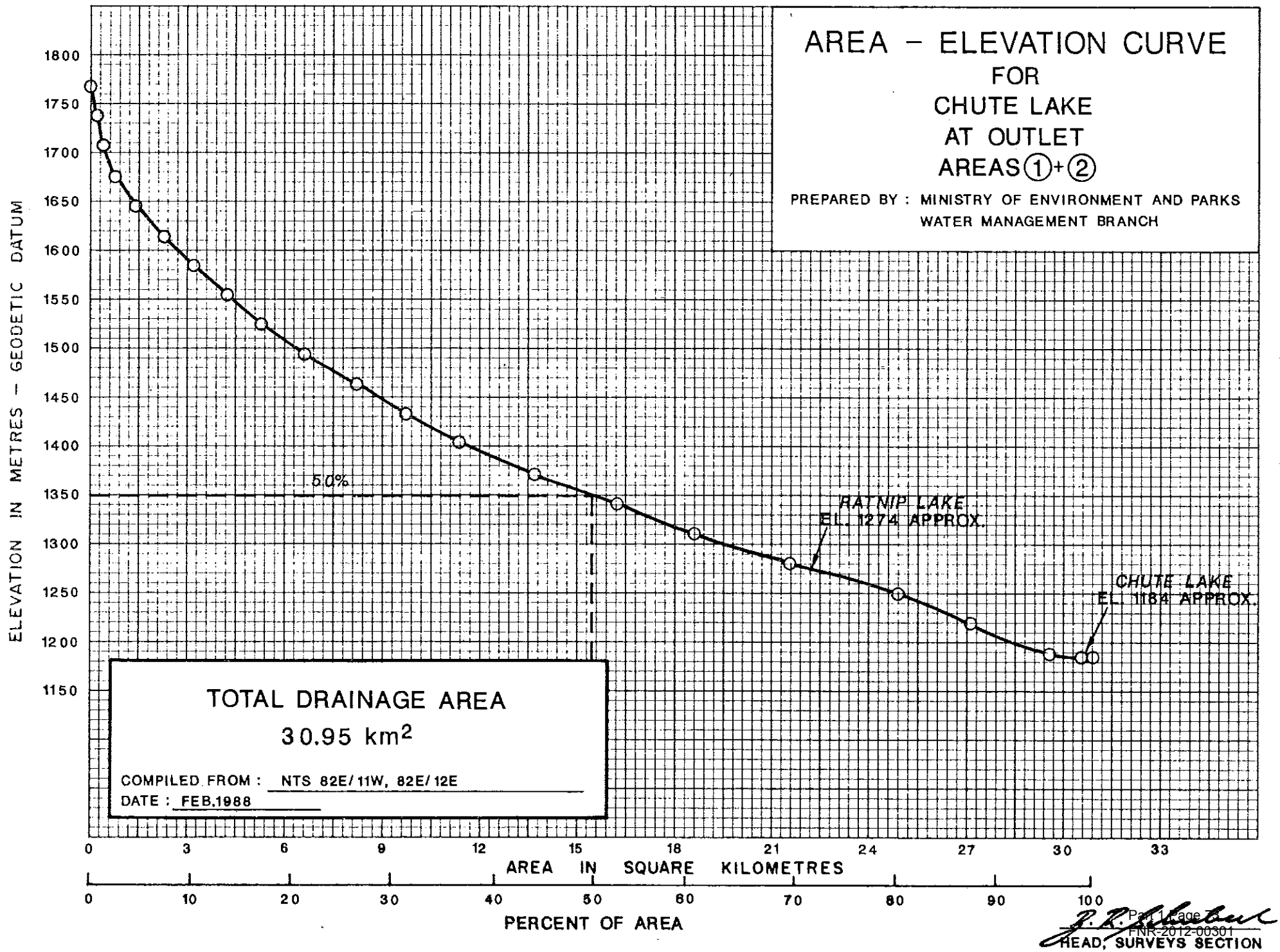


TOTAL DRAINAGE AREA
19.90 km²

COMPILED FROM : NTS 82E/11W, 82E/12E
DATE : FEB. 1988

E. E. Schubert
HEAD, SURVEYS SECTION

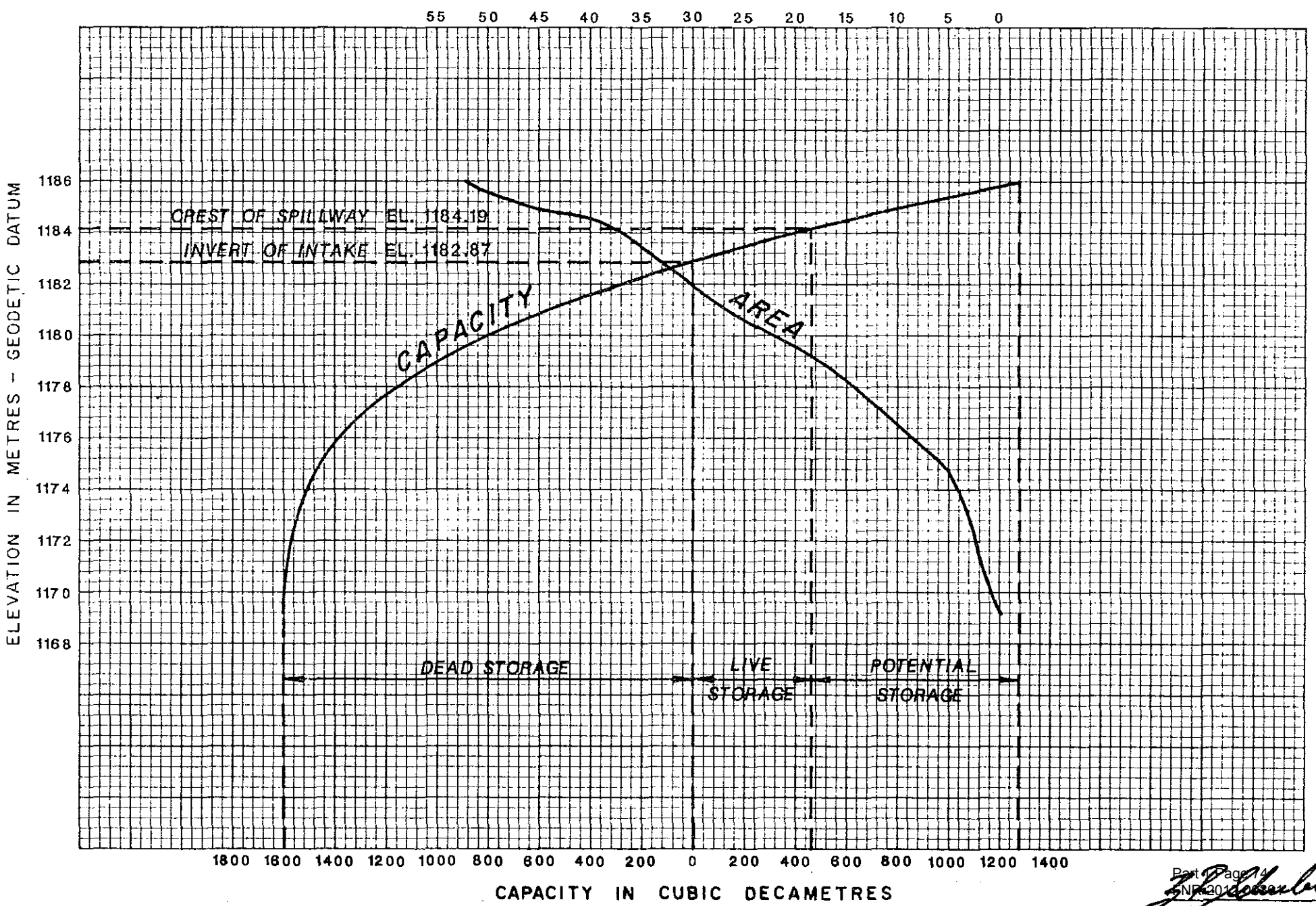
Part 1 Page 22
FNR 2012-00301



Part 1 Page 1
FNR-2012-00301

STORAGE CAPACITY AND AREA CURVES

CHUTE LAKE (Invert As Control)



PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS, WATER MANAGEMENT BRANCH

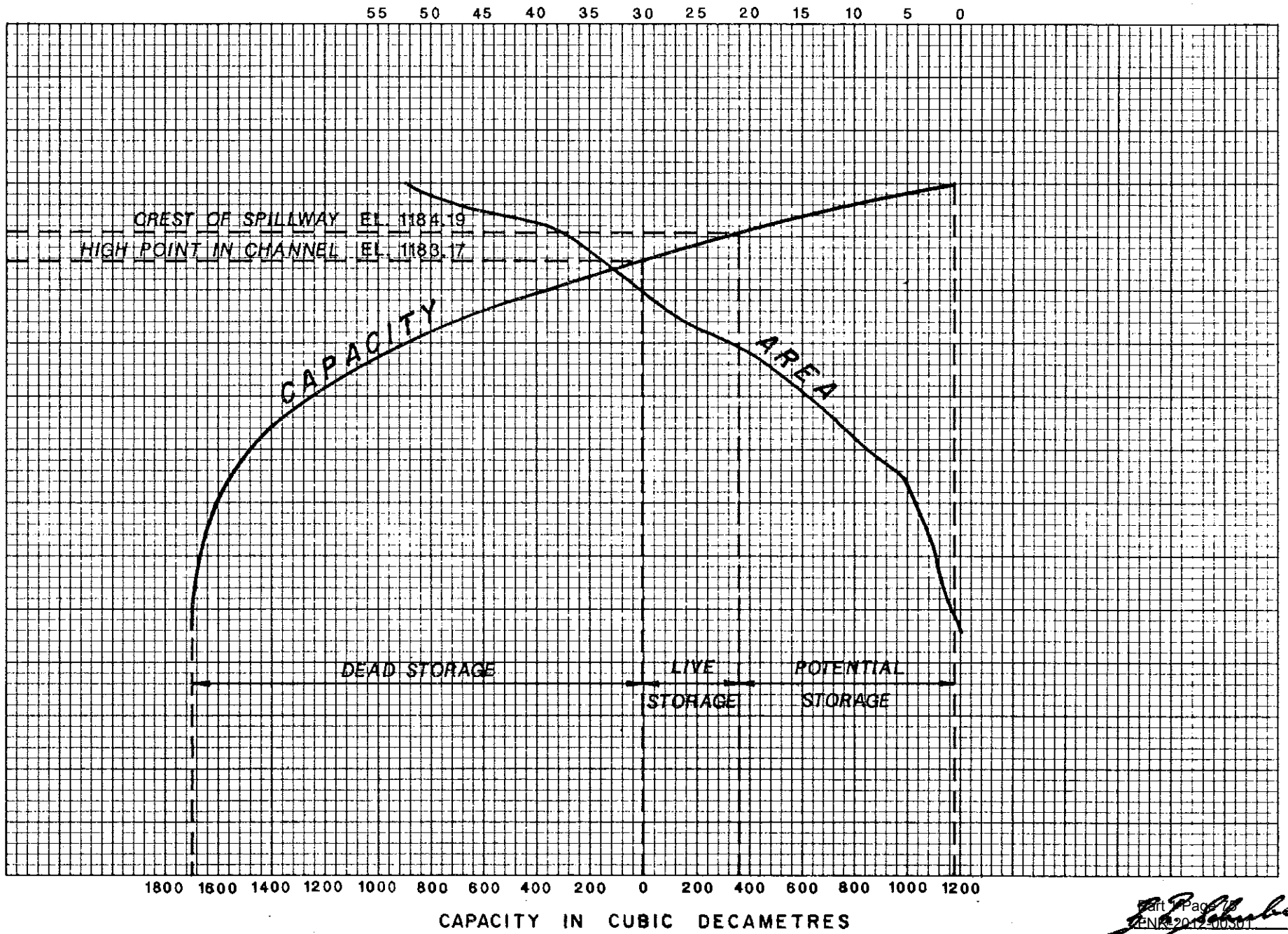
DATE : APRIL 1988

HEAD, SURVEYS SECTION

Part 4 Page 14
SNR 2011

STORAGE CAPACITY AND AREA CURVES

CHUTE LAKE (High Point As Control)



PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS, WATER MANAGEMENT BRANCH

DATE : APRIL 1988

HEAD, SURVEYS SECTION

Part 7 Page 78
ZENR-2012-00301

STORAGE CAPACITY TABLE

Chute Lake (Invert as Control)

MAPPING DATA			STORAGE CAPACITY				REMARKS
CONTOUR ELEVATION		Area In Hectares	Depth of Storage In Metres	Area In Hectares	STORAGE IN DECAMETRES^3		
Geodetic Datum	Local Datum				Net	Gross	
1169.2		0.01	-13.67			1601	Low Point in Lake
					0.2		
			-13.5	0.19		1601	
					2.5		
			-13.0	0.71		1598	
					1.0		
1170.0		0.85				1597	
					3.8		
			-12.5	1.18		1593	
					7.0		
			-12.0	1.63		1586	
					2.2		
1171.0		1.75				1584	
					6.8		
			-11.5	1.94		1577	
					10		
			-11.0	2.20		1567	
					2.9		
1172.0		2.27				1564	
					8.9		
			-10.5	2.54		1555	
					13		
			-10.0	2.91		1542	
					3.8		
1173.0		3.00				1538	
1173.0		3.12					
					12		
			- 9.5	3.53		1526	
					19		
			- 9.0	4.09		1507	
					5.4		
1174.0		4.24				1502	
					17		
			- 8.5	4.60		1485	
					24		
			- 8.0	5.09		1461	
					6.7		
1175.0		5.22				1454	
					22		
			- 7.5	6.53		1432	
					37		
			- 7.0	8.29		1395	
					11		
1176.0		8.75				1384	
1176.0		8.85					
					35		
			- 6.5	9.75		1349	
					51		
			- 6.0	11.0		1298	
					15		
1177.0		11.3				1283	
1177.0		11.4			44		
			- 5.5	12.5		1239	
					66		
			- 5.0	14.0		1173	
					18		
1178.0		14.4				1155	
					56		
			- 4.5	15.5		1099	
					82		
			- 4.0	17.0		1017	
					22		
1179.0		17.4				995	
					67		
			- 3.5	18.8		928	
					99		
			- 3.0	20.8		829	
					27		
1180.0		21.3				802	
					83		
			- 2.5	23.4		719	
					124		
			- 2.0	26.2		595	
					34		
1181.0		26.9				561	
					102		
			- 1.5	28.1		459	
					28		
			- 1.4	28.4		431	
					29		
			- 1.3	28.8		402	
					29		
			- 1.2	29.1		373	
					29		
			- 1.1	29.4		344	
					30		
			- 1.0	29.8		314	
					30		
			- 0.9	30.1		284	
					9.0		
1182.0		30.2				275	
					21		
			- 0.8	30.4		254	
					31		
			- 0.7	30.7		223	

DEAD STORAGE

STORAGE CAPACITY TABLE

Chute Lake (Invert as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area In Hectares	Depth of Storage In Metres	Area In Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
			- 0.6	31.1	31	192	DEAD STORAGE
			- 0.5	31.4	31	161	
			- 0.4	31.7	31	130	
			- 0.3	32.1	32	98	
			- 0.2	32.4	32	66	
			- 0.1	32.7	33	33	
1182.87			0.0	33.1	33	0	Invert of Intake
			0.1	33.4	33	33	
1183.0		33.5			10	43	
			0.2	33.7	24	67	
			0.3	34.0	34	101	
			0.4	34.4	34	135	LIVE STORAGE
			0.5	34.7	34	169	
			0.6	35.0	35	204	
			0.7	35.3	35	239	
			0.8	35.6	36	275	
			0.9	35.9	36	311	
			1.0	36.2	36	347	
			1.1	36.5	36	383	
			1.2	36.8	37	420	
			1.3	37.2	37	457	
1184.19		37.2	1.32 = 433'		7.4	464 3764F	Crest of Spillway
			1.4	38.0	30	494	
			1.5	38.9	39	533	
			1.6	39.8	39	572	
			1.7	40.7	40	612 5688F=162 dam^3	
			1.8	41.6	41	653	
			1.9	42.5	42	695	
			2.0	43.4	43	738	
			2.1	44.3	44	782	POTENTIAL STORAGE
1185.0		44.6			13	795	
			2.2	45.1	32	827	
			2.3	45.9	45	872	
			2.4	46.6	46	918	
			2.5	47.4	47	965	
			2.6	48.2	48	1013	
			2.7	48.7	49	1062	
			2.8	49.7	49	1111	
			2.9	50.4	50	1161	
			3.0	51.2	51	1212	
1186.0		52.2	3.13		67	1279	

STORAGE CAPACITY TABLE

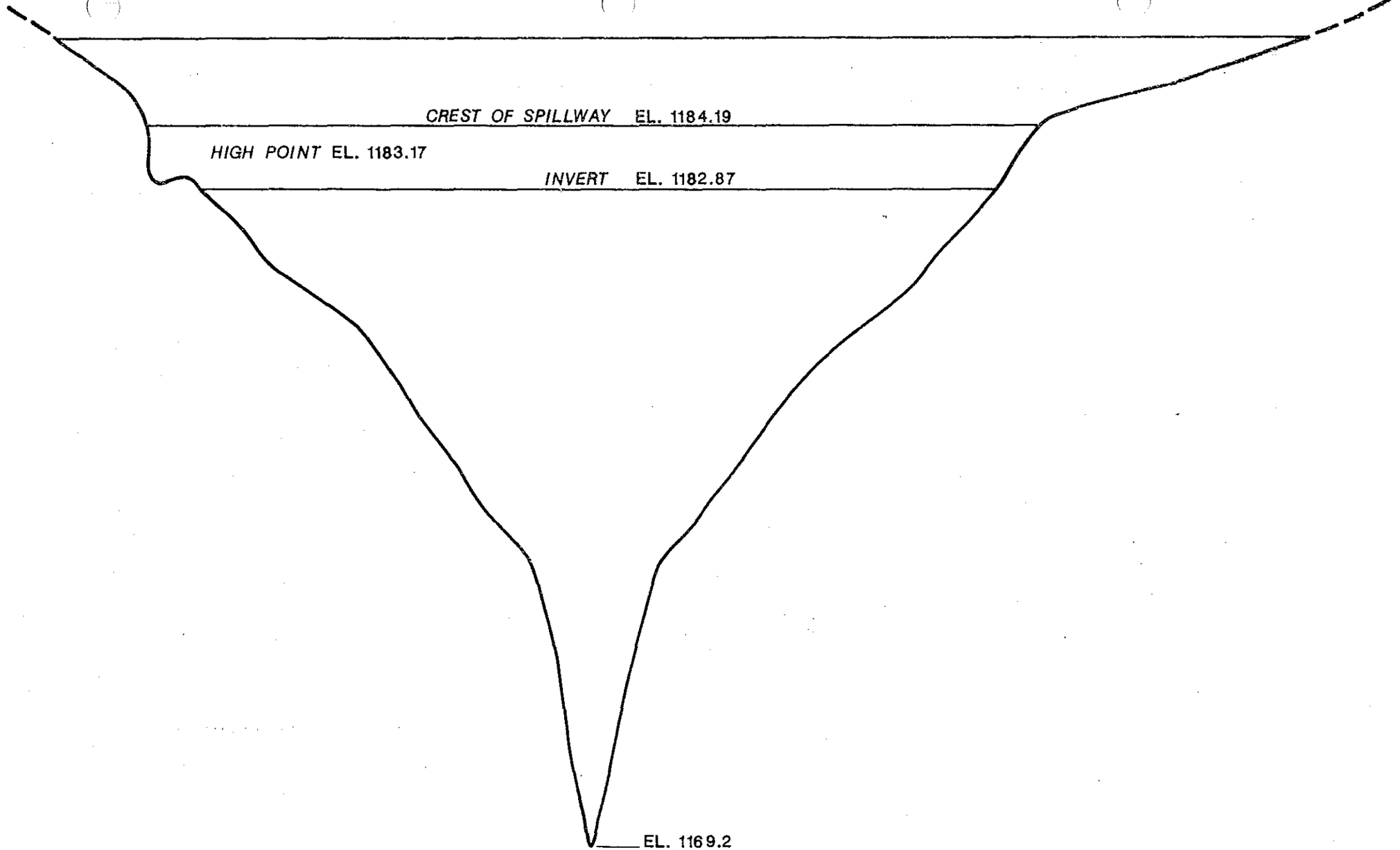
Chute Lake (High Point as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area in Hectares	Depth of Storage in Metres	Area in Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
1169.2		0.01	-13.97			1701	Low Point In Lake
					1.2		
			-13.5	0.50		1700	
					2.2		
1170.0		0.85				1698	
					1.6		
			-13.0	1.00		1696	
					6.1		
			-12.5	1.45		1690	
					5.3		
1171.0		1.75				1685	
					3.1		
			-12.0	1.84		1682	
					9.8		
			-11.5	2.10		1672	
					7.2		
1172.0		2.27				1665	
					4.0		
			-11.0	2.39		1661	
					13		
			-10.5	2.76		1648	
					10		DEAD
1173.0		3.00				1638	
1173.0		3.12					
					5.5		
			-10.0	3.31		1633	
					18		
			- 9.5	3.87		1615	
					14		
1174.0		4.24				1601	
					7.3		
			- 9.0	4.41		1594	
					23		
			- 8.5	4.90		1571	
					17		
1175.0		5.22				1554	
					9.4		
			- 8.0	5.82		1545	
					33		
			- 7.5	7.59		1512	
					27		
1176.0		8.75				1485	
1176.0		8.85					
					16		
			- 7.0	9.26		1469	
					49		
			- 6.5	10.5		1420	
					36		
1177.0		11.3				1384	
1177.0		11.4					
					20		
			- 6.0	11.9		1364	
					63		
			- 5.5	13.4		1301	
					46		
1178.0		14.4				1255	
					25		
			- 5.0	15.0		1230	STORAGE
					79		
			- 4.5	16.4		1151	
					56		
1179.0		17.4				1095	
					30		
			- 4.0	18.1		1065	
					95		
			- 3.5	20.0		970	
					68		
1180.0		21.3				902	
					37		
			- 3.0	22.2		865	
					118		
			- 2.5	25.0		747	
					86		
1181.0		26.9				661	
					46		
			- 2.0			615	
					141		
			- 1.5	29.1		474	
					29		
			- 1.4	29.4		445	
					30		
			- 1.3	29.8		415	
					30		
			- 1.2	30.1		385	
					9.0		
1182.0		30.2				376	
					21		
			- 1.1	30.4		355	
					31		
			- 1.0	30.7		324	
					31		
			- 0.9	31.1		293	
					31		
			- 0.8	31.4		262	
					32		

STORAGE CAPACITY TABLE

Chute Lake (High Point as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area In Hectares	Depth of Storage In Metres	Area In Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
			- 0.7	31.7	32	230	DEAD STORAGE
			- 0.6	32.1	32	198	
			- 0.5	32.4	32	166	
			- 0.4	32.7	33	134	
			- 0.3	33.1	33	101	
			- 0.2	33.4	10	68	
1183.0		33.5			24	58	
			- 0.1	33.7	34	34	
1183.17			0.0	34.0	34	0	High Point in Channel
			0.1	34.4	35	34	
			0.2	34.7	35	69	
			0.3	35.0	35	104	LIVE STORAGE
			0.4	35.3	35	139	
			0.5	35.6	36	174	
			0.6	35.9	36	210	
			0.7	36.2	36	246	
			0.8	36.5	37	282	
			0.9	36.8	37	319	
			1.0	37.2	7.4	356	
1184.19		37.2	1.02	≈ 3.35'		363 294 AF	Crest of Spillway
			1.1	38.0	30	393	
			1.2	38.9	39	432	
			1.3	39.8	39	471	
			1.4	40.7	40	511	
			1.5	41.6	41	552	
			1.6	42.5	42	594	
			1.7	43.4	43	637	
			1.8	44.3	44	681	
1185.0		44.6			14	695	POTENTIAL STORAGE
			1.9	45.1	31	726	
			2.0	45.9	46	772	
			2.1	46.6	46	818	
			2.2	47.4	47	865	
			2.3	48.2	48	913	
			2.4	48.9	49	962	
			2.5	49.7	49	1011	
			2.6	50.4	50	1061	
			2.7	51.2	51	1112	
			2.8	52.0	51	1163	
1186.0		52.2	2.83		16	1179	



Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

CHUTE (LEQUIME) LAKE RESERVOIR
STORAGE COMPUTATION SKETCH

SCALE: VERT. _____ HOR. _____

DATE APRIL 1988

_____ ENGINEER

FILE No. _____ DWG No. FNR-2012-00301

VANCAL - 10253

Chute Lake (Invert as Control)

MAPPING DATA			STORAGE CAPACITY					
CONTOUR ELEVATION		Area In Hectares	Depth of Storage In Metres	Area In Hectares	STORAGE IN DECAMETRES^3		REMARKS	
Geodetic Datum	Local Datum				Net	Gross		
			- 0.6	31.1	31	192	DEAD STORAGE	
			- 0.5	31.4	31	161		
			- 0.4	31.7	31	130		
			- 0.3	32.1	32	98		
			- 0.2	32.4	32	66		
			- 0.1	32.7	33	33		
1182.87			0.0	33.1	33	0	Invert of Intake	
			0.1	33.4	33	33		
1183.0		33.5			10	43		
			0.2	33.7	24	67	LIVE STORAGE	
			0.3	34.0	34	101		
			0.4	34.4	34	135		
			0.5	34.7	34	169		
			0.6	35.0	35	204		
			0.7	35.3	35	239		
			0.8	35.6	36	275		
			0.9	35.9	36	311		
			1.0	36.2	36	347		
			1.1	36.5	36	383		
			1.2	36.8	37	420		
			1.3	37.2	37	457		
1184.19		37.2	1.32 = 4.33'		7.4	464 376AF	Crest of Spillway	
			1.4	38.0	30	494		
			1.5	38.9	39	533		
			1.6	39.8	39	572		
			1.7	40.7	40	612		
			1.8	41.6	41	653		
			1.9	42.5	42	695		
			2.0	43.4	43	738		
			2.1	44.3	44	782	POTENTIAL STORAGE	
1185.0		44.6			13	795		
			2.2	45.1	32	827		
			2.3	45.9	45	872		
			2.4	46.6	46	918		
			2.5	47.4	47	965		
			2.6	48.2	48	1013		
			2.7	48.7	49	1062		
			2.8	49.7	49	1111		
			2.9	50.4	50	1161		
			3.0	51.2	51	1212		
1186.0		52.2	3.13		67	1279		

+4 = 4.66' ⇒ 5[illegible] 3dam³

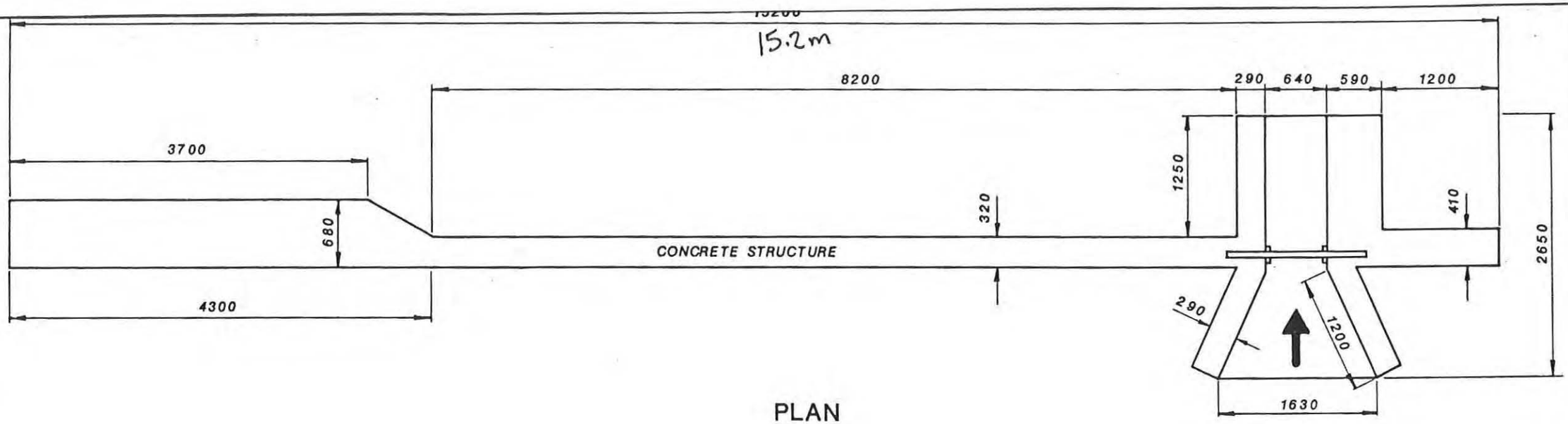
376AF = 602 dam³ = 457AF

STORAGE CAPACITY TABLE

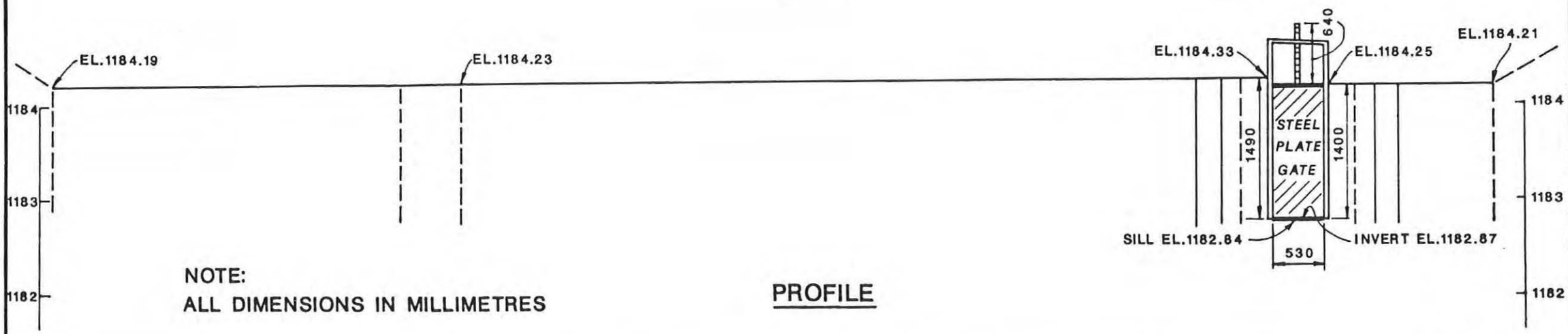
Chute Lake (High Point as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area In Hectares	Depth of Storage In Metres	Area In Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
			- 0.7	31.7		230	DEAD STORAGE
			- 0.6	32.1	32	198	
			- 0.5	32.4	32	166	
			- 0.4	32.7	32	134	
			- 0.3	33.1	33	101	
			- 0.2	33.4	33	68	
1183.0		33.5			10	58	
			- 0.1	33.7	24	34	
1183.17			0.0	34.0	34	0	High Point in Channel
			0.1	34.4	34	34	LIVE STORAGE
			0.2	34.7	35	69	
			0.3	35.0	35	104	
			0.4	35.3	35	139	
			0.5	35.6	35	174	
			0.6	35.9	36	210	
			0.7	36.2	36	246	
			0.8	36.5	36	282	
			0.9	36.8	37	319	
			1.0	37.2	37	356	
1184.19		37.2	1.02 = 3.345'		7.4	363	294 AF Crest of Spillway
			1.1	38.0	30	393	
			1.2	38.9	39	432	
			1.3	39.8	39	471	
			1.4	40.7	40	511	
			1.5	41.6	41	552	
			1.6	42.5	42	594	
			1.7	43.4	43	637	
			1.8	44.3	44	681	
1185.0		44.6			14	695	POTENTIAL STORAGE
			1.9	45.1	31	726	
			2.0	45.9	46	772	
			2.1	46.6	46	818	
			2.2	47.4	47	865	
			2.3	48.2	48	913	
			2.4	48.9	49	962	
			2.5	49.7	49	1011	
			2.6	50.4	50	1061	
			2.7	51.2	51	1112	
			2.8	52.0	51	1163	
1186.0		52.2	2.83		16	1179	

15.2m



PLAN



NOTE:
ALL DIMENSIONS IN MILLIMETRES

PROFILE

Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

CHUTE LAKE RESERVOIR
DAM AND SPILLWAY STRUCTURE

SCALE: VERT. 1 : 50
HOR. 1 : 50

DATE APR.1988

F. R. Schubert

FILE No. DWG No. 4567-9C

VANCAL - 10263

OUTLET CHANNEL | STORAGE DATA | RESERVOIR & BASIN

Province of
British Columbia

Ministry of
Environment

Suite 201
3547 Skaha Lake Road
Penticton
British Columbia
V2A 7K2
Telephone: (604) 493-8261

April 24, 1990

File: 55.5604
xr: D220117

returned

Hidden Bar Ranch Ltd.
Suite 201 - 4750 - 101st Street
Edmonton, Alberta
T6E 5G9

to all 9 licensees as per list

Dear Sir:

Re: Chute Lake Dam

The above dam was inspected on April 18, 1990. A copy of the inspection report is attached.

The items marked with an "X" on the inspection report require your attention for the safe operation of this dam.

27. & 49. The driftwood and debris should be removed from the areas upstream and downstream of the dam, and disposed of above the high water mark.

Should you have any questions in this regard, do not hesitate to contact this office.

Yours truly,

N.G. Banera. P.Eng.
Head, Water Allocation Section
Water Management Program

ROWE/ms

Attachment

cc: J. Mattison, Manager
Water Licencing Section

Province of British Columbia

Ministry of Environment and Parks

Water Management Branch

DAM INSPECTION REPORT

DAM Chute Lake STATUS A-Operating

DESCRIPTION Concrete dam-approx. 4 feet of storage

LICENSEE Many

FWL/CWL Many FILE No. Many DAM FILE No. 55.5604 (220 117)

DATE INSPECTED April 18, 1990 LAST INSPECTED May 27, 1988

TYPE OF INSPECTION: REGULATORY √ INCIDENT-RELATED _____ FOLLOW-UP _____

WATERSHED AND RESERVOIR CONDITIONS

1. Saturated		6. Outlet Discharge	Closed m3/s
2. Wet		7. Spillway Discharge	0.5 m3/s (15 CFS)
3. Dry	√	8. Reservoir Debris	~~H~~ ~~M~~ L
4. Freeboard	N/A m	9. Reservoir Bank Stability	H ~~M~~ ~~L~~
5. Water Level	Spilling m		

EMBANKMENTS

N/A (concrete)

10. Growth		30. Gate	√
11. Upstream Slope		31. Sluice	
12. Crest		32. Submerged	
13. Downstream Slope		33. Walls	√
14. Downstream Toe		34. Stilling Basin	√
15. Rip Rap		35. Toe Drain	
16. Seepage		36. Channel	
17. Erosion		37. Weir	
18. Sloughing		38. Erosion	
19. Boils		39. Seepage	

OUTLET WORKS

GATE WORKS

SPILLWAY - over dam crest

20. Accessibility	√	40. Boom	
21. Wheel		41. Entrance	
22. Threads	√	42. Walls	√
23. Pedestal	√	43. Sill	
24. Stem Guides		44. Apron	
25. Stem	√	45. Channel	
26. Gate	√	46. Growth	
27. Grill	X	47. Erosion	√
28. Boom	none	48. Seepage	
29. Gauge	none	49. Debris	X

Inspected No.
Inspected, requiring attention (see remarks over page) x

27. Outlet screen plugged.
49. Driftwood and debris U/S, on, and D/S of the dam.

INSPECTED WITH _____ SIGNED S. Rowe

S. Rowe

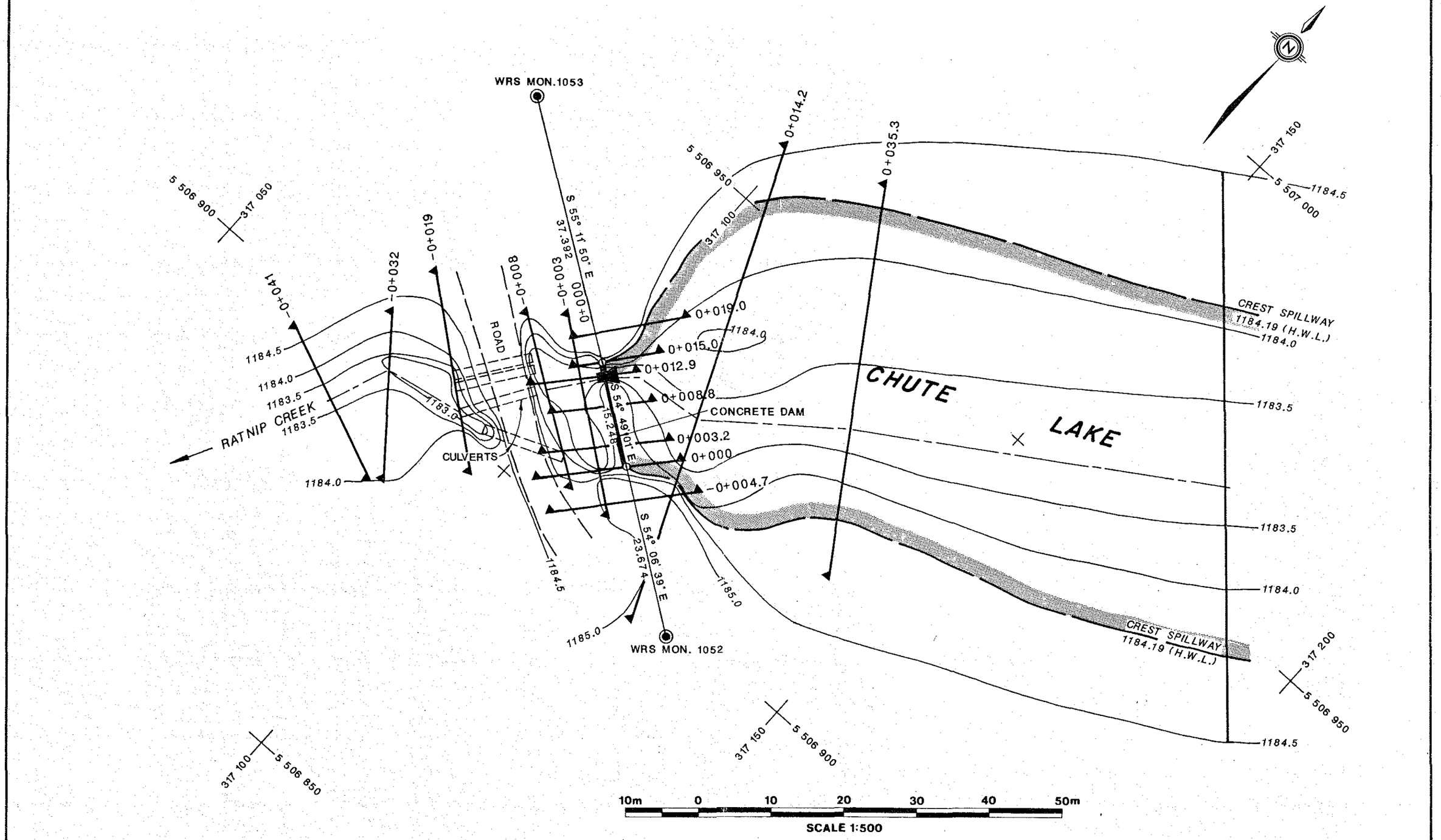
DATE April 23, 1990

NOTE TO LICENSEE:

Section 18 (1) of the *Water Act* states:
"Every licensee and person who has obtained approval under Section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use of operation of the licensee's works."

. . . /2 (Tumble)

MR-1295



Province of British Columbia
Ministry of Environment and Parks
Water Management Branch

TO ACCOMPANY REPORT ON

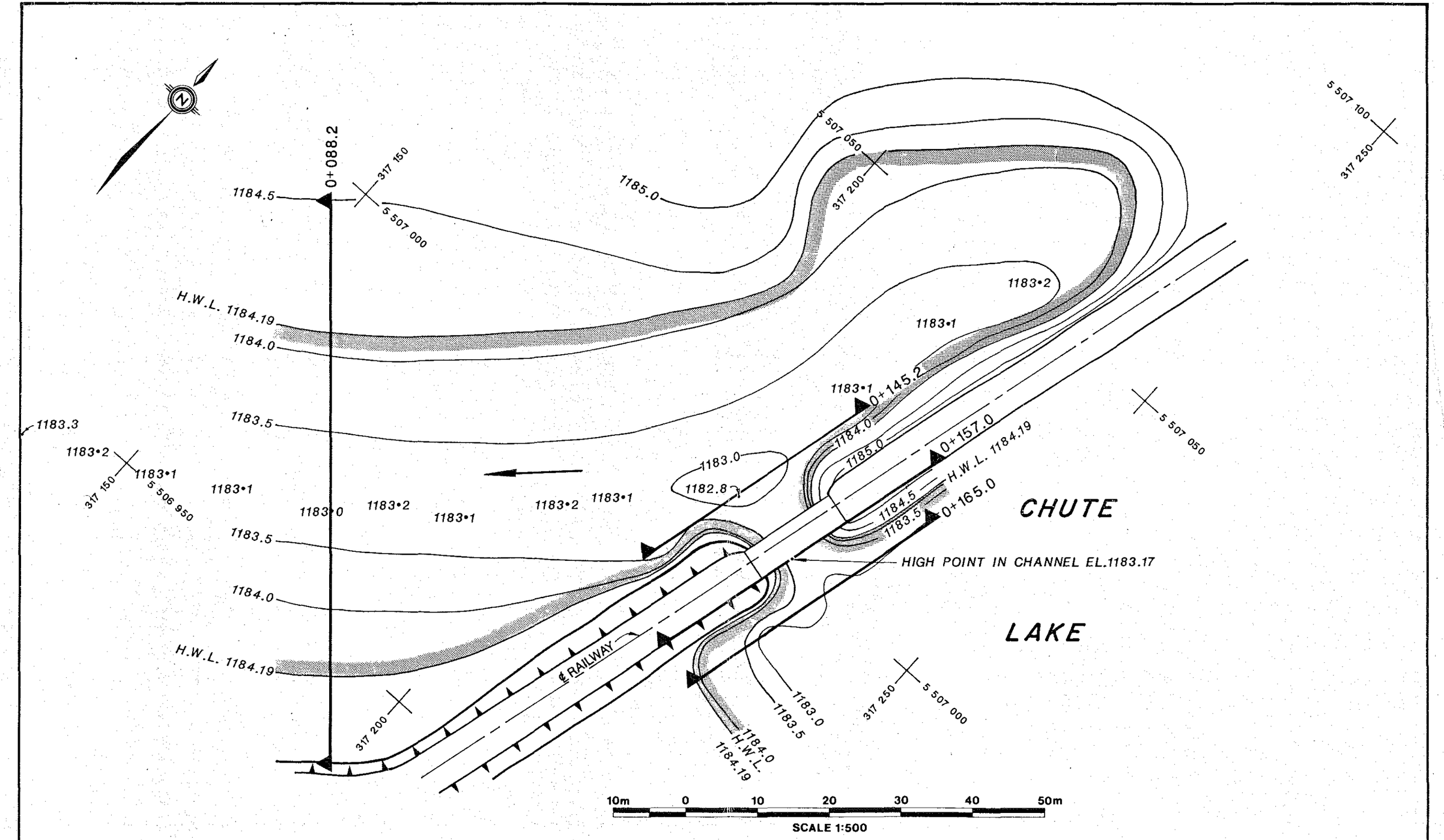
CHUTE LAKE RESERVOIR
GENERAL PLAN OF DAM

SCALE: 1:500

DATE: APRIL 1988

FILE No. DWG. No. 457-9A

Part 1 Page 67
ENR 2012-00301



	Province of British Columbia Ministry of Environment and Parks Water Management Branch	TO ACCOMPANY REPORT ON CHUTE (LEQUIME) LAKE RESERVOIR GENERAL PLAN OF OUTLET CHANNEL	SCALE: 1:500 DATE: APRIL 1988 J. R. Schubert FILE No. DWG No. 4567-98

Part 1 Page 87
ENE 20 P 70301

PEACHLAND
Peachland
OKANAGAN MOUNTAIN PROVINCIAL PARK
OKANAGAN FOREST
SUMMERLAND
DISTRICT MUNICIPALITY
Penticton
Naramata
Kelowna
Tp 29
Tp 28
2711
MT ENOS
MT ATHINSON
MT RANDOLPH
Nuttall L.
Big Meadow
Elinor L.
Crescent L.
Crewbark Lake
Deep L.
Kerrd.
Reed L.
Trout Creek
Okanagan R.
Penticton Creek
Ellis Creek
Shingle Creek
Summerland Creek
Trapanier
Lomul
Adra
Wiltsey
Wyndosa
Garnet Valley
Faulder
Creata
Naramata Ranch
Corporation
Camping
Lookout
Ranger Station
Forest Service Road
Power Line
Pipeline
Gravel Pit
Quarry
Cemetery
Church
Golf Course
Airport
Campground
Picnic Area
Boat Launch
Beach
Trail
Viewpoint
Fish Hatchery
Fish Ladder
Fish Counting Station
Fish Spawning Area
Fish Rearing Area
Fish Migration Route
Fish Habitat
Fish Stocking
Fish Harvesting
Fish Management
Fish Research
Fish Conservation
Fish Protection
Fish Enhancement
Fish Restoration
Fish Monitoring
Fish Evaluation
Fish Assessment
Fish Inventory
Fish Survey
Fish Census
Fish Count
Fish Tagging
Fish Marking
Fish Recapture
Fish Release
Fish Transport
Fish Handling
Fish Holding
Fish Rearing
Fish Spawning
Fish Migration

June 20, 1988

File: B220 116
55.5604

s.22

Dear Sir:

Re: Chute Lake Dam

The above dam was inspected on May 27, 1988. A copy of the inspection report is attached. The items marked "X" require remedial work as outlined below.

Item 36 & 45 The outlet/spillway channel requires brushing out and clearing of driftwood and debris.

Yours truly,

N.G. Banera, P. Eng.
Allocation Section Head
Water Management Program

PODZUN/pa

Attachment

cc: T.F. Smith, P. Eng.
Manager, Water Licensing Section

Province of British Columbia

Ministry of Environment and Parks

Water Management Branch

DAM INSPECTION REPORT

DAM Chute Lake STATUS A - Operating

DESCRIPTION Concrete

LICENSEE s.22

FWL/CWL Many FILE No. 0202356 DAM FILE No. 220 116-55.5604

DATE INSPECTED May 27, 1988 LAST INSPECTED September 8, 1988

TYPE OF INSPECTION: REGULATORY √ INCIDENT-RELATED ____ FOLLOW-UP ____

WATERSHED AND RESERVOIR CONDITIONS

1. Saturated	____	6. Outlet Discharge	0 m3/s
2. Wet	√	7. Spillway Discharge	0.4 m3/s
3. Dry	____	8. Reservoir Debris	H M L
4. Freeboard	____m	9. Reservoir Bank Stability	(H) M L
5. Water Level	spilling m		

EMBANKMENTS concrete

10. Growth	____
11. Upstream Slope	____
12. Crest	____
13. Downstream Slope	____
14. Downstream Toe	____
15. Rip Rap	____
16. Seepage	√
17. Erosion	√
18. Sloughing	____
19. Boils	√

OUTLET WORKS

30. Gate	√
31. Sluice	√
32. Submerged	____
33. Walls	√
34. Stilling Basin	√
35. Toe Drain	____
36. Channel	X
37. Weir	____
38. Erosion	____
39. Seepage	√

GATE WORKS

20. Accessibility	√
21. Wheel	____
22. Threads	√
23. Pedestal	√
24. Stem Guides	√
25. Stem	√
26. Gate	√
27. Grill	____
28. Boom	____
29. Gauge	____

SPILLWAY

40. Boom	____
41. Entrance	____
42. Walls	____
43. Sill	____
44. Apron	____
45. Channel	X
46. Growth	X
47. Erosion	____
48. Seepage	____
49. Debris	____

Inspected No.
Inspected, requiring attention (see remarks over page) x

INSPECTED WITH ____ SIGNED U.O. Podzun

U.O. Podzun

DATE ____

NOTE TO LICENSEE:

Section 18 (1) of the *Water Act* states:
"Every licensee and person who has obtained approval under Section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use of operation of the licensee's works."

MR-1295

. . . /2 (Tumble)

September 11, 1987

File: D 220 116-55.5604

s.22

Dear Sir:

Re: Chute Lake Dam.

The above storage dam was inspected in your presence on September 8, 1987. A copy of the inspection report is attached. The items mared "X" and listed under the "Remarks" section of that report required remedial work as outlined below.

12. The sand bags have to be removed from the crest of the dam. The unauthorized storage of water is in contravention of the Water Act and is an offence. See our letter of February 11, 1987.

17. The erosion at the abutments is best stopped by placing burlap bags filled with dry concrete against the eroded area or by grouting rocks in place.

36 & 45 The driftwood and debris should be removed from the outlet/spillway channel.

36 & 46 The outlet/spillway channel needs to be brushed out.

It is requested that the above remedial work be carried out prior to October 15, 1987.

Yours truly,

N.G. Banera, P.Eng.
Allocation Section Head
Water Management Program

PODZUN/smc

Attachment

cc: T.F. Smith, P.Eng.
Manager, Water Licensing Section

Province of British Columbia
Ministry of Environment

DAM INSPECTION REPORT

Chute Lake RESERVOIR DATE September 8, 1987

FWL/CWL Many FILE NO. D 220 116-55.5604

LICENCEE s.22

WATERSHED AND RESERVOIR CONDITIONS

1.	Saturated		6.	Outlet Discharge	0.05 m3/s
2.	Wet		7.	Spillway Discharge	0 m3/s
3.	Dry	✓	8.	Reservoir Debris	H M L
4.	Freeboard	meters	9.	Reservoir Bank Stability	H M L
5.	Water Level	0 meters			

NOTE: Items marked X require attention - See Remarks

EMBANKMENTS		OUTLET WORKS	
10. Growth		30. Gate	✓
11. Upstream Slope		31. Sluice	None
12. Crest	X	32. Submerged	
13. Downstream Slope		33. Walls	✓
14. Downstream Toe		34. Stilling Basin	✓
15. Rip Rap		35. Toe Drain	None
16. Seepage		36. Channel	X
17. Erosion	X	37. Weir	
18. Sloughing		38. Erosion	✓
19. Boils		39. Seepage	✓
GATE WORKS		**SPILLWAY**	
20. Accessibility	✓	40. Boom	
21. Wheel	✓	41. Entrance	
22. Threads	✓	42. Walls	
23. Pedestral	✓	43. Spill	
24. Stem Guides	✓	44. Apron	
25. Stem	✓	45. Channel	X
26. Gate	✓	46. Growth	X
27. Grill	✓	47. Erosion	
28. Boom		48. Seepage	
29. Gauge		49. Debris	

REMARKS: (Refer Above)

12. Sand bags on crest of dam.

17. Erosion at both abutments.

36 & 45. Driftwood and debris in outlet/spillway channel.

36 & 46. Outlet/spillway channel overgrown with brush.

INSPECTED WITH E. E. Hindson SIGNED U. O. Podzun

U.O. Podzun, *Dam Inspector*

NOTE TO LICENSEE: Section 18(1) of the Water Act states:
"Every licensee and person who has obtained approval under Section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use of operation of the licensee's works."

May 9, 1985

File: 55.5604
D220116

s.22

Dear s.22

Re: Chute Lake Dam

Further to our telephone conversation of May 9th, regarding raising of the above mentioned dam.

The dam was inspected on May 7th. The water spilling over the dam on the east side measured seven inches, of which approximately three inches were surcharge. To bring the dam up to its authorized elevation you may add one row of sandbags for this run-off season, provided we are not receiving any complaints and that the bags are removed when the lake level drops below the crest.

Attached are copies of our letter of June, 1977 and of the survey notes taken on June 22, 1977.

Yours truly,

N.G. Banera, P.Eng.
Allocation Section Head
Okanagan Sub-Region

PODZUN/ma

Attachment

cc: Comptroller, Water Rights
Parliament Buildings, Victoria

O. Podzun

s.22

APR 2 5 1985

Dr H Harries
Hidden Bar Ranch Ltd.,
1418- 10025 Jasper Ave.,
EDMONTON ALTA.

Dear Sir- Chute Lake--

Bruce and I saw ~~xxx~~ it on Sunday 21st.

Mr Podsun- W R man handling it- was available this morning and informs me that the objection to sandbagging the well is that the levels of the F L P houses should first be taken!

We must review the situation and prepare for the fall. There should be another .41 ' available- with a bit of luck.

Yours faithfully-

s.22

c.c.

Water Rights-
Dept of Environment
3547 Skaha Lake Road
PENTICTON B.C.

For the kind attention of Mr O O Podsun.

MINISTRY OF ENVIRONMENT
RECEIVED
APR 30 1985
OKANAGAN

DIST.	DATE	INITIALS
NGD		
VOP		

s.22

For the kind attention of- s.22 14 JUN 1983.

Regional Water Manager-

Dear Sir- File 55.5604
D220116

Chute Lake Reservoir-

I acknowledge your letter dated 31st ultimo.

We hope to attend to the work in July- I saw s.22 s.22 representing s.22 and they are busy planting just now. I understand that part of s.22 licence has been applied to s.22 and others; I mention this ~~believing~~ ** that they might feel neglected if not summoned to attend to matters such as maintenance.

** feeling

Yours faithfully-

s.22

The Comptroller of Water Rights
Ministry of Environment
3547 Skaha Lake Road,
PENTICTON B.C. V2A 7K2

May 31, 1983

File: 55.5604
D220116

[redacted]

Dear Sir:

Re: Chute Lake Reservoir

On May 26, 1983, your above-mentioned reservoir and dam was inspected. A copy of the inspection report is attached.

Please note item 49 under the "Remarks" section of that report. The debris and driftwood above and below the dam and from the dam itself should be removed and disposed of by burning or some other means.

Yours truly,

N.G. Banera, P. Eng.

D.B. Lovdahl, P. Eng.
Regional Water Manager
Okanagan Regiona

UOP/cdh

attachment

cc. Comptroller of Water Rights
Victoria, B.C.

Province of British Columbia
Ministry of Environment

DAM INSPECTION REPORT

Chute Lake RESERVOIR DATE May 26, 1983

FWL/CWL Many FILE NO. D220116

LICENCEE s.22

WATERSHED AND RESERVOIR CONDITIONS

1. Saturated		6. Outlet Discharge	0 m3/s
2. Wet	✓	7. Spillway Discharge	1.0 m3/s
3. Dry		8. Reservoir Debris	H M L
4. Freeboard	meters	9. Reservoir Bank Stability	H M L
5. Water Level	spilling meters		

NOTE: Items marked X require attention - See Remarks

EMBANKMENTS		OUTLET WORKS	
10. Growth	✓	30. Gate	✓
11. Upstream Slope	✓	31. Sluice	
12. Crest	✓	32. Submerged	
13. Downstream Slope	✓	33. Walls	✓
14. Downstream Toe	✓	34. Stilling Basin	✓
15. Rip Rap		35. Toe Drain	
16. Seepage		36. Channel	✓
17. Erosion		37. Weir	
18. Sloughing		38. Erosion	
19. Boils		39. Seepage	
GATE WORKS		**SPILLWAY**	
20. Accessibility	✓	40. Boom	
21. Wheel		41. Entrance	
22. Threads	✓	42. Walls	
23. Pedestral	✓	43. Spill	
24. Stem Guides	✓	44. Apron	
25. Stem	✓	45. Channel	
26. Gate		46. Growth	
27. Grill		47. Erosion	
28. Boom		48. Seepage	
29. Gauge	Not Required	49. Debris	X

REMARKS: (Refer Above)

49. **All driftwood and debris should be removed from the outlet channel upstream of the dam and from the dam itself.**

INSPECTED WITH N.B. Banera, P. Eng. SIGNED U.O. Podzun, C.E.T.
Dam Inspector

NOTE TO LICENSEE: Section 18(1) of the Water Act states:
"Every licensee and person who has obtained approval under Section 7 shall exercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use of operation of the licensee's works."

s.22

DIST.	DATE	INITIALS

4 MAR 1983.

Regional Water Manager
Ministry of Environment
3547 Skaha Lake Road
PENTICTON B.C. V2A 7K2

Dear Sir- File: 55.5606 D220 116

I acknowledge your letter dated 11th instant.

We shall remove the sandbags as soon as we can get in.

18 MAR '83. I have just returned from Chute Lake.(13 Kil- road still covered under snow in upper parts) About half of the crest is free of bags- 27'. The other is under bags but they are frozen,some under snow. GATE - has been vandalised.A screw was mounted on a steel frame- steel chain and padlock to lock the wheel. Mounting bolts on west side loosened up about 1½"- chain and padlock and wheel completely removed.

We shall try again later and remove the remaining sandbags. Matter of interest- the ice starts about 20' from the wall.

I have the honour to be, Sir-
Yours faithfully-

s.22

MINISTRY OF ENVIRONMENT
RECEIVED
MAR 28 1983
OKANAGAN

February 11, 1983

File: [illegible]55.5604
[illegible]D220 116

s.22

Dear
Dear Sir:

Re: Chute Lake Dam

Further to our conversation of February 7, 1983, regarding the placement of sand bags for the purpose of increasing storage, this practice is in contravention of the Water Act. Quote:

"Offences

41. (1) A person commits an offence who
(g) places, maintains or makes use of an obstruction in the channel of a stream without authority
(j) constructs, maintains, operates or uses works without authority
(m) diverts more water from a stream than he is lawfully entitled to divert

(2) A person who commits an offence under this section is liable on conviction
(a) to a fine of not more than $2,000 or to imprisonment not exceeding 6 months or both; and
(b) where the offence is a continuing one, toaa fine not more than $500 for each day the offence is continued"

We further quote:

Powers of engineer

37. (1) In addition to all other powers given under this Act and the regulations, every engineer may
(d) order the repair, alteration, improvement, removal or addition to any works;
(h) order the release of stored or impounded water that he considers a danger to life or property
(j) order a person to remove from a stream any substance or thing that he has put into or permitted to get into the stream.

2.....

We, herewith, request that the sand bags be removed from the dam on Chute Lake by March 15, 1983.

Yours truly,

N. G. Banera

N.G. Banera, P. Eng.

D.B. Lovdahl, P. Eng.
Regional Water Manager
Okanagan Region

OP/cf

s.22

Ministry of The Environment
WATER RIGHTS BRANCH
SEP 14 1978
Kelowna, B.C.

13 SEP 1978

Regional Engineer,
Water Resources Service
1905 Kent Road
KELOWNA B.C. V1Y 7S6

Dear Sir- Chute Lake Reservoir Dept File 8-9

Thank you for your letter of 8th instant. I have sent copiesof it and the Dam Inspection Report to other licence holders on this Lake. s.22

Yours faithfully-

s.22

DAVID
OLE
SER

Telephone: 860-6280

1905 Kent Road,
KELOWNA
V1Y 7S6

September 8, 1978

s.22

Dear Sir:

Re: Chute Lake Reservoir

On August 1st, 1978, I inspected the above Reservoir. A copy of my Inspection Report is attached.

Please note Item Number 49 under the "Remarks" section of this Report. The debris and driftwood above and below the dam should be removed from the channel and deposited above the high water mark and disposed of by burning, or some other means.

Yours truly,

J.E. Farrell, P. Eng.,
REGIONAL ENGINEER

UOP/mk
Encls.

per: U.O. Podzun,
Technician

c.c.: Comptroller of Water Rights, Victoria

DAM INSPECTION REPORT
WATER RIGHTS BRANCH

CHUTE LAKE Reservoir D- 9 Date August 1st, 1978

C.W.L.

F.W.L. Many File No. 0201942

Licencee s.22

WATERSHED

1.	Snow Cover	____ Inches
2.	Snow Patches	____
3.	Saturated	____
4.	Wet	____
5.	Dry	____

RESERVOIR

6.	Freeboard	3.3 Feet
7.	Water Level	____ Feet
8.	Outlet Discharge	1 cfs
9.	Spillway Discharge	0 cfs

(Note: Items marked X require attention - See Remarks)

EMBANKMENTS

10.	Growth	____
11.	Upstream Slope	____
12.	Crest	____
13.	Downstream Slope	____
14.	Downstream Toe	____
15.	Rip Rap	____
16.	Seepage	____
17.	Erosion	____
18.	Sloughing	____
19.	Boils	____

OUTLET WORKS

30.	Gate	____
31.	Sluice	____
32.	Submerged	____
33.	Walls	____
34.	Stilling Basin	____
35.	Toe Drain	____
36.	Channel	____
37.	Weir	____
38.	Erosion	____
39.	Seepage	____

GATE WORKS

20.	Accessibility	____
21.	Wheel	____
22.	Threads	____
23.	Pedestral	____
24.	Stem Guides	____
25.	Stem	____
26.	Gate	____
27.	Grill	____
28.	Boom	____
29.	Gauge	____

SPILLWAY

40.	Boom	____
41.	Entrance	____
42.	Walls	____
43.	Sill	____
44.	Apron	____
45.	Channel	____
46.	Growth	____
47.	Erosion	____
48.	Seepage	____
49.	Debris	____

REMARKS: (Refer above)

49. All driftwood and debris should be removed from the outlet channel upstream of the dam.

Signed: _____

U.O. PODZUN, TECHNICIAN

NOTE TO LICENCEE: Section 18(1) of the Water Act states:
"Every licencee and person who has obtained approval under Section 7 shall excercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use or operation of the licencee's works."

WATER RESOURCES SERVICE
WATER RIGHTS BRANCH
OFFICE OF THE REGIONAL ENGINEER

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

DEPT. FILE No.

LOCAL FILE No.

DEPARTMENT OF ENVIRONMENT

Ole

NOTES FOR RECORD

, B.C.

COMMUNICATION ☐ PROJECT ☐

Phone call ☑ In ☐
Visit ☐
:tten ☐ Out ☐

Date 21 June 77

Time

SUBJECT Chute Lake Dam

Ref. No.

s.22

See previous notes of

OTHER PERSONS

COMMENTS

1. Sandbags - but decided we would not - vandalism
2. has decided not [redacted] near the dam - would be content for now
3.

See over ☐

FURTHER ACTION

Taken ☐

RECORDED BY

file 8

s.22

20 JUN 1977.

Regional Engineer
Water Resources Service
Dept of Environment
1905 Kent Road KELOWNA B.C.

JUN 20 1977

Dear Sir: Chute Lake.

Following discussion with Mr Podzun on Tuesday, it would seem necessary to defer increasing the storage pending the decisions of C T C and other matters including the railway bridge and S U P's.

Mr Podzun indicates that the wall could be raised to the ~~le~~ level of 4" above the West end.

The freshette is nearly over: we could- however- still impound some of the ~~water~~ residue with sandbags, and I shall telephone you on Monday.

Yours faithfully-

s.22

Copies to s.22 and s.22 .

DAVE

JCK

1905 Kent Road,
KELOWNA
V1Y 7S6

s.22

Dear Sir:

Re: Chute Lake Concrete Storage Dam

Further to our conversation of June 14, 1977, regarding the raising of the storage dam on Chute Lake.

The line of levels that you and I established on May 30th, 1977, confirms that the two cabins on Chute Lake will be below the new proposed Highwater Mark. To provide for the 30 inch clearing under the C.P.R. trestle, as agreed with the C.P.R., you could raise the dam to elevation 3885.50.

The present dam differs in elevation by 0.23 feet between the east and west side. To provide a level grade for the new crest at elevation 3885.50, you may raise the structure 0.41 feet on the west side and 0.64 feet on the east side. This would provide 61 acre feet of additional storage.

It is requested that before commencement of construction, a drawing of the final dam design and an outline of construction procedure is submitted to this office for approval.

Yours truly,

J.E. Farrell, P. Eng.,
REGIONAL ENGINEER.

per: U.O. Podzun,
Technician.

UOP/mk

D-9
496-5267

s.22

22 APR 1977.

The Regional Engineer,

Attention please : Mr Podzun.

Dear Sir: Chute Lake levelling.

On Saturday 16th., I found the Chute Lake road good-some snow on it still but conditions are now suitable to do the levelling.

The approach from Kelowna via Mission is very rough. I hope you will be able to do the work soon and that I may accompany you on the job. I shall ask s.22 for permission to level up to his building at the South end of the Lake.

Yours faithfully-

s.22

The Regional Engineer,
Water Resources Service
Dept of Lands, Forests and Water Resources
1905 Kent Road
KELOWNA B.C.

April 24/90
55.5604 Chute Lk

Memo to File

Re: Licenced Usage in Excess of Developed Storage

The 14 storage licences on Chute Lake presently total 488.32 AF (see the attached summary). Some of the diversion licences are not tied to a release from storage, and there are several priority dates.

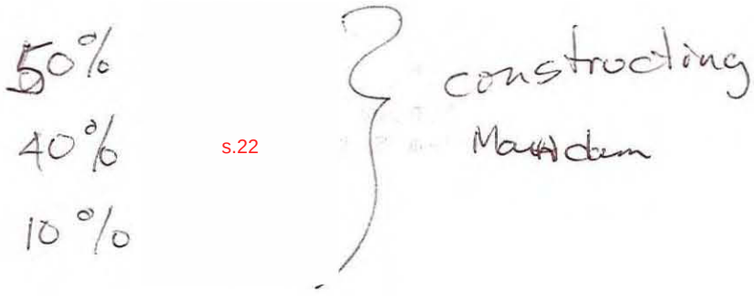
Developed storage is 294 AF, due to a high section in the approach channel. The authorized storage could be utilized by dredging the channel control about one foot lower (to the outlet elevation) and by raising the dam by about one foot.

The question of who "owns" the present storage has not come up, but it is noted that most licensees have not previously been sent coorespondence in regard to the dam. Sending the Inspection Report to licensees who haven't contributed to the dam construction may imply some tenure to the structure.

There are several riparian parties that may be affected by an increase in lake level, which is presently authorized by licence.

Could/should the storage table be used as an FL survey and the storage licences be reduced to the available quantity?

S.Rowe
Dam Safety Tech


50%
40%
10%
s.22
constructing
Markdem

from Jan 11/90 Fiche

Chute Lake Licensees (under Ratnip)

C 22673 (0202356) 180 AF :1) Hidden Bar Ranch Ltd
Suite 201 - 4750 - 101 Street
Edmonton Alta T6E 5G9

C 37425 (0270042) 90 AF PCL? :2) Trans Internal Investments Ltd
Box 261
Naramata BC V0H1N0

C 50405 (0346143) 20 AF :3) s.22

C 50407 (0277218) 20 AF :4) s.22

C 55456 (0367598) 16.67AF :5)
& C 55458 (0367599) 40 AF s.22

C 55460 (0368200) 1.34 AF :6) s.22

C 55462 (0368201) 12.04 AF :7) Indian Rock Orchards Ltd
3448 Beach Drive
Victoria BC V8R 6M5

C 55464 (0368202) 1.6 AF :8) s.22

C 55597 (0201942) 16.67AF :9)
& C 59633 (0277541) 20 AF s.22
& C 59635 (8-367) 36 AF ?
& C 59637 (8-368) 18 AF
& C 59639 (8-369) 16 AF

Chute Lake June 10/92

Sand bagged @ low spot

4" concrete

CHUTE 191

April 1990

below dam

Province of British Columbia

Ministry of Environment and Parks

Water Management Branch

DAM INSPECTION REPORT

DAM FILE: 76915-20/220
DAM Chute Lake STATUS: A -Operational

DESCRIPTION: Concrete - Approx 407 AF at 4.66 Ft of Storage
(A 4" Concrete Sill, and Sandbags are @ Spillway)

LICENSEE: Hidden Bar Ranch / Trans International Investments /
s.22 / Indian Rock Orchards / s.22
s.22

14 Conditional Licences AUTHORIZED STORAGE: 488.32 AF

DATE INSPECTED: June 10/92 LAST INSPECTED: April 18/90
TYPE OF INSPECTION: Regulatory

WATERSHED AND RESERVOIR CONDITIONS

1. Saturated		6. Outlet Discharge	2	CFS
2. Wet		7. Spillway Discharge	0	CFS
3. Dry	✓	8. Reservoir Debris	LOW	
4. Freeboard	2 Ft	9. Reservoir Bank Stability	HIGH	
5. Water Level	8"below spill			

EMBANKMENTS
N/A - Concrete

10. Growth	
11. Upstream Slope	
12. Crest	
13. Downstream Slope	
14. Downstream Toe	
15. Rip Rap	
16. Seepage	
17. Erosion	
18. Sloughing	
19. Boils	

OUTLET WORKS
- Concrete Wall 50' long

30. Gate	no D/S gate
31. Sluice	no sluice
32. Submerged	
33. Walls	✓
34. Stilling Basin	✓
35. Toe Drain	none
36. Channel	✓
37. Weir	none
38. Erosion	✓
39. Seepage	✓

GATE WORKS

20. Accessibility	✓
21. Wheel	removed
22. Threads	✓
23. Pedestal	✓
24. Stem Guides	
25. Stem	✓
26. Gate	submerged
27. Grill	debris
28. Boom	none
29. Gauge	none

SPILLWAY
- over dam crest

40. Boom	none
41. Entrance	✓
42. Walls	✓
43. Sill	✓
44. Apron	✓
45. Channel	✓
46. Growth	X
47. Erosion	✓
48. Seepage	✓
49. Debris	X

Notes:
46. and 49. Weed growth in U/S channel and brush growth in D/S channel may eventually cause obstruction. Some logs and debris at dam face and below dam, and weed debris at gate entrance. Some debris has been removed recently.

This dam structure is in generally sound condition, mainly requiring continued clean up of debris as part of the regular maintenance. No coorespondence sent.

SIGNED S.J. Rowe
S.J. Rowe, Dam Inspection Officer

DATE July 6/92

Province of British Columbia

Ministry of Environment, Lands and Parks

Water Management Branch

Dam Inspection Report

Beaver Lake
Reservoir Name

Status: Operating Date: Tues. 22 Apr 14/92 10:40 am.

Hazard Rating: File No:

Water District: Penticton Inspection Type: Regulatory

General Observations

Description	....
Type	....
Water Level	....
Sluice Discharge	....
Spillway Flow	....
Res. Debris	....
Res. Slope Stab.	....
Unusual Items	....

Reservoir is full and overflowing the concrete overflow sill.

Embankment

Description	X
Growth	X
Debris	X
U/S Slope	....
Crest	....
D/S Slope	....
D/S Toe	....
Adj. Toe Area	....
Freeboard	....
Toe Drain	....
Abutments	X
Seepage	....
Erosion	....
Sloughing	....
Rip Rap	....
Boils	....
Burrows	....
Unusual Items	....

Dam is an arch type concrete overflow type dam abutted into earthen embankments on both sides with approx 24 inches of freeboard at the abutments.

Moderate erosion is occurring at both abutting embankments - particularly the left side.

Growth should be cleared from the right side and also in behind the structure due to accumulated debris.

Gateworks

Description	....
Operational	....
Access	....
Wheel	....
Stem	....
Gate	....
Trash Rack	....
Boom	....
Gauge	....
Unusual Items	....

Gate works are located near the dam on right side. Works are 1 vertical telescope sliding gate with a recessed intake. Presently there is no operational wheel in place but washed down from previous operations. An old log boom sent from apparently to act as a trash (high water) this time prevented access to better observations.

Sluice Works

Description	....
U/S Headwall	....
D/S Headwall	....
D/S End	....
D/S Channel	....
Growth	....
Obstructions	....
Seepage	....
Piping	....
Erosion	....
Wier	....
Unusual Items	....

The vertical slot works in the concrete overflow structure are in fair condition.

(Water level at time of inspection too high to make any detailed examinations.)

Spillway

Description	....
Location	....
Boom	X
Inlet	....
Entrance	....
Sill	....
Channel	....
Width	....
Walls	....
Slopes	....
Growth	X
Debris	X
Erosion	....
Seepage	....
Rip Rap	....
Unusual Items	....

Water is presently discharging over the spillway sill.
- Floated debris has collected on the U/S side of the structure
- Growth + debris has accumulated on the D/S side of the structure.
- It does not appear that an internal boom has been put in place.

Spillway flows discharge D/S for approx. 50-100 ft. then under the historic restored roadway.

Hazard Assesment

Storage Height	....
Storage Volume	....
D/S Channel	....
People	....
Property	....
Reserves	....
Livestock	....
Industry	....
Railways	....
Roadways	....
Unusual Items	....

Assessed consequence category for the hazard rating for the present → B

Comments

Action	....
Priority 1.... 2.... 3....	
Letter	....
Order	....
Follow Up	X

Inspect at low water to get more detailed observations of the works.

Items
- Erosion at abutments
- Floated debris collected U/S
- Growth

Inspector: D. Duggan

Note

Section 18 (1) of the Water Act states:
"Every licensee and person who has obtained approval under Section 7 shall excercise reasonable care to avoid damaging any land, works, trees, or other property, and shall make full compensation to the owners for any damage or loss resulting from the construction, maintenance, use of operation of the licensee's works."

CHUTE LAKE OCT/92

Before dredging channel

Channel dug z Excavator

No lowering @ old R/R bridge

April 27/93
See Video #1

overflow May 18/94 2"@ leftend
8"@ s.11
≈ 25 CFS

Oct/94
Video #6

RATNIP ~~NUTTAL~~ LK Oct/94

Lake Outlet

Rd Xing
D/s of Lake

Land and Water British Columbia Inc.
An agency of the government of British Columbia

facsimile transmittal

To: Jodie Mould Eng
Fax: 868-2078
Phone:

From: Steve Rowe
Water Management
Penticton
Fax: (250) 492-1314
Phone: (250) 480-8226

Date: July 24/03
No. of pages including this page: 2

Re: Joint Use Agreement

This is the old info sheet on JOA's. Especially for storage sites, the operational aspects should be identified as well, perhaps in the document Operation, Maintenance & Surveillance Manual (OMS) for the dam. (see Inspection & Maintenance of Dams Guidebook)

S Rowe

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3547 Skaha Lake Road Penticton BC V2A 7K2 Phone: (250) 490-8200 Fax: (250) 492-1314
Website: www.lwbc.bc.ca

Dean, Al

From: Bloudell, Linda
Sent: May 25, 2000 11:04 AM
To: Dean, Al
Subject: RE: File 3400594 Chute lake

SL9 is in the OKANAGAN Forest. I'm not entirely sure where the dam is located. I've put an arrow where I think it is. If that's the right location, then that portions of SL9 is Crown. The portion of SL9 east of KVR is also Crown. BKS A an B of DL 827s and DL 769s are all Crown under RES/REC Leases. PC A of SL9 LD 2711 PLAN 1190 IS CROWN EXCEPT FOR PLAN 28183 (REED-WELL HOLDINGS LTD).

Let me know if you need any more info. I'm faxing you a sketch of our ref map and a sketch from one of our rec leases showing Lots 827s and 769s.

Thanks

Linda

P.S File 3403297 shown on cut sheet is a NOTATION OF INTEREST for trapline cabin - MOE Penticton File #0809T022

-Original Message-----
From: Dean, Al
Sent: Wednesday, May 24, 2000 12:31 PM
To: Scherly, Ernie
Cc: Bloudell, Linda
Subject: RE: File 3400594 Chute lake

Thanks Ernie.

I just had a complaint about some camping activities at the south end of Chute Lake and RCMP want to know who has jurisdiction over land and whether they should be dealing with us or Forests. By cc'ing this to Linda, I'm hoping she or Shannon can confirm status of land between dam and east of KVR (which I think is also under our jurisdiction) and fax or email info and a map of any reserve established in favour of MOF or Parks if its a UREP. Looks like the usual summer activities are getting started. I think MOF has recreation site and my first response is MOF Recreation deals with public recreation on Crown land within Provincial Forest. Is SL 9 in or out of Forest?. Please refer to Map 82E.063. Thanks.

-----Original Message-----
From: Scherly, Ernie
Sent: May 23, 2000 9:04 AM
To: Dean, Al
Subject: RE: File 3400594 Chute lake

Will get something down to you in the next couple of days.

-----Original Message-----
From: Dean, Al
Sent: May 19, 2000 4:59 PM
To: Scherly, Ernie
Subject: RE: File 3400594 Chute lake

If you send me a duplicate file down we will follow up with inspection within next 2-3 weeks. or in the interim if you want to give me full names and previous known address and phone #, I can make some inquiries through CO Service and perhaps ICBC or BCAA. Maps and copy of tenure could be sent by fax for starters as well as total bill owing to date. Thanks.

Now that we've tracked down s.22 he may know of s.22 whereabouts since they have s.22 s.22. Did you manage to talk to s.22 today? Have a good weekend. s.22

-----Original Message-----
From: Scherly, Ernie
Sent: May 19, 2000 3:56 PM
To: Dean, Al
Subject: File 3400594 Chute lake

I can't track the lessee down for this file. Do you know when Shaun or yourself may be making a trip up to that area. Ineed someone to post a letter on the door of the cabin, to let s.22 know he needs to contact me and let me know what his new address is.

AA-FYI

FILE NO. _____

DATE Nov 26/04

TIME _____

TELEPHONE/OFFICE INQUIRY

CALLING PARTY s.22 _____ PHONE NO. s.22

SUBJECT Clute Lake - high water level

- reports lake very high for this time of year & concerned ~ possible flooding next spring. s.22

- discussed freshet would normally fill lake, and then have peak discharges anyway - so there wouldn't be a change in peak water levels in lake, just higher level through winter.

- she will look at dam next time s.22 is there and - if there are any sand bags above concrete sill - s.22 will call back.

ACTION TAKEN SR

SIGNED _____

Popowich, Tracy CSNR:EX

From: Mould Engineering [mouldeng@silk.net]
Sent: Thursday, September 16, 2010 2:16 PM
To: Noseworthy, Mike ENV:EX
Cc: Mike Molloy
Subject: Chute Lake Dam - Leave to Commence Construction
Attachments: Chute Lake Dam FIG 3-CROSS.pdf; Chute Lake Dam FIG 1.pdf; Chute Lake Dam FIG 2.pdf; Dam Insp Checklist & notes.pdf

Good afternoon Mike,

Mould Engineering has inspected Chute Lake Dam and has identified maintenance items that need to be addressed. As per your recent discussions with Ken Langedyk, it is understood that a Section 9 Application will not be required as the work can be covered under the water licence. We would like to obtain a 'Leave to Commence Construction', and attached are Figures 1 through 3 along with the inspection checklist that identifies the proposed maintenance work to be completed. If you have any questions or concerns, please let us know.

Regards,

Jody Good
Mould Engineering
206-437 Glenmore Road
Kelowna, BC V1V 1Y5
Tel: 250-868-2072
Fax: 250-868-2078

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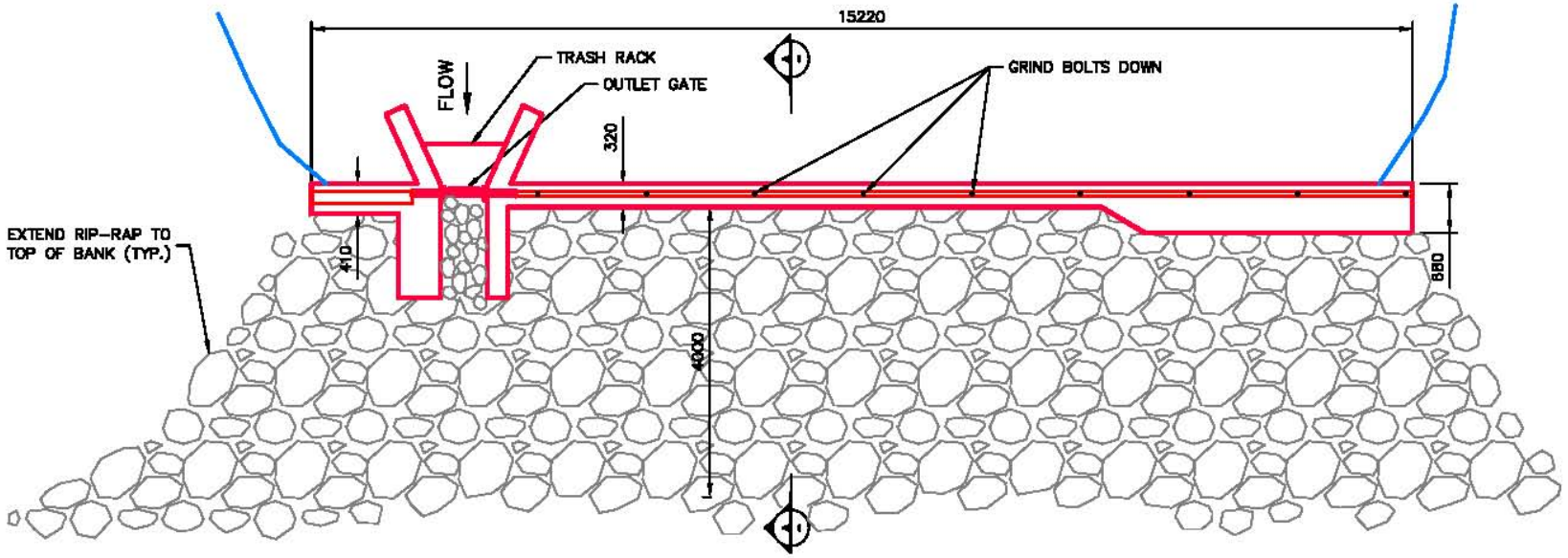
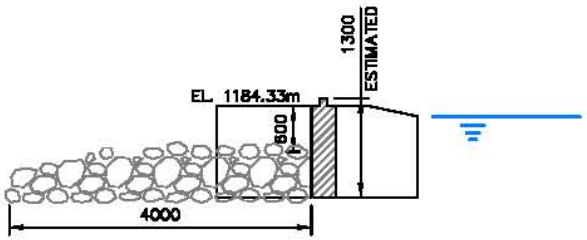


CONCRETE STRUCTURE PLAN VIEW



SECTION VIEW

RIP-RAP SPECIFICATIONS:

MINIMUM THICKNESS	– 500mm
MAXIMUM SIZE	– 600mm(1500kg)
40 TO 50%	– 300mm TO 600mm (750kg TO 1500kg)
50 TO 60%	– 50mm TO 300mm (50kg TO 750kg)
0 TO 10%	– LESS THAN 50mm (50kg)
NOTE	– THE ROCK DIMENSIONS IN A PLANE CAN NOT BE MORE THAN TWO TIMES THE MINIMUM DIMENSION OF THE ROCK

Mould Engineering

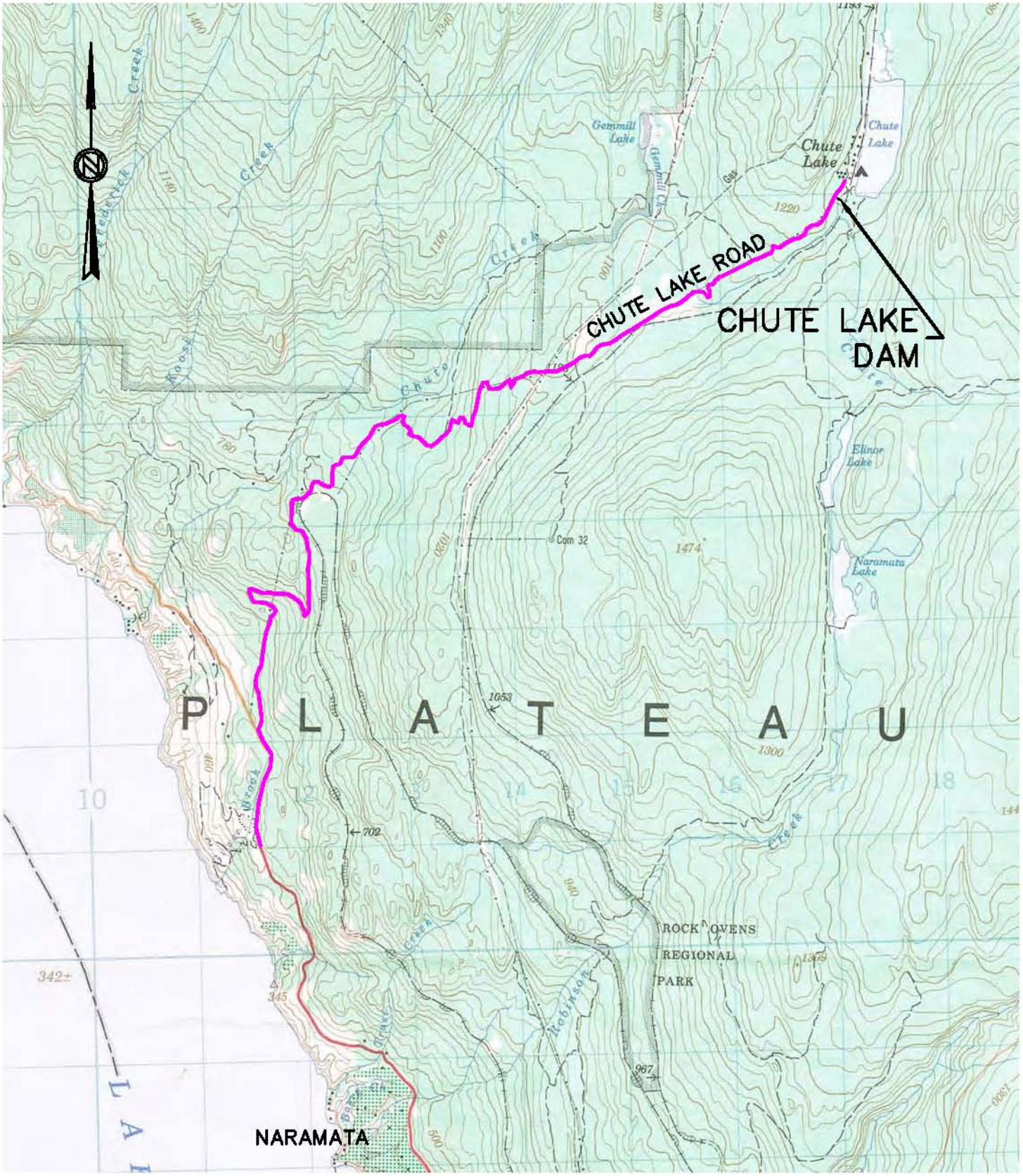
MISSION HILL

PARADISE RANCH-CHUTE LAKE DAM

FIGURE 3

RIP-RAP ON DOWNSTREAM SIDE OF DAM

SCALE 1:100 AUG. 2010



Mould Engineering

MISSION HILL

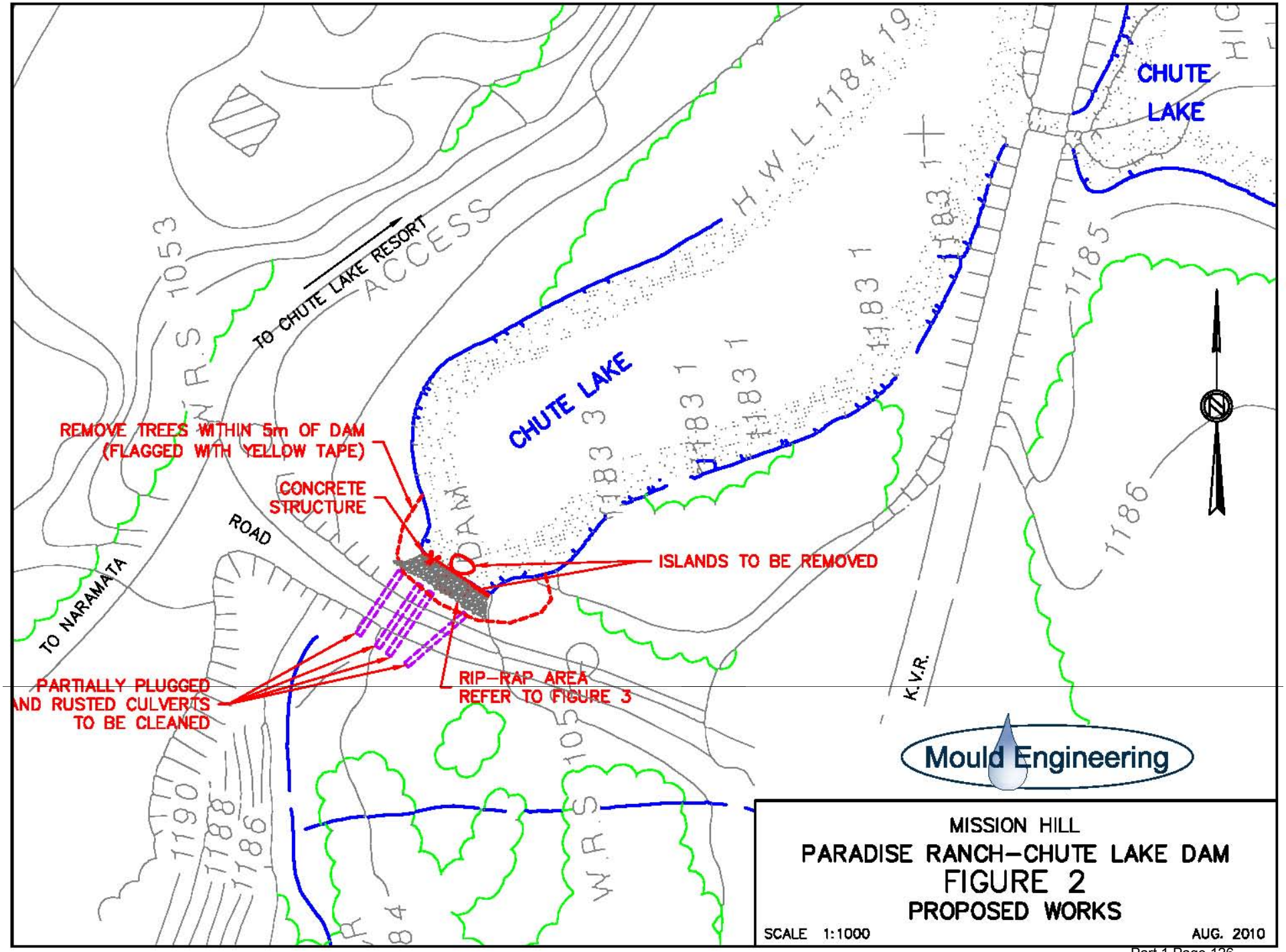
PARADISE RANCH–CHUTE LAKE DAM

FIGURE 1

KEY MAP

SCALE NTS

AUG. 2010


CHUTE LAKE
CHUTE LAKE
TO CHUTE LAKE RESORT
ACCESS
REMOVE TREES WITHIN 5m OF DAM
(FLAGGED WITH YELLOW TAPE)
CONCRETE
STRUCTURE
ROAD
TO NARAMATA
ISLANDS TO BE REMOVED
PARTIALLY PLUGGED
AND RUSTED CULVERTS
TO BE CLEANED
RIP-RAP AREA
REFER TO FIGURE 3
K.V.R.
W.R.S. 1053
W.R.S. 1053
H.W.L. 1184.19
1183.1
1185
1186
1190
1188
1186
Mould Engineering
MISSION HILL
PARADISE RANCH-CHUTE LAKE DAM
FIGURE 2
PROPOSED WORKS
SCALE 1:1000
AUG. 2010

BRITISH COLUMBIA DAM INSPECTION CHECKLIST

Dam Name: Chute Lake Inspection Date: Aug 19/10 Water Licence No.: _____

Your Name: Ken Langedyk, P.Eng. Provincial Dam File No.: _____

	Yes	No	
Was the spillway flowing?	☐	☑	If yes, what was the approximate flow rate? _____
			If no, then how far was the reservoir drawn down below the spillway sill level? _____
Was the outlet open?	☑	☐	If yes, what was the approximate discharge rate? 0.1 m³/sec

applicable), check one. If the No box is checked, please comment on deficiency at bottom of page.

EMBANKMENT	Yes	No	N/A
1. U/S Slope debris	☐	☑	☐
2. Crest spalling	☐	☑	☐
3. D/S Slope debris	☐	☑	☐
4. D/S Toe erosion	☐	☑	☐
5. Drains (toe, others)	☐	☐	☑
6. Erosion Protection needs more rip-rap on d/s toe	☐	☑	☐

OUTLET	Yes	No	N/A
1. Outlet Pipe corr; Failing	☐	☐	☑
2. Energy Dissipater	☐	☑	☐
3. Stilling Basin	☐	☐	☑
4. Toe Drains	☐	☐	☑
5. Outlet Channel debris	☐	☑	☐
6. Measuring Weir	☐	☐	☑
7. Outlet Control	☐	☑	☐
8. Gates debris	☐	☑	☐

SPILLWAY	Yes	No	N/A
1. Debris Boom	☐	☐	☑
2. Entrance	☐	☑	☐
3. Sill debris.	☐	☑	☐
4. Apron	☐	☑	☐
5. Walls	☐	☑	☐
6. Channel	☐	☑	☐
7. Channel Slopes	☐	☑	☐
8. Gates	☐	☐	☑
9. Culverts (4) ↳ Plugged			

Were any of the following *POTENTIAL PROBLEM INDICATORS* found?

INDICATOR	EMBANKMENT Yes	EMBANKMENT No	OUTLET Yes	OUTLET No	SPILLWAY Yes	SPILLWAY No
a) Seepage	☐	☑ concrete	☐	☑	☐	☐?
b) External Erosion	☑	☐	☑	☑ - under SW side, 300mm	☐	☐?
c) Cracks	☐	☑	☐	☑	☐	☐?
d) Settlement	☐	☑	☐	☑	☐	☑ Probably
e) Sloughing / Slides	☐	☑	☐	☑	☐	☑
f) Animal Activity	☐	☑	☐	☑	☐	☐?
g) Excessive Growth	☑	☐	☑	☐	☑	☐ Clean min 2m back from ToB
h) Excessive Debris	☑	☐	☑	☐	☑	☐

Evaluation of the conditions downstream of the dam must be undertaken at the same time as the formal inspection to ensure the consequence classification of the dam has not changed. Any changes must be reported to the Dam Safety Officer.

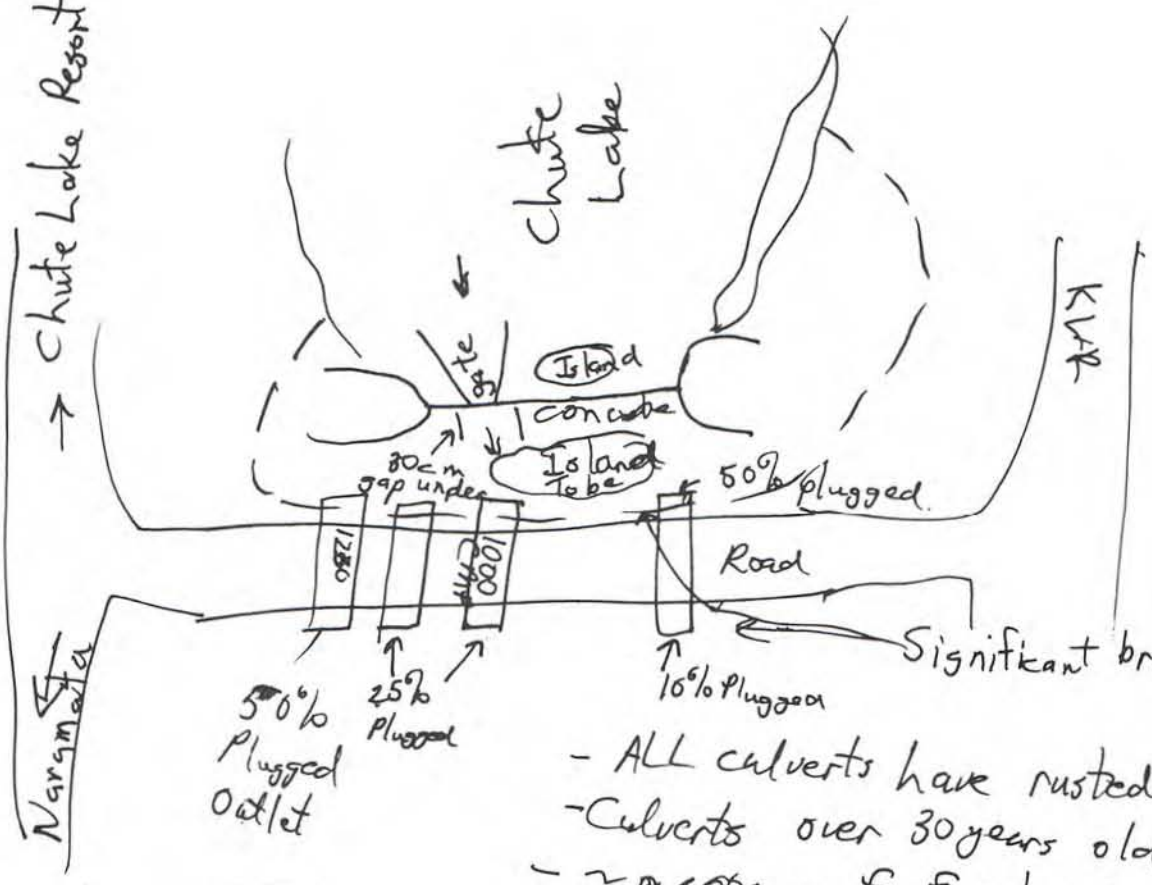
Please Comment on Deficiency(s) Found:

Turn Over →

- no structural cracks in the concrete

Note: Please complete this report form semi-annually. A copy may be requested by the Dam Safety Officer in your Region.

Revision Date: May, 1998



- ALL culverts have rusted out bottoms
- Culverts over 30 years old.
- ≈ 600mm of freeboard on east side
- ≈ 700mm " " " west side

Recomendations

- Remove Islands in front of dam and in spillway
- clean spillway + culverts (4) under road
- Remove (grind) bolts on top of concrete spillway
- Remove all trees within 5 m of dam - flagged with pull back flagging in the field.

Popowich, Tracy CSNR:EX

From: Noseworthy, Mike ENV:EX
Sent: Wednesday, September 22, 2010 9:15 AM
To: 'Mould Engineering'
Subject: RE: Chute Lake Dam - Leave to Commence Construction
Attachments: terms conditions Okanagan 27may2009.pdf

Ken;

Just to summarize our conversation earlier this week, I would like to reiterate that the proposed work that you have presented falls under general maintenance of the licensed works and as such you do not require a "Leave to Commence Construction" nor a Section 9 approval. However, no "harmful alteration, disruption, or destruction" (HADD) of fish habitat is authorized. A qualified professional should be engaged to ensure no HADD occurs. If a qualified professional determines a potential HADD may occur as a result of the works, a review for formal "authorization" from DFO is required.

In addition you must follow the "**Habitat Officer's Terms and Conditions for changes in and about a stream specified by Ministry of Environment Habitat Officers, Okanagan Region".** A copy of the document has been attached.

If you have any questions, feel free to call.

Regards,

Michael E. Noseworthy, PGeo, EngL
Water Stewardship Officer / Dam Safety Officer
Resource Stewardship and Parks Division
Ministry of Environment
Ph: 250.490.2291
Fx: 250.490.2231

From: Mould Engineering [mailto:mouldeng@silk.net]
Sent: Thursday, September 16, 2010 2:16 PM
To: Noseworthy, Mike ENV:EX
Cc: Mike Molloy
Subject: Chute Lake Dam - Leave to Commence Construction

Good afternoon Mike,

Mould Engineering has inspected Chute Lake Dam and has identified maintenance items that need to be addressed. As per your recent discussions with Ken Langedyk, it is understood that a Section 9 Application will not be required as the work can be covered under the water licence. We would like to obtain a 'Leave to Commence Construction', and attached are Figures 1 through 3 along with the inspection checklist that identifies the proposed maintenance work to be completed. If you have any questions or concerns, please let us know.

Regards,

Jody Good
Mould Engineering
206-437 Glenmore Road
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Tel: 250-868-2072
Fax: 250-868-2078

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Habitat Officer's Terms and Conditions for changes in and about a stream specified by Ministry of Environment Habitat Officers, Okanagan Region

Section 42 (1) of the Water Regulation gives authority to a Habitat Officer to add specific conditions to ensure the protection of habitat in addition to the conditions of general application. Under this authority, Ministry of Environment (MoE) Habitat Officers, Okanagan Region, require the following mandatory terms and conditions:

42 (1) To protect habitat, a person making a change in and about a stream[*] under this regulation, other than under section 44(1)(o) to (s) or (2), must make that change in accordance with terms and conditions specified by the habitat officer with respect to

---

a) The timing window or the period or periods of time in the year during which the change can proceed without causing harm to fish, wildlife or habitat,

Windows of least risk for fish and wildlife, including some species at risk, in Okanagan Region can be found on the work windows webpage:
http://www.env.gov.bc.ca/wsd/regions/okr/wateract/workwindows.html

Fish and Fish Habitat:

1. All activities in fish streams, as well as tributaries that have a risk of depositing sediment into fish streams, must be undertaken within a window of least risk to fish and fish habitat. Windows of least risk are designed to protect all fish species known to occur in a stream.
2. **If works are proposed outside the listed windows the proponent must engage a qualified professional** to assess species and habitats present and determine if a site specific plan can be developed to ensure compliance with the *Fisheries Act*.
3. The recommendations and the technical rational for the plan must be developed, signed and sealed by an appropriately qualified professional(s). A report must be maintained by the proponent in the event the works are monitored or a compliance inspection is conducted.
4. If impacts cannot be mitigated to avoid the potential *Fisheries Act* violation, and the proponent wishes to continue to seek approval for the operations to proceed, the proponent must obtain an authorization from Fisheries and Oceans Canada (DFO) as outlined in section (h) below.
5. Notwithstanding the above, the fisheries timing window is not applicable if the stream channel is naturally dry (no flow), or frozen to the bottom, at the worksite and the instream activity will not adversely impact fish habitat (e.g., result in the introduction of sediment into fish habitat or damage to fish habitat).

[*] A "stream" is defined in the *Water Act* as "a natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch". For the purposes of this document, the definition of "stream" includes all those watercourses that are considered to be fish habitat, including channelized streams, and ditches that are fish habitat.

Wildlife:

1. Most species of wildlife are at their highest risk for disturbance during the period where they raise their young.
2. Some may be at risk during their dormant or hibernating period.
3. Wildlife, including species at risk, observation records can be obtained through IMapBC http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc.
4. The absence of an observation record does not confirm that a species is not present.
5. **A qualified professional may be able to determine minor variances to these least risk work windows based on the location in the region and species presence.**

NOTE: In all cases, minimize the amount of time the work site is in a disturbed state by completing work as quickly as possible, while considering worker safety and minimizing environmental risk.

b) The minimum instream flow or the minimum flow of water that must remain in the stream while the change is being made,

The natural rate of water flow must be maintained upstream and downstream of the worksite during all phases of instream activity.

c) The removal of material from the stream or stream channel in connection with the change,

1. In fish streams, the permanent removal of stable, naturally occurring material from the stream or stream channel is not permitted.
2. In non-fish bearing streams with a species at risk, or habitat of a species at risk, the permanent removal of stable, naturally occurring material from the stream or stream channel is not permitted.
3. In non-fish bearing streams without species at risk, the permanent or temporary removal of stable, naturally occurring material must be minimized and completed only as necessary to make the change in accordance with Part 7 of the Water Regulation.
4. The removal of material must not lead to stream channel instability or increase the risk of sedimentation into the watercourse.
5. Any spoil materials must be placed in a manner that ensures that sediment, or debris, does not enter the watercourse.
6. The spoil must be placed where it will not impact riparian habitats or impact habitats of species at risk.

d) The addition of substance, sediment, debris or material to the stream or stream channel in connection with the change,

1. Instream activities must be conducted in the dry (no water present within the worksite) and the worksite must be isolated from water flowing in the stream channel.
2. Measures must be taken to ensure that no harmful material (e.g., fuel and other hydrocarbons, soil, road fill, or sediment), which could adversely impact water quality, fish and other aquatic life, species at risk and/or fish habitat (including riparian and or emergent vegetation), can enter the wetted perimeter as a result of the project activities.
3. All equipment must be located and operated outside of the wetted perimeter of the stream unless operated from a barge where deleterious substances will not enter the water and in a manner that will not result in grounding of the barge.
4. Equipment used in close proximity to the wetted perimeter must be free of deleterious material (e.g., hydrocarbons) and in good mechanical condition (e.g., no fuel or hydraulic leaks).
5. Erosion and sediment control structures are to be available onsite and utilized as necessary.
6. Do not work in weather conditions likely to substantially increase the risk of sediment introduction to the stream.
7. If approved, beaver dam removal must occur slowly, a portion at a time, in order to minimize scouring and the addition of silt to downstream areas. A dam breach should normally not exceed 0.2 square metres in area (i.e., a typical breach could measure 1.0 metre x 20 centimetres in size). All material removed from a beaver dam must be disposed of in such a manner that it cannot re-enter the stream.

e) The salvage or protection of fish or wildlife while the change is being made or after the change has been made,

1. If dewatering of the worksite is necessary, fish salvage must occur on a fish-bearing stream prior to commencing works. A fish collection permit must be obtained from the MoE prior to commencing salvage activities
   http://www.env.gov.bc.ca/pasb/applications/process/scientific_fish_collect.html
2. If an area is de-watered as a result of beaver dam removal or modification and results in the stranding of fish, then these fish must be salvaged and returned to the stream.
3. Measures must be taken to ensure that operating equipment (e.g., water pumps) does not harm aquatic life.
4. **NOTE** – when undertaking an activity in a western ridged mussel (*Gonidea angulata*) **red zone,** as defined in the Okanagan Region Large Lake Foreshore Protocol[1] (LLP) and impacts cannot be avoided, then mussels are to be salvaged and relocated to an area with similar site conditions. Salvage must be untaken by a qualified professional and must be consistent with DFO's Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk (contact MOE Ecosystems Staff to obtain this protocol). Follow up monitoring is to be conducted for 2 years post relocation and reports provided to the Habitat Officer annually.

f) The protection of natural materials and vegetation that contribute to habitat or stream channel stability,

Minimize disturbance to natural materials and vegetation that contribute to habitat or stream channel stability. In addition to fish habitats this includes protection of riparian habitats for wildlife.

g) The restoration of the work site after the change has been made, and

1. Complete restoration activities (including erosion control), as soon as possible following construction/disturbance.
2. Any disturbed areas must be restored to function as they did in their pre-disturbance condition (e.g., riparian areas, including grasslands). Appropriate native seed/plant/tree species must be used to restore the site to pre disturbance conditions.
3. Restoration must be completed in a manner that will minimize colonization and spread of invasive plants.

h) The requirement to obtain an approval from the federal Department of Fisheries and Oceans (DFO) in connection with the change.

1. **Proponents are responsible for complying with the federal *Fisheries Act***. No "harmful alteration, disruption, or destruction" (HADD) of fish habitat is authorized by this document.
2. If a qualified professional or Habitat Officer determines a potential HADD may occur as a result of the works, a review for formal "authorization" from DFO is required.
3. If requested, the proponent will need to provide the Habitat Officer more information (including assessments by qualified professionals) to determine if an "authorization" is required from DFO.
4. **If you are constructing a dock**, as defined in the Okanagan Region Large Lake Foreshore Protocol[1] (LLP), **the following applies:**

   (A) An approval from DFO is **not required** when:

   i. The structure is proposed on a water body not identified in the LLP or in a **no colour or yellow zone** (as identified in the LLP). In addition, dock construction and design must meet **all** of the conditions and measures outlined in the *Fisheries and Oceans Canada Pacific Region Operation Statement for Dock and Boathouse Construction in Fresh water Systems*[2] (ROS). If some of the conditions or measures of the ROS cannot be met then you must engage a qualified professional (fish biologist) to assist you in your design and construction to ensure a HADD does not occur, or obtain a HADD authorization.
   ii. The structure is proposed in a **red zone** (as identified in the LLP) where there is no shore spawning habitat, and a qualified professional (fish biologist) has been engaged to ensure all of the conditions and measures outlined in the ROS have been followed and that a HADD will not occur.
   iii. The structure is proposed in a **red zone** (as identified in the LLP) where the ROS measures for dock location has not been followed (i.e. dock is in a known spawning area), and a qualified professional (fish biologist) has been engaged, and all of the design criteria identified below are met.

Design Criteria:

- All instream works must occur during the least risk timing window;
- Piles are not to be placed within known or potential spawning substrates;
- The spanning structure (gangway) of spawning area must be no greater than 1.5m in width;
- The spanning structure (gangway) over the spawning area must be made with light penetrating materials;
- Dock must be no less than 0.5m above the high water mark, or the Geodetic Survey of Canada datum (if available);
- Batter boards are not to be used on the dock; and
- There will be no floating structures.

(B) An approval from DFO is **required** when:

i. A qualified professional or a MoE Habitat Officer has indicated a **HADD** will likely occur as a result of your works, regardless of what lake or zone you are in.
ii. The structure is proposed in a **black zone** on any of the lakes identified in the LLP (see section 6.1 of the LLP).
iii. The structure is proposed in a **red zone** and all the design criteria (listed above) have **not** been met. NOTE: In your submission to DFO for approval you must include a summary of what design criteria are not being met along with a justification from a qualified professional as to why the criteria is not being met.

[1] Okanagan Region Large Lakes Foreshore Protocol http://www.env.gov.bc.ca/okanagan/esd/ecosystems.html
[2] Fisheries and Oceans Canada Pacific Region Operation Statement - Dock and Boathouse Construction in Fresh Water Systems http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/operational_statements_e.htm

From: Mould Engineering [mouldeng@silk.net]
Sent: Thursday, September 23, 2010 10:06 AM
To: Noseworthy, Mike ENV:EX
Subject: Re: Chute Lake Dam - Leave to Commence Construction

Hi Mike,

Thanks for reviewing our proposed maintenance works and getting back to us. As we discussed, we will be employing an environmental monitor on the Chute Lake Dam project and they will assess for a HADD and any other environmental issues.

Thanks for the prompt reply and talk to you soon,

Ken

From: Noseworthy, Mike ENV:EX
Sent: Wednesday, September 22, 2010 9:14 AM
To: Mould Engineering
Subject: RE: Chute Lake Dam - Leave to Commence Construction

Ken;

Just to summarize our conversation earlier this week, I would like to reiterate that the proposed work that you have presented falls under general maintenance of the licensed works and as such you do not require a "Leave to Commence Construction" nor a Section 9 approval. However, no "harmful alteration, disruption, or destruction" (HADD) of fish habitat is authorized. A qualified professional should be engaged to ensure no HADD occurs. If a qualified professional determines a potential HADD may occur as a result of the works, a review for formal "authorization" from DFO is required.

In addition you must follow the "**Habitat Officer's Terms and Conditions for changes in and about a stream specified by Ministry of Environment Habitat Officers, Okanagan Region".** A copy of the document has been attached.

If you have any questions, feel free to call.

Regards,

Michael E. Noseworthy, PGeo, EngL
Water Stewardship Officer / Dam Safety Officer
Resource Stewardship and Parks Division
Ministry of Environment
Ph: 250.490.2291
Fx: 250.490.2231

From: Mould Engineering [mailto:mouldeng@silk.net]
Sent: Thursday, September 16, 2010 2:16 PM
To: Noseworthy, Mike ENV:EX
Cc: Mike Molloy
Subject: Chute Lake Dam - Leave to Commence Construction

Good afternoon Mike,

Mould Engineering has inspected Chute Lake Dam and has identified maintenance items that need to be addressed. As per your recent discussions with Ken Langedyk, it is understood that a Section 9 Application will not be required as the work can be covered under the water licence. We would like to obtain a 'Leave to Commence Construction', and

attached are Figures 1 through 3 along with the inspection checklist that identifies the proposed maintenance work to be completed. If you have any questions or concerns, please let us know.

Regards,

Jody Good
Mould Engineering
206-437 Glenmore Road
Kelowna, BC V1V 1Y5
Tel: 250-868-2072
Fax: 250-868-2078

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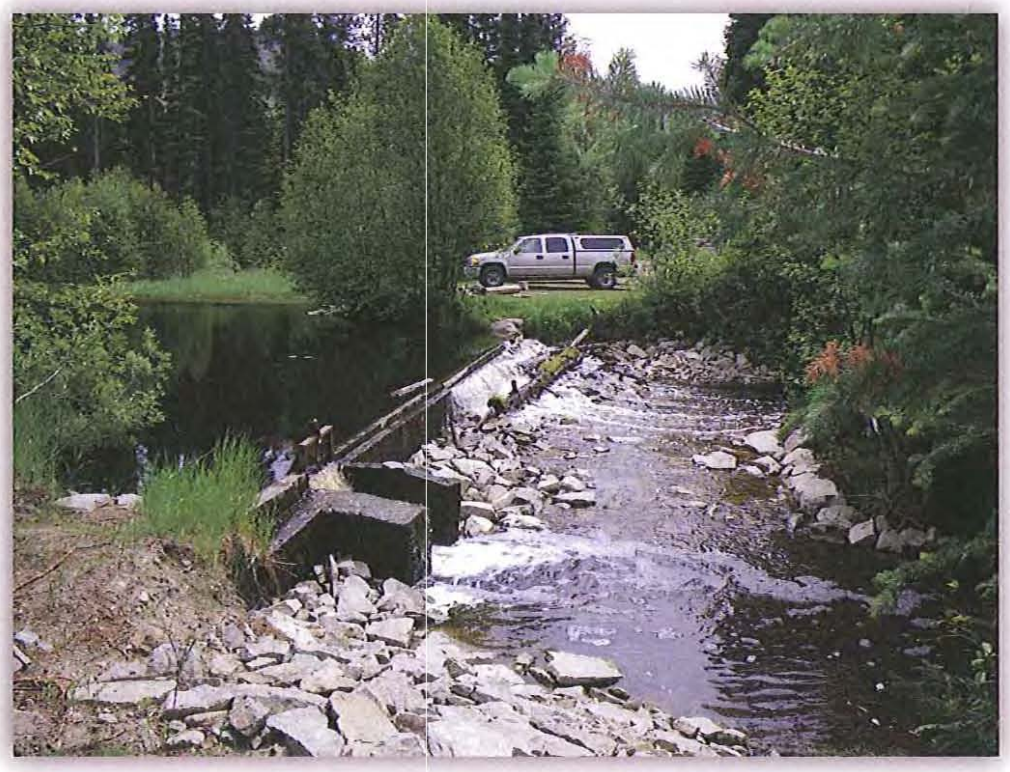
2011 Dam Audit

Chute Lake

Photo Summary

6/27/2010



Downstream face of dam.

Chute Lake FSR with partially blocked CMP causing back-flooding at toe of dam.

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DAM AUDIT PROGRAM

DAM AUDIT CHECK SHEET

Dam : Chute Lake D220117 Date : June 27, 2011

Consequence Rating : VH (H) L VL

Probability Rating : Lrg Sig (Sm) VSm

Risk Level : (see over)
1 2 (3) 4 5

This Audit is not an Inspection of the dam. The owner is responsible for dam inspections.

DAM SAFETY REGULATION REQUIREMENTS

	Yes	No	N/A	Follow Up?
Consequence Rating Appropriate?	✓			
Alterations or Hazards occurred recently?	✓			
Owner Reported any recent alterations or hazards?	✓			
Emergency Plan Prepared?		✓		✓
Emergency Plan Submitted and Updated?		✓		✓
OMS Plan Prepared?		✓		✓
OMS Plan Submitted?		✓		✓
Reservoir Operation as per OMS Manual?			✓	
Maintenance Suitable? *(2)	✓			
Surveillance Suitable? (1)	✓			
Annual Inspection Suitable? (3)	✓			
Dam Safety Review Requirement Discussed :	Complete	Started	Not Started	✓

Comments : (1) Weekly in spring, Summer monthly, fall? weekly
(2) Recent cleaning.
(3) Mould Engineering.

Dam Site Observations : Overflow concrete dam recently cleaned up on the downstream face & coarse rip-rap applied. FSR immediately d/s with 4 OMP's, needs replacement. No significant deficiencies noted. OMS & EPP needs to be prepared/submitted. Dam Safety Review needs to be completed by 2013.

Dam Safety Officer : _____ Owner (if present) :

s.22

(Page 2 over)

RISK LEVEL CHART

Failure Probability Rating[1]	Failure Consequence Rating[2]			
	Very High	High	Low	Very Low
Large	1	1	2	3
Significant	1	2	3	4
Small	3	3	4	5
Very Small	3	4	5	5

1) ALERT – immediate attention:
   Enhanced monitoring / consultants involved / repairs ASAP / may restrict reservoir operation / EP reviewed / CWR or RWM notified, possible Order

2) CAUTION – considerable work to do:
   Increased monitoring / planning for rehab / may modify reservoir operation / EP reviewed / may request submission of Inspection Report (perhaps weekly), OMS, or early DSR / CWR or RWM made aware of situation

3) STABLE:
   Regular owner inspections plus monitoring operation under peak loading / rehab as appropriate / may request submission of Annual Inspection Report, OMS, or early DSR / may audit on an increased frequency

4) NO CONCERNS:
   Included in regular audit program to identify any changes / normal operation

5) EFFECTUAL (Low and Very Low ONLY)
   LOW dams included in regular audit program to monitor failure consequence only/ normal operation

[1] Table 2, Failure Probability Rating Guidelines, Dam Safety Risk Based Consequence Classification and Monitoring
[2] Schedule 1, Dam Safety Regulations, BC Reg. 44/2000

Mould Engineering

June 7, 2011

Mission Hill Family Estate
1730 Mission Hill Road
Kelowna, BC V4T 2E4

ATTN: Mike Molloy

Dear Mike:

RE: Chute Lake Dam – Update of Downstream Consequence Classification

This letter summarizes the change to the Downstream Consequence Classification for Chute Lake Dam. The downstream consequence classification basically summarizes in one or two words (Very Low, Low, High, Very High) what would potentially be impacted and the result of that impact if the dam were to fail. Until recently, the downstream consequence classification for Chute Lake Dam was Low and recently it has been updated to High.

BACKGROUND

The downstream consequence classification for any dam, according to the British Columbia Dam Safety Regulation, must be Very Low, Low, High or Very High. The original downstream consequence classification for Chute Lake Dam was Low. According to the British Columbia Dam Safety Regulation, this meant that if there was a dam failure, there could be one or more of the following: a. a low potential for multiple loss of life, b. that the economic losses would be less then $100,000 and c. loss or significant deterioration of water quality and wildlife habitat.

Mike Noseworthy, P.Eng., Dam Safety Officer with the Ministry of Forests, Lands and Natural Resource Operations Dam Safety Branch of the Ministry of Environment, recently reviewed the downstream consequence classification for Chute Lake dam and other dams. We provided Mike with information (current conditions downstream of the dam) to assist with the review. Mr. Noseworthy's conclusion was that the downstream consequence classification should be updated to High. The High downstream classification notes that there is one or more of the following: a. some potential for multiple loss of life, b. there is substantial economic losses exceeding $1 million, and c. there is a loss or significant deterioration of water quality and wildlife habitat.

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High Consequence Classification – Impact on Operations

Updating the downstream consequence classification from Low to High for Chute Lake Dam has an impact on the operation and maintenance of the dam. Table 1 outlines the minimum inspection frequency and Dam Safety review requirements for a High Consequence Dam. This table is derived from Schedule 2 contained in the British Columbia Dam Safety Regulation's contained within the Water Act.

Table 1
Minimum Inspection Frequency and Dam Safety Review Requirements
for a High-Consequence Dam

Item	Minimum Frequency
Site Surveliance – Visual inspection. Reduced frequencies of visual inspections may be determined by seasonal conditions.	**Weekly**
Formal Inspections – a more thorough inspection performed by the appropriate representative of the owner responsible for safety surveillance	**Semi-Annually or Annually**
Instrumentation – currently none on site	**As per Operation, Maintenance & Surveillance Manual (OMS)**
Test operation of outlet facilities, spillway gates and other mechanical components	**Annually**
Emergency Preparedness Plan (EPP)	**Update Communications directory Semi-Annually**
Operation, Maintenance & Surveillance Plan (OMS)	**Review Every Ten years**
Dam Safety Review	**Every Ten years Note: Dam owners must conduct an annual review of conditions downstream of the dam and report them to the Dam Safety Officer immediately if they change.**

Conclusion

The updating of the downstream consequence classification from Low to High by Mr. Noseworthy appears reasonable. When we discussed it with him on May 25, 2011, he noted that he would be sending a letter to you noting the update of the downstream consequence classification.

In summary, the future activities that should be conducted to minimize the risks associated with the dam include:

a. Weekly surveillance during spring and summer and an annual inspection;
b. Routine maintenance to remove accumulated organic debris immediately above and below the concrete dam structure;
c. Removal of organic debris that becomes lodged in the culverts under Elinor Lake FSR,
d. Test the outlet gate on an annual basis to ensure that it is working properly.
e. Complete an Operation, Maintenance & Surveillance Manual,
f. Complete an Emergency Preparedness Plan, and
g. Complete a Dam Safety Review.

Items a. to d. can be completed by staff from Mission Hill Estate. The person completing the (a.) Annual Inspection should be a different person then the one completing the weekly surveillance.

Items e. and f. could be completed by Mould Engineering. We have recently completed several Operation, Maintenance & Surveillance Manuals (OMS) as well as Emergency Preparedness Plans (EPP) for other dams. The typical costs to complete and distribute the OMS and the EPP is about $10,000. Since we have recently worked on Chute Lake Dam, we can not complete g. the Dam Safety Review. We recommend that you hire another competent Engineer that has experience working with dams.

If you have any questions about the above, please contact me.

Regards,

Ken Langedyk, P.Eng., M.Eng.

KL

cc: Mike Noseworthy, Dam Safety Officer, Ministry of Forests, Lands and Natural Resource Operations

Chute Lake Dam – Site Visit Summary by Mould Engineering

Site Visits

October 29, 2010

On October 29, 2010, Stu Mould, P.Eng., and Ken Langedyk, P.Eng., M.Eng. of Mould Engineering completed a review of the conditions downstream of the Chute Lake dam. The review consisted of looking at structures (houses) and infrastructure that would be impacted if Chute Lake Dam failed.

In summary, there were numerous structures and infrastructure downstream of Chute Lake dam that would be impacted is the dam failed. These included:

- Four wooden bridges on the Kettle Valley Railway
- Four road crossings that had culverts of various sizes, capacities and configurations.
- One road crossing with a foot bridge.
- Power and telephone lines.
- One house by Indian Rock Road that is worth less than $1,000,000.
- Three houses on Okanagan Lake that are worth in excess of $1,000,000 each.

If the Chute Lake Dam fails, the above infrastructures will be impacted. The road crossings that contain culvert and bridges will probably be washed out and leave a large impassable hole in the road. Since the road crossings are on roads with good sight lines or dirt roads with low traveling speeds, there is a low potential that someone will crash into the open hole and be injured or die.

The four houses noted above will probably sustain a reasonable amount of damage if the Chute Lake Dam fails. Since the houses are close to Chute Creek, there will be very little time for the occupants of the houses to leave prior to a flood wave impacting the houses.

Conclusion

In conclusion, there is infrastructure (road, culverts, etc.) located downstream of Chute Lake Dam that will be impacted if the dam fails. The infrastructure impacted includes five bridges, four road crossings as well as telephone and power lines. If the infrastructure noted is impacted, it is estimated that it will cost $600,000 to replace. There should also be no loss of life.

The four structures (houses) located downstream of Chute Lake dam may be severely impacted if Chute Lake Dam fails. The houses will probably sustain a significant amount of damage and people may be injured or killed. There is a potential for multiple loss of life (less than 100) and direct and indirect costs exceeding $1 million.

In summary, if the Chute Lake Dam fails there will be loss of life, loss of wildlife habitat and infrastructure and structure losses.

Mould Engineering

May 4, 2011

Mission Hill Family Estate
1730 Mission Hill Road
Kelowna, BC V4T 2E4

ATTN: Mike Molloy

Dear Mike:

RE: Fall 2010 Chute Lake Dam Maintenance

This letter together with attached photos and drawing summarize the maintenance activities undertaken on the Chute Lake Dam located at the south end of Chute Lake. The objective of the maintenance program was to minimize dam failure risks at the Chute Lake Dam.

BACKGROUND

Mike Molloy of Mission Hill Family Estate contacted Jody Good of Mould Engineering on June 22, 2010 to determine who has the responsibility and liability for Chute Lake Dam. It was noted that there are numerous licensees responsible for Chute Lake Dam with Mission Hill Family Estate (Mark Anthony Properties) being the largest user of the stored water. It was requested that a dam inspection be completed on behalf of Mission Hill Family Estate.

Two inspections were completed, and a list of recommended maintenance activities was outlined in a letter report dated September 9, 2010. Upon receipt of this report, Mike Molloy requested that Mould Engineering oversee the completion of the recommended maintenance work. A pre-work site meeting took place on Thursday, October 14th, 2010. In attendance were representatives of Mould Engineering (Stu Mould & Shawn Mamchur), Golder Associates (Darrell Arsenault & Jason Marzinzik), Mission Hill Family Estate (Mike Molloy), and Scott Contracting (Joe Scott & Rob Black). Other water licensees, s.22 s.22 were present at the conclusion of the meeting and were informed of the planned maintenance activities.

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MAINTENANCE WORK COMPLETED

Maintenance work generally followed the recommendations in the September 9, 2010 letter report. Work commenced on October 18th and concluded on October 20th. Equipment on-site included a Hitachi Zaxis 75 excavator and Morooka rubber-tracked dump truck. Rock rip-rap was sourced off-site by the contractor, Scott Contracting. The maintenance work completed is summarized below and shown on Figure 1, attached.

Prior to commencement of construction activities, the outlet gate on the dam was closed, and fish present between the dam and the culverts on Elinor Lake Forest Service Road (FSR) were relocated by Jason Marzinzik of Golder Associates. Additionally, sand bag barriers were constructed at the inlets and/or outlets of these culverts to isolate the stream below the dam from the work area. A representative of Golder Associates acted as the environmental monitor and was on site for the duration of the project.

Work involved removing vegetation, organic debris, and sediment upstream and downstream of the dam as outlined in Recommendations 1, 3 & 4 of the September 9, 2010 letter report. At the request of the client and other parties with a water licence, a visual barrier of coniferous and deciduous vegetation was left along Elinor Lake FSR and upstream of the dam on both sides. Rock rip-rap placement immediately downstream of the dam was completed as per Recommendation 5. Bolts protruding from the top of the concrete structure were removed as per Recommendation 2.

The four 1200 mm culverts crossing under Elinor Lake FSR immediately downstream of the dam were assessed and the inlets and outlets cleaned of organic debris and some sediment. The two western-most culverts have collapsed (they have been in this condition for some time) and are only passing a small amount of water. The two eastern-most culverts show signs of rust perforation at the waterline. These culverts, together with the stream gradient below, are back-watering the area downstream of the dam. The Ministry of Forests (Bill Henriksen) has been contacted about the condition of these culverts.

At present, the bottom of the dam outlet gate is below the culvert inverts. Replacement of these culverts at a different elevation may result in scour and material movement in the stream below the outlet gate and may necessitate the removal of some rock armouring in order to provide additional flow capacity.

CONCLUSION & RECOMMENDATIONS

The maintenance work performed on Chute Lake Dam between October 18th and 20th, 2010, will minimize the risks at the dam. Work consisted of removing vegetation and accumulated organic debris and sediment from above and below the concrete dam structure as well as and rock armouring the downstream face of the spillway. An environmental monitor (a representative of Golder Associates) was in attendance for the duration of the project, and ensured that fish present in the lake and stream below the dam were not adversely affected by the work.

Future activities that should be conducted to minimize risks associated with the dam include:

- Monthly surveillance and annual inspection;
- Routine maintenance to remove accumulated organic debris immediately above and below the concrete dam structure;
- Advise Ministry of Forests that culvert failure under Elinor Lake FSR needs to be addressed;
- Removal of organic debris that becomes lodged in the culvert inlets under Elinor Lake FSR; and
- Test the outlet gate on an annual basis to ensure that it is working properly.

Also, as per Recommendations 7 and 8 of the September 9, 2010 letter report, an Operation and Maintenance Manual and Emergency Preparedness Plan should be prepared for the Chute Lake Dam.

We trust the enclosed information meets your requirements at this time, and if there are any questions, please advise.

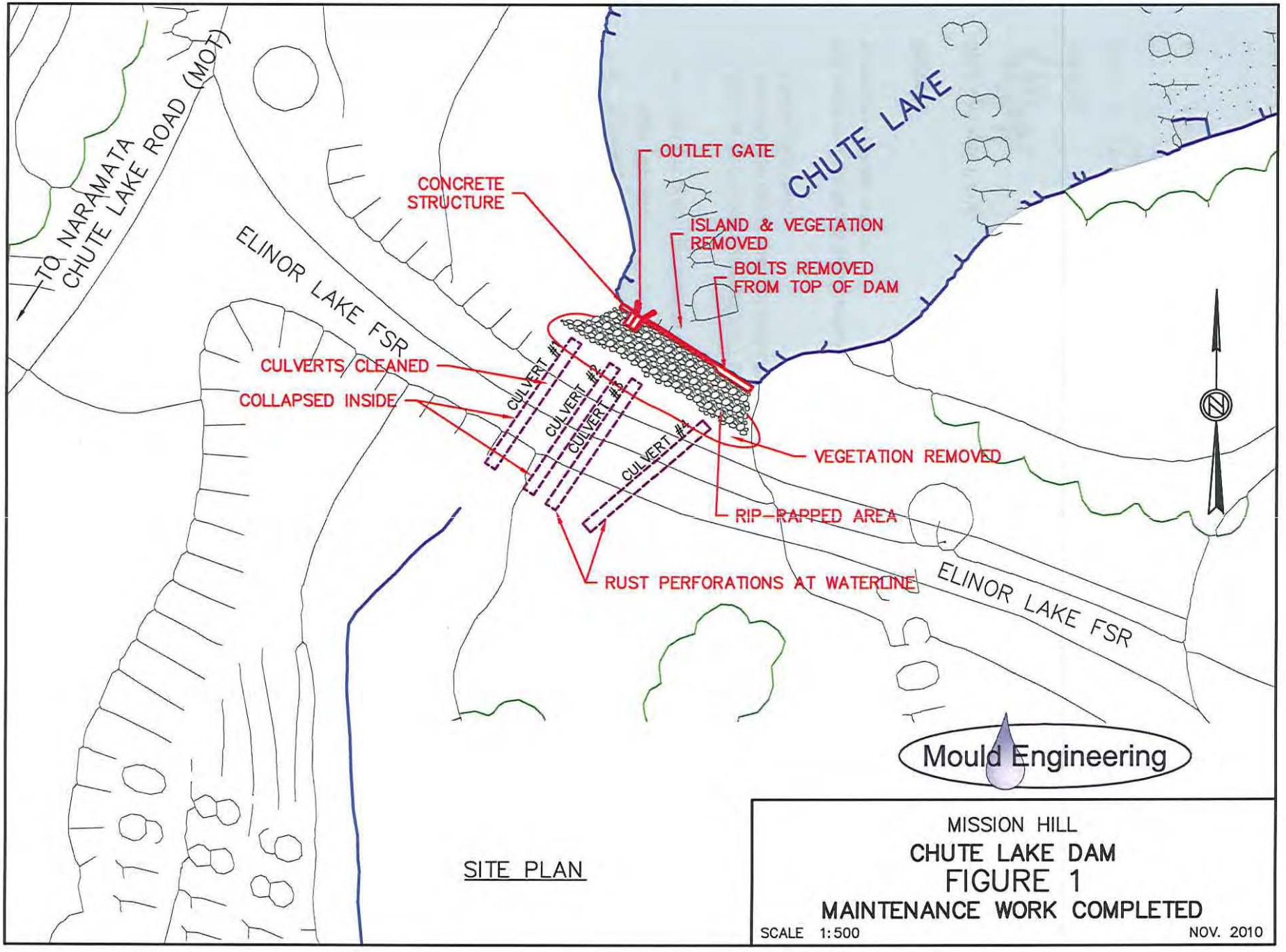
Regards,

Stuart Mould, P.Eng.

SBM/kg

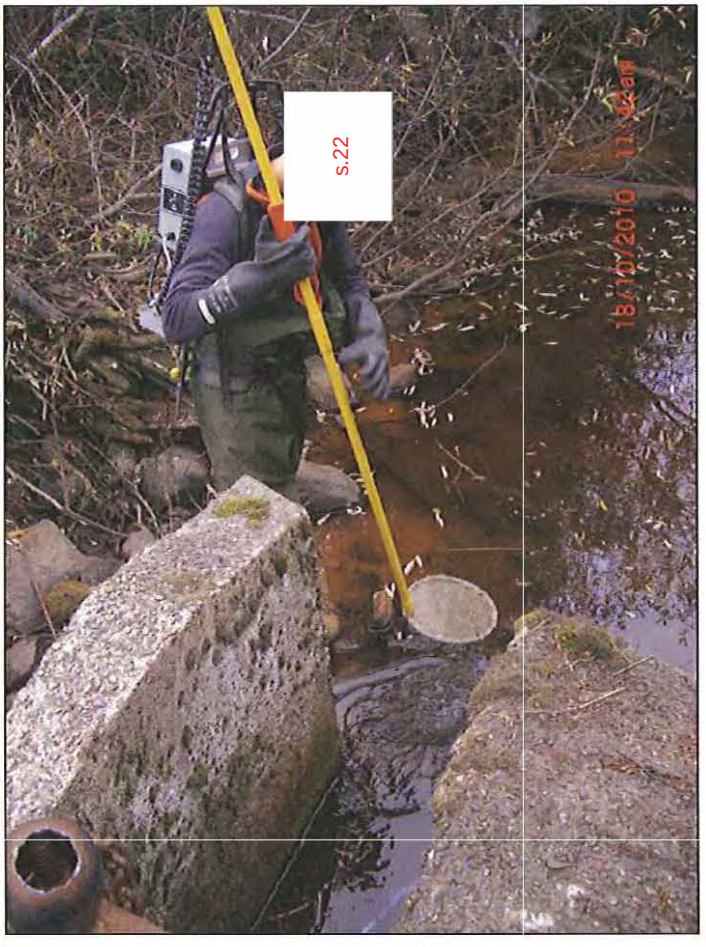
Encls. 1. Photos & Figure 1
2. Golder & Associates report, February 28, 2011 (as a separate file)
3. Inspection Report, September 9, 2010

cc: Mike Noseworthy, Dam Safety Officer, Ministry of Forests, Lands and Natural Resource Operations


TO NARAMATA
CHUTE LAKE ROAD (MOT)
ELINOR LAKE FSR
CHUTE LAKE
OUTLET GATE
CONCRETE STRUCTURE
ISLAND & VEGETATION REMOVED
BOLTS REMOVED FROM TOP OF DAM
CULVERTS CLEANED
COLLAPSED INSIDE
CULVERT #1
CULVERT #2
CULVERT #3
CULVERT #4
VEGETATION REMOVED
RIP-RAPPED AREA
RUST PERFORATIONS AT WATERLINE
ELINOR LAKE FSR
Mould Engineering
SITE PLAN
MISSION HILL
CHUTE LAKE DAM
FIGURE 1
MAINTENANCE WORK COMPLETED
SCALE 1:500
NOV. 2010

MISSION HILL WINERY

SITE PHOTOS – CHUTE LAKE DAM MAINTENANCE WORK – OCTOBER 18 TO OCTOBER 20, 2010



Jason Marzinzik (Golder Associates)
Electro-shocking stream for fish

Rock armouring downstream of the concrete spillway/dam

Sand bag barriers on Elinor Lake FSR culverts

Rock armouring of earth embankment near outlet gate

Rock armouring downstream of the concrete spillway/dam

Mould Engineering

September 9, 2010

Mission Hill Family Estate
1730 Mission Hill Road
Kelowna, BC V4T 2E4

ATTN: Mike Molloy

Dear Mike:

RE: Chute Lake Dam
Dam Inspections and Recommendations

This letter with attached drawings and photos summarize inspections of the Chute Lake Dam located on Chute Lake. Chute Lake is situated east of Naramata and Paradise Ranch as shown on Figure 1. The objective of the inspections was to determine if the dam required any maintenance as well as to determine the condition of the dam.

BACKGROUND

Mike Molloy of Mission Hill Family Estate e-mailed Jody Good of Mould Engineering on June 22, 2010. Mike asked that we determine who has the responsibility and liability for Chute Lake Dam. It was noted that there was numerous licensees that are responsible for Chute Lake Dam with Mission Hill Family Estate (Mark Anthony Properties) being the largest user of the stored water. Mike requested that we complete a Dam Inspection on behalf of Mission Hill Family Estate.

SITE VISITS

July 6, 2010

On July 6, 2010, Stu Mould, P.Eng., and Jody Good, AScT of Mould Engineering completed a partial dam inspection. The inspection was not fully completed due to the amount of brush and debris on and around the dam (see Photos 1 & 2). The amount of water that was spilling over the spillway also limited a proper inspection of the downstream toe and the outlet gate. The spillway crest is the top of the concrete dam and therefore when the spillway is flowing, the downstream side of the concrete dam is difficult to view.

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The partial dam inspection recommended that the debris on and in front of the spillway be removed immediately and that another dam inspection be completed once the debris was removed. These recommendations were contained in an email from Stu Mould to yourself on July 7, 2010.

August 19, 2010

Once some of the debris was removed, another dam inspection was completed on August 19, 2010 by Ken Langedyk, M.Eng, P.Eng. The dam inspection entailed looking at the concrete dam and its earthen abutments. The results of the Dam Inspection are noted on the attached Dam Inspection Forms and are summarized below.

The Inspection concluded that the concrete portion of the dam is in relatively good condition (refer to Photos 4 and 5). There is some surface spalling of the concrete but no structural cracks were noted. It appeared that some concrete had fallen off the downstream side (back) of the dam and is laying in the spillway channel (Refer to Photo 8). There is some erosion/undermining of the concrete near the outlet gate as noted on Photo 7.

The trash rack on the outlet gate contained some small sticks and debris as noted on Photo 6. A recent locking mechanism was installed on the top of the gate structure. The outlet gate was not operated nor was the condition of the gate checked since it was underwater.

An island comprised of earth and vegetation is situated at the front of the dam as shown on Photo 8. The island does not appear natural due to the presence of sand and its close proximity to the dam.

On the downstream side of the concrete dam, there are broken pieces of concrete and small loose rocks as shown on Photo 8. There also is some soil in the spillway channel that has a significantly higher elevation than the bottom of the concrete dam. Some vegetation had been removed, but there was still a significant amount of vegetation in the spillway channel and on the sides of the dam.

Approximately eight meters downstream of the concrete dam is the Chute Lake Road. Four corrugated metal pipes 1000 mm in diameter, convey the flow from the dam under the road. All culverts were partially plugged with soil and logs and some had rusted-out bottoms. It appears that the two culverts on the west side have higher outlets than inlets, which impede the flow of water. The elevation of the outlet channel downstream of Chute Lake Road appears to increase for the first 50 meters. This elevation increase is part of the reason the culverts are partially plugged.

The top of the concrete dam had a small concrete lip with some bolts protruding up. These bolts were spaced about 1.5 meters apart and protruded about 0.1 m above the concrete. The purpose of the bolts is not known.

The dam Freeboard (top of spillway to ground level at abutments) is visually estimated to be about 0.6 metres. The minimum freeboard required under current dam safety standards is 0.9 metres from water level at peak flows. That water level has not been calculated, but may be done as part of Recommendation 7.

CONCLUSION

In conclusion, the concrete spillway at Chute Lake appears to be in reasonable shape. There is excess vegetation and soil around the dam which limited the extent of the Dam Inspection and may cause problems in the future. There was also some undermining of the concrete noted by the outlet gate and a lack of rip-rap within the spillway channel and on the downstream side of the dam. The Freeboard on the two earthfill abutments is considerably less than dam safety standards.

RECOMMENDATIONS

The following recommendations should be completed to minimize the risks at the Chute Lake Dam:

1. Remove the earth and vegetation island at the front of the dam. The island should be removed with a vacuum truck to a depth of 0.5 meters below the top of the concrete dam. The island has been painted with "Remove" in the field.
2. The bolts that are protruding from the top of the concrete structure in the spillway inlet should be removed flush with the top of the concrete. The bolts have been spray painted orange in the field.
3. The vegetation within about 5 meters of the dam should be removed to facilitate site surveillance and dam inspections. This includes all vegetation in the spillway between the dam and Chute Lake Road. The extent of vegetation removal has been flagged with yellow "Pull Back" flagging in the field.
4. The island of soil in the spillway channel between the concrete dam and Chute Lake Road should be removed. The island has been painted with "Remove" in the field. This recommendation should be completed under the supervision of a Mould Engineering representative to ensure the appropriate depth is reached.

5. The loose rocks and concrete on the downstream side of the dam should be removed. Once removed, rock riprap should be placed to protect the toe of the concrete dam as well as the bottom and sides of the spillway. Figure 3 contains the design and the rock rip-rap specifications. Approximately 40 m^3 of rip-rap is required to protect the toe of the dam and the initial section of the spillway. This recommendation should be completed under the supervision of a Mould Engineering representative to ensure the proper placement of the rip-rap.
6. The culverts under Chute Lake Road should be cleaned. The organization responsible for Chute Lake Road should be contacted to complete this recommendation. The culvert's inlets and outlets have been flagged with pink "Culvert" flagging in the field.
7. A Dam Safety Review should be completed this fall by a qualified Professional Engineer.
8. An Operation and Maintenance Manual as well as an Emergency Preparedness Plan should be completed for Chute Lake dam.

CONDITIONS OF WORK

Any work in and about the water must be completed during the Instream Fisheries Work Window which is typically from July 22 to October 31 for the area. During construction, the creek should be isolated from the job site by pumping the water around and installing silt fences appropriately. Since the instream work will require isolating a section of the creek immediately below the dam, a fish salvage should be completed before construction. During construction, turbidity readings should be collected to documents sediment control issues. An environmental monitor must be retained to assist with the above recommendations.

If you require more information about the above or attached or would like a cost estimate for the recommendations, please contact us.

Yours truly,
MOULD ENGINEERING

Ken Langedyk, P.Eng., M.Eng.

Encls.

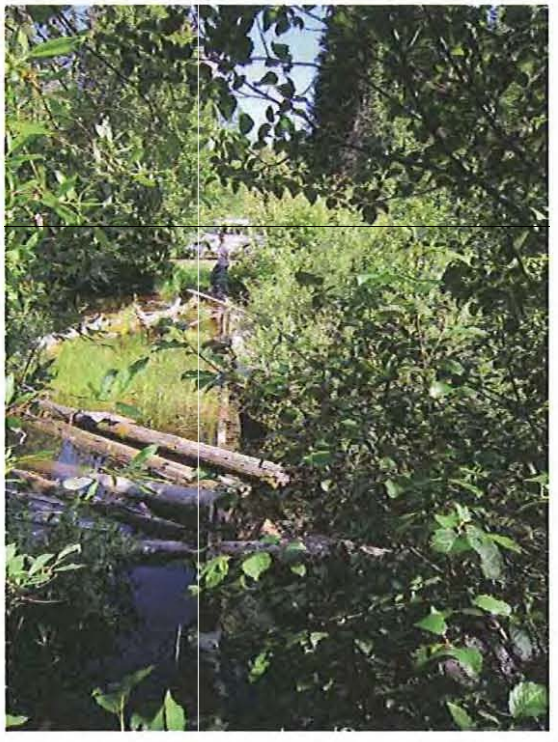


Photo 1: July 7, 2010 - Looking East across the top of the Concrete dam.
Note debris on and around the dam

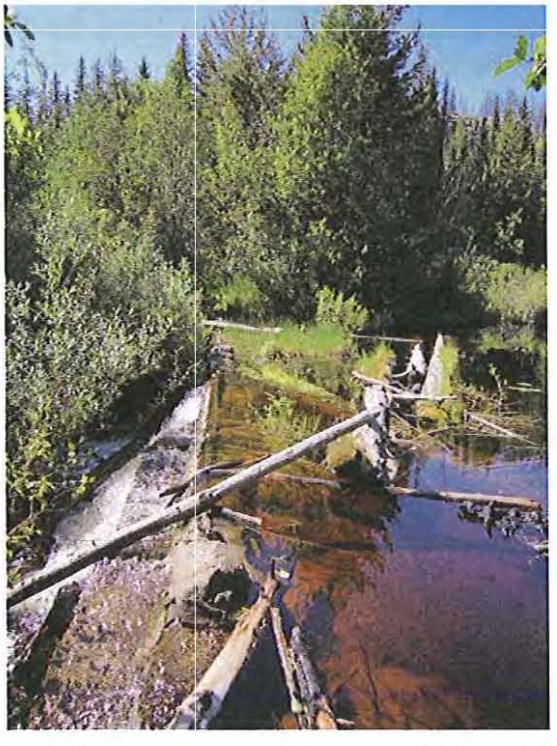


Photo 2: July 7, 2010 - Looking West across the top of the Concrete dam. Note debris on and around the dam.

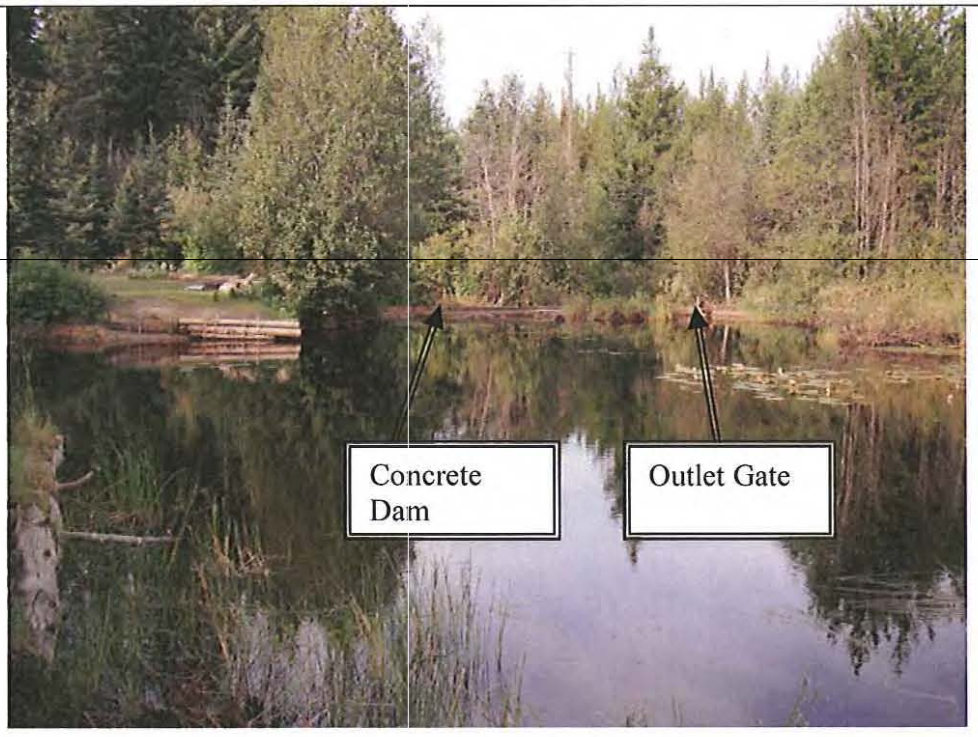


Photo 3: August 19, 2010 - Looking South at the dam

Photo 4: August 19, 2010 - Looking West across the dam

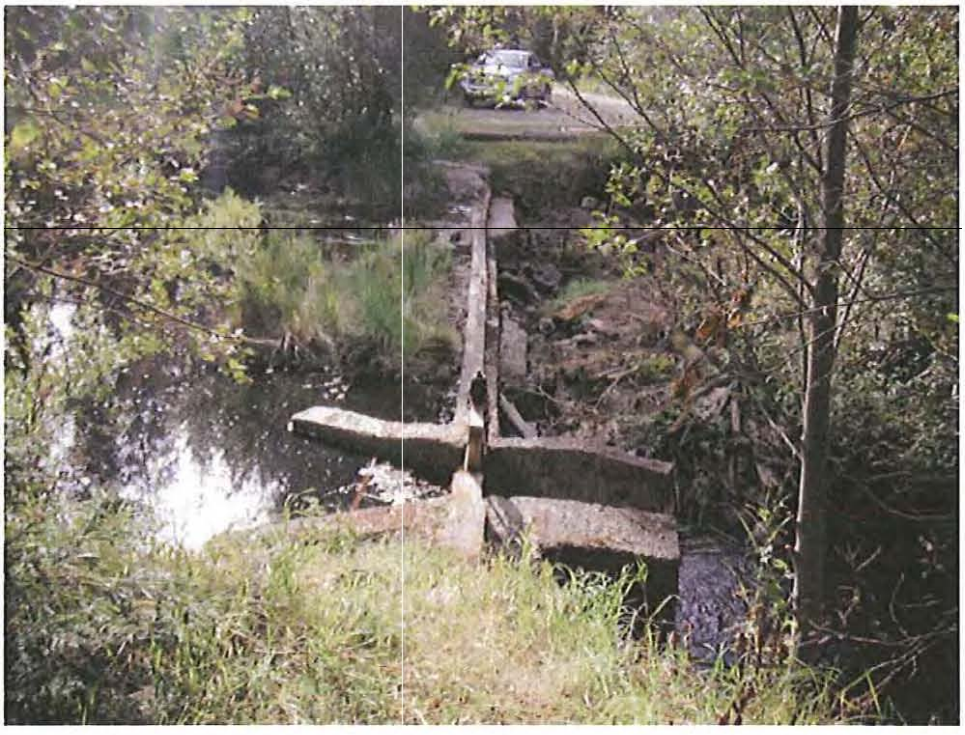


Photo 5: August 19, 2010 - Looking East Across the dam

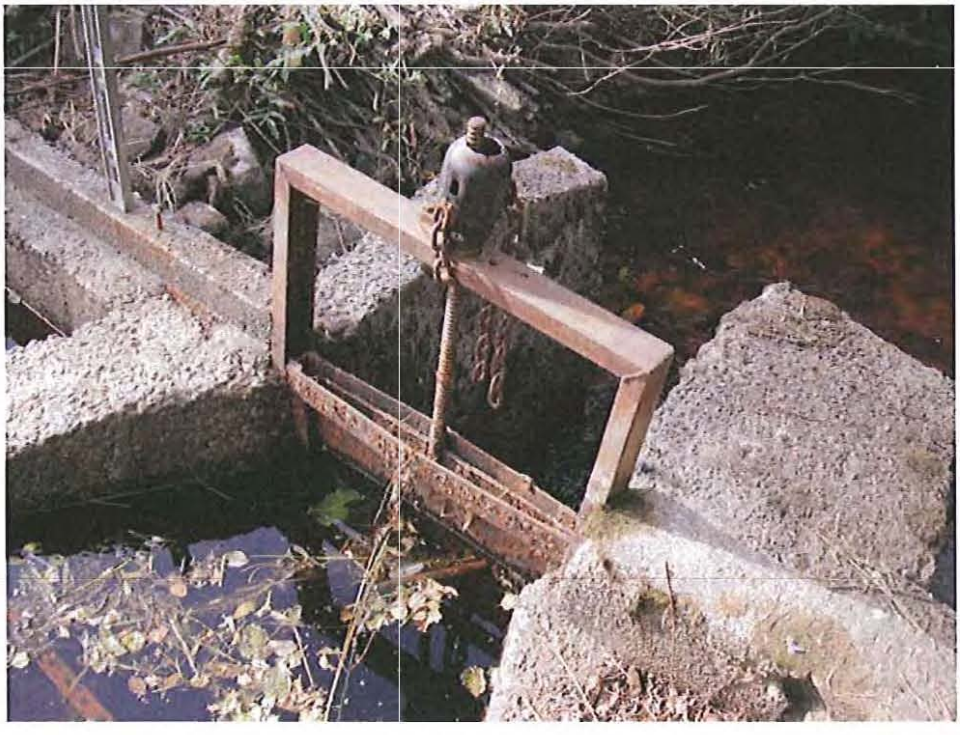


Photo 6: August 19, 2010 - Outlet Gate with new stem cover and lock

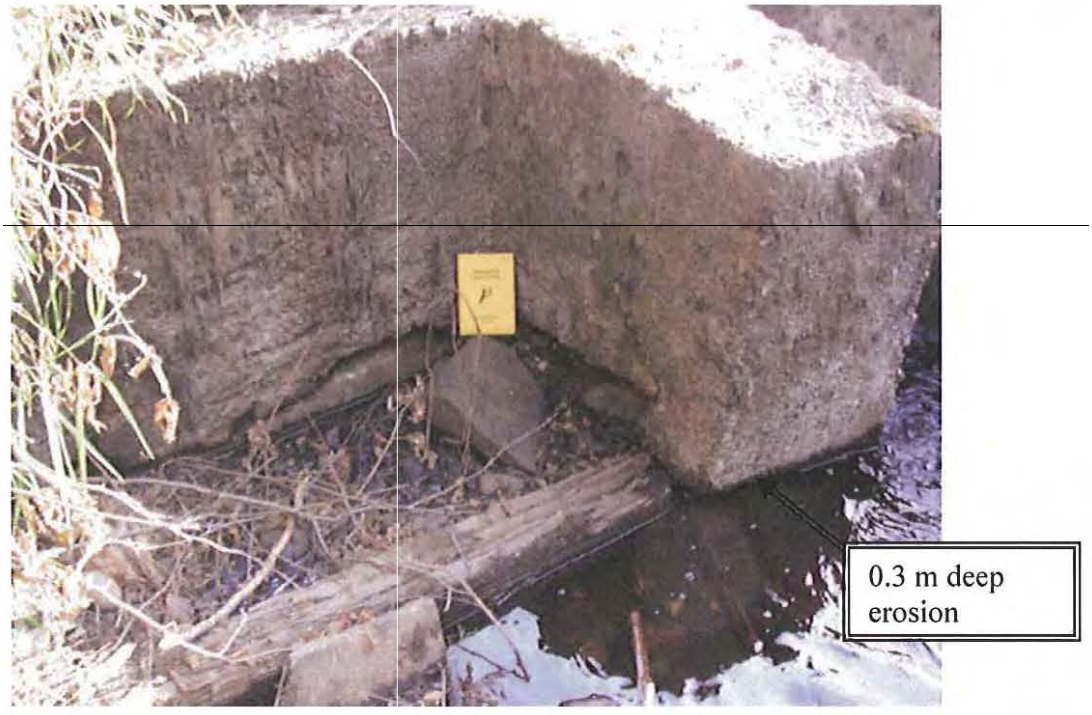


Photo 7: August 19, 2010 - West side of Gate outlet, note erosion location

Photo 8: August 19, 2010 - Loose concrete on downstream side of the dam

Photo 9: August 19, 2010 - Downstream side of Concrete Dam

Photo 10: August 19, 2010 - Plugged outlet of most Western Chute Lake Road culvert

BRITISH COLUMBIA DAM INSPECTION CHECKLIST

Dam Name: Chute Lake Inspection Date: Aug 19/10 Water Licence No.: _____

Your Name: Ken Langedyk, P. Eng. Provincial Dam File No.: _____

	Yes	No	
Was the spillway flowing?	☐	☑	If yes, what was the approximate flow rate? _____
			If no, then how far was the reservoir drawn down below the spillway sill level? _____
Was the outlet open?	☑	☐	If yes, what was the approximate discharge rate? 0.1 m³/sec

[illegible] applicable), check one. If the No box is checked, please comment on deficiency at bottom of page.

EMBANKMENT	Yes	No	N/A	OUTLET	Yes	No	N/A	SPILLWAY	Yes	No	N/A
1. U/S Slope debris	☐	☑	☐	1. Outlet Pipe	☐	☐	☑	1. Debris Boom	☐	☐	☑
2. Crest spalling	☐	☑	☐	2. Energy Dissipater concrete Failing	☐	☑	☐	2. Entrance	☐	☑	☐
3. D/S Slope debris	☐	☑	☐	3. Stilling Basin	☐	☐	☑	3. Sill debris.	☐	☑	☐
4. D/S Toe erosion	☐	☑	☐	4. Toe Drains debris	☐	☐	☑	4. Apron	☐	☑	☐
5. Drains (toe, others)	☐	☐	☑	5. Outlet Channel	☐	☑	☐	5. Walls	☐	☑	☐
6. Erosion Protection needs more rip-rap on d/s toe	☐	☑	☐	6. Measuring Weir	☐	☐	☑	6. Channel	☐	☑	☐
				7. Outlet Control	☐	☑	☐	7. Channel Slopes	☐	☑	☐
				8. Gates debris	☐	☑	☐	8. Gates	☐	☐	☑
								9. Culverts (4) ☑ Plugged			

Were any of the following *POTENTIAL PROBLEM INDICATORS* found?

INDICATOR	EMBANKMENT Yes	EMBANKMENT No	OUTLET Yes	OUTLET No	SPILLWAY Yes	SPILLWAY No
a) Seepage	☐	☑	☐	☑	☐	☐?
b) External Erosion	☑	☐ concrete	☑	☑ - under SW side, 300mm	☐	☐?
c) Cracks	☐	☑	☐	☑	☐	☐?
d) Settlement	☐	☑	☐	☑	☐	☑ Probably
e) Sloughing / Slides	☐	☑	☐	☑	☐	☑
f) Animal Activity	☐	☑	☐	☑	☐	☐?
g) Excessive Growth	☑	☐	☑	☐	☑	☐ Clean pi
h) Excessive Debris	☑	☐	☑	☐	☑	☐ 2m back from ToB

Evaluation of the conditions downstream of the dam must be undertaken at the same time as the formal inspection to ensure the consequence classification of the dam has not changed. Any changes must be reported to the Dam Safety Officer.

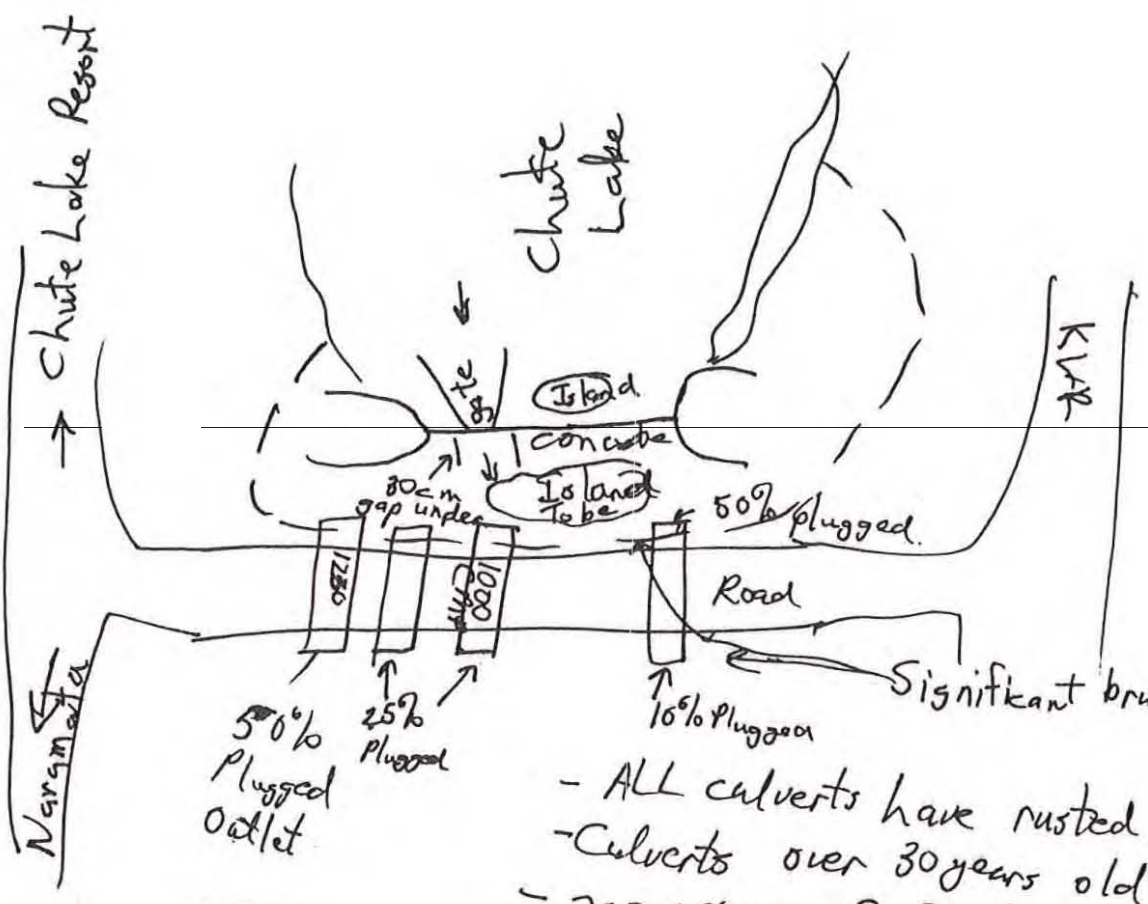
Please Comment on Deficiency(s) Found:

Turn Over →

- no structural cracks in the concrete

Note: Please complete this report form semi-annually. A copy may be requested by the Dam Safety Officer in your Region.

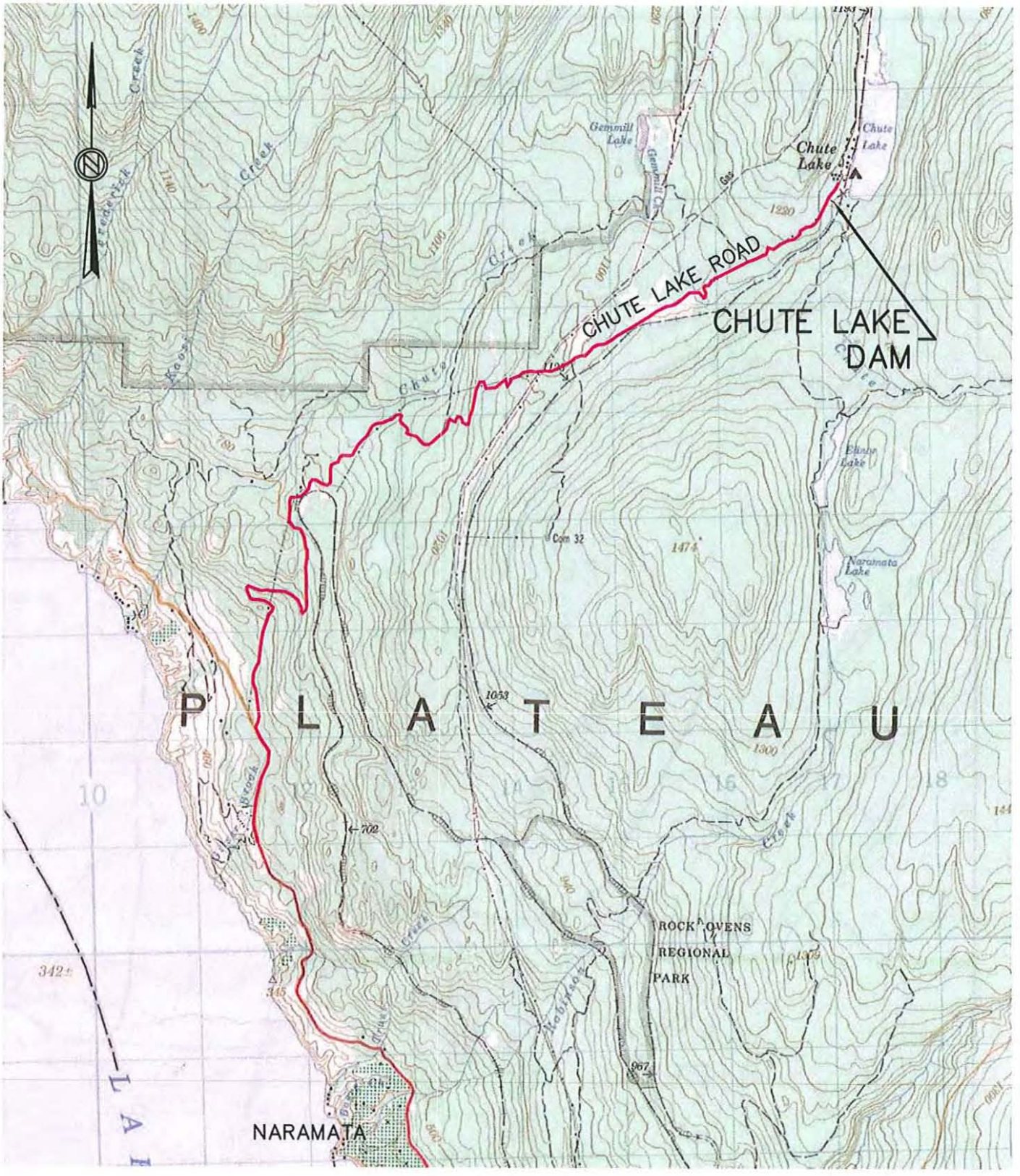
Revision Date: May, 1998



- ALL culverts have rusted out bottoms
- Culverts over 30 years old.
- ≈ 600mm of freeboard on east side
- ≈ 700mm " " " west side

Recomendations

- Remove Islands in front of dam and in spillway
- clean spillway + culverts (4) under road
- Remove (grind) bolts on top of concrete spillway
- Remove all trees within 5 m of dam - flagged with pull back flagging in the field.



Mould Engineering

MISSION HILL

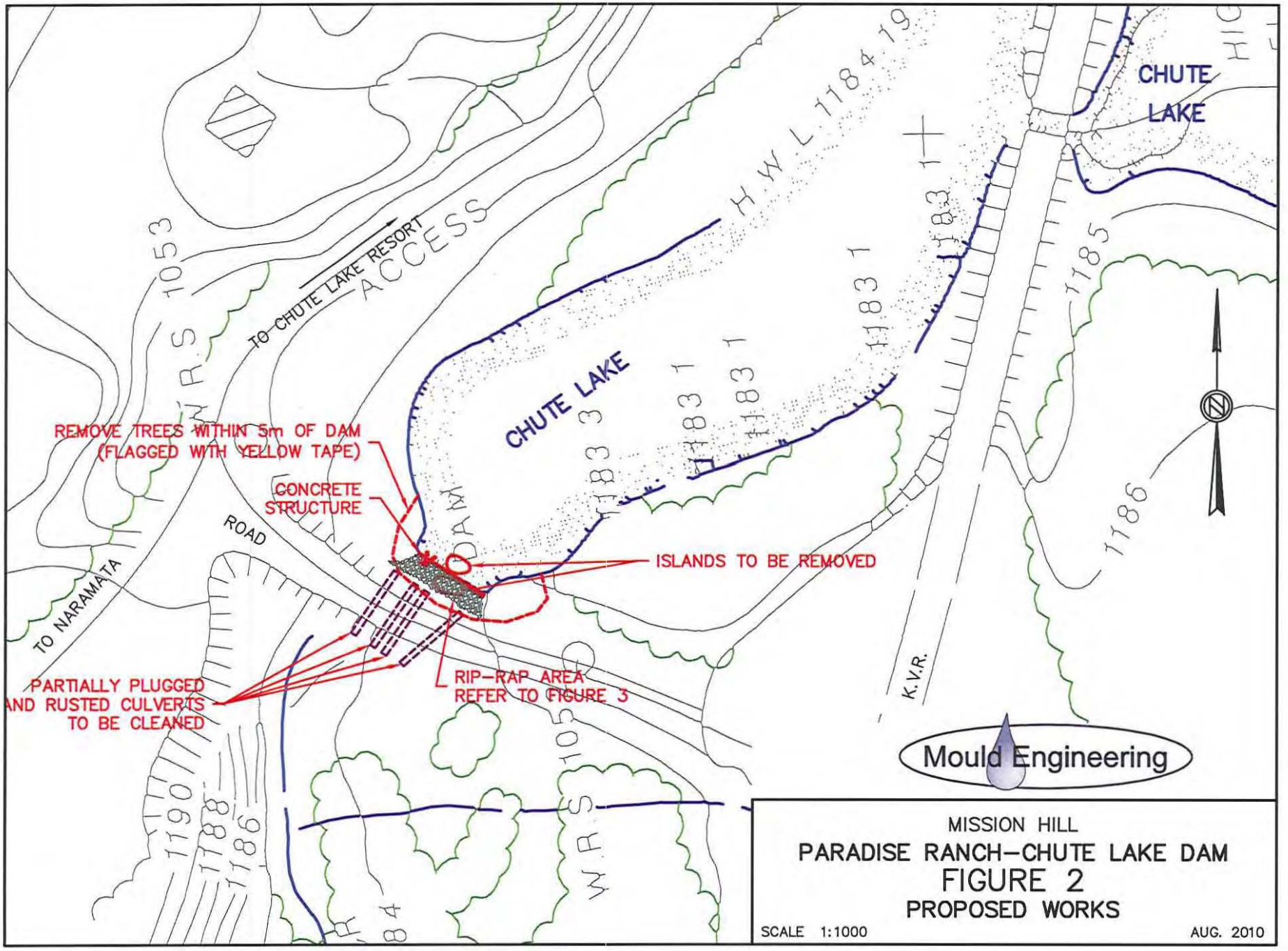
PARADISE RANCH–CHUTE LAKE DAM

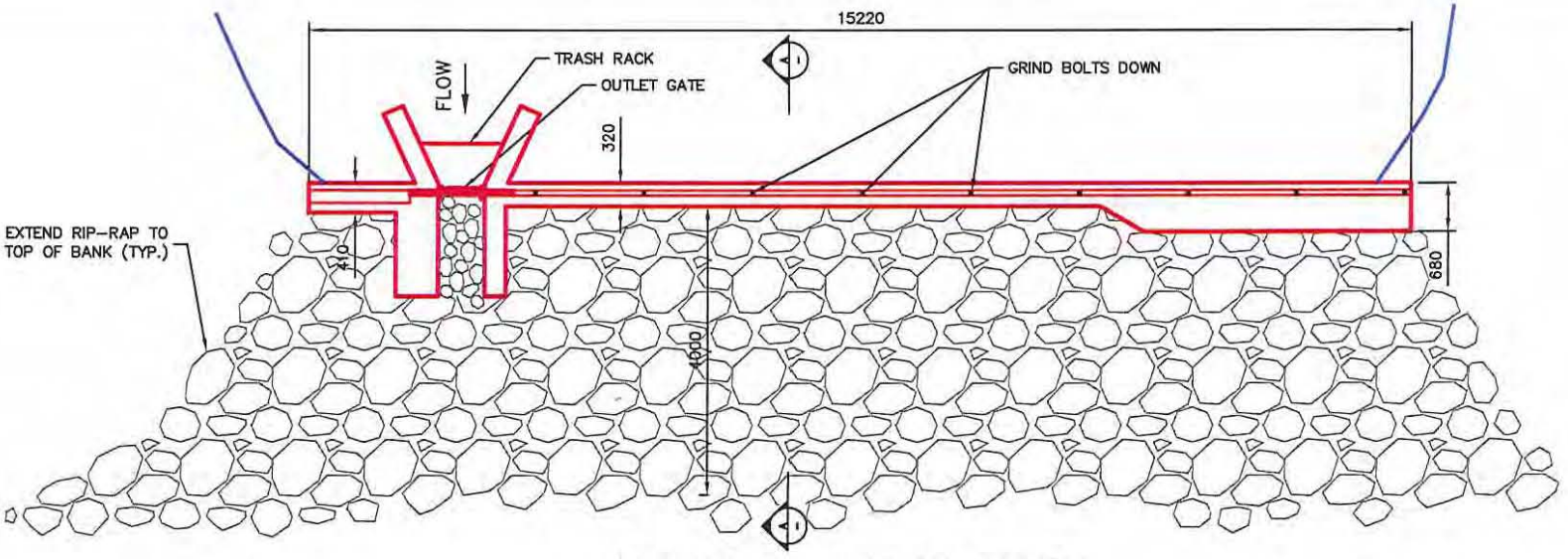
FIGURE 1

KEY MAP

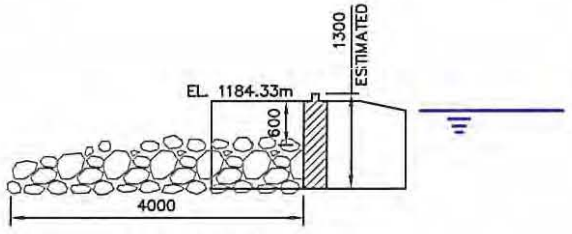
SCALE NTS

AUG. 2010


CHUTE LAKE
CHUTE LAKE
H.W.L. 1184.19
1183.1
1183.3
1183.1
1183.1
1185
1186
1053
W.R.S.
TO CHUTE LAKE RESORT
ACCESS
REMOVE TREES WITHIN 5m OF DAM
(FLAGGED WITH YELLOW TAPE)
CONCRETE
STRUCTURE
ROAD
TO NARAMATA
ISLANDS TO BE REMOVED
PARTIALLY PLUGGED
AND RUSTED CULVERTS
TO BE CLEANED
RIP-RAP AREA
REFER TO FIGURE 3
K.V.R.
1050
W.R.S.
1190
1188
1186
N
Mould Engineering
MISSION HILL
PARADISE RANCH-CHUTE LAKE DAM
FIGURE 2
PROPOSED WORKS
SCALE 1:1000
AUG. 2010



CONCRETE STRUCTURE PLAN VIEW



SECTION VIEW

RIP-RAP SPECIFICATIONS:

MINIMUM THICKNESS	– 500mm
MAXIMUM SIZE	– 600mm(1500kg)
40 TO 50%	– 300mm TO 600mm (750kg TO 1500kg)
50 TO 60%	– 50mm TO 300mm (50kg TO 750kg)
0 TO 10%	– LESS THAN 50mm (50kg)
NOTE	– THE ROCK DIMENSIONS IN A PLANE CAN NOT BE MORE THAN TWO TIMES THE MINIMUM DIMENSION OF THE ROCK

Mould Engineering

MISSION HILL

PARADISE RANCH-CHUTE LAKE DAM

FIGURE 3

RIP-RAP ON DOWNSTREAM SIDE OF DAM

SCALE 1:100 AUG. 2010

February 28, 2011 Project No. 10-1492-0131

Mr. Mike Molloy
Mission Hills Family Estate
1730 Mission Hill Road
West Kelowna, BC
V4T 2E4

ENVIRONMENTAL MONITORING SUMMARY REPORT FOR DAM MAINTENANCE ON RATNIP CREEK (MINISTRY OF ENVIRONMENT WATER STORAGE AND IRRIGATION LICENSE C105820 & C105821), CHUTE LAKE, BC

Dear Mr. Molloy,

Golder Associates Ltd. (Golder) is pleased to provide you with the following summary of environmental monitoring activities conducted during the Ratnip Creek Dam maintenance project at Chute Lake, BC (the Site). Dam maintenance activities were required following an inspection of the dam by Mould Engineering on July 6 and August 19, 2010. Golder was retained by Mission Hills Family Estate (Mission Hills) to provide environmental monitoring services during maintenance activities. A copy of field inspection reports completed by Golders' environmental monitor is attached and provides a chronological account of mitigation measures and best management practices implemented at the Site during maintenance activities. In addition, a summary of the fish salvage results (as required in paragraph 6 of Fish Salvage Permit PE10-66575) and photographic documentation of dam maintenance activities is also provided.

Dam maintenance activities commenced with an on Site meeting held October 14, 2010 and was attended by representatives from Mission Hills, Mould Engineering, Scott Excavating, and Golder. The proposed work plan was discussed and mitigation measures to be implemented were outlined.

Site works commenced on October 18, 2010. Due to trickle of water flow in Ratnip Creek, the majority of work was able to be conducted in isolation from stream flow. Sandbag and plastic sheeting dams were placed across the culverts at the downstream end of the Site to contain erodible materials to the work area. Once isolated from flow, a fish salvage was conducted within the work area. Captured fish were enumerated and released upstream of the work area; no fish mortalities were observed during capture, holding and subsequent release. Turbidity was monitored during maintenance activities conducted over a three day period from October 18 to 20, 2010. Seepage of sediment laden water from the Site resulted in elevated turbidity levels (maximum recorded: 663 NTU) within the pools immediately downstream of the Site, however, due to the lack of flow in Ratnip Creek, turbid water was limited to approximately 50 m downstream of the Site. Environmental monitoring was conducted full time during instream works.

Golder Associates Ltd.
220 - 1755 Springfield Road, Kelowna, British Columbia, Canada V1Y 5V5
Tel: +1 (250) 860 8424 Fax: +1 (250) 860 9874 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

Debris and soil accumulated along the upstream side of the dam was removed by an excavator operated from behind the dam structure. Due to favourable weather and Site conditions (i.e., no wind/wave action, course grained sediment) sediment dispersal to adjacent waters was limited to a sediment plume which extended approximately 2 m from the dam structure and cleared in approximately 30 minutes. In addition to dam maintenance activities, a small amount of sediment (approximately 1.5 m^3) deposited by road surface runoff was removed from the downstream end of two culverts located immediately below the dam.

Debris and soil removed from the work area was temporarily stockpiled immediately south-west of the Site. Upon completion of dam maintenance activities this material was hauled off Site for disposal at the Mission Hills property. Final grading of the work area was conducted by hand raking disturbed areas. Sandbags and polyethylene sheeting dams were removed after all necessary dam maintenance activities were completed. Impounded water appeared clear at the time of dam removal (pers. com. Rob Black, October 22, 2010).

Golder is satisfied that maintenance activities conducted during the Ratnip Creek Dam project were in compliance with Section 36 of the *Fisheries Act*. We trust that the information contained in this letter meets your present requirements. Please contact us if you have any questions or concerns regarding the above.

Yours truly,

GOLDER ASSOCIATES LTD.

COLLEGE OF APPLIED BIOLOGY
Darryl J. Arsenault
R.P.Bio #1088
CAB

for Jason Marzinzik, B.Sc.
Environmental Scientist

Darryl Arsenault, M.Sc., R.P.Bio.
Senior Biologist

JM/DJA/JF/jc

CC: Don McKee, Ministry of Environment

Attachments: Site Photographs
Field Inspection Reports (October 18 to October 20, 2010)
Fish Salvage Summary

n:\active\2010\1492 bcio biology\10-1492-0131 mission hill chute lake dam\reports\final wp\1014920131 em summary rpt_28feb11.docx

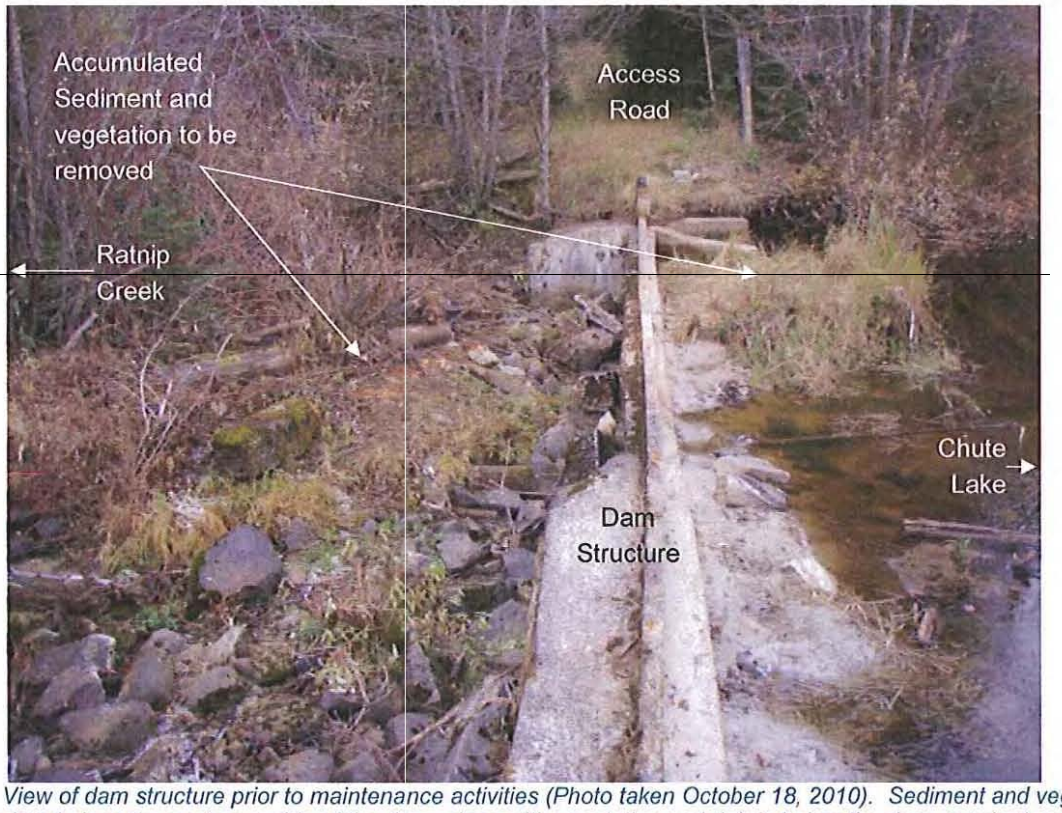


Photo 1: View of dam structure prior to maintenance activities (Photo taken October 18, 2010). Sediment and vegetation accumulated along the upstream side of the dam, along with vegetation and debris below the dam, required removal (according to Mould Engineering). Existing rip rap was reused on Site and supplemented with additional blast rock rip rap.

Photo 2: Rainbow trout (Oncorhynchus mykiss) captured during fish salvage on October 18, 2010.

Photo 3: View of debris removal on downstream side of dam structure facing north-west. Photo taken October 18, 2010.

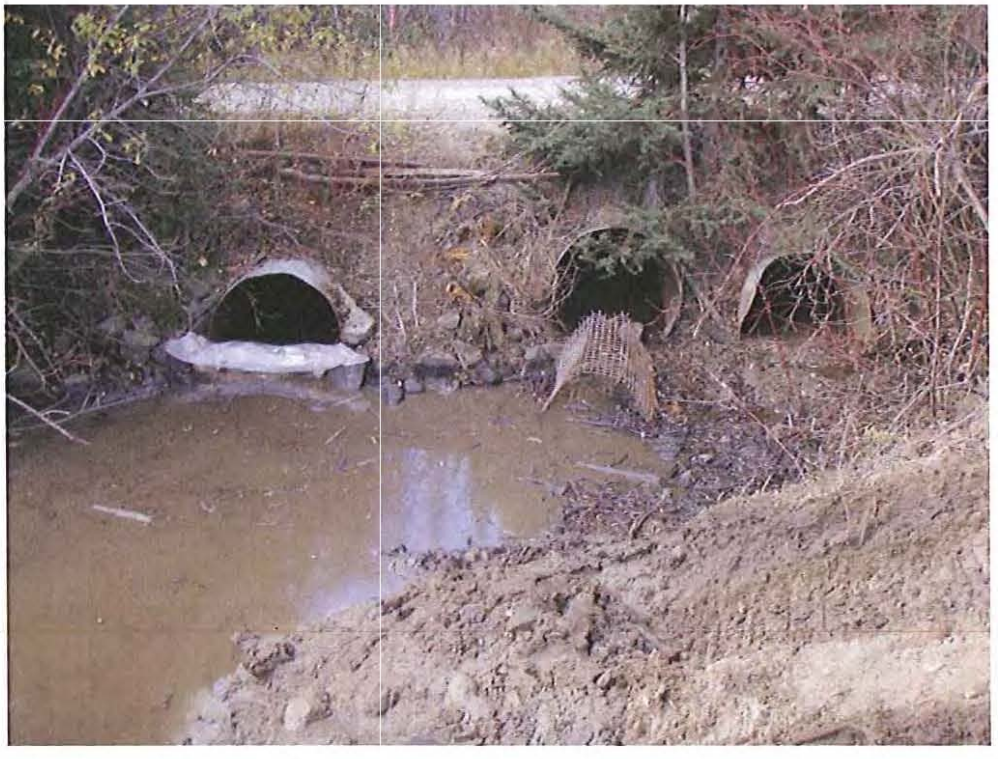


Photo 4: View of culverts located immediately downstream of dam (Photo taken October 19, 2010 facing south-west). The two western most culverts (on right) were blocked by sediment deposited by road runoff on the downstream end. The two eastern most culverts were blocked with sandbags and plastic sheeting (only one of the eastern culverts visible in photo).

Photo 5: View of sediment removal on upstream side of dam structure facing south-east (Photo taken October 19, 2010). The sediment plume extended approximately 2 m from the dam and dissipated within approximately 30 minutes.

Photo 6: View of rip rap placed behind dam structure following removal of vegetation and debris (Photo taken October 20, 2010 facing south-east). The sandbag dams were left in place until the end of the following day to allow settlement of water within the work area.

Photo 7: View of western most culvert located immediately below the dam before debris removal. The culvert has been blocked by sediment deposited by road surface runoff.

Photo 8: View of two western most culverts after the removal of sediment from the outlet area (Photo taken October 20, 2010 facing north-east).

(1)

Chute Lake Dam ID-1492-0131
Date: Oct 18, 2010
Crew: s.22
Purpose: EM at Chute Lake Dam Upgrade.
Equip: waiders x2, Electrofisher, shovel, buckets
Weather: few clouds

7:00am Arrive @ lab + get truck ready
7:18am Leave Lab. +
8:18am Arrive @ Chute Lake
9:00am Contractor Arrives s.22
9:09am
Turbidity Measures: Before any work.

Above Dam:	2.87
Below Dam:	3.50
Downstream of culverts:	4.01

9:28am s.22 starts up backhoe + works on road.
Pic 101-7313 looking north Chute Lk
7314 Westwards along dam
7315 Below weir, pool
7316 Looking N to dam
7317 Downstream of culverts

(2)

9:35 another contractor arrives.
- 4 Beavers seen upstream of dam (family?)

Fish caught - 1st pass 60hrtz 300volts

RB	44mm	
RB	80mm	
RB	46mm	
RB	50mm	
RB	49mm	
RB	42mm	
RB.	39mm	
RB	51mm	(burn mark)
RB	39mm	
RB	52mm	
RB	41mm	

2nd pass 60hrtz

RB	53mm	300volts
RB	39mm	681 sec
RB	30mm	
RB	40mm	(burn mark)

end 12:41pm

No. 312
J. L. DARLING CORP. TACOMA, WA 98424-1017
www.RiteintheRain.com

- Evid. e of runoff on downstrea. side of road + est. small swale on west corner (settling pond)

2pm Turbidity Readings

Above Dam: 3.17
Below culverts downstream: 27.94

3:14pm Turbidity (After island in front of dam removed)
Above Dam: 3.85
Below culverts: 176/183

3:45pm start putting in riprap. into channel

4:00pm Leave site

5:00pm Back at office

Golder Associates

ENGINEER'S/INSPECTOR'S REPORT

Project No. 10-1492-0181
Date Oct 19, 2010
Shift ☒ Day ☐ Night
Time arrived on site 10 am hrs
Time left site hrs
Time on site
Travel time
Total time

Project Name Chute Lake Dam Maintenance
Weather Sunny / high cloud Temperature Range °C
Contractor's Working Hours

Work Carried Out

10:30 Turbidity Measurements: 3.98 @ u/s of dam
51 below culvert / 93 ~20 m d/s
~50 m d/s 16.30 / 4.07 u/s of confl. Chute Cr.

- During excavation on u/s side of dam turbidity (sediment plume) extended ~ 2m from wall.
- ↳ Sand/gravel with some fines on u/s side of dam
- Some flow obs. through sandbag/poly dam on SE culvert

12:45 Turbidity: 2.74 NTU @ u/s of Dam
91 below culverts
557 ~ 20 m d/s ⇒ Channel ~5cm deep, ~ 50cm wide
⇒ minimal flow.
88 NTU ~ 50 m d/s ⇒ channel ~ 3 m wide, 30-45cm deep
⇒ no observable flow
10.98 u/s of confl. Chute Cr.

14:00 ~ 50cm Rb salvaged from pool behind dam

Turbidity: 5.45 NTU u/s of Dam
106 NTU Below culverts
663 NTU ~ 20 m d/s
10.85 NTU ~ 50 m d/s

Distribution	Initials
Mission Hills Winery	

Engineer/Inspector Jason Marcinzik

Golder Associates

ENGINEER'S/INSPECTOR'S REPORT

Project No. 10-1492-0131
Date Oct 20, 2010
Shift ☒ Day ☐ Night
Time arrived on site _____ hrs
Time left site _____ hrs
Time on site _____
Travel time _____
Total time _____

Project Name Chute Lake Dam Maintenance
Weather Overcast Temperature Range _____ °C
Contractor's Working Hours _____

Work Carried Out

~11.00 Turbidity: 3.69 NTU u/s of dam
15.79 NTU d/s of culverts
56 NTU ~20 m d/s of culverts
106 NTU ~50 m d/s of culverts
25.02 NTU u/s of confl. w Chute Crk.
3.22 NTU d/s of confl. w Chute Crk

~14.30 - 1 northern most culverts cleared of deposited sediment @ d/s end
↳ those two culverts collapsed / filled w sediment
↳ small (5-10 m) discharge of turbid water from culvert when excavated.

Turbidity 4.55 NTU u/s of dam
14.86 NTU d/s of culverts
90 NTU ~20 m d/s culverts
93 NTU ~50 m d/s culverts
24.21 NTU u/s of confl. w Chute Cr.
154 NTU d/s of confl. Chute Cr.

- Access rd to be blocked / deactivated at end of proj
- Sandbags to be removed at end of day tomorrow (if rain).

Distribution	Initials
Mission Hills Winery	

Engineer/Inspector Jason Marinuk

File No.

File name Chute Lk

Date Aug 23/10

Time

FILE MEMO *RE* TELEPHONE CONVERSATION

Calling party: Ken Langedyke Phone No. 868-2072 cell s.22

Call taken by: Phone No.

For attention of:

Action required:

Subject: Chute Dam – Mission Hills (Mark)

- Maintenance clean up underway ~~gravel~~/debris
- will restore Lows @ Low (+)
- also sectioned @ front for ~~weed~~ sediment accumulation
- will place some rip rap @ D/S area - spec sizing
- will contact s.22 to advise of work etc

Record of Inspection for Chute Lk (site), Sept 26/08 (year)

Summarize the past year conditions and operation of the dam, and submit to Water Management if requested to do so. Save photos, and any supplementary information/mearurements/descriptions on separate sheet(s).

EMBANKMENT(S):

Were there any seepage flows, wet or moist areas, standing water at or near the downstream slope ?
NO ☐ YES ☐ (if yes, describe)

Was there discharge from any installed drainage collectors in the embankment?
NO ☐ YES ☐ (if yes, describe) N/A ☐

Are there any trees, brush, excessive vegetation growth, or debris on, or near, the embankment?
NO ☐ YES ☐ (if yes, describe)

Are there any signs of erosion, sloughing, cracking, settlement, burrows, or other deterioration of the embankment?
U/S Slope: NO ☐ YES ☐ (if yes, describe)
D/S Slope: NO ☐ YES ☐ (if yes, describe)
Crest: NO ☐ YES ☐ (if yes, describe)

OUTLET WORKS: Concrete

Are the gate, gate stem, pedestal and wheel (or other control works) in good operating condition?
YES ☐ NO ☐ (if no, describe) – broken pressure plate to close

Is the outlet pipe through the dam, and the intake structure in good condition?
YES ☐ NO ☐ (if no, describe) UNKNOWN ☐

Are the outlet structure(s) and outlet channel clear of debris and vegetation growth, and in good condition?
YES ☐ NO ☑ (if no, describe) – log debris @ dam

SPILLWAY:

Is the spillway structure (ie sill, walls, erosion protection) clear of obstructions and in good condition?
YES ☐ NO ☐ (if no, describe)

Is the spillway channel, both upstream and downstream, clear of debris and vegetation, and in good condition?
YES ☐ NO ☐ (if no, describe)

Is the log boom, or other debris retention device, present and in good condition?
YES ☐ NO ☐ (if no, describe)

OTHER COMPONENTS:

Is vehicle access to the site in good condition?
YES ☐ NO ☐ (if no, describe)

Are the stream diversion works to fill the reservoir (if any) in good condition?
YES ☐ NO ☐ (if no, describe) N/A ☐

Does the reservoir have excess driftwood debris, unstable slopes, or beaver activity?
NO ☐ YES ☐ (if yes, describe)

Do you propose to undertake any work at this site in the next calendar year?
NO ☐ YES ☐ (if yes, describe)

Do you propose to alter the normal operation of the water storage?
NO ☐ YES ☐ (if yes, describe)

OPERATION:

Describe the general operating method for the past year, and/or provide monthly observations on the reverse side.

WL 27" below top sill + addition of water release

Owner/Agent: _____ Signed: _____ Date: _____

SR

ANNREP00

Sept 26/08

2011 INSPECTION COMPLIANCE FORM FOR OWNERS OF HIGH, VERY HIGH & EXTREME CONSEQUENCE DAMS

Ministry of Forests, Lands and Natural Resource Operations
DATE RECEIVED
MAR 15 2012
Water Management Branch

SUBMIT FORM TO:

By Mail at: Dam Safety Section, Water Management Branch
Ministry of Forests, Lands and Natural Resource Operations, Victoria BC
Please use pre-paid, self addressed envelope or address below

By Fax at: 250-952-6792

By email at: dam.safety@gov.bc.ca

OFFICE USE ONLY:
Region: HQ, VI, SR, KM, PN, NL, WL, PG
Consequence: AG, DA

CHUTE LAKE DAM

Received
MAR 22 2012
102 Industrial Place
Penticton, BC V2A 7C8

Attn: Mike Molloy
Mark Anthony Properties Ltd.
500 – 887 Great Northern Way
Vancouver BC V5T 4T5

File Number for correspondence: D220117-00

Is Contact Name and Address correct?
YES___ NO ✓ Please correct below:
1730 MISSION HILL ROAD
WESTBANK B.C.
CANADA
V4T 2E4

Please include contact phone # & e-mail:
Phone: 250 768 6432
E-mail: mmolloy@missionhillwinery.com

Please read the information overleaf (page 2) before completing this form. You will find more information on our website: www.env.gov.bc.ca/wsd/public_safety/dam_safety/.

1. Has your Formal Inspection for 2011 been completed? Yes ☑ No ☐
   Inspected By: Owner ☑, Other ☐, Who? _____
   Comments: WORK DONE IN 2010
2. Have any Dam Safety Concerns been identified? Yes ☐ No ☑ If yes please elaborate.
   _____
3. *If yes to #2*;
   Has a plan been prepared to address the safety concern(s)? Yes ☐ No ☐ N/A ☑
   Comments: _____
4. Did you undertake *regular* (see page 2) Site Surveillance? Yes ☑ No ☐
   Comments: SPRING & SUMMER
5. Has a Professional Engineer completed your Dam Safety Review? Y ☐ No ☑ Started ☐
   If "Started DSR"; scheduled completion date is: _____
6. Have you submitted your Dam Safety Review? Yes ☐ No ☑
7. Do you have a current OMS & EPP? Yes ☑ No ☐
8. Have you completed the annual EPP review? Yes ☐ No ☑ Year last updated: 2011

Additional comments or suggestions: Please consider the attached reports, and advise if they add up to a DSR.

Submitted by: MIKE MOLLOY Date: 14 MARCH 2012

Position: VINEYARD OPERATIONS MANAGER Phone: 250 768 6432

SM ✓

2011 DAM INSPECTION COMPLIANCE FORM FOR OWNERS OF HIGH, VERY HIGH & EXTREME CONSEQUENCE DAMS

(1) Formal Inspections are defined in the Dam Safety Regulation (DSR) as a thorough inspection performed by the appropriate representative of the owner (i.e. the individual responsible for safety surveillance). A Dam Inspection & Maintenance Guidebook is available on our website and Dam Inspection & Maintenance Workshops are available through the BC Water & Waste Association. Many dam owners hire an engineering consultant to inspect their dams but this is not a requirement. The minimum frequency for formal inspections is annual for high and very-high consequence dams and semi-annual for extreme consequence dams. A formal inspection report shall be recorded and kept by the dam owner, and must be available for review by the Dam Safety Officer on request.

(2 & 3) Dam Safety Concerns: Do you have any concerns regarding the safety of the dam? The Dam Safety Officer is available to discuss any concern you may have and will be able to assist you to determine the severity of your concern. Please also see Section 7.1, Potential safety hazard at a dam and Section 8, Hazardous Conditions at a dam in the Dam Safety Regulation.

(4) Site Surveillance is part of the routine maintenance and is a straightforward procedure that allows the dam tender to make an accurate assessment of a dam's condition. Surveillance involves an assessment of the surface of all parts of the structure. Seepage readings (or any other condition that is subject to change) should be measured and recorded as well as the reservoir level, operational conditions and releases from outlets and spillways. Site surveillance is usually performed on a weekly basis for all high, very high and extreme consequence dams; see Dam Safety Regulation, Schedule 2. Reduced frequencies of the site surveillance may be selected to suit seasonal conditions (e.g. snow cover). Any site surveillance schedule other than weekly should be described in the dam owners Operation, Maintenance & Surveillance Manual*.

(5 & 6) Dam Safety Reviews (DSRs) are comprehensive formal evaluations by a qualified engineer conducted every 10 years for high and very high and every 7 years for extreme consequence classification dams to determine whether an existing dam meets current engineering standards. DSRs shall be carried out in accordance with the Dam Safety Regulations and the Canadian Dam Association Guidelines. A guideline is available from the Dam Safety Officer or as a download from the Dam Safety Webpage.

Other Dam Safety Regulation Requirements:

- **(7)** *Prepare an Operation Maintenance and Surveillance (OMS) manual and an Emergency Preparedness Plan (EPP)
- **(8)** Review, revise, update and submit the OMS & EPP as per Schedule 2 of the Dam Safety Regulation.
- Maintain a record of all formal inspections and site surveillance,
- Submit information to, or undertake an activity requested by, or notify a Dam Safety Officer as required.

Dam owners must also operate and maintain their dam in accordance with the following:

- Any applicable (water) licence or approval,
- Any order that is made under the (*Water*) *Act*.

**Note: simplified versions of EPP and OMS for less complex dams may be acceptable (see templates in our Guidebook entitled Inspection & Maintenance of Dams, available on our Dam Safety Webpage (www.env.gov.bc.ca/wsd/public_safety/dam_safety/)).*

BRITISH COLUMBIA
The Best Place on Earth

June 29, 2011 File: 76915-20/220 CHU-PEN

REGISTERED MAIL

Name
Address
City & Postal Code

FILE COPY

Attention: Chute Lake Dam Owner

Re: Dam Safety Audit for Chute Lake Dam (D220117-00)

Your water storage facility has been audited to determine compliance with the Dam Safety Regulation. This does not constitute an annual inspection of the dam. Annual dam inspections and regular site surveillance are the responsibility of the dam owner.

The site was visited on June 27, 2011 by the undersigned in the company of Mr. Mike Molloy (contact for Mark Anthony Properties Ltd., dam owner), Mr. Bud Hindson (dam owner), and Joe Scott (contractor responsible for undertaking repairs/upgrades, fall 2010). The components of the site and of your Dam Safety Program were discussed. A copy of the Dam Audit Check Sheet is provided herein. The review has indentified that the site is currently out of compliance with the Dam Safety Regulation for the following dam safety regulatory requirements:

- An Operation, Maintenance & Surveillance Manual (OMS) has not been prepared/submitted.
- An Emergency Preparedness Plan (EPP) has not been prepared/submitted.

A recent review of the dam failure consequence classification for Chute Lake Dam has increased from Low to **High**. As such, you should review Schedule 2, Section 2 - *Frequency of activities*, contained within the Dam Safety Regulations. Of particular note is the requirement for conducting a dam safety review every ten years. As a high consequence dam owner, you must have a professional engineer, with qualifications and experience in dam safety analysis, carry out a review, prepare a dam safety report, and submit a copy of the report to the dam safety officer for acceptance, no later than June 9, 2013.

Along with the regulatory requirements, the dam safety audit is also undertaken to verify that the consequence rating, structural attributes, maintenance and reservoir operation are appropriate for the dam. Below is a list of improvements, concerns or issues that are recommended:

- Establish a survey bench mark to aid in monitoring dam settlement.
- No log boom was noted upstream of the dam.

.../2

Ministry of
Forests, Lands and
Natural Resource Operations

Water Division
Okanagan Shuswap Region
102 Industrial Place
Penticton BC V2A 7C8

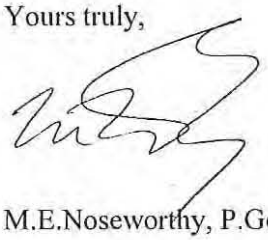
Telephone: (250) 490-8200
Facsimile: (250) 490-2231

As there are numerous licensees (dam owners) associated with Chute Lake Dam, you are encouraged to develop a water users' agreement or petition to have the group incorporated into a water users' community. Additional information can be found on our website http://www.env.gov.bc.ca/wsd/.

You are reminded that as a dam owner in British Columbia you have a duty to minimize the risk to the public, the economy and the environment by ensuring the structural integrity, safe operation and adequate maintenance and inspection of your dams are adhered to as outlined in the Dam Safety Regulation.

Should you wish to further discuss any aspect of your dam site and storage operation, do not hesitate to contact the undersigned.

Yours truly,



M.E.Noseworthy, P.Geo., Eng.L.

Senior Regional Dam Safety Officer
Okanagan Shuswap District
Mike.Noseworthy@gov.bc.ca

MN/js

Attach. Chute Lake Dam Owners list
Dam Audit Check Sheet

Licence No	Stream Name	Purpose	Quantity	Units	Licensee	File No
C050407	Ratnip Creek	Storage-Non Power	24669.6	MY	s.22	277218
C055456	Ratnip Creek	Storage-Non Power	20562.112	MY	YENNADON HOLDINGS LTD PO BOX 18028 1215C - 56 ST DELTA BC V4L2M4	367598
C055458	Ratnip Creek	Storage-Non Power	49339.2	MY	s.22	367599
C055462	Ratnip Creek	Storage-Non Power	14851.099	MY	YENNADON HOLDINGS LTD PO BOX 18028 1215C - 56 ST DELTA BC V4L2M4	368201
C055464	Ratnip Creek	Storage-Non Power	1973.568	MY		368202
C055597	Ratnip Creek	Storage-Non Power	20562.112	MY		201942
C059633	Ratnip Creek	Storage-Non Power	24669.6	MY	s.22	277541
C059637	Ratnip Creek	Storage-Non Power	22202.64	MY		8000368
C059639	Ratnip Creek	Storage-Non Power	19735.68	MY		8000369
C105820	Ratnip Creek	Irrigation	111013.2	MY	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	270042
"	Ratnip Creek	Storage-Non Power	111013.2	MY	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	270042
C105821	Ratnip Creek	Irrigation	222026.4	MY	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	202356
"	Ratnip Creek	Storage-Non Power	222026.4	MY	MARK ANTHONY PROPERTIES LTD 887 GREAT NORTHERN WAY VANCOUVER BC V5T4T5	202356
C118786	Ratnip Creek	Irrigation	44405.28	MY		8000367
"	Ratnip Creek	Storage-Non Power	44405.28	MY	s.22	8000367
C123001	Ratnip Creek	Irrigation	19365.636	MY		8002005
"	Ratnip Creek	Storage-Non Power	19365.636	MY		8002005

Mould Engineering

September 26, 2011

Mark Anthony Properties
c/o Mission Hill Family Estate
1730 Mission Hill Road
West Kelowna, BC V4T 2E4

Attention: Mike Molloy, Vineyard Operations Manager

Dear Mr. Molloy:

RE: Chute Lake Dam and Reservoir
Operation, Maintenance and Surveillance manual & Emergency Preparedness Plan

Enclosed is one copy of the Operation, Maintenance and Surveillance (OMS) manual and Emergency Preparedness Plan (EPP) for Chute Lake Dam and Reservoir for your review and comment. The OMS manual and EPP have been written with the following recommendations being implemented:

- A staff gauge that can be used to measure the water level in the reservoir should be installed. This gauge will allow tracking of reservoir levels over time, and will give Mark Anthony Properties, together with other dam owners, the ability to better predict and manage flood events. A staff gauge is required in order to accomplish the tasks noted in Sections 2.7, 2.8 and 3.2. The fact that no gauge presently exists is noted in Section 2.6.

- Reservoir inflow forecasting should be undertaken based on local snow pillow data. Inflow forecasting will improve the ability to predict and manage flood events. Snow pillow data is available at the following internet address: http://bcrfc.env.gov.bc.ca/data. The closest survey site is located at Greyback Reservoir, 49°36' N latitude & 119°25' E longitude (Station ID: 2F08). The fact that inflow forecasting is not presently undertaken is noted in Section 2.3.

- Sandbags should be acquired and be made readily available for use. 50 bags should be stored on the Paradise Ranch property, as noted in Section 5.7.2.

- The OMS manual contains sections on the inspection and maintenance of dam signage (Section 3.3 and 4.4.2, respectively). The requirement for signage comes into effect on November 30, 2011 (see amendment to BC Dam Safety Regulation dated June 9, 2011).

567 Lawrence Avenue, Kelowna, BC V1Y 6L8 ♦ Tel: 250-868-2072 ♦ Fax: 250-868-2078 ♦ e-mail: mouldeng@silk.net

In addition, as a measure of due diligence, when dam surveillance is undertaken inspection personnel should check the condition of the culverts carrying Ratnip Creek flows beneath Elinor Lake F.S.R. and Chute Creek flows beneath Chute Lake Road, North Naramata Road and Indian Rock Road. The Ministry of Forests, Lands and Natural Resource Operations should be contacted regarding problems associated with Elinor Lake F.S.R. and Argo Road Maintenance should be contacted concerning problems associated with Chute Lake, North Naramata and Indian Rock Roads.

If you have any questions regarding the above, please contact our office.

Yours truly,
MOULD ENGINEERING

Jody Good, AScT

JG/sm
Encl.

MARK ANTHONY PROPERTIES

CHUTE LAKE DAM & RESERVOIR

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL and EMERGENCY PREPAREDNESS PLAN

PREPARED BY: MOULD ENGINEERING SEPTEMBER 2011

REVISION SHEET

DATE	PAGE NO.	REVISION	BY

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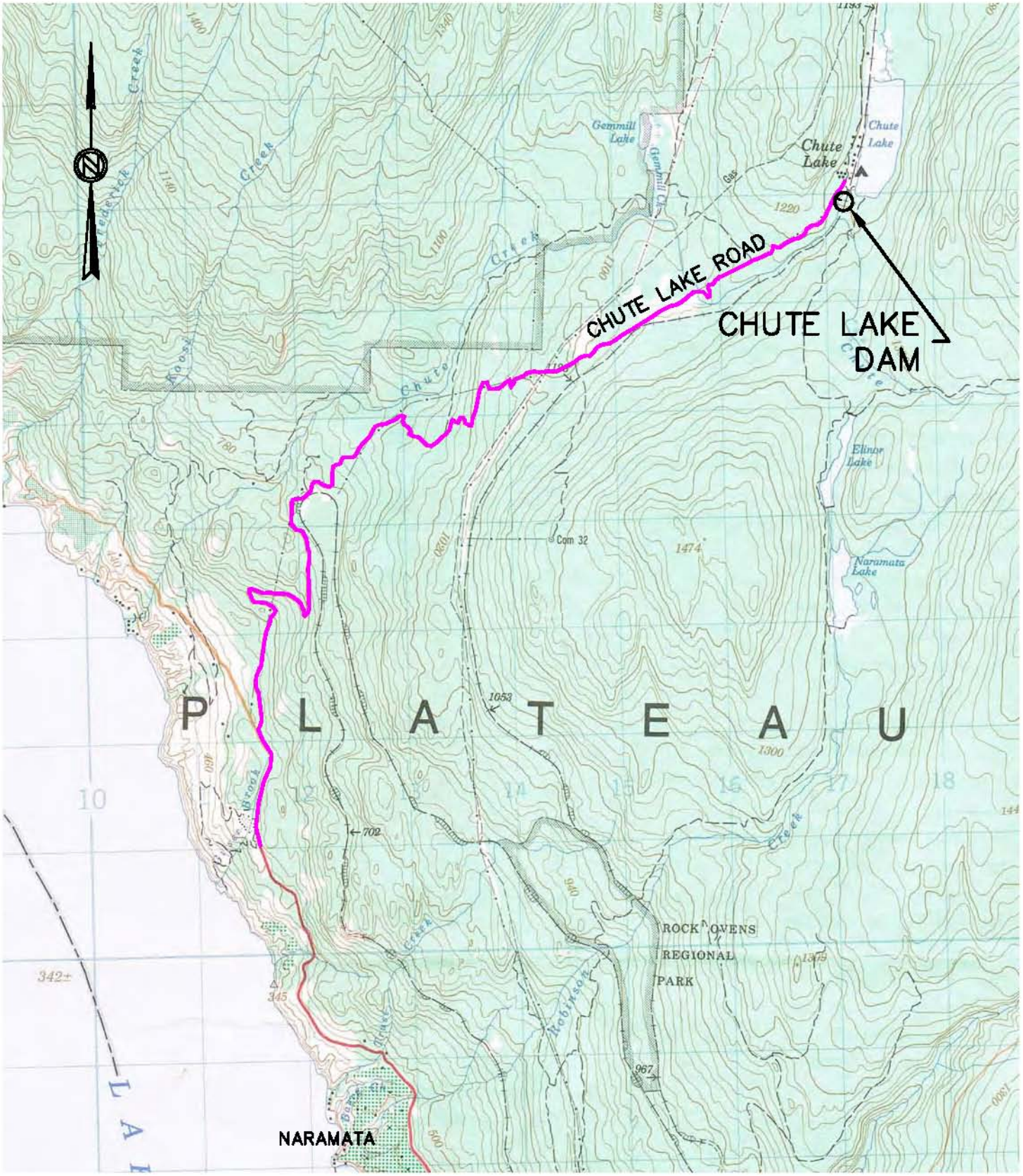
PREFACE

This Operation, Maintenance and Surveillance (OMS) manual and Emergency Preparedness Plan (EPP) was prepared to establish, in one central reference document (with associated supporting documents), structure-oriented operating, maintenance and surveillance procedures for the Chute Lake Reservoir, Dam and related structures. The purpose is to ensure utmost safety through adherence to approved operating, maintenance and surveillance procedures over long periods of time and during changes in operating personnel.

The Chute Lake Reservoir, Dam and related structures are located north of the community of Naramata as shown on Figure 1.0 and in the Chute Lake watershed as shown on Figure 1.1.

The OMS manual is prepared primarily for the use of the person or persons located at, or nearest the Dam, and immediate supervisors, who are assigned responsibility for the physical operation and maintenance of the Dam. The OMS manual contains all information and instructions necessary for the Dam operators to perform their duties. In addition, the instructions permit responsible persons who are knowledgeable in reservoir operation, but are unfamiliar with the conditions at a particular dam, to operate the Dam during emergency situations and at such other times when the regular operator cannot perform his/her normal duties.

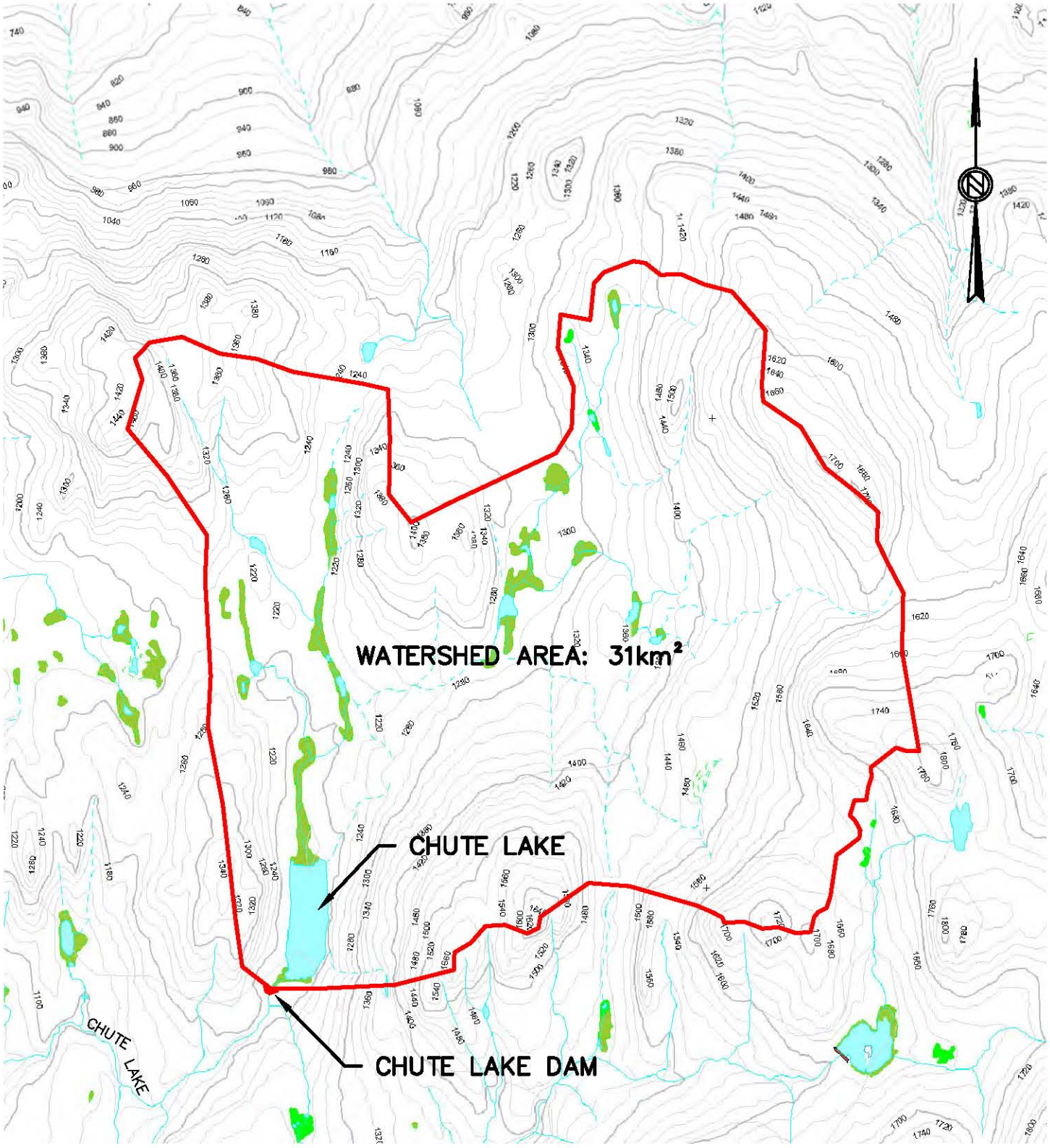
The Emergency Preparedness Plan is for the use of the person's located at, or near the Dam and immediate supervisors, who are assigned responsibility for any emergency at the Dam. The EPP contains all the important procedures and contact information that may be useful during an emergency at the Dam.



MARK ANTHONY PROPERTIES

FIGURE 1.0 KEY MAP

SCALE 1:50,000 AUG. 2011



MARK ANTHONY PROPERTIES

FIGURE 1.1
CHUTE LAKE
WATERSHED BOUNDARY

SCALE 1:50,000 AUG. 2011

DAM AND SPILLWAY
WATERSHED BOUNDARY

Section 1.0 GENERAL INFORMATION

1.1 Purpose of Reservoir

Chute Lake Dam and Reservoir are owned and operated by the dam owners listed below and are utilized for the purpose of storing runoff water. The Dam and Reservoir are situated in the mountains northeast of the community of Naramata. Water storage in the Reservoir is discharged to augment Chute Creek flows.

1.2 Dam Owner's Responsibility

A recent review by Ministry of Forests, Lands and Natural Resource Operations, Water Division, has increased the consequence classification for Chute Lake Dam from Low to High. The consequence classification is based on the downstream risks associated with a dam failure, as shown in Table 1.

As defined in the *Water Act*, the Owner is fully responsible for the dam including inspections and regular maintenance and is liable for any damages that are caused to the structure, appurtenances or any surrounding structures. As shown in Table 2, several individuals/organizations share ownership of Chute Lake Dam, with Mark Anthony Properties holding the greatest share. While Mark Anthony Properties has assumed the responsibility for preparing this Operation, Maintenance and Surveillance (OMS) manual and Emergency Preparedness Plan (EPP), Mark Anthony Properties will endeavour to assemble all dam owners with the intention of either preparing a water users' agreement or forming a water users' community. The objective of preparing such an agreement or forming such a community is to recognize that dam ownership responsibilities should be shared between all dam owners. In recognition of this objective, the dam owner noted in this OMS manual and the EPP will read "Mark Anthony Properties, together with other dam owners".

The frequency of inspection and maintenance activities undertaken by Mark Anthony Properties, together with other dam owners, is suggested to take place as follows (as a minimum):

- Site Surveillance – Weekly
- Routine Maintenance – As required
- Formal Inspection – Annually
- Monitor Instrumentation – n/a (currently none on site)

Downstream Dam Failure Consequences Classification Table[1]

Dam failure consequences classification	Population at risk	Consequences of failure		
		Loss of life	Environment and cultural values	Infrastructure and economics
Low	None[1]	There is no possibility of loss of life other than through unforeseeable misadventure	Minimal short-term loss or deterioration and no long-term loss of deterioration of (a) fisheries habitat or wildlife habitat, (b) rare or endangered species, or (c) unique landscapes or sites of cultural significance.	Minimal economic losses mostly limited to the dam owner's property, with virtually no pre-existing potential for development within the dam inundation zone.
Significant	Temporary only[3]	Low potential for multiple loss of life	No significant loss or deterioration of (a) important fisheries habitat or important wildlife habitat, (b) rare or endangered species, or (c) unique landscapes or sites of cultural significance, and restoration or compensation in kind is highly possible.	Low economic losses affecting limited infrastructure and residential buildings, public transporation or services or commercial facilities, or some destruction of or damage to locations used occasionally and irregularly for temporary purposes.
High	Permanent[4]	10 or fewer	Significant loss or deterioration of (a) important fisheries habitat or important wildlife habitat, (b) rare or endangered species, or (c) unique landscapes or sites of cultural significance, and restoration or compensation in kind is highly possible.	High economic losses affecting infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to scattered residential buildings.
Very high	Permanent[4]	100 or fewer	Significant loss or deterioration of (a) critical fisheries habitat or critical wildlife habitat, (b) rare or endangered species, or (c) unique landscapes or sites of cultural significance, and restoration or compensation in kind is possible but impractical.	Very high economic losses affecting important infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to residential areas.
Extreme	Permanent[4]	More than 100	Major loss or deterioration of (a) critical fisheries habitat or critical wildlife habitat, (b) rare or endangered species, or (c) unique landscapes or sites of cultural significance, and restoration or compensation in kind is impossible.	Extremely high economic losses affecting critical infrastructure, public transportation or services or commercial facilities, or some destruction of or some severe damage to residential areas.

[1] This table is a copy of Schedule 1 of the Dam Safety Regulation 108/2011. In case of discrepency between this table and the approved Regulation, the Regulation takes precedence.

[2] There is no identifiable population at risk.

[3] People are only occasionally and irregularly in the dam-breach inundation zone, for example stopping temporarily, passing through on transportation routes or participating in recreational activities.

[4] The population at risk is ordinarily or regularly located in the dam-breach inundation zone, whether to live, work or recreate.

- Test operation of outlet facilities, spillway gates and other mechanical components – Annually
- Update emergency contact information in the EPP – Annually
- Review, and revise if necessary, the OMS Manual and the EPP – Every 10 years
- Conduct Dam Safety Review and submit dam safety report – Every 10 years
- Review downstream conditions and notify a dam safety officer of any change in classification – Annually

Table 2. Chute Lake Dam and Reservoir – Ownership

Licensee (Owner)	Water Licence Nos.	Purpose	Allotted Quantity m^3/year	% of Total
s.22	C050407	Storage	24,669.6	4.1
	C055464	Storage	1,973.6	0.3
	C055597 & C059633	Storage	45,231.7	7.6
	C059637, C059639 & C118786	Irrigation & Storage	86,343.6	14.5
	C055458	Storage	49,339.2	8.3
Mark Anthony Properties	**C105820 & C105821**	**Irrigation & Storage**	**333,039.6**	**55.9**
s.22	C123001	Irrigation & Storage	19,365.6	3.3
Yennadon Holdings Ltd.	C055456 & C055462	Storage	35,413.2	6.0
		TOTAL =	**595,376.1**	**100**

Source: B.C. Mi SSource: B.C. Ministry of Environment – Water Stewardship Division

1.3 Description and History of Dam and Reservoir

Chute Lake Reservoir is licensed to impound 595 dam^3 (483 ac-ft) of water. Refer to the Figure 1.0 (Key Map) for the location of the Dam and Reservoir. Chute Lake Reservoir is impounded by a gravity dam, constructed of concrete, approximately 1.4 m (4.6 ft) in height with a crest length of 15.2 m (50 ft). The Dam crest is at an elevation of 1,184.19 m (3,885 ft). The abutments of the Dam are constructed of earth.

The Dam impounds runoff obtained from a drainage area of approximately 31 km^2 (12 mi^2). Water released from Chute Lake Reservoir flows into Ratnip Creek, which joins Chute Creek approximately 150 m below the dam. Chute Creek flows into Okanagan Lake. See Figure 1.1.

Chute Lake is formerly known as Lequime Lake. No other reference to this historical name appears in this manual or Emergency Preparedness Plan.

Maintenance to remove sediment and debris upstream of the dam, and sediment and debris in the spillway below the dam was completed in October of 2010. At this time, additional rock armouring was placed at the toe of the dam and in the spillway in order to protect the Dam's foundation. See Appendix J for a plan view of the maintenance work completed.

No log boom has historically been in place upstream of the dam/spillway sill.

A plan drawing of the Reservoir and plan and profile drawing of the Dam can be found in Appendix H. A copy of the Chute Lake Reservoir Survey and Storage Compilation is included in Appendix K.

See also the Dam Information Sheet in Appendix C.

1.2 Assignment of Responsibility

Responsibility for the day-to-day operation and maintenance of the Chute Lake Dam and Reservoir rests with the **Vineyard Operations Manager**. During an emergency, any decisions regarding the procedures to be carried out at the Dam shall be made by the **Vineyard Operations Manager** or his designate. See Emergency Preparedness Plan, Section 5.3 for a list of contact personnel during emergencies.

1.3 Regulatory Bodies

Operation, maintenance and surveillance of dams is regulated by the British Columbia *Dam Safety Regulation*. The provincial government will occasionally conduct dam safety seminars and audits to ensure the dams are being properly maintained.

1.4 Other Agencies

Mark Anthony Properties, together with other dam owners, have unscheduled contact with Forests, Lands and Natural Resource Operations, Environment and Highways Ministries as circumstances warrant.

1.5 Communications

Radio and Television Station, Royal Canadian Mounted Police (RCMP), and Provincial Emergency Plan (PEP) facilities for flood warnings are located in Penticton, Kelowna and Kamloops. The names and phone numbers of such agencies are given in Appendix A.

1.6 Data Reporting

All dam inspections are to be carried out as described in the Surveillance Section (3.2) by Qualified Personnel, and Inspection and Deficiency Checklists filed in the Operations Record Book which is maintained at the office of the **Vineyard Operations Manager**. Copies of the Checklists are included in Appendix G.

Changes in normal operation and unusual events, conditions, public activity, and maintenance activities are to be highlighted on the Checklists and flagged in the Operations Record Book for ease of access. The **Vineyard Operations Manager** and the Dam Safety Officer are to be notified of any flagged additions to the Operations Record Book that relate to the dam's safety.

An Annual Summary of Operations report is to be sent to the Dam Safety Section, Water Management Branch in Victoria.

1.7 Public Safety

Surveillance personal shall carry a mobile telephone. The nearest land-line phone is located at the Chute Lake Resort (located approximately 200 m north of the Dam). The closest police, medical and emergency facilities serving this area are in Penticton, as listed in Appendix A.

There are several seasonally occupied cabins and at least one permanent residence in the immediate vicinity of the Lake.

1.8 Access

Access to Chute Lake Dam is unrestricted.

1.9 Security Plans

There are no security plans at present, other than the Emergency Preparedness Plan (EPP) outlined in Section 5.0.

1.10 Distribution of OMS manual

One copy of the OMS Manual complete with EPP is to be provided to the following:

- Mark Anthony Properties, together with other dam owners

- Ministry of Forests, Lands and Natural Resource Operations - Water Division – Dam Safety Officer - Penticton
- Mould Engineering

1.11 Revisions to OMS manual and EPP

Reviews shall be conducted as per Section 5.1.3 of the Emergency Preparedness Plan.

1.12 Definitions (in part from the BC Dam Safety Guidelines)

Abutment: The part of the valley side against which the dam is constructed.

Appurtenances: Structures and equipment on a project site, other than the embankment itself. They include, but are not limited to facilities, such as spillways, log booms, intake towers, powerhouse structures, tunnels, canals, penstocks, low-level outlets, surge tanks and towers, gate hoist mechanisms and their supporting structures, and all critical water control and release facilities. Also included are mechanical and electrical control and stand-by power supply equipment located in the powerhouse or in remote control centers.

Breach of Dam: The uncontrolled release of the contents of a reservoir through collapse of the dam or appurtenant structures.

Comptroller: A person employed by the government and designated in writing by the minister as the Comptroller of Water Rights and includes any persons designated in writing by the minister as acting, deputy or assistant comptrollers.

Consequences of Dam Failure: Impacts in the downstream as well as upstream areas of the dam resulting from failure of the dam or its appurtenances.

Crest of Dam: Elevation of the uppermost surface of a dam proper, not taking into account any camber allowed for settlement, curbs, parapets, guard rails, or other structures that are not a part of the main water-retaining structure. This elevation may be roadway, walkway or the non-overflow section of a dam.

Dam: A man made barrier that would create a water storage reservoir or divert water. “Dam” is herein defined to include works (appurtenances) incidental to, necessary for, or in connection with, the barrier.

Dam Owner: A person, including a company, organization, government unit, public utility, corporation or other entity, which either holds a water licence to operate a dam or retains the legal property title on the dam site, dam and/or reservoir, or a person who acts as the principal agent of the dam owner and which is responsible for the safety of the dam.

Dam Safety Officer: An engineer or officer who is designated in writing by the comptroller as a dam safety officer.

Dam Safety Review: Comprehensive formal review carried out at regular intervals to determine whether an existing dam is safe, and if it is not safe, to determine what improvements are required.

Drawdown: The resultant lowering of water surface level due to controlled release of water from the reservoir.

Earthfill Dam: See "Embankment Dam".

Embankment Dam: Any dam constructed of natural excavated materials placed without addition of binding materials other than those inherent in the natural material. The materials are usually obtained at or near the dam site. Embankment dams are usually referred to by type such as earthfill or rockfill. The term Embankment Dam is used to indicate a zone fill dam involving selected areas of rock, gravel and impervious zones or a homogeneous earthfill dam which is not necessarily zoned.

Emergency: In terms of dam operation, any condition which develops naturally or unexpectedly, endangers, the integrity of the dam and upstream or downstream property or life, and requires immediate action.

Emergency Preparedness Plan: Document which contains procedures for dealing with various emergencies, as well as communication directories and may contain inundation maps showing upstream and downstream water levels and times of arrival of floods which would result from the failure of the dam or its appurtenances.

Engineer: A professional engineer employed by the government and designated in writing by the Comptroller of Water Rights as and engineer and includes a regional water manager.

Failure of Dam: In terms of structural integrity, the uncontrolled release of the contents of a reservoir through collapse of the dam or some part of it; in terms of performance to fulfill its intended function, the inability of a dam to perform functions such as water supply or prevention of excessive seepage.

Formal Inspection: An inspection of the dam to observe its condition. A formal inspection is intended to be more thorough than a routine visual inspection. These inspections are carried out by the appropriate representative of the dam owner responsible for safety surveillance (i.e. the dam owner or owners engineering consultant).

Foundation: Rock and/or soil mass that forms a base for the structure, including its abutments.

Freeboard: Vertical distance between the dam crest and the reservoir water surface. The more specific term "Design Freeboard" is defined as the difference in elevation between dam crest and the normal reservoir water level as fixed by design requirements such as the spillway sill level. The term "Minimum Freeboard" is defined as the difference in elevation between the dam crest and the maximum reservoir water surface that would result should the inflow design flood occur and the outlet and spillway function as planned.

Full Supply Level: Maximum normal operating water surface level or a reservoir (also called maximum normal reservoir water level). Generally the spillway sill elevation.

Gate: A general term for any mechanical device to control the flow of water in intakes, outlet works and over controlled spillways.

Height of Dam: The difference in elevation from the lowest point at the downstream toe to the dam crest.

Homogeneous Earthfill Dam: An embankment type dam constructed of more or less uniform earth materials throughout, except for possible inclusion of internal drains or blanket drains. Used to differentiate this type of dam from a zoned earthfill dam.

Inspection: See “Formal Inspection” & “Visual Inspection”

Instrumentation: Devices which are installed in or near a dam to monitor the dam and impoundment. These devices may include but are not limited to survey monuments and stations, inclinometers, extensometers, piezometers, measuring weirs.

Internal Drain or Drainage Blanket: A layer of pervious material in a dam to facilitate drainage.

Internal (piping) Erosion: A layer of pervious material from within a dam caused by seepage, appearing downstream as a hole or seam discharging water that contains solid particles.

Log boom: A series of floating logs connected (preferably with boom chain) end to end, and placed on the reservoir surface at a line just upstream of the dam in order to collect trash, ice and floating debris and prevent their entrance to spillway or outlet works.

Low-Level Outlet: A conduit through the dam to allow for controlled release of the reservoir contents. Also see “Outlet Works”.

Maintenance: Those tasks accepted as routine in keeping the dam and appurtenant works in a serviceable condition. It is not to be confused with alterations.

Operation, Maintenance & Surveillance Manual: A manual which documents procedures for safe operation, maintenance and surveillance of a dam.

Operations Record Book: A book which contains all of the inspection and maintenance records for the dam and reservoir.

Outlet Gate: See “Gate”.

Outlet Works: Combination of intake structure, gates, conduits, tunnels, flow controls and energy dissipation devices to allow the release of water from a dam.

Owner: See “Dam Owner”.

Piping: See “Internal Erosion”.

Qualified Personnel: Persons who have received sufficient and relevant training in the applicable field of study. In the case of inspection personnel, they must have taken industry recognized training.

Qualified Professional Engineer: A person registered, and in good standing, as a professional engineer under the Engineers and Geoscientists Act. The individual must also be experienced in the applicable field of practice. For example, the Qualified Professional Engineer responsible for conducting a Dam Safety Review must be experienced in dam safety analysis.

Regional Water Manager: A person employed by the Crown and designated in writing by the minister as a regional water manager and includes and acting or assistant regional water manager. Reference to the Regional Water Manager means the designated person for the geographic location or Water District where the works are located.

Repair: To essentially restore a dam to its approved design condition. Many older dams may be required to be upgraded to current design standards if there is a difference between the initial approved design and current design standards.

Reservoir: Water body impounded by one or more dams, inclusive of its shores and banks and of any facility or installation necessary for its operation.

Right Abutment: The abutment of the right-hand side of an observer when looking downstream.

Riprap: Layered broken (angular) rock or precast blocks, generally placed on the upstream slopes of an embankment or along a water course as protection against wave action, erosion or scour, riprap should be properly placed by mechanical methods and in some cases is hand placed. It consists of pieces of relatively large size as distinguished from a gravel blanket.

Rockfill Dam: See “Embankment Dam”.

Safe Dam: Dam which does not impose an unacceptable risk to people or property, and which meets safety criteria that are acceptable to the government, the engineering profession and the public.

Seepage: Flow or movement of water through a dam, its foundation or abutments.

Spillway: Weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the reservoir.

Spillway Sill: The control level of the spillway overflow section.

Stoplogs: Large logs, timbers, concrete or steel beams stacked vertically on each other so as to close off entrance to dam outlets or penstocks. Normally stoplogs are used intermittently as temporary outlet gates in order to effect repairs or replacements to the permanent facilities.

Storage : The collection, impounding and conservation of water.

Types of storage are:

Natural Storage – what is/was the natural body of water (i.e. the existing lake or pond).

Dead Storage – created storage not accessible with the permanent outlet works. This is normally between the upstream toe and the outlet sill. It may include what was natural storage if the toe of the dam is constructed below the natural lake outlet.

Live Storage – the accessible storage, typically from low level outlet sill to spillway sill.

Licenced Storage – typically includes dead storage plus live storage.

Surcharge Storage – typically from the spillway sill to design flood level.

Surveillance: Close monitoring of dam behaviour through visual inspections and, in addition, may include the systematic collection, analysis and interpretation of data obtained through automated instrumentation.

Tailwater Level: Level of water in the discharge channel immediately downstream of a dam.

Toe of Dam: Junction of the downstream (or upstream) face of dam with the ground surface (foundation). Sometimes “heel” is used to define the upstream toe of a concrete gravity dam.

Top of Dam: See “Crest of Dam”.

Trashrack: A screen or grill structure placed at the inlet end of penstocks and low level outlets to prevent the entrance of logs, timbers, trash or other debris from the reservoir.

Visual Inspection: An inspection performed by the dam owner as a regular part of their routine maintenance activities.

Works: Anything capable of or used for diverting, storing, measuring, conserving, conveying, retarding, confining or using water, or producing, measuring, transmitting or using electricity.

Zoned Earthfill Dam: See "Embankment Dam".

Section 2.0 OPERATION

Chute Lake Dam and Reservoir are to be operated by Qualified Personnel. Operations shall not jeopardise the structural integrity of the Dam, ancillary works, or any slopes. Furthermore, operational activities shall be conducted in a manner that will not compromise the water quality of the Reservoir or creeks downstream. Appendix C contains the Dam Information Sheets, which list the Dam, ancillary works and Reservoir dimensions and capacities.

2.1 Watershed Size and Reservoir Capacity

The natural catchment area for Chute Lake Reservoir is 31.0 km^2 (11.9 mi^2). Elevations within the watershed range from a high of approximately 1,800 m (5,900 ft) to the lake high water elevation of 1,184.19 m (3,885 ft), for an average of approximately 1,400 m (4,500 ft). Chute Lake Reservoir has a live storage capacity of approximately 460 dam^3 (373 ac-ft) at the spillway sill. A storage capacity table showing surface elevation with corresponding surface area, depth and quantity of storage is included in Appendix D.

2.2 Design Flood

The spillway structure is the top of the Dam itself, which lies at an elevation of 1,184.19 m (3,885 ft); the sidewalls of the spillway (and dam) are constructed of earth. The inflow design flood and corresponding freeboard are unknown, but the freeboard from spillway sill to Dam crest (design freeboard) is 1.4 m (4.6 ft).

2.3 Inflow Forecasting

None at the present time.

2.4 Filling Schedule and Release Procedure

Major Chute Lake Reservoir inflows occur during April to mid-June, usually reaching spillway level by mid-May. Inflows are primarily dependent on the natural runoff from the snow pack of the past winter.

Release of storage for irrigation purposes is authorised from April 1st to September 30. Mark Anthony Properties, together with other dam owners, practices year-round water conservation techniques in order to maximise carry-over storage in Chute Lake Reservoir each fall.

2.5 Gate Configuration and Operation

The rectangular fabricated steel sluice gate is the only means of discharging controlled flow from Chute Lake Reservoir. The sluice gate measures approximately 1,400 mm x 530 mm, and is contained within a 1,400 x 640 mm steel frame affixed to the concrete dam structure (see Water Management Branch Drawing No. 4567-9C). The sluice gate is operated by turning a nut on a threaded rod located at the top of the frame. Access to the nut is blocked by a steel cover which is chained and padlocked to the top of the frame. Keys are held by **Vineyard Manager Ray Gill & dam owner Robert Hindson**.

The gate operates as follows:

- Counter clockwise rotation to close
- Clockwise rotation to open

2.6 Reservoir Level and Discharge Measurement

Presently not measured.

2.7 Flood Control

To minimise the amount of uncontrolled flow over the Chute Lake Reservoir spillway and to avoid a flood event during heavy runoff in the spring, the outlet gate is to be regulated to allow controlled releases.

2.8 Special Reporting During High-Water Conditions

Qualified Personnel are to record Chute Lake Reservoir levels daily. Any unusual conditions are to be reported to the **Vineyard Operations Manager** immediately and are to be flagged in the Operations Record Book, as described in Section 1.8.

2.9 Landslide Surveillance

There are no known landslide risks in the area around the Dam or Reservoir surface. Similarly, there are no known landslide risks in the area around Ratnip and Chute Creeks below the dam. Immediately below the Dam the grade of Ratnip and Chute Creeks is relatively flat, after which Chute Creek follows a narrow, confined bedrock lined channel to within approximately 140 m of Okanagan Lake. Within 140 m of Okanagan Lake the grade of Chute Creek flattens once again.

2.10 Fish and Wildlife Considerations

Ratnip and Chute Creeks are home to spawning Rainbow Trout; therefore, all in-stream work must be approved by the provincial Ministry of Environment.

2.11 Floating Islands and Floating Debris

At least one floating island is present approximately 20 m upstream of the dam. Although floating islands and other debris may approach the dam and spillway from time to time, routine inspection and maintenance is expected to preclude the need for a log boom.

Section 3.0 SURVEILLANCE

Outlined in this section are the inspection schedules, procedures and tools required, along with guidelines of when to notify dam experts.

3.1 Inspection Equipment

The following tools are to be carried by or readily accessible to Qualified Personnel conducting any level of inspection:

- Clipboard with inspection and deficiency checklists
- Plan and Profile of dam - BC MOE Dwg. No. 4567-9C
- Field notebook
- Pencils, erasers, and permanent markers
- 30 m tape measure and ruler
- Camera (still and/or video)
- Flashlight
- Shovel
- Hammer and stakes

3.2 Inspection Frequencies and Categories

All inspections are to be conducted by Qualified Personnel. Mark Anthony Properties, together with other dam owners, is to ensure that an annual inspection and formal report on the condition of the Dam is completed. Good practice is to have the formal inspections performed by an independent third party not conducting the weekly or monthly inspections. Following is the inspection schedule.

Table 3. Dam and Ancillary Works Inspection Schedule

Category / Date	Frequency	Procedure
Visual inspection. Year round.	No Snow: Weekly. Snow: Monthly.	Fill out Dam Inspection and Deficiency Checklists (Appendix G), using Sections 3.3 and 3.4 as a guide.
Formal inspection in the fall including test of ancillary works.	Annually	Fill out the Dam Inspection and Deficiency Checklists (Appendix G) and complete written report on the condition of the dam. See Section 3.5 for details.

Additional inspections are to be conducted in the wake of irregular, potentially damaging events, such as:

- Floods
- Wind and rain storms
- Earthquakes
- Unusual observations (e.g. cracks, settlements, sinkholes, and slope failures)
- Vandalism

The level of inspection for the above listed irregular events shall be conducted to at least the same detail as the weekly visual inspection. A Qualified Professional Engineer must be consulted if the structural integrity of the Dam or any ancillary works is in question.

A Dam Safety Review is to be conducted every ten years by a Qualified Professional Engineer. The review must encompass all applicable points outlined in the Dam Safety Review section of the Canadian Dam Safety Association's Dam Safety Guidelines. The report must also be in accordance with the Comptroller of Water Rights' or Regional Water Manager's specifications and adhere to the British Columbia *Dam Safety Regulation*.

During the reservoir filling period, approximately April 15th to May 15th, reservoir water level readings are to be recorded by Qualified Personnel and recorded in the Operations Record Book.

3.3 Inspection Procedure

All inspections are to be conducted using the Dam Inspection and Deficiency Checklists. The Deficiency Checklist is to be used in conjunction with Section 7 – Self Help Guide, of the provincial government's Dam Safety Guidelines (see Appendix G). Section 7 identifies problems and suggests common causes and methods of remediation. In addition, Appendix E contains a description of proper inspection techniques and Section 4.0 contains guidelines for the remediation of minor deficiencies. Major deficiencies are to be remediated as per the Qualified Professional Engineer's specifications.

Each fall, prior to filling the Reservoir, the following should occur:

1. Check the **Reservoir and its banks** for:
    - Erosion in the form of slides or slumps;

- Floating debris and;
- Beaver activity.

2. Check the **Dam and spillway sill** for:
   - Evidence of overturning or sliding (indicative of foundation and/or abutment erosion);
   - Evidence of foundation failure due to overstressing;
   - Indicators of potential structural failure (concrete cracking, spalling, pitting, etc.)

3. Check the **spillway channel** for:
   - Seepage;
   - Excessive Vegetation;
   - Erosion and;
   - Debris (logs, branches, litter, etc.)

4. Check the **abutments** for:
   - Seepage on the downstream slope and especially at the abutment / dam contact zone;
   - Bulges on the downstream slope (indicative of imminent slide);
   - Slides or slumps;
   - Sinkholes;
   - Longitudinal or transverse cracking;
   - Erosion, including beaching / scarps on the upstream slope;
   - Displaced and broken down riprap;
   - Excessive vegetation;
   - Burrowing animal activity;
   - Presence and condition (legibility) of signage.

5. Check the **sluice gate** for:
   - Alignment of the gate within the frame;
   - Corrosion of the gate and frame assembly;
   - Loose bolts holding frame to concrete structure;
   - Gate seating;
   - Condition of painted or otherwise protected surfaces;
   - Before operating the sluice gate, check the outlet for dirty, murky, or silt-laden water flowing from the gate, or around it. *If dirty water is noticed, or seepage is*

coming from around the outside of the sluice gate, a Qualified Professional Engineer must be notified immediately;

- Annually, ensure the sluice gate is in good working order by fully closing the gate for approximately ten minutes. While the gate is closed inspect the outlet for any cracking, spalling, foundation undercutting, or other deterioration, and removed any debris and growth around the outlet. Restore the gate to its original position upon completion of the inspection.

Seepage external to the structure (a potential indicator of water piping around the dam through the abutments) is to be reported to a Qualified Professional Engineer immediately.

Inspection records are filed in the Operations Record Book. If the inspection includes any unusual findings, discuss with the **Vineyard Operations Manager** and highlight the unusual findings and place the report in the Operations Record Book with a flag for easy reference.

Known, normal seepage areas, as well as any deficiencies are to be marked and documented in the manner outlined in Appendix F.

3.4 Deficiencies

Deficiencies are to be documented as per Appendix F. In addition, the Dam Safety Officer and the **Vineyard Operations Manager** must be kept abreast of any additions to the Operations Record Book if the additions relate to the dam's safety. Guidelines for a variety of maintenance activities are outlined in the Maintenance Section 4.0. Major maintenance activities are to be stipulated and supervised by the Qualified Professional Engineer.

3.5 Photography

Photographs of each of the following features must be taken during the formal inspection and test of ancillary works in the fall, be properly labelled and placed with the corresponding inspection form in the Operations Record Book:

- Dam and spillway sill (At least 3 pictures: 1 picture from each abutment, 1 picture from spillway, 1 picture from Reservoir)
- Abutments (1 picture of each abutment)
- Spillway channel between Dam and Elinor Lake Forest Service Road (F.S.R.) (1 picture from each abutment)
- Culverts beneath Elinor Lake F.S.R. (as many pictures as required to capture condition of all culvert inlets and outlets)

- Sluice gate and frame (1 picture from above dam and 1 picture from below)
- Sluice gate outlet (1 picture)

Photographs are to be labelled as follows:

- Dam name
- Number in set
- Date taken
- Feature location / description

Photographs are also required to document any deficiencies, operation anomalies or unusual events. These photos are to be kept in the Operations Record Book and flagged for easy reference. *Be sure to include some object of known size in the pictures for scale.*

3.6 When to Notify Higher Authorities

A provincial Dam Safety Officer must be notified upon discovery of any of the following:

- Whirlpools in Reservoir (the most serious deficiency)
- Concrete structure:
  - Longitudinal cracking
  - Transverse cracking
  - Misalignment
- Abutments:
  - Cracking extending below the waterline or potential waterline
  - Slides or bulges
  - Sinkholes
  - Sand boils or dirty seepage
  - Increased seepage from the last inspection (take into account the reservoir levels at the time of each inspection)
- Sluice Gate & Spillway:
  - Failure of the sluice gate
  - Seepage from the outer edges of the spillway

The Dam Safety Officer must be notified of any changes in the conditions within the flood path of the dam. Examples include new subdivisions and roads.

3.7 Survey Monuments & Piezometers

WRS Monument 1052 is located east of the dam. WRS Monument 1053 (located west of the dam) has not been located to date. Monuments are shown on Drawing 4567-9.

3.8 Safety Procedures

A first aid kit should be kept on-hand during inspection and maintenance activities. WorkSafeBC requirements apply.

Section 4.0 MAINTENANCE

Concrete structures with earth abutments require maintenance to control seepage and erosion, and to prevent deterioration of associated structures. The regular maintenance program includes control of vegetation and burrowing animals, riprap maintenance, slope stabilisation, and removal of upstream and downstream debris. Section 7 – Self Help Guide of the provincial government's Dam Safety Guidelines in Appendix G gives recommended actions to deal with deficiencies.

The regular inspections, set out in the surveillance Section 3.2, are to determine the required maintenance. Major maintenance work is to be specified by a Qualified Professional Engineer. Guidelines for a variety of minor maintenance operations are listed in the sections below.

Maintenance work shall not jeopardise the structural integrity of the dam, its ancillary works, or any slopes. Furthermore, maintenance activities shall be conducted in a manner that will not compromise the water quality of the reservoir or creek. The installation of silt fences may be required or work may need to be completed by hand. In-stream work (including beaver dam removal) may require approval from the Ministry of Environment.

4.1 Dam and Spillway Sill

- Repair damaged concrete as required. Consult a Qualified Professional if necessary.
- Add/arrange riprap as required to protect the integrity of the dam foundation.
- Remove floating debris and sediment immediately upstream of the spillway sill & dam by hand or excavator. Clear debris from the trash rack in front of the sluice gate as required.
- All debris/spoil material is to be removed from the dam site to prevent its re-introduction into the reservoir or spillway and to allow for a clear view of all areas requiring inspection.

4.2 Sluice Gate

- The sluice gate stem is to be lubricated, annually. Straighten the sluice gate frame, if required. Tighten any bolts holding the frame to the concrete structure.
- Repair gate wear as required.
- All painted or otherwise protected surfaces are to be re-coated, annually, as required.

4.3 Spillway

- Grasses are to be maintained to less than 300 mm (1 ft) height.
- All other plants shall not be permitted to exceed a height of 600 mm (2 ft).
- Root systems, with the exception of grasses, are to be removed by hand, or with a mechanical device not projecting into the ground more than 300 mm (12 in.). The area is to be restored to original or design condition.
- Pesticides or herbicides are not to be used.
- Consult a Qualified Professional Engineer when removing large trees and other plants with large and deep root systems.
- Remove loose debris (logs, branches, etc.) that has the potential to restrict/redirect flows and/or block the culverts beneath Elinor Lake Forest Service Road by hand or excavator.
- Add/arrange riprap as required to maintain the functionality of the spillway channel.
- Oil spill kits must be on-site if an excavator is required to work in-stream.
- All debris/spoil material is to be removed from the dam site to prevent its re-introduction into the reservoir or spillway and to allow for a clear view of all areas requiring inspection.

4.4 Abutments

4.4.1 Burrowing Animal Control

Remediation is to be specified by a Qualified Professional Engineer if the burrowing is deeper than 300 mm (12 in.) or wider than 450 mm (18 in.). Burrows within these parameters may be corrected as follows.

- Holes are to be filled with soil matching the soil surrounding the burrow.
- Backfill material is to be compacted to 95% Modified Proctor density.
- Burrowing animals are to be humanely controlled.

4.4.2 Signage

Required signage is to be repaired or replaced as necessary.

Section 5.0 EMERGENCY PREPAREDNESS PLAN

5.1 Introduction

Chute Lake Dam is classified as a High Consequence dam and therefore requires an Emergency Preparedness Plan (EPP) under the BC *Dam Safety Regulation*. This plan has been prepared to assist Mark Anthony Properties, together with other dam owners, Provincial Emergency Program (PEP) officials, the Royal Canadian Mounted Police (RCMP), and other local and regional officials in responding quickly to any emergency that may arise at Chute Lake Dam or Reservoir.

The plan facilitates mobilization of manpower and equipment, and allows emergency officials to establish timely warning and evacuation procedures for the protection and security of downstream communities.

While the likelihood of Chute Lake Dam failing due to breaching or any other cause is extremely remote, such an occurrence would cause considerable damage downstream (see Figure 5.0, Possible Flooded Area, at the end of section 5). The issuance of this EPP does not in any way reflect on the safety of the dam or its ancillary works.

5.1.1 Responsibilities

Responsibility for the operation of Chute Lake Dam and Reservoir rests with Mark Anthony Properties, together with other dam owners. During an emergency, any decisions regarding the procedures to be carried out at Chute Lake Dam will be made by the **Vineyard Operations Manager** or his designate.

5.1.2 Plan Distribution

Mark Anthony Properties, together with other dam owners, shall distribute copies of the EPP, along with Appendices A and B, to each of the following:

- **2 copies:** Regional District of Okanagan-Similkameen (RDOS) (Penticton)
  Attention: Dale Kronebusch, Emergency Services Supervisor
- **1 copy:** Provincial Emergency Program (PEP) Regional Office (Kamloops)

The EPP is also contained in the Operation, Maintenance and Surveillance (OMS) manual. One copy of the OMS manual complete with EPP has been provided to the following:

- Mark Anthony Properties, together with other dam owners
- Ministry of Forests, Lands and Natural Resource Operations - Water Division - Dam Safety Officer - Penticton
- Mould Engineering

5.1.3 Revisions to OMS manual & EPP

In accordance with the British Columbia Dam Safety Regulation in the *Water Act*, the **Vineyard Operations Manager** shall ensure the 'Communications Directory' (Appendix A) and 'Dam Access Routes' (Appendix B) are verified and updated semi-annually. Annually, all relevant Qualified Personnel shall be given a refresher briefing on the OMS Manual and EPP. Furthermore, the OMS Manual and EPP shall be assessed for adequacy every ten years.

5.2 Emergency Situations

This section defines emergency situations and gives direction for the appropriate level of response.

EVENT	EMERGENCY RESPONSE PROCEDURE (see Section 5.3)
1. Dam Breach, Potential Dam Breach, Flood Definition: At least the strong likelihood of excessive, uncontrolled release of water via the dam or ancillary works. Possible Causes: Rapid snowmelt, severe storm, outlet gate failure, seepage, piping, earthquake, sabotage.	Steps 1 - 5 inclusive
2. Earthquake An earthquake alert exists if an earthquake is felt in the vicinity of Chute Lake.	The **Vineyard Operations Manager** shall immediately direct an inspection of the dam as outlined in Section 3.0 of the OMS Manual and take the following action:

Severe / Significant Damage Minor / No Damage	Steps 2 - 5 inclusive. File a complete written report.
3. Criminal Action Definition: Malicious destruction of, or threat to, dam or ancillary works.	The **Vineyard Operations Manager** must notify the RCMP and take action as required.

5.3 Emergency Response Procedures

STEP 1 NOTIFICATION OF PERSONNEL

Emergency calls will be received by the 911 Communications Centre.

In addition to contacting emergency services as required, the 911 Communications Centre will contact the Provincial Emergency Program (PEP) who will then contact the Regional District of Okanagan-Similkameen (RDOS).

RDOS officials will contact the following dam owner representatives:

1. Mark Anthony Properties – Mike Molloy, Vineyard Operations Manager
2. SOS Security - Penticton

STEP 2 ASSESSMENT OF DAM AND ANCILLARY WORKS

The Dam's level of emergency must be assessed by Qualified Personnel, and be categorised as:

Type 1: Minor Damage to Structure and Works

The structural integrity of the dam and ancillary works is sound, and any damage can be safely remediated. There is no apparent reason to believe there will be any downstream flooding from a controlled, or an uncontrolled release of water.

Type 2: Possibility of Flooding

The release of large amounts of water is possible or necessary, but the structural integrity of the dam is at least temporarily sound. Assess whether any evacuation is required downstream.

Type 3: Major Failure Imminent

The dam is in certain danger of breaching, releasing mass quantities of water. Evacuation is required in the area shown on the Possible Flooded Area map, Figure 5.0.

Upon completion of the assessment, on site personnel will contact the **Vineyard Operations Manager** to communicate the state of the dam in one of the three above categories. Onsite personnel shall also communicate the required materials and equipment necessary to repair the damaged structure(s) and which access route(s) may be used. Step 4 lists professional personnel that are to be notified immediately if the emergency is classified as Type 2 or Type 3.

STEP 3 NOTIFICATION OF PROFESSIONAL PERSONNEL

The following list of experts is to be notified immediately if the emergency is categorised as Type 2 or Type 3. See Step 2 for category descriptions.

#	NAME / COMPANY	WORK	HOME	FAX	CELLULAR
(1)	**Jody Good, AScT** Mould Engineering	868-2072	s.22	868-2078	s.22
(2)	**Darryl Arsenault, R.P.Bio** Golder and Associates	860-8424		860-9874	300-9206
(3)	**Don Dobson, P.Eng.** Dobson Engineering	861-5595	s.22	861-8766	s.22
(4)	**Mike Noseworthy, P.Geo.** Senior Regional Dam Safety Officer Ministry of Forests, Lands and Natural Resource Operations (Penticton)	490-8200		490-2231	

STEP 4 EMERGENCY ACTIONS

On receipt of the status report from Chute Lake Dam, the **Vineyards Operation Manager** will take the following actions:

Type 1: Minor Damage to Structure and Works

- Assemble all local available equipment required to the site to remediate the damaged structure(s). A list of contractors and materials locations is in Appendix A and Section 5.7.2, respectively.

Type 2: Possibility of Flooding – Regional Emergency Plan to be implemented

- Notify the residential, business and infrastructure contacts in Appendix A. Explain they may experience some flooding, and evacuate if necessary. A map of the possible affected area is shown in Figure 5.0.
- Assemble all local available equipment to the site to remediate the damaged structure(s). A list of contractors and materials locations is in Appendix A and Section 5.7.2, respectively.
- Notify all contacts on the Health, Local Government and Media lists in Appendix A.

Type 3: Major Failure Imminent – Regional Emergency Plan to be implemented

- Immediately evacuate the residential, business and infrastructure contacts in Appendix A. A map of the possible affected area is shown in Figure 5.0.
- Assemble all local available equipment to the site to remediate the damaged structure(s). A list of contractors and materials locations is in Appendix A and Section 5.7.2, respectively.
- Notify all contacts on the Health, Local Government and Media lists in Appendix A.
- Notify the provincial government's Water Management Branch officials listed below.

WATER MANAGEMENT BRANCH OFFICIALS TO BE NOTIFIED

NAME / POSITION	WORK	HOME	FAX	CELLULAR
Will Jolley, AScT Dam Safety Section Head, Victoria	(250) 387-3263	s.22	(250) 952-6792	s.17
Glen Davidson, P.Eng. Director & Comptroller of Water Rights, Victoria	(250) 387-6949		(250) 356-0605	s.17
Scott Morgan, AScT Senior Dam Safety Officer, Victoria	(250) 387-3265	s.22	(250) 952-6792	s.17

STEP 5 SUGGESTED REMEDIAL ACTIONS

The following two bullets are requirements in all situations:

- The Dam is to be monitored by at least one Qualified Professional Engineer and one other qualified Personnel 24 hours a day until such time as the Dam and ancillary works are deemed safe by a Qualified Professional Engineer.

- Remediation is to be specified and supervised by a Qualified Professional Engineer if it is important to the performance or safety of the structure.

Further action will depend on the specific emergency and must be specified by Qualified Personnel. In all situations, all or some of the following actions may be taken, depending on the judgement of the above listed Qualified Personnel.

Reservoir Draining Procedures

- If the structural and operational integrity of the outlet works is intact (i.e. there is no chance of internally or externally eroding the dam and inducing a failure via the discharge of large amounts of water through the sluice gate), lower the reservoir by opening the sluice gate to a level specified by Qualified Personnel, to alleviate excessive pressure on the structure and/or downstream seepage.
- If the structural and operational integrity of the outlet works is compromised, flow should be restricted to the point where it no longer poses an erosion threat to the dam, either internally or externally. *In the case of conflicting issues regarding this procedure, the competent judgement of Qualified Personnel shall prevail*.

5.4 Communications near the Dam

A telephone is located at the Chute Lake Resort, located approximately 200 m to the north of Chute Lake Dam. There may be additional mobile phones at nearby cabins and residences around Chute Lake. For additional communications information, refer to Appendix A.

5.5 Inundation Maps

Detailed inundation maps have not been developed at this time. Areas anticipated to be threatened by flooding are highlighted on Figure 5.0.

5.6 Warning Systems

None in place at present.

5.7 Construction Equipment and Materials

5.7.1 Equipment

Refer to Appendix A for equipment contractors.

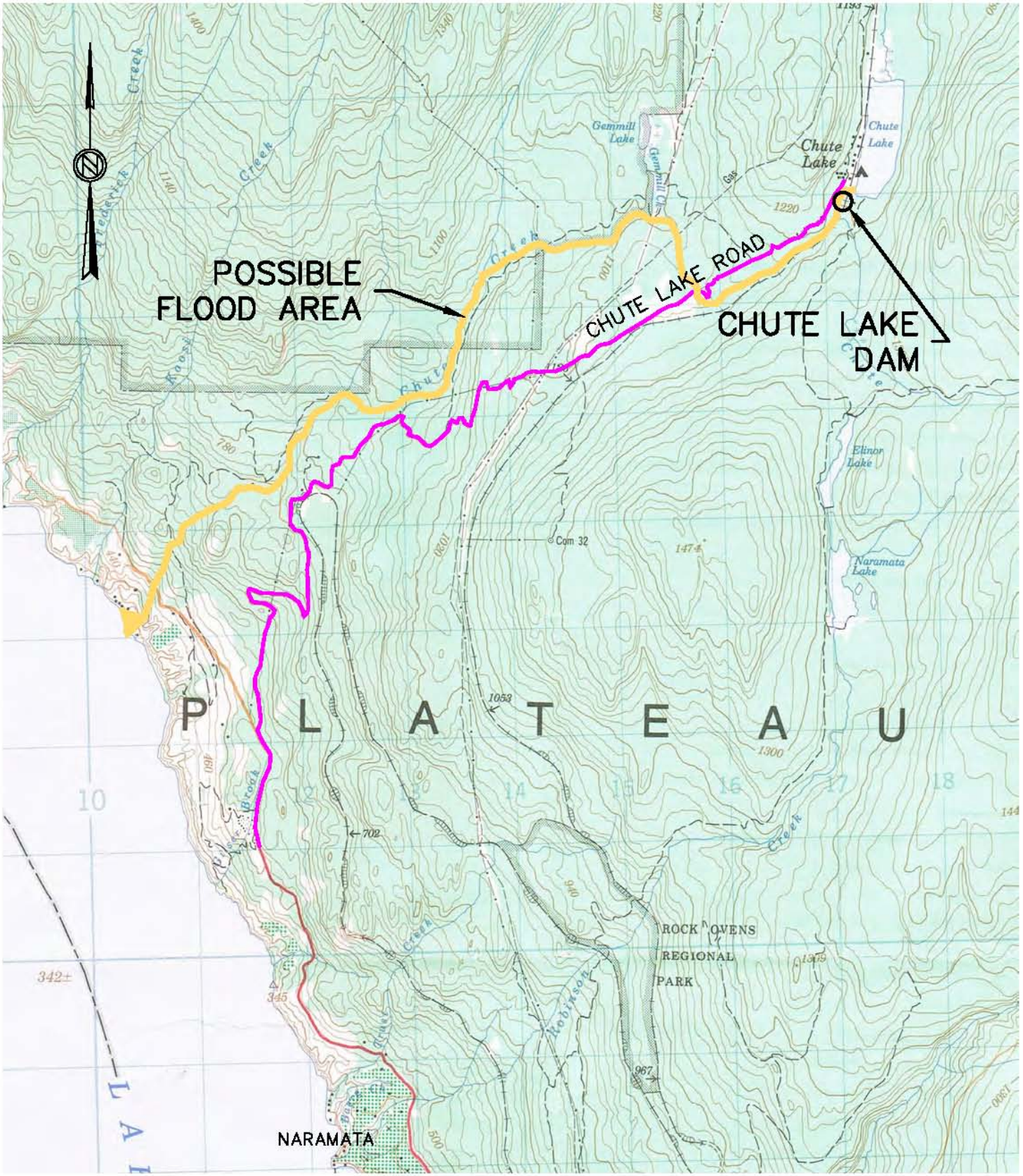
5.7.2 Materials

Sandbags: - 50 stored on Paradise Ranch property

Sand & Gravel:- Contact Ministry of Transportation and Infrastructure for access to established source located off of Chute Lake road.
- See also "Local Equipment and Earth Materials Contractors" under "Support Services" in Appendix A.

Till: - Contact Ministry of Transportation and Infrastructure for access to established source located off of Chute Lake road.
- See also "Local Equipment and Earth Materials Contractors" under "Support Services" in Appendix A.

Riprap: - Contact Ministry of Transportation and Infrastructure for access to established source located off of North Naramata Road.
- See also "Local Equipment and Earth Materials Contractors" under "Support Services" in Appendix A.



MARK ANTHONY PROPERTIES

FIGURE 5.0 POSSIBLE FLOOD AREA

SCALE 1:50,000 AUG. 2011

APPENDIX A

COMMUNICATIONS DIRECTORY

EMERGENCY CONTACTS

POLICE – FIRE – AMBULANCE ---------- 911

PROVINCIAL EMERGENCY PROGRAM (PEP) 24 hours Toll-Free: **1-800-663-3456**

Including:
- Flood emergencies;
- Spill reporting as per *Environmental Management Act*, *Spill Reporting Regulation*;
- Earthquakes.

The Provincial Emergency Program will in turn contact the Okanagan Similkameen Regional District (RDOS) who will be the lead agency for emergency management.

WILDFIRE REPORTING Toll-Free: 1-800-663-5555

Cellular Toll-Free: *5555

NON-EMERGENCY

Police – Penticton RCMP	250-492-4300
Ambulance – BC Ambulance Service	250-490-8337
Penticton Regional Hospital	250-492-4000
Penticton Fire Department (Office)	250-490-2300
Naramata Fire Rescue (Volunteer) Hall (Office), Debeck Road, Naramata:	250-496-5319

Note: Potentially impacted area is outside of the Naramata Fire Rescue coverage area. The RDOS contracts with the City of Penticton to provide fire protection for the rural area of Electoral Area 'E'. Response by Naramata Fire Rescue first requires that an Emergency Response Task Number be issued by the Provincial Emergency Program.

RESIDENCES/BUSINESSES LOCATED IN THE POTENTIAL INUNDATION AREA

RESIDENCES

Indian Rock Road: (Isolated or potentially flooded)

s.22

Home:
Home:
Home:
Home: s.22
Home:
Home:

Somerset Lane: (Isolated or potentially flooded)

s.22 Home: s.22

BUSINESSES

None at the present time.

POTENTIALLY IMPACTED INFRASTRUCTURE

CHUTE LAKE DAM and RESERVOIR

SOS Security - Penticton **24 hours:** _____
Contracted by Dam owners to coordinate emergency response

Dam Owners

Mark Anthony Properties **Office:** **250-768-5125**
Mike Molloy – Vineyard Operations Manager Fax: 250-768-2044
Cellular: s.22
Ray Gill - Vineyard Manager Office: 250-496-5533

s.22 _____ _____

s.22 _____ _____

s.22 _____ _____

Yennadon Holdings Ltd. _____ _____

s.22 _____ _____

s.22 _____ _____

s.22 _____ _____

UTILITIES

Natural Gas - FortisBC	24 hr. Emergency Line:	1-800-663-9911
Electricity - FortisBC	24 hr. Emergency Line:	1-866-436-7847
Telephone - Telus	Repair Services:	611

ROAD INFRASTRUCTURE

Ministry of Transportation & Infrastructure (MOT) Okanagan Shuswap District, Penticton Area	**Office:**	**250-490-8200**
Argo Road Maintenance Inc.	**Office:**	**250-493-6969**
MOT Contractor	24 hr. Road Hazard Reporting:	1-800-663-7623
Ministry of Forests, Lands and Natural Resource Operations	**Office:**	**250-558-1700**
Forest Service Roads	Fax:	250-549-5485

LAND TENURE

BC TIMBER SALES

Okanagan-Columbia Sales Office – Vernon	**Office:**	**250-558-1700**
	Fax:	250-549-5485

FOREST LICENSEES

Gorman Bros. Lumber Ltd. – West Kelowna	**Office:**	**250-768-5131**
	Toll-Free:	1-800-663-5087
	Fax:	250-768-2822

RANGE LICENSEES

s.22	**Office:**	s.22
	Home:	

REGISTERED TRAPLINE HOLDERS

	Home:	
	Home:	
	Home:	
s.22	Home:	s.22
	Home:	
	Home:	
	Home:	

LICENCED GUIDE OUTFITTERS

Marc Hubbard, Okanagan Outfitters – Penticton	**Office:**	**250-493-6293**

LOCAL GOVERNMENT

Regional District of Okanagan-Similkameen (RDOS) **Office: 250-490-4139**
Dale Kronebusch - Emergency Services Supervisor

HEALTH

Public Health Centre (Penticton) Office: 250-770-3434
Fax: 250-770-3470

MEDIA

TELEVISION

CHBC-Okanagan Television **Office: 250-762-4535**
Toll-Free: 1-888-762-4535

Shaw Cable
Send public service announcements to: oktoday@sjrb.ca

INTERNET

Castanet Media (www.castanet.net)
News Tips news@castanet.net

MyNaramata (www.mynaramata.com)
News Tips
editor@MyNaramata.com

RADIO

CBC Radio One – Kelowna Office **Office: 250-861-3781**
News tip line (province-wide): 604-662-6801
93.7 FM Penticton & Naramata, 88.9 FM Kelowna

CIGV Giant FM 100.7 **Office: 250-493-6767**
Toll Free: 1-888-493-6767
On-air studio: 250-492-2727
On-air studio Toll-Free: 1-800-990-2448

CJMG 97.1 Sun FM	**Office:**	**250-492-2800**
John Ferebee News Director (jferebee@astral.com)	Newsroom:	250-493-6397
	On-air studio:	250-487-4487
News tips - bcnews@astral.com		

CKOR EZ Rock 800 (AM)	**Office:**	**250-492-2800**
John Ferebee News Director (jferebee@astral.com)	Newsroom:	250-493-6397
	On-air studio:	250-492-2818
News tips - news@am1150.astral.com		

NEWSPAPERS

Penticton Herald	**Office:**	**250-492-4002**
John Moorhouse – Extension 304	Reporter:	250-490-0880
Scott Trudeau – Extension 307	Reporter:	250-490-0880

Penticton Western	**Office:**	**250-492-3636**

SUPPORT SERVICES

DAM TECHNICAL SUPPORT

MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

Water Management	**Office:**	**250-490-2291**
Mike Noseworthy – Water Stewardship Officer, Penticton	Fax:	250-490-2231
e-mail: mike.noseworthy@gov.bc.ca		

CONSULTANTS

Dobson Engineering (Watershed / Forestry)	**Office:**	**250-861-5595**
Don Dobson, P.Eng.	Fax:	250-861-8766
ddobson@dobsoneng.com	Home:	s.22
	Cellular:	s.22

Golder and Associates (Geotechnical & Environmental)	**Office:**	**250-860-8424**
Darryl Arsenault, R.P.Bio	Fax:	250-860-9874
	Cellular:	s.22

Mould Engineering (Hydraulic)	**Office:**	**250-868-2072**
Jody Good, AScT	Fax:	250-868-2078
	Home:	s.22
	Cellular:	s.22

McElhanney Consulting Services (Engineering)	**Office:**	**250-492-7399**
Derek Blaszak	Fax:	250-492-5488
EBA Engineering Consultants Limited (Geotechnical)	**Office:**	**250-862-4832**
Scott Martin, P. Eng.	Fax:	250-862-2941
	Cellular:	s.22

HELICOPTER SERVICES

Alpine Helicopters - West Kelowna	**Office:**	**250-769-4111**
	Fax:	250-769-2040
Canadian Helicopters - Penticton	**Office:**	**250-492-0637**
Wildcat Helicopters - West Kelowna	**Office 24-hours:**	**250-769-9093**
Valhalla Helicopters - West Kelowna	**Office:**	**250-769-1486**
	Toll-Free:	1-866-769-1486
Skyline Helicopters - Kelowna	**Office:**	**250-765-1910**
	Fax:	250-765-1972

LOCAL EQUIPMENT AND EARTH MATERIALS CONTRACTORS

Scott Contracting & Excavating – West Kelowna	**Office:**	**250-768-1118**
	Fax:	250-768-1119
Joe Scott	Cellular:	s.22
Naramata Excavating & Contracting - Naramata	**Office:**	**250-496-5916**
	Cellular:	s.22
Cantex Okanagan Construction	**Office:**	**250-492-7622**
Rital Enterprises - Penticton	**Office:**	**250-493-1624**
Westhills Aggregates	**Office:**	**250-492-2225**
L&H Trucking	**Office:**	**250-492-8003**

EQUIPMENT RENTAL

Westminster Equipment Rentals	**Office:**	**250-492-7551**
	Toll-Free:	1-888-509-7551

Pacific Rim Equipment	**Office:**	**250-493-4545**
Joe	After hours:	s.22
Dave	After hours:	s.22

WATER PRODUCT SUPPLIERS

Corix Water Products - Kelowna	Office:	250-765-8668
Wastewater & Irrigation Products	Toll-Free:	1-800-667-2343
	Fax:	250-765-6036
Wolseley Waterworks Group - Kelowna	Office:	250-765-5186
Wastewater & Irrigation Products	Fax:	250-765-5187

BOTTLED WATER SUPPLIERS

Grizzly Springs Water Co. Ltd. – Penticton	Office:	250-493-8228
The Penticton Water Depot	Office:	250-770-8304
Okanapure Water – Serving Penticton	Office Toll-Free:	1-888-768-1685
Canadian Springs Water Co. Ltd. - Kelowna	Office Toll-Free:	1-877-442-7873
Blue Valley Water - Kelowna	Office Toll-Free:	1-866-902-2583
Culligan Water Conditioning - Kelowna	Office:	250-860-6733

MISCELLANEOUS

WELDING

O'Brien Welding Services	**Office:**	**250-488-1286**
Mobile Welding		
Calta Welding	**Office:**	**250-492-6181**

RESORTS

Chute Lake Resort	**Office:**	**250-493-3535**

APPENDIX B

DAM ACCESS ROUTES

DAM ACCESS ROUTES

The geographic coordinates of Chute Lake dam are:

Longitude: -119^{0} 32$'$ 12$''$
Latitude: 49^{0} 41$'$ 19$''$.

The following are written descriptions of the access routes, together with an attached map.

From Pentiction via Naramata (PRIMARY Access Route – ORANGE highlight)

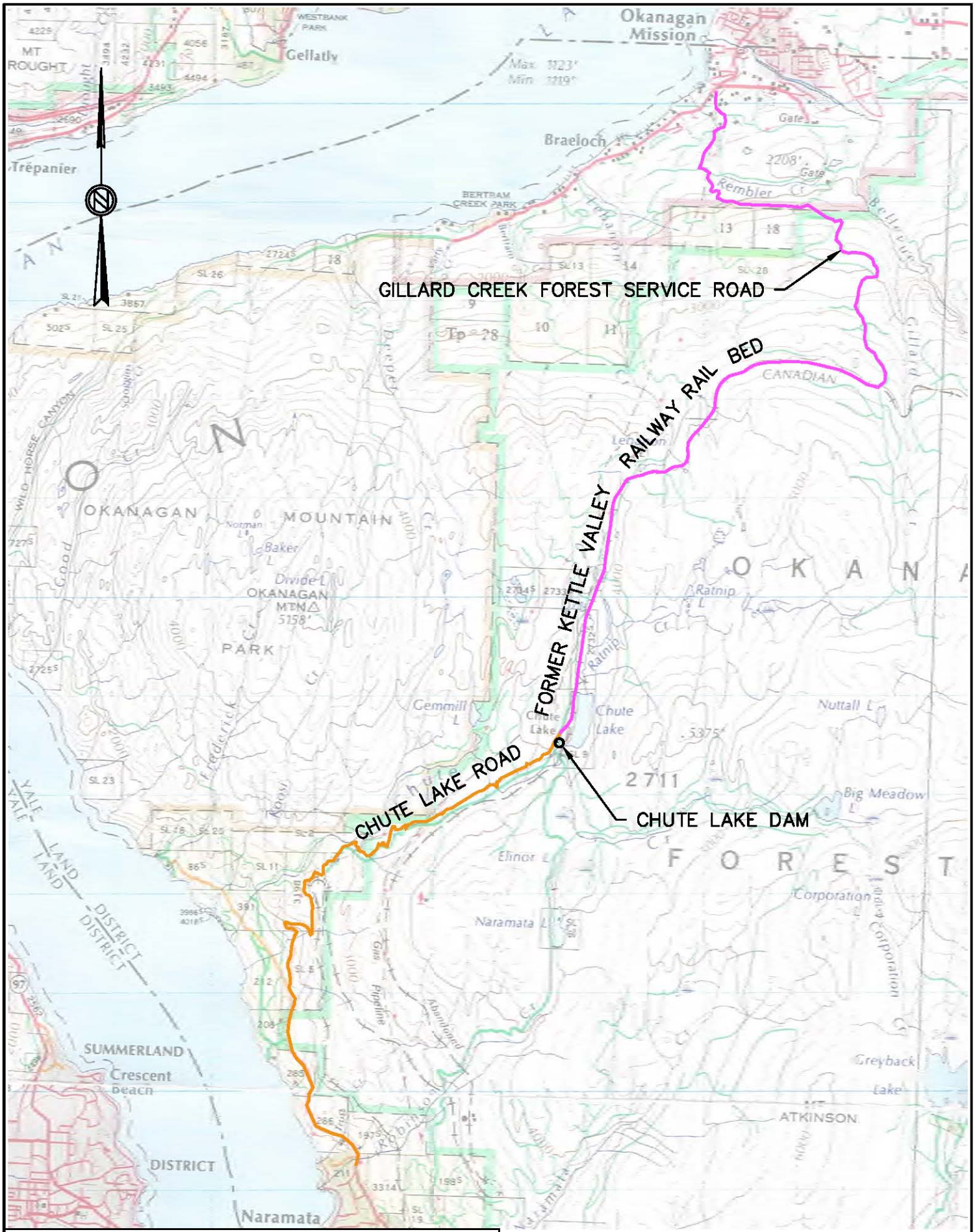
1. Follow Naramata Road north past the community of Naramata to the junction with Chute Lake Road.
2. Follow Chute Lake Road for approximately 10.3 km to the junction with Elinor Lake Forest Service Road (F.S.R.).
3. Turn right and follow Elinor Lake F.S.R. 50 m to the site.

From Kelowna (SECONDARY Access Route – RED highlight)

1. From the junction of Lakeshore Road and Chute Lake Road, follow Chute Lake Road south.
2. Turn left onto Upper Mission Drive where Chute Lake Road turns 90^{0} to the right.
3. Follow Upper Mission Drive for approximately 300 m to the junction with Gillard Creek F.S.R.
4. Follow Gillard Creek F.S.R. for approximately 8.5 km until you reach the former Kettle Valley Railway (KVR) railbed.
5. Turn right and follow the railbed for approximately 11 km.
6. Take the first right turn past Chute Lake reservoir and follow Elinor Lake F.S.R. 100 m to the site.

Other Alternatives

If access is not possible by either of the above routes, transportation can be arranged by helicopter. Appendix A contains a list of phone numbers for helicopter services.



MARK ANTHONY PROPERTIES

FIGURE 7.0 CHUTE LAKE DAM ACCESS ROUTE(S)

SCALE 1:100,000 SEPT. 2011

LEGEND

MAIN ACCESS ROUTE

ALTERNATE ACCESS ROUTE

APPENDIX C

DAM INFORMATION SHEET

MARK ANTHONY PROPERTIES

DAM INFORMATION SHEET

NAME: CHUTE LAKE DAM

LOCATION: 11.2km (7 mi) NORTHEAST OF NARAMATA **MAP ATTACHED: YES** X **NO** ___

SOURCE: CHUTE LAKE RESERVOIR

PURPOSE: STORAGE / IRRIGATION

CONSTRUCTION HISTORY: BUILT BY LOCAL LANDOWNER (HINDSON)

DAM

- **TYPE** CONCRETE WITH EARTH ABUTMENTS
- **HEIGHT** >1.4 m (4.5 ft+), EXACT HEIGHT UNKNOWN **BASE WIDTH** UNKNOWN
- **CREST: LENGTH** 15.2 m (49.9 ft) **WIDTH** varies between 0.32 m & 0.58 m
  ELEVATION 1,184.19 m (3,885.1 ft)
- **SLOPES: UPSTREAM** VERTICAL **DOWNSTREAM** VERTICAL
  PROTECTION ROCK RIPRAP D/S
- **NORMAL FULL POOL ELEVATION** 1,184.19 m (3,885.1 ft)
- **DESIGN FLOOD ELEVATION** UNKNOWN

SLUICE

- **DESCRIPTION** STEEL SLIDE GATE
- **CONTROL** APPROX. 50 mm OPERATING NUT ON THREADED ROD
- **CAPACITY** UNKNOWN **NUMBER** 1

SPILLWAY

- **DESCRIPTION** 15.2 m (49.9 ft) WIDE REINFORCED CONCRETE WALL
- **SPILL ELEVATION** 1,184.19 m (3,885.1 ft)
- **CAPACITY** UNKNOWN

DRAINAGE SYSTEM - NONE

RESERVOIR CHARACTERISTICS

- **WATERSHED AREA** (NATURAL) 31 km^2 (12 mi^2)
- **RESERVOIR AREA** 37.5 ha (92.7 ac) AT FULL POOL
- **CAPACITY** 460 dam^3 (373 ac-ft) LIVE STORAGE **FETCH** 150 m

APPENDIX D

RESERVOIR STORAGE CAPACITY TABLE

OKANAGAN BASIN - COLUMBIA SYSTEM

Latitude: 49°41'19 Longitude: -119°32'12" Reference Map: 1:50,000-82E/12
Storage Capacity: Licenced: 595.4 dam^3 Developed: 464 dam^3
Storage Licenses: C105820 & C105821 Licensee: Mark Anthony Properties, together with other dam owners
Source of Storage Data: Dwg. No. 4567-9 Date: April 1988
Description: Plan of Reservoir, prepared by Water Management Branch
Watershed Area: 31 km^2 Tributary Streams: Ratnip Creek, Chute Creek

STORAGE CAPACITY TABLE (Invert as Control)

MAPPING DATA			STORAGE CAPACITY				REMARKS
CONTOUR ELEVATION		AREA	DEPTH OF	AREA	STORAGE IN DECAMETRES^3		
GEODETIC DATUM (ft)	LOCAL DATUM	IN HECTARES	STORAGE IN METRES	IN HECTARES	NET	GROSS	
1169.2		0.01	-13.7		0.2	1601	Low Point in Lake
			-13.5	0.19	2.5	1601	
			-13.0	0.71	1.0	1598	
1170.0		0.85			3.8	1597	
			-12.5	1.18	7.0	1593	
			-12.0	1.63	2.2	1586	
1171.0		1.75			6.8	1584	
			-11.5	1.94	10.0	1577	
			-11.0	2.20	2.9	1567	
1172.0					8.9	1564	
			-10.5	2.54	13.0	1555	
			-10.0	2.91	3.8	1542	
1173.0						1538	
1173.0					12.0		
			-9.5	3.53	19.0	1526	
			-9.0	4.09	5.4	1507	
1174.0					17.0	1502	
			-8.5	4.60	24.0	1485	
			-8.0	5.09	6.7	1461	*DEAD*
1175.0					22	1454	
			-7.5	6.53	37	1432	
			-7.0	8.29	11	1395	
1176.0						1384	*STORAGE*
1176.0					35		
			-6.5	9.75	51	1349	
			-6.0	11.0	15	1298	
1177.0		11.30			44	1283	
1177.0		11.40				1239	
			-5.5	12.5	66		
			-5.0	14.0	18	1173	
1178.0		14.40			56	1155	
			-4.5	15.5	82	1099	
			-4.0	17.0	22	1017	
1179.0		17.40			67	995	
			-3.5	18.8	99	928	
			-3.0	20.8	27	829	
1180.0		21.30			83	802	
			-2.5	23.4	124	719	
			-2.0	26.2	34	595	
1181.0		26.90			102	561	
			-1.5	28.1	28	459	
			-1.4	28.4	29	431	
			-1.3	28.8	29	402	

STORAGE CAPACITY TABLE (Invert as Control)							
MAPPING DATA			STORAGE CAPACITY				REMARKS
CONTOUR ELEVATION		AREA	DEPTH OF	AREA	STORAGE IN DECAMETRES^3		
GEODETIC DATUM (ft)	LOCAL DATUM	IN HECTARES	STORAGE IN METRES	IN HECTARES	NET	GROSS	
			-1.2	29.1	29	373	
			-1.1	29.4	30	344	
			-1.0	29.8	30	314	
			-0.9	30.1	9	284	*DEAD*
1182.0		30.20			21	275	
			-0.8	30.4	31	254	
			-0.7	30.7	31	223	
			-0.6	31.1	31	192	*STORAGE*
			-0.5	31.4	31	161	
			-0.4	31.7	32	130	
			-0.3	32.1	32	98	
			-0.2	32.4	33	66	
			-0.1	32.7	33	33	
1182.87			0.0	33.1	33	0	Invert of Intake
			0.1	33.4	10		
1183.0		33.50			24		
			0.2	33.7	34	67	
			0.3	34.0	34	101	
			0.4	34.4	34	135	*LIVE*
			0.5	34.7	35	169	
			0.6	35.0	35	204	
			0.7	35.3	36	239	
			0.8	35.6	36	275	*STORAGE*
			0.9	35.9	36	311	
			1.0	36.2	36	347	
			1.1	36.5	37	383	
			1.2	36.8	37	420	
			1.3	37.2	7.4	457	
1184.19		37.20	1.32		30	464	Crest of Spillway
			1.4	38.0	39	494	
			1.5	38.9	39	533	
			1.6	39.8	40	572	
			1.7	40.7	41	612	
			1.8	41.6	42	653	
			1.9	42.5	43	695	
			2.0	43.4	44	738	*POTENTIAL*
			2.1	44.3	13	782	
1185.0		44.60			32	795	
			2.2	45.1	45	827	
			2.3	45.9	46	872	
			2.4	46.6	47	918	
			2.5	47.4	48	965	*STORAGE*
			2.6	48.2	49	1013	
			2.7	48.7	49	1062	
			2.8	49.7	50	1111	
			2.9	50.4	51	1161	
			3.0	51.2	67	1212	
			3.13			1279	
1186.0		52.20					

APPENDIX E

INSPECTION TECHNIQUES

CONCRETE DAM

The entire surface of the dam must be checked in order to properly assess the condition of the dam. The surfaces should be viewed from more than one perspective, as certain deficiencies may not be apparent from a particular angle. All concrete components should be inspected for the five main categories of concrete dam deficiencies: cracks, concrete deterioration, surface defects, displacement, and leakage / seepage. Chute Lake Dam was likely constructed before air-entrained concrete was common, therefore, freeze-thaw action should be particularly watched for.

Crest

The dam's alignment can be checked by sighting along the dam face.

Upstream Face

The best time to inspect the upstream face is during low water levels in the fall.

Downstream Face

The best time to inspect the downstream face is during low water levels in the fall.

EARTH ABUTMENTS

The earth abutments on either side of concrete dam structure must be walked in order to properly assess their condition. Deficiencies are more easily detected after vegetation has been cut back. Viewing the dam during the early morning or late afternoon when the sun is low in the horizon helps reveal seepage areas.

It is helpful to use a parapet wall or other permanent structure as a guide. Having a constant grade surface parallel to the ground to reference in the distance can point out such deficiencies as depressions and bulges. In addition to crouching near the ground, check the alignment from different elevations and angles to gain varying perspectives, which may reveal deficiencies. The waterline on the upstream slope is a good place to check alignment.

Look for more lush or green areas, which indicate that water is at or near the surface. These areas should be carefully checked for seepage.

Sinkholes and depressions should be probed for voids with a long rod. Also, be sure to check for running water in the bottom of sinkholes / depressions.

APPENDIX F

DOCUMENTING DEFICIENCIES

PROCEDURES FOR DOCUMENTING CONCRETE DAM / EARTH ABUTMENT DEFICIENCIES

These procedures are intended to provide Qualified Personnel with a methodical, standardised set of instructions for documenting and surveying dam deficiencies such as, cracks, settlement, sinkholes, slope failures, and seepage.

First and foremost, the **Vineyard Operations Manager** should be notified upon the discovery of any deficiencies.

Remember this acronym, **"SMPL"**, when documenting any deficiency.

S **Sketch**
M **Measure**
P **Photograph**
L **Locate**

Equipment

- Clipboard with inspection and deficiency checklists
- Photocopied set of as-builts
- Field notebook
- Pencils, erasers and permanent markers
- 30 m tape measure and ruler
- Camera (still and/or video)
- Flashlight
- Shovel
- Hammer and stakes

Marking

1. **Concrete Dam:** The key features (e.g. NW corner, crack width = ___, date, etc.) should be marked with a permanent marker.
   Earth Abutments: The area of distress should be marked with stakes around its immediate border. The stakes should be marked to describe the key features noted above.
2. The area should be geodetically referenced to permanent features or structures away from the area that are not susceptible to earth movement. Ideally, referencing should be done with a Total Station survey for the purpose of accurately monitoring movement or fluctuations in size of the area.

Documenting

1. Relevant measurements and observations, including pictures and sketches, should be made about the area. These may include:
    - Crack / Sinkhole / Settlement length, width, depth and orientation
    - Slope breaks
    - Seepage rate, colour, turbidity (e.g. sand boils)
    - Soil type of the area and its relative compaction
    - Distance from present water line (PWL), if applicable
    - Distance from other nearby features or structures that may contribute to, or feel the effects from the distressed area
    - Vegetation of the surrounding area

    It is good practice to show observations and measurements on a set of photocopied as-builts.
2. Observations concerning the existing operation of the dam should also be made, such as PWL and discharge rates from both the sluice and spillway.
3. A detailed written description and sketch of the deficiency's characteristics should be made, including photographs and/or narrated video. *Photographs are to be labelled as in Section 3.8. Be sure to include some object of known size in the pictures for scale.*
4. If the area of distress poses an immediate hazard to the public (e.g. sinkhole on crest of dam), the area, as well as the dam, should be cordoned off.
5. If the area was originally incapable of being geodetically surveyed with a Total Station, this should be done as soon as possible. The area should then be monitored by means of additional Total Station surveys and inspections as stipulated by a Qualified Professional Engineer. *Remediation of the deficiency is the responsibility of the Mark Anthony Properties, together with other dam owners. The remediation, in its entirety, must be specified by a Qualified Professional Engineer, with the exception of minor deficiencies (see Section 4.0).*

APPENDIX G

DAM INSPECTION AND DEFICIENCY CHECKLISTS
AND
SECTION 7 - SELF HELP GUIDE

SECTION 7
SELF-HELP GUIDE

IDENTIFYING PROBLEMS AND SOLUTIONS: A SELF-HELP GUIDE

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DEFICIENCY CHECKLIST

If you find deficiencies with any component of your dam, use the following table to guide you to the relevant section of the ***SELF-HELP GUIDE*** in the **Inspection and Maintenance of Dams** guidebook.

IS THERE ANY APPARENT...	*YES*	*NO*	*IF YES THEN...*
CRACKS			
a) embankment cracks on the crest?	☐	☐	section 2.4, 2.5 & 2.6
b) embankment cracks on the u/s slope?	☐	☐	section 3.5
c) embankment cracks on the d/s slope?	☐	☐	section 4.1
VEGETATION GROWTH AND DEBRIS			
a) excessive vegetation growth on the embankments?	☐	☐	section 2.1, 3.4 & 5.2
b) floating debris?	☐	☐	section 1.2
c) vegetation or debris blocking the spillway channel?	☐	☐	section 8.2
STRUCTURAL PROBLEMS			
a) settlement on the crest?	☐	☐	section 2.7
b) slough, slides or bulges on the u/s slope?	☐	☐	section 3.6
c) slough, slides or bulges on the d/s slope?	☐	☐	section 4.2
d) slough, slides or bulges on the reservoir shore?	☐	☐	section 1.1
e) slough, slide or erosion of spillway channel?	☐	☐	section 8.1
f) sinkhole on crest?	☐	☐	section 2.8
g) sinkhole on u/s slope?	☐	☐	section 3.7
h) sinkhole on d/s slope?	☐	☐	section 4.4
i) displaced or broken down riprap armor?	☐	☐	section 3.2
SEEPAGE			
a) wet areas or seepage on the d/s slope or toe?	☐	☐	section 4.3 & 5.1
b) ponded water at the downstream toe?	☐	☐	section 5.2
c) wet areas or seepage along d/s abutments?	☐	☐	section 6.1
ANIMAL ACTIVITY			
a) signs of livestock traffic across dam embankment?	☐	☐	section 4.5
b) rodent burrows in dam embankment?	☐	☐	section 2.2 & 3.3
c) beaver dams in reservoir or across spillway channel?	☐	☐	section 1.3
OUTLET PROBLEMS			
a) outlet (gate) operating problems?	☐	☐	section 7.1
b) deterioration of the outlet conduit?	☐	☐	section 7.2
SPILLWAY PROBLEMS			
a) spillway blockage	☐	☐	section 8.3
b) channel blockage	☐	☐	section 8.2
c) inadequate capacity	☐	☐	section 8.3

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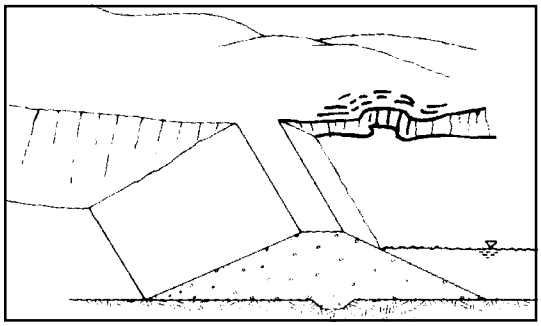
1. Reservoir Problems

1 - Slides and Sloughs

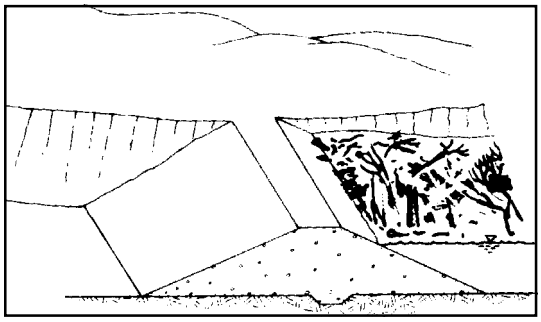


Causes:
1. Ice action and wave erosion which creates vertical slopes.
2. Steep slopes left unsupported by erosion.
3. Toe of slope becomes saturated by the reservoir.

Concerns:
1. The slides or slough area may endanger the embankment.
2. Waves caused by a slide may endanger the embankment.

Recommended Action:
1. Monitor the area and notify your Dam Safety Officer if the embankment is threatened. The services of a qualified Professional Engineering Consultant may be required.

2 - Floating Debris

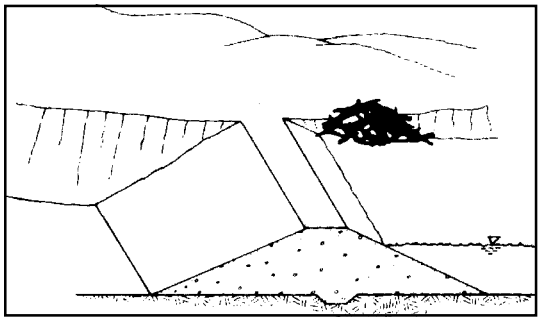


Causes:
1. Beaver activity.
2. Heavy runoff.

Concern:
1. Debris may block spillway or outlet.

Recommended Action:
1. Install trash racks or floating booms where necessary and clean them as required.

3 - Beaver Activity



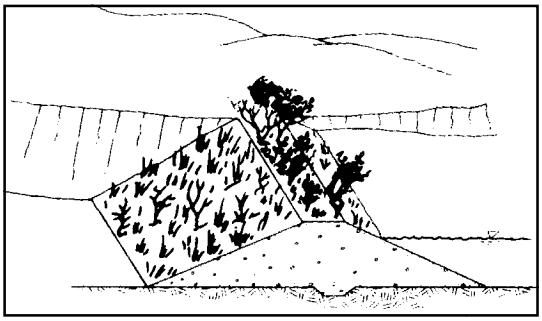
Cause:
1. A favourable habitat.

Concern:
1. Beaver activity may block spillway or outlet causing water to rise and overtop the embankment.

Recommended Action:
1. Remove the beaver dam.
2. Contact the Wildlife Branch of the Ministry of Environment Lands & Parks re: relocating the beaver.

2. Crest Problems

1 - Excessive Vegetation

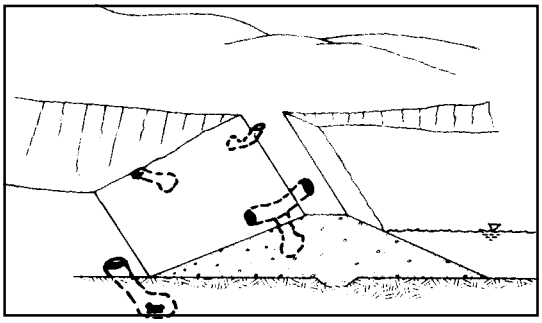


Causes:
1. Lack of maintenance.
2. Neglect.

Concerns:
1. Prevents a thorough inspection.
2. Obscures any problems which might exist.
3. Root system can weaken the embankment and result in a failure.
4. Prevents easy access.
5. Provides a habitat for unwanted burrowing animals.

Recommended Action
1. Remove excessive vegetation and root system
2. Remove cuttings and debris from embankment area.
3. The embankment should be seeded with an appropriate grass.
4. Prevent or remove re-occurring growth as part of a regular maintenance program.

2 - Rodent Activity

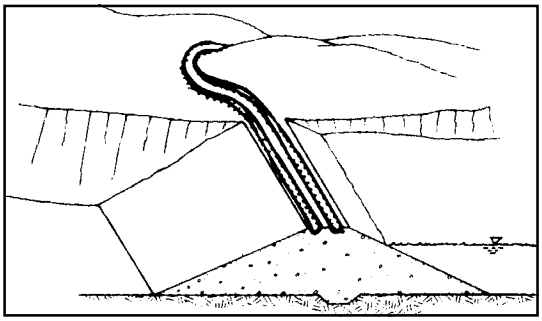


Cause:
1. Burrowing animals.

Concerns:
1. Can weaken the embankment.
2. Can cause a piping failure.

Recommended Action:
1. Control rodents.
2. Remove favourable habitat conditions.
3. Backfill rodent burrows with compacted fill or a pumped grout.

3 - Ruts Along Crest



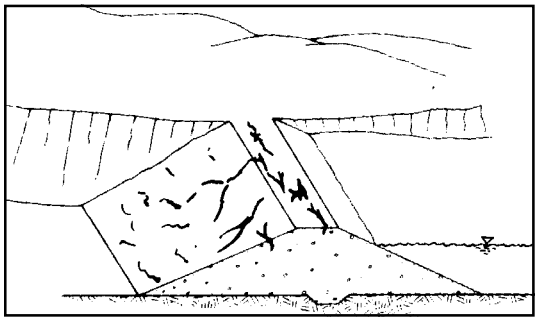
Causes:
1. Heavy vehicles, farm equipment or livestock traffic.
2. Lack of maintenance or inadequate crest surfacing.

Concerns:
1. Allows continued rutting.
2. Allows standing water to collect and saturate the crest.
3. Vehicles crossing the crest can get stuck causing further damage.

Recommended Action:
1. Regrade and recompact crest to original elevation with a camber to the upstream slope which will encourage proper drainage of runoff back into the reservoir.
2. Provide surface resistant to rutting such as placement of crushed gravel surfacing.

2. Crest Problems (cont.)

4 - Drying Cracks

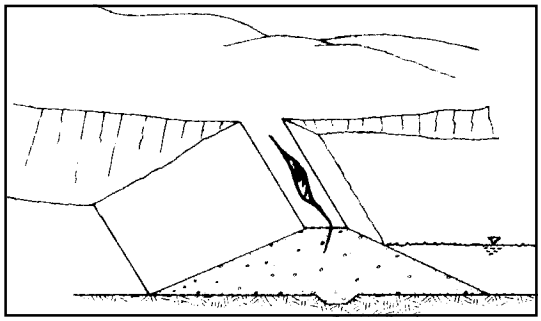


Cause:
1. Crest material expands and contracts with alternating wet and dry weather.

Concern:
1. Provides an entrance point for surface water which can saturate the crest material.

Recommended Action:
1. Regrade or tight blade the crest if necessary.

5 - Longitudinal Cracking

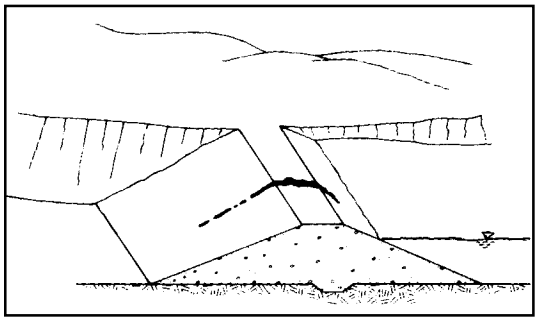


Causes:
1. Uneven settlement within the embankment or foundation.
2. Initial stage of a slope failure or embankment slide.

Concerns:
1. Results in an area of high instability.
2. Can lead to future movements or failure (see Figure 8, page 17).
3. Provides an entry point for surface water which can promote movement.
4. Can reduce the effective crest width.

Recommended Action:
1. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.
2. The crack(s) should be monitored.
3. A lower reservoir operating level may be required.

6 - Transverse Cracking



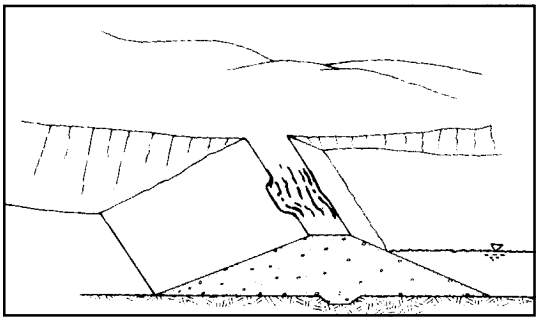
Causes:
1. Uneven movement between two adjacent segments of the embankment.
2. Instability of the embankment or foundation.

Concerns:
1. Provides an entry point for surface water.
2. Creates an area of structural weakness which could result in further movements or failure.
3. May create a seepage path from the reservoir and a potential piping failure (see Figure 9, page 18).

Recommended Action:
1. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.
2. The crack(s) should be excavated and back-filled with compacted material to prevent seepage.
3. Area should be closely monitored for future movement.

2. Crest Problems (cont.)

7 - Low Area on the Crest

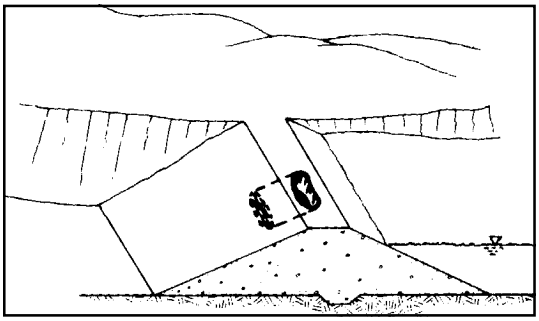


Causes:
1. Excessive settlement of the embankment material or the foundation.
2. Internal erosion of the embankment material.
3. Prolonged erosion from wind or water.
4. Poor construction practices.

Concerns:
1. Reduced freeboard for safe routing of floodwater.
2. Floodwater may overtop the embankment in the low area rather than passing through the spillway.

Recommended Action:
1. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

8 - Sinkhole on the Crest



Causes:
1. Burrowing animals.
2. Internal erosion from seepage piping or a hole in the conduit.

Concerns:
1. Sloughing/caving can occur in the sinkhole leading to embankment instability and development of a low area.
2. Provides an entrance point for surface water.
3. Depending on size and depth, may lead to a failure.

Recommended Action:
1. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

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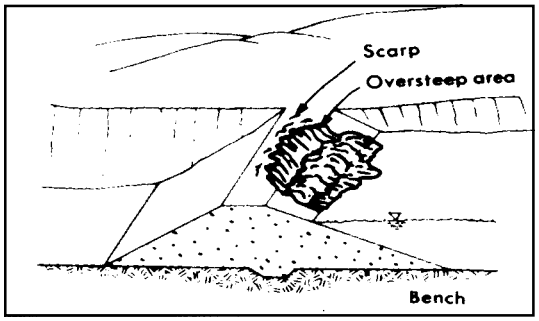
3. Upstream Slope Problems

1 - Erosion (Beaching and Scarps)

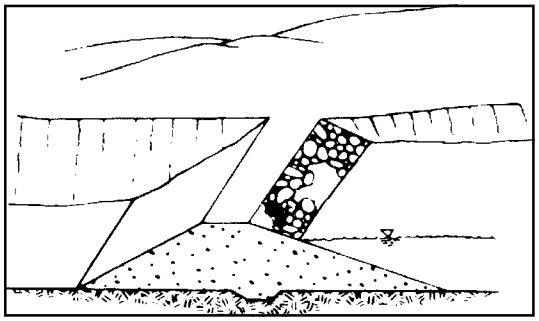


Causes:
1. Wave or ice action.
2. Local settlement.
3. Inadequate erosion protection.

Concerns:
1. Continued erosion can reduce crest width and height leading to a possible overtopping.
2. May cause increased seepage.

Recommended Action:
1. Regrade the upstream slope to the original design grade.
2. Provide adequate slope protection.

2 - Displaced and Broken Down Riprap

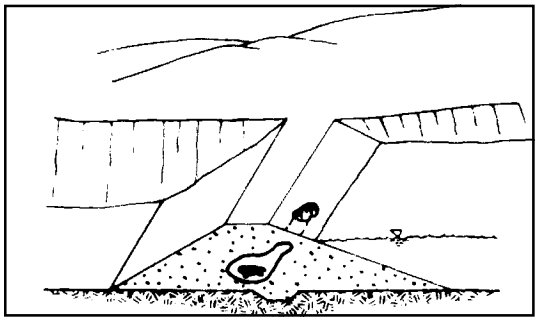


Causes:
1. Wave or ice action.
2. Poor quality riprap.
3. Same size rock (improperly designed), leaving gaps which allow waves to erode underlying material.

Concerns:
1. Allows increasing erosion which can reduce the width and height of the embankment.

Recommended Action:
1. Re-establish adequate slope protection with underlying filter bed.
2. Repair erosion damage with properly designed erosion protection.

3 - Burrowing Animal Activity



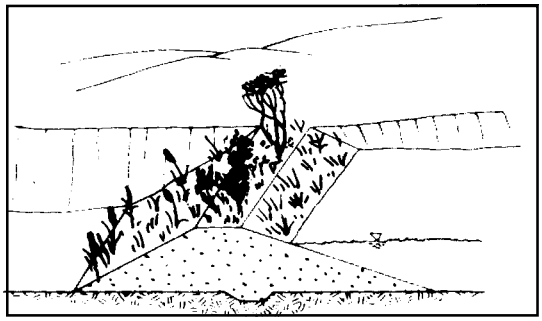
Cause:
1. A habitat which encourages beaver and muskrat activity.

Concern:
2. Burrowing can weaken the embankment and lead to its failure.

Recommended Action:
1. Remove the burrowing animals.
2. Compact the burrows with compacted fill or a pumped grout.
3. Remove the supporting habitat.

3. Upstream Slope Problems (cont.)

4 - Excessive Vegetation and Trees

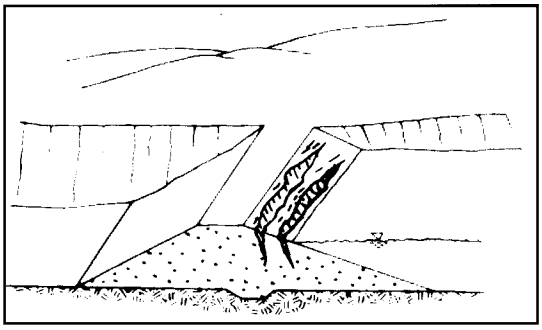


Causes:
1. Neglect.
2. Poor maintenance procedures.

Concerns:
1. Can obscure serious problem which may exist.
2. Root systems can penetrate and weaken the embankment and create seepage paths.

Recommended Action:
1. Remove excessive vegetation.
2. Keep vegetation under control as part of a regular maintenance program.

5 - Large Cracks

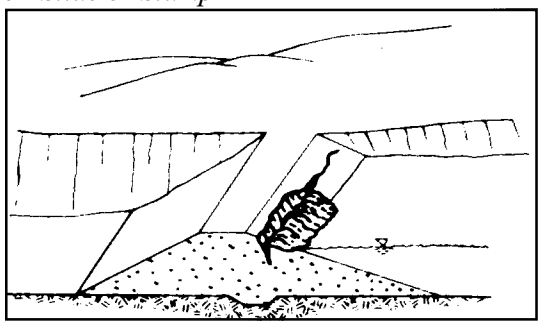


Causes:
1. A foundation failure.
2. Localized instability.

Concerns:
1. Almost always precedes a slope failure or large scale settlement.

Recommended Action:
1. The reservoir should be drawn down.
2. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

6 - Slide or Slump



Causes:
1. Foundation failure.
2. Too steep a slope.
3. A rapid draw down of the reservoir.

Concerns:
1. Can lead to a failure of the dam.
2. Slide debris can block low level outlets.

Recommended Action:
1. Draw the reservoir down.
2. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

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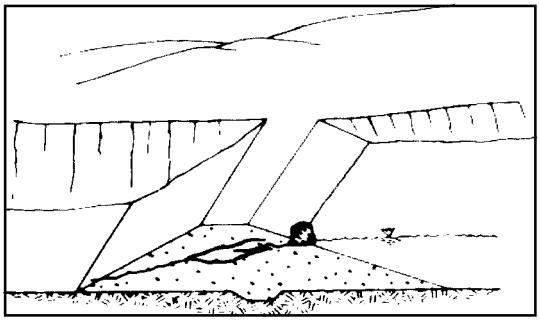
3. Upstream Slope Problems (cont.)

7 - Sinkhole



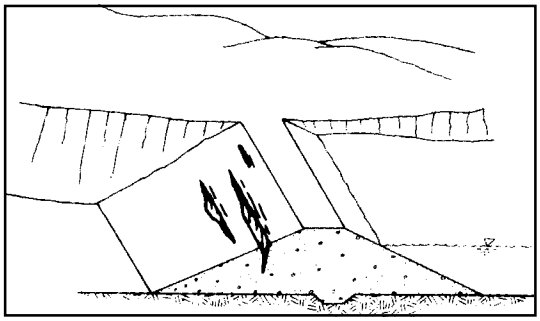
Cause:
1. Concentrated seepage begins to "pipe" embankment material through the dam. This loss of material causes the inlet of the "pipe" to collapse forming a sinkhole.

Concern:
1. Usually results in a piping failure.

Recommended Action:
1. Draw the reservoir down.
2. Look for other sinkholes and their exits.
3. Examine outflow for dirty water.
4. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

4. Downstream Slope Problems

1 - Longitudinal Cracking

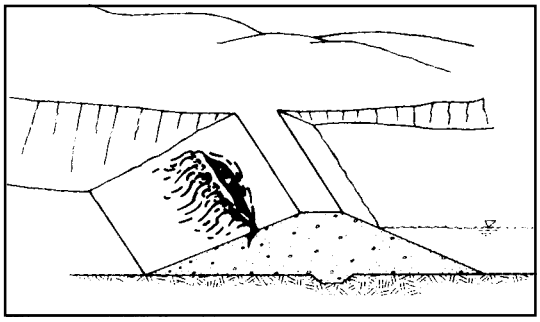


Causes:
1. Drying and shrinking of embankment material.
2. Settlement of embankment of foundation material.

Concerns:
1. Provides an entry point for surface water.
2. Causes embankment instability.
3. Can be an early warning of a slope failure, slide or slump.

Recommended Action:
1. Drying cracks should be sealed.
2. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

2 - Slump / Slide



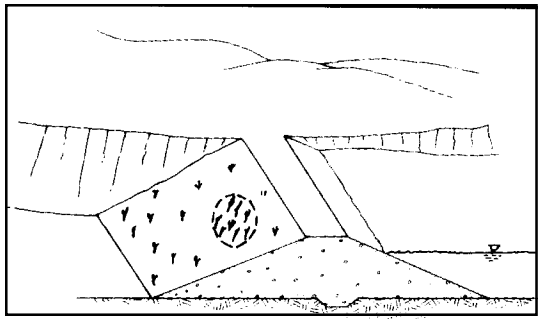
Causes:
1. Too steep a slope.
2. Loss of embankment material strength from settlement or excessive seepage.

Concerns:
1. Can cause additional slumps/slide.
2. Can lead to embankment failure.

Recommended Action:
1. Draw down the reservoir.
2. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

4. Downstream Slope Problems (cont.)

3 - Wet Areas / Seepage

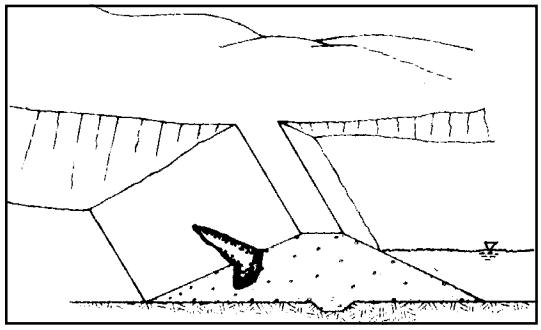


Causes:
1. Seepage through the embankment or under the foundation.
2. Surface water entering through cracks or animal burrows.

Concern:
1. Creates slope instability which can lead to a failure.
2. Indicates the possibility of internal erosion (piping).

Recommended action:
1. Monitor the area for a change in size.
2. Monitor seepage outflow, if any, for dirty water which would indicate internal erosion (piping).
3. If dirty water is seen notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

4 - Cave in / Collapse

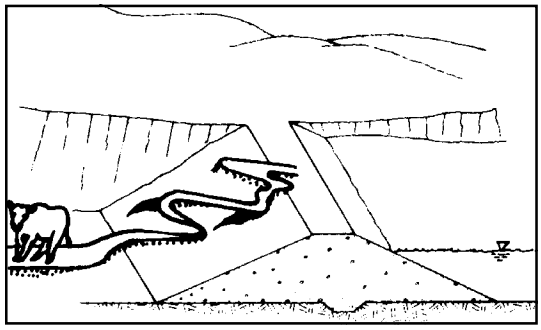


Causes:
1. Poor compaction during construction.
2. Internal erosion (piping) through the embankment or foundation.
3. Animal burrowing.

Concerns:
1. Can cause increased seepage.
2. Indicates a potential for failure.

Recommended action:
1. Monitor the area for change.
2. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

5 - Erosion / Rutting



Causes:
1. Livestock traffic.
2. Surface runoff.
3. Poorly protected slope.

Concerns:
1. Encourages further erosion.

Recommended action:
1. Regrade slope and sow a cover crop.
2. Keep livestock off embankment.

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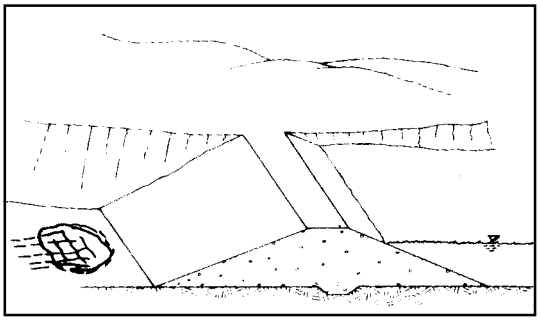
5. Downstream Toe Problems

1 - Seepage Water Exiting as a Sand or Water Boil

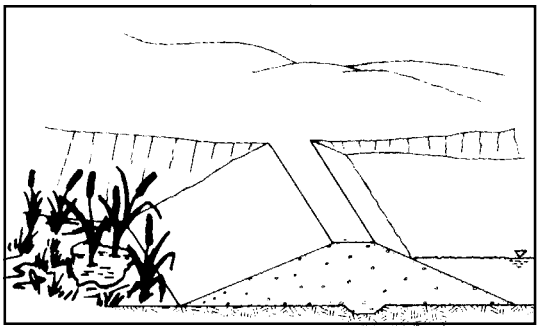


Causes:
1. A concentrated seepage path or pipe has developed through the foundation.
2. A layer of sand or gravel in the foundation being charged by the reservoir.

Concern:
1. Dirty seepage water is an indication that piping may be occurring and may result in a piping failure of the foundation and ultimately the embankment.

Recommended Action:
1. The outflow should be examined for dirty water.
2. The area and flow should be monitored and the reservoir drawn down if flows increase.
3. Notify your Dam Safety Officer.
4. The services of a qualified Professional Engineering Consultant may be required.

2 - Standing / Ponded Water at the Downstream Toe



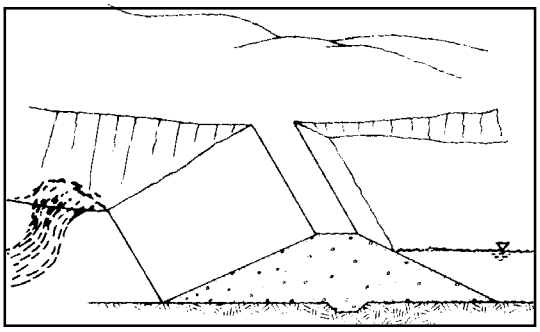
Causes:
1. Heavy seepage.
2. Surface runoff.
3. Poor drainage away from the toe.

Concerns:
1. Obscures source and makes flow rates difficult to estimate.
2. Saturates and destabilizes the downstream slope.
3. Can result in slope failure.

Recommended Action:
1. Provide and adequate drainage system to prevent ponding.
2. Identify source of water and consult a Professional Engineer if necessary.

6. Downstream Abutment Problems

1 - Wet Areas or Water Exiting from Downstream Abutment



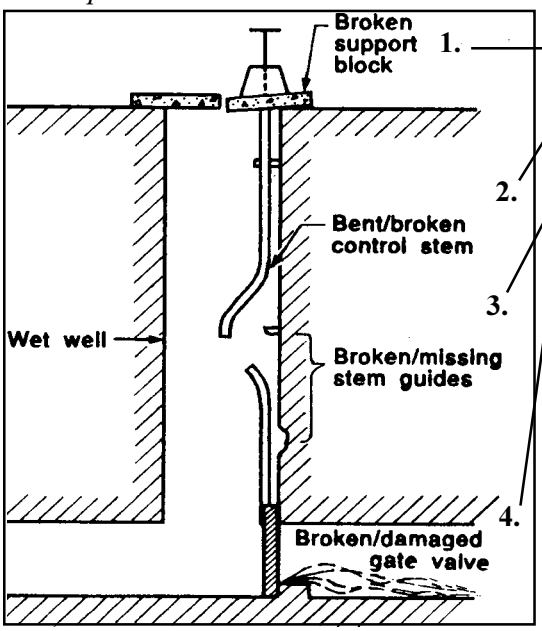
Cause:
1. A seepage path or “pipe” passing around the embankment through the natural abutment material.

Concern:
1. May result in an abutment piping failure.

Recommended Action:
1. Monitor the area and flow for change and the presence of dirty water.
2. Notify your Dam Safety Officer.
3. The services of a qualified qualified Professional Engineering Consultant is required if the seepage flow increases and dirty water is present.

7. Low Level Outlet Problems

1 - Inoperable Low Level Outlet Control

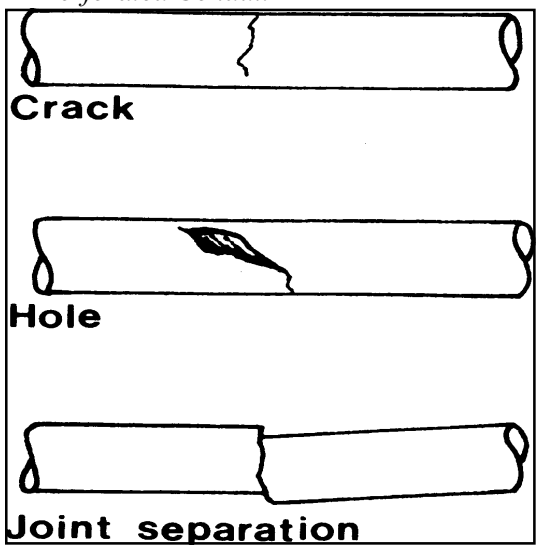


Causes:
1. Deterioration of concrete. Excessive force applied to a jammed control stem.
2. Inadequate or broken stem guides. Lack of maintenance requiring excessive pressure to operate the gate.
3. Lack of maintenance causing guides to bind to stem and break when gate is jammed.
4. Corrosion, cavitation, impact from water borne debris.

Concerns:
1. Gate control becomes inoperable preventing a draw down of the reservoir, if required, and preventing passage of water for downstream uses.
2. If gate is jammed open, reservoir operating levels cannot be maintained and water is wasted.

Recommended Action:
1. Use of the outlet control should be minimized until all damaged components are repaired.
2. Institute a regular maintenance program to ensure control system is fully operable.

2 - Perforated Conduit



Causes:
1. Corrosion
2. Joint separation.

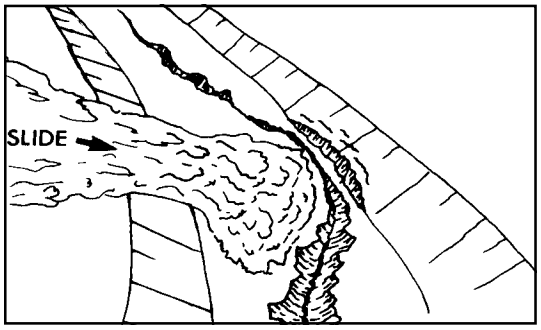
Concern:
1. May lead to serious internal erosion and a possible piping failure (see Figs. 16 and 17 on pp. 30 & 31).

Recommended Action:
1. Notify your Dam Safety Officer. The services of a qualified Professional Engineering Consultant may be required to determined the cause and recommend a plan of action.

Part 1 Page 261
FNR-2012-00301

8. Spillway Problems

1 - Eroded Channel / Slide

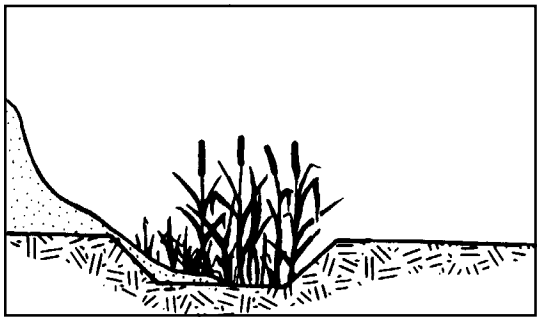


Causes:
1. Inadequate erosion protection.
2. Too steep a gradient.

Concerns:
1. Channel erosion deepens and generally works its way upstream.
2. Can result in the reservoir draining through the eroded channel.

Recommended Action:
1. Repair the eroded area with compacted fill.
2. Provide adequate erosion protection.
3. Regrade the channel if necessary.

2 - Blocked Channel



Causes:
1. Floating debris from the reservoir.
2. Animal activity.
3. Man-made.

Concerns:
1. May restrict spillway channel flow causing the embankment to overtop.

Recommended Action:
1. Remove the blockage.
2. Prevent future blockages.
3. Install trash racks if necessary.

3 - Other Problems

There are many problems that can develop depending of the type of spillway and the materials it is constructed from. If the spillway develops problems which go unnoticed the embankment may be endangered.

Recommended action:
1. Ensure that the capacity of the spillway matches the design flood inflow.
2. Regularly inspect and maintain the spillway.
3. Remove any blockage of the spillway.
4. If uncertain about a particular problem, an engineer should be consulted.

BRITISH COLUMBIA DAM INSPECTION CHECKLIST

Dam Name: _____ Inspection Date: _____ Water Licence No.: _____

Your Name: _____ Provincial Dam File No.: _____

	Yes	No	
Was the spillway flowing?	☐	☐	If yes, what was the approximate flow rate? _____
			If no, then how far was the reservoir drawn down below the spillway sill level? _____
Was the outlet open?	☐	☐	If yes, what was the approximate discharge rate? _____

Are the following components of your dam in *SATISFACTORY CONDITION*? Yes, No or N/A (not applicable), check one. If the No box is checked, please comment on deficiency at bottom of page.

EMBANKMENT	Yes	No	N/A	***OUTLET***	Yes	No	N/A	***SPILLWAY***	Yes	No	N/A
1. U/S Slope	☐	☐	☐	1. Outlet Pipe	☐	☐	☐	1. Debris Boom	☐	☐	☐
2. Crest	☐	☐	☐	2. Energy Dissipater	☐	☐	☐	2. Entrance	☐	☐	☐
3. D/S Slope	☐	☐	☐	3. Stilling Basin	☐	☐	☐	3. Sill	☐	☐	☐
4. D/S Toe	☐	☐	☐	4. Toe Drains	☐	☐	☐	4. Apron	☐	☐	☐
5. Drains (toe, others)	☐	☐	☐	5. Outlet Channel	☐	☐	☐	5. Walls	☐	☐	☐
6. Erosion Protection	☐	☐	☐	6. Measuring Weir	☐	☐	☐	6. Channel	☐	☐	☐
				7. Outlet Control	☐	☐	☐	7. Channel Slopes	☐	☐	☐
				8. Gates	☐	☐	☐	8. Gates	☐	☐	☐

Were any of the following *POTENTIAL PROBLEM INDICATORS* found?

INDICATOR	***EMBANKMENT***		***OUTLET***		***SPILLWAY***	
	Yes	No	Yes	No	Yes	No
a) Seepage	☐	☐	☐	☐	☐	☐
b) External Erosion	☐	☐	☐	☐	☐	☐
c) Cracks	☐	☐	☐	☐	☐	☐
d) Settlement	☐	☐	☐	☐	☐	☐
e) Sloughing / Slides	☐	☐	☐	☐	☐	☐
f) Animal Activity	☐	☐	☐	☐	☐	☐
g) Excessive Growth	☐	☐	☐	☐	☐	☐
h) Excessive Debris	☐	☐	☐	☐	☐	☐

Evaluation of the conditions downstream of the dam must be undertaken at the same time as the formal inspection to ensure the consequence classification of the dam has not changed. Any changes must be reported to the Dam Safety Officer. **Please Comment on Deficiency(s) Found:**

_____

_____

_____

_____

Note: Please complete this report form semi-annually. A copy may be requested by the Dam Safety Officer in your Region.

Revision Date: May, 1998

BRITISH COLUMBIA DAM INSPECTION CHECKLIST

Dam Name: _____ Inspection Date: _____ Water Licence No.: _____

Your Name: _____ Provincial Dam File No.: _____

	Yes	No	
Was the spillway flowing?	☐	☐	If yes, what was the approximate flow rate? _____
			If no, then how far was the reservoir drawn down below the spillway sill level? _____
Was the outlet open?	☐	☐	If yes, what was the approximate discharge rate? _____

Are the following components of your dam in *SATISFACTORY CONDITION*? Yes, No or N/A (not applicable), check one. If the No box is checked, please comment on deficiency at bottom of page.

EMBANKMENT	Yes	No	N/A	***OUTLET***	Yes	No	N/A	***SPILLWAY***	Yes	No	N/A
1. U/S Slope	☐	☐	☐	1. Outlet Pipe	☐	☐	☐	1. Debris Boom	☐	☐	☐
2. Crest	☐	☐	☐	2. Energy Dissipater	☐	☐	☐	2. Entrance	☐	☐	☐
3. D/S Slope	☐	☐	☐	3. Stilling Basin	☐	☐	☐	3. Sill	☐	☐	☐
4. D/S Toe	☐	☐	☐	4. Toe Drains	☐	☐	☐	4. Apron	☐	☐	☐
5. Drains (toe, others)	☐	☐	☐	5. Outlet Channel	☐	☐	☐	5. Walls	☐	☐	☐
6. Erosion Protection	☐	☐	☐	6. Measuring Weir	☐	☐	☐	6. Channel	☐	☐	☐
				7. Outlet Control	☐	☐	☐	7. Channel Slopes	☐	☐	☐
				8. Gates	☐	☐	☐	8. Gates	☐	☐	☐

Were any of the following *POTENTIAL PROBLEM INDICATORS* found?

INDICATOR	***EMBANKMENT***		***OUTLET***		***SPILLWAY***	
	Yes	No	Yes	No	Yes	No
a) Seepage	☐	☐	☐	☐	☐	☐
b) External Erosion	☐	☐	☐	☐	☐	☐
c) Cracks	☐	☐	☐	☐	☐	☐
d) Settlement	☐	☐	☐	☐	☐	☐
e) Sloughing / Slides	☐	☐	☐	☐	☐	☐
f) Animal Activity	☐	☐	☐	☐	☐	☐
g) Excessive Growth	☐	☐	☐	☐	☐	☐
h) Excessive Debris	☐	☐	☐	☐	☐	☐

Evaluation of the conditions downstream of the dam must be undertaken at the same time as the formal inspection to ensure the consequence classification of the dam has not changed. Any changes must be reported to the Dam Safety Officer. **Please Comment on Deficiency(s) Found:**

_____

_____

_____

_____

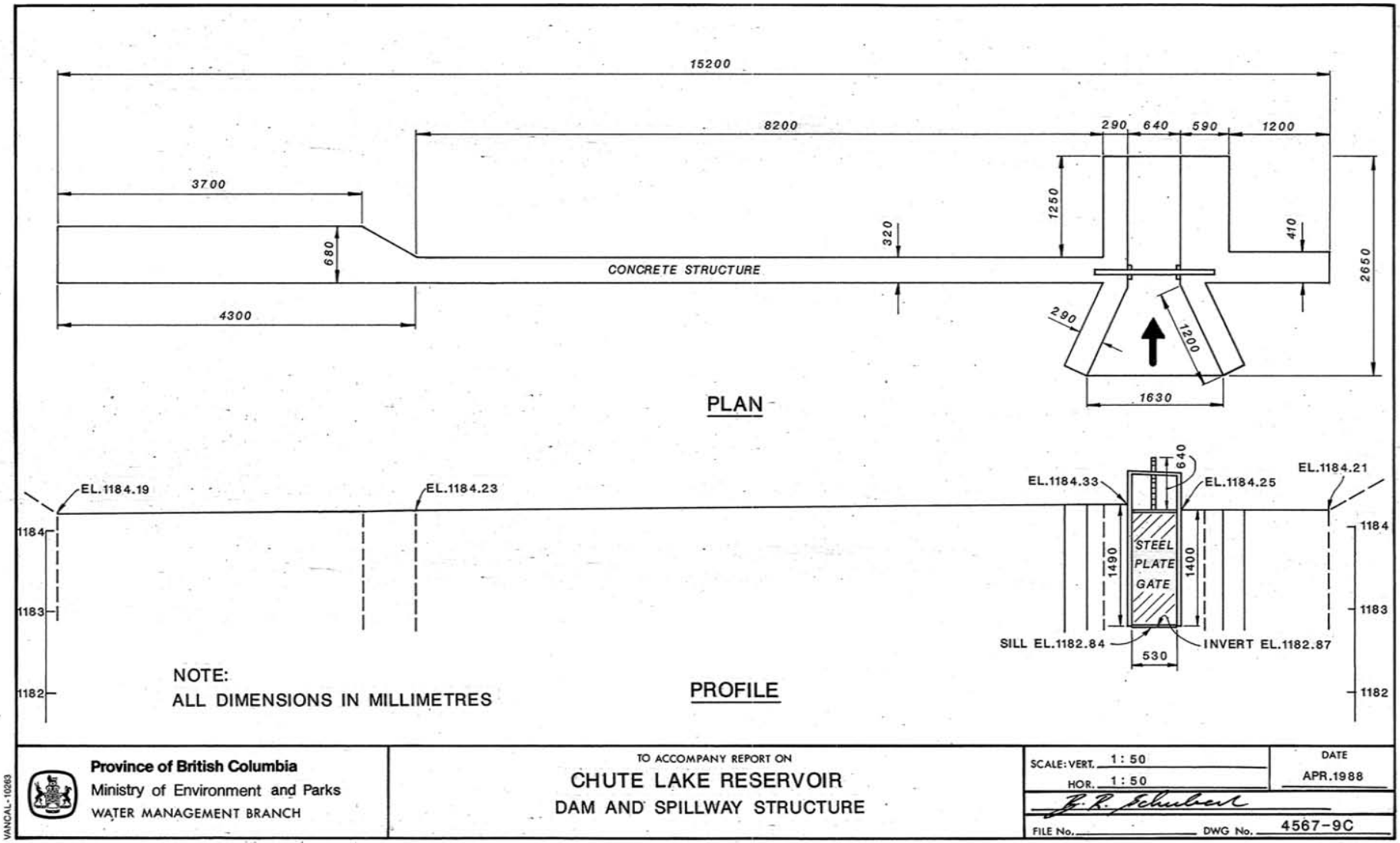
_____

Note: Please complete this report form semi-annually. A copy may be requested by the Dam Safety Officer in your Region.

Revision Date: May, 1998

APPENDIX H

DAM AND SPILLWAY PLAN & PROFILE - DRAWING 4567-9C
PLAN OF RESERVOIR - DRAWING 4567-9


15200
8200
290
640
590
1200
3700
1250
320
410
2650
680
CONCRETE STRUCTURE
4300
290
1200
1630
PLAN
EL.1184.19
EL.1184.23
EL.1184.33
640
EL.1184.25
EL.1184.21
1184
1183
1182
1490
STEEL PLATE GATE
1400
SILL EL.1182.84
INVERT EL.1182.87
530
NOTE:
ALL DIMENSIONS IN MILLIMETRES
PROFILE
Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH
TO ACCOMPANY REPORT ON
CHUTE LAKE RESERVOIR
DAM AND SPILLWAY STRUCTURE
SCALE: VERT. 1:50
HOR. 1:50
DATE
APR.1988
FILE No.
DWG No. 4567-9C
VANCAL-10263

KEY MAP
SCALE 1 : 125 000

50m 0 50 100 150 200m
SCALE 1:2000

NOTES

1) This plan has been prepared by the Ministry of Environment and Parks, Province of British Columbia.

2) SURVEY DATA:
a) Field surveys were carried out by the Surveys Section, Water Management Branch.
b) Horizontal control was established by EDM traverse using a total station theodolite and a second reading theodolite.
c) Vertical control was established by differential levels. Throughout the project area, differential levelling was confirmed by trigonometric levelling using a total station theodolite.
d) Cross sections and topography of dam and outlet channel were obtained using a total station theodolite.
e) Position control for bathymetry was maintained using a total station theodolite.
f) Subaqueous contours were drawn from depths obtained using an echo sounding depth recorder.

3) DATUM:
a) Horizontal control is based on POST 80H2751 established by Surveys and Resource Mapping Branch in 1980.
b) Vertical control is based on Bench Mark 387-J established by Geodetic Survey of Canada in 1946.
c) Coordinates are Universal Transverse Mercator, Zone 11, Central Meridian 117 degrees.
d) Elevations are in metres and are referred to Canadian Geodetic datum.

4) MAPPING:
Project area above elevation 1184 was mapped by Surveys and Resource Mapping Branch, using second order mapping equipment, under Project No. 87-0041.

5) AIR PHOTOGRAPHS:
ROLL No: BC 5513
Frames: 111-116 inclusive
Date of Photography: August 26, 1972
Photo Scale: 1:6000 approximately

6) FIELD BOOKS:
Survey data are recorded on Disc labelled 2383-D and Field Book No. 2383-F.

7) High Water Level = Crest of Spillway

8) REFERENCE POINTS:

	Northing	Easting	Elevation
WRS POST 1052	5 506 897.707	317 131.572	1185.046
WRS POST 1053	5 506 941.713	317 069.226	1186.010

POST 1052 ⟶ POST 1053 N 54-47-04 W 76.312

Distance between reference points as shown is Grid or Projection distance.

LEGEND

- △ TRIANGULATION STATION
- ◉ REFERENCE MONUMENT (P.CON.or P.ROCK)
- ▣ 50 000 HORIZ. CONTROL POINT
- • 60 000 VERT. CONTROL POINT
- ←T.B.M. TEMPORARY BENCH MARK
- ○ TEMPORARY REFERENCE POINT
- ===== ROAD, ----- TRAIL, ~~~ CREEK,
- ~~~ CREEK INTERMITTENT, (S) SWAMP
- BASIN SUB BASIN
- ○⟶ AIR PHOTO CENTRE

STORAGE LICENCES

LICENCE	PRIORITY DATE	AUTHORIZED ACRE-FEET	DEVELOPED
CL 22673	DEC. 3, 1953	180	464 dam³
CL 37425	JUNE 13, 1966	90	
CL 50405	OCT. 12, 1967	20	
CL 50407	OCT. 12, 1967	20	
CL 55456	DEC. 3, 1953	16.67	
CL 55458	DEC. 3, 1953	40	
CL 55460	DEC. 3, 1953	1.34	
CL 55462	DEC. 3, 1953	12.04	
CL 55464	DEC. 3, 1953	1.6	
CL 55597	DEC. 3, 1953	16.67	
CL 59633	JAN. 30, 1968	20	
CL 59635	JAN. 30, 1968	36	
CL 59637	JAN. 30, 1968	18	
CL 59639	JAN. 30, 1968	16	
		488.32	
		(602.33 dam³)	

1 CUBIC DECAMETRE = 0.810713 ACRE FOOT

REFERENCES

DWG. No.	DESCRIPTION	DATE
4567-9A	GENERAL PLAN OF DAM	APR.1988
4567-9B	GENERAL PLAN OF OUTLET CHANNEL	APR.1988
4567-9C	DAM AND SPILLWAY STRUCTURE	APRIL 1988

REVISIONS

No.	DESCRIPTION	DATE

SURVEYED M. PRONK
DATE OCTOBER 1986
COMPILED R. BARCLAY
CHECKED
DATE APRIL 1988
DRAWN R. Wade
APPROVED
HEAD, DRAFTING SECTION
DATE APRIL 1988
ENGINEER

Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

STORAGE INVENTORY PROGRAMME
OKANAGAN BASIN – COLUMBIA SYSTEM

CHUTE (LEQUIME) LAKE RESERVOIR

PLAN OF RESERVOIR

APPROVED
HEAD, SURVEYS SECTION
DATE APRIL 1988

FILE No.
Branch
Inventory 0305080-1
SURVEY PROJECT No. 86-SIP-4
NTS
Map No. 82E/12
Map Scale 1:50 000
SCALE 1:2000
NEGATIVE No. 272529
DRAWING No. 4567-9
SHEET 1 of 1

DD

VANCAL-12260

APPENDIX I

PHOTOGRAPHS OF DAM AND RESERVOIR

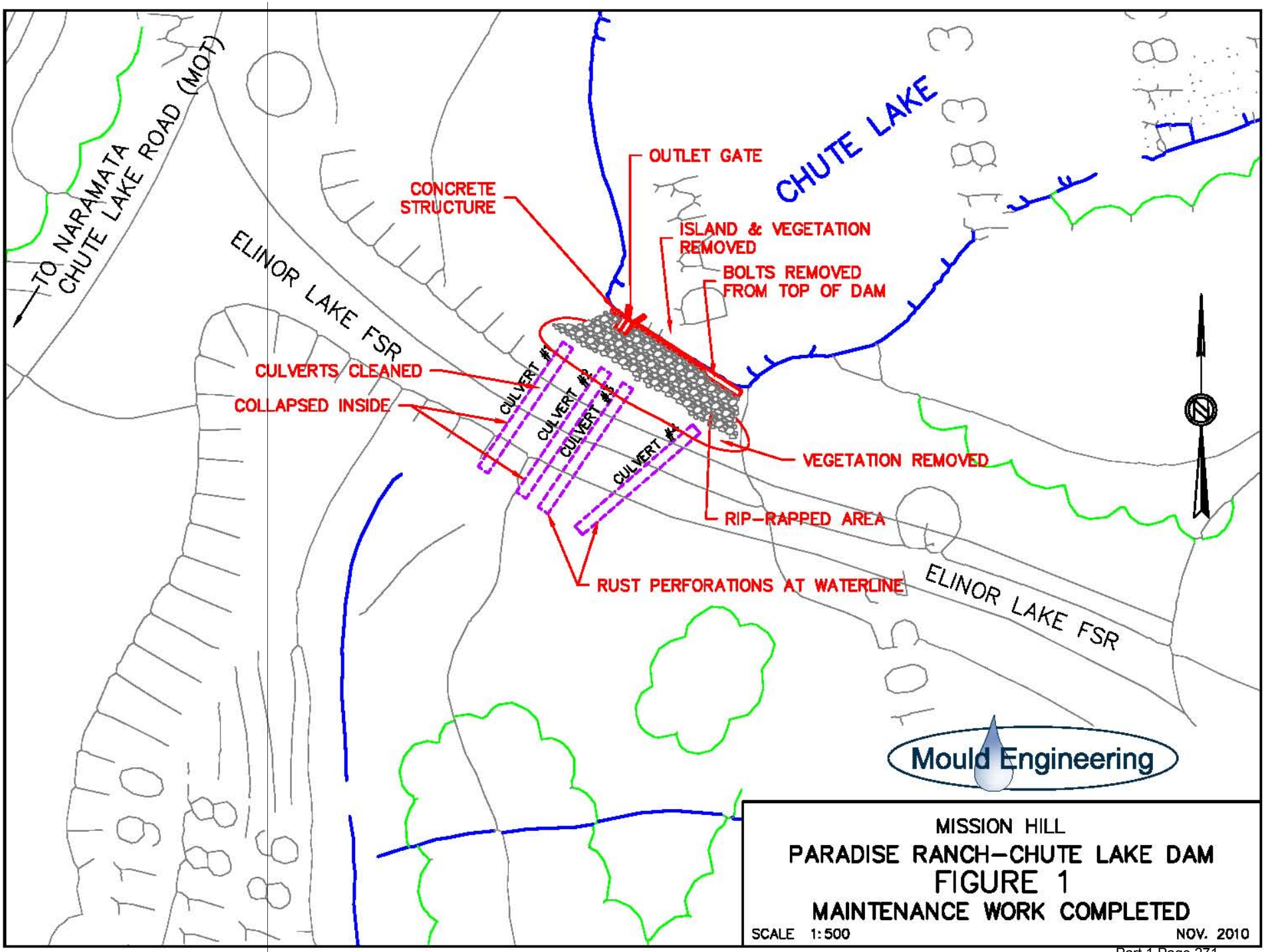
Chute Lake Dam and Reservoir, October 2010

Looking east across the Dam/Spillway

View of Dam from Reservoir (looking south)

APPENDIX J

PLAN VIEW OF MAINTENANCE WORK COMPLETED, OCTOBER 2010

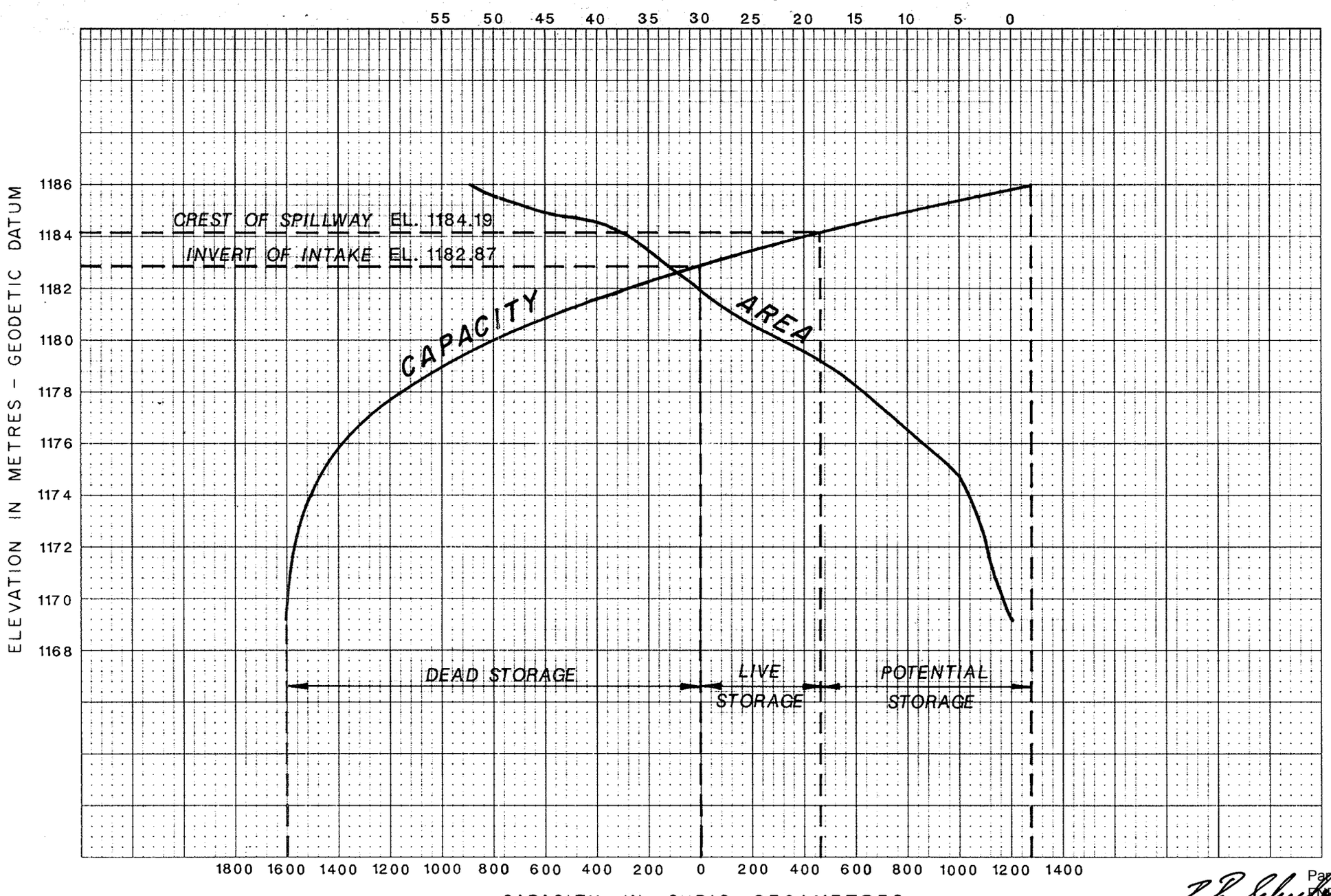

TO NARAMATA
CHUTE LAKE ROAD (MOT)
ELINOR LAKE FSR
CHUTE LAKE
OUTLET GATE
CONCRETE STRUCTURE
ISLAND & VEGETATION REMOVED
BOLTS REMOVED FROM TOP OF DAM
CULVERTS CLEANED
COLLAPSED INSIDE
CULVERT #1
CULVERT #2
CULVERT #3
CULVERT #4
VEGETATION REMOVED
RIP-RAPPED AREA
RUST PERFORATIONS AT WATERLINE
ELINOR LAKE FSR
Mould Engineering
MISSION HILL
PARADISE RANCH-CHUTE LAKE DAM
FIGURE 1
MAINTENANCE WORK COMPLETED
SCALE 1:500
NOV. 2010

APPENDIX K

CHUTE LAKE RESERVOIR
SURVEY AND STORAGE COMPILATION

STORAGE CAPACITY AND AREA CURVES

CHUTE LAKE (Invert As Control)



PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS, WATER MANAGEMENT BRANCH

DATE : APRIL 1988

E. R. Schreier

HEAD, SURVEYS SECTION

TABLE OF CONTENTS

Chute (Lequime) Lake/Reservoir Project No. 86-SIP-4

Okanagan Basin Columbia System

Subject	Complete	Advanced	N/A	Remarks
Survey Notes:	X			
Dam:				
General Plan	X			
Cross Sections	X			2 Sheets
Longitudinal Section	X			
Section of Outlet Works				
Structural Details	X			
Spillway:				
Cross Sections				
Longitudinal Section				
Structural Details				
Outlet Channel:				
General Plan	X			
Cross Sections	X			3 Sheets
Longitudinal Section	X			
Structural Details				
Storage Data:				
Area Elevation Curve	X			3
Capacity & Area Curves	X			2
Storage Table(s)	X			2
Storage Computation Sketch	X			
Plan of Lake/Reservoir	X			
Drainage Basin Map	X			

Data Prepared By: James Tam

Surveys Section
Water Management Branch
Ministry of Environment & Parks
Province of British Columbia

Head, Surveys Section

(2/FORMS,TAB/CONTS)

STORAGE CAPACITY TABLE

Chute Lake (Invert as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area in Hectares	Depth of Storage in Metres	Area in Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
1169.2		0.01	-13.67			1601	Low Point in Lake
					0.2		
			-13.5	0.19		1601	
					2.5		
			-13.0	0.71		1598	
					1.0		
1170.0		0.85				1597	
					3.8		
			-12.5	1.18		1593	
					7.0		
			-12.0	1.63		1586	
					2.2		
1171.0		1.75				1584	
					6.8		
			-11.5	1.94		1577	
					10		
			-11.0	2.20		1567	
					2.9		
1172.0		2.27				1564	
					8.9		
			-10.5	2.54		1555	
					13		
			-10.0	2.91		1542	
					3.8		
1173.0		3.00				1538	
1173.0		3.12					
					12		
			- 9.5	3.53		1526	
					19		
			- 9.0	4.09		1507	
					5.4		
1174.0		4.24				1502	
					17		
			- 8.5	4.60		1485	
					24		
			- 8.0	5.09		1461	
					6.7		
1175.0		5.22				1454	
					22		
			- 7.5	6.53		1432	
					37		
			- 7.0	8.29		1395	
					11		
1176.0		8.75				1384	
1176.0		8.85					
					35		
			- 6.5	9.75		1349	
					51		
			- 6.0	11.0		1298	
					15		
1177.0		11.3				1283	
1177.0		11.4			44		
			- 5.5	12.5		1239	
					66		
			- 5.0	14.0		1173	
					18		
1178.0		14.4				1155	
					56		
			- 4.5	15.5		1099	
					82		
			- 4.0	17.0		1017	
					22		
1179.0		17.4				995	
					67		
			- 3.5	18.8		928	
					99		
			- 3.0	20.8		829	
					27		
1180.0		21.3				802	
					83		
			- 2.5	23.4		719	
					124		
			- 2.0	26.2		595	
					34		
1181.0		26.9				561	
					102		
			- 1.5	28.1		459	
			- 1.4	28.4	28	431	
			- 1.3	28.8	29	402	
			- 1.2	29.1	29	373	
			- 1.1	29.4	29	344	
			- 1.0	29.8	30	314	
			- 0.9	30.1	30	284	
					9.0		
1182.0		30.2				275	
					21		
			- 0.8	30.4		254	
			- 0.7	30.7	31	223	

DEAD STORAGE

STORAGE CAPACITY TABLE

Chute Lake (High Point as Control)

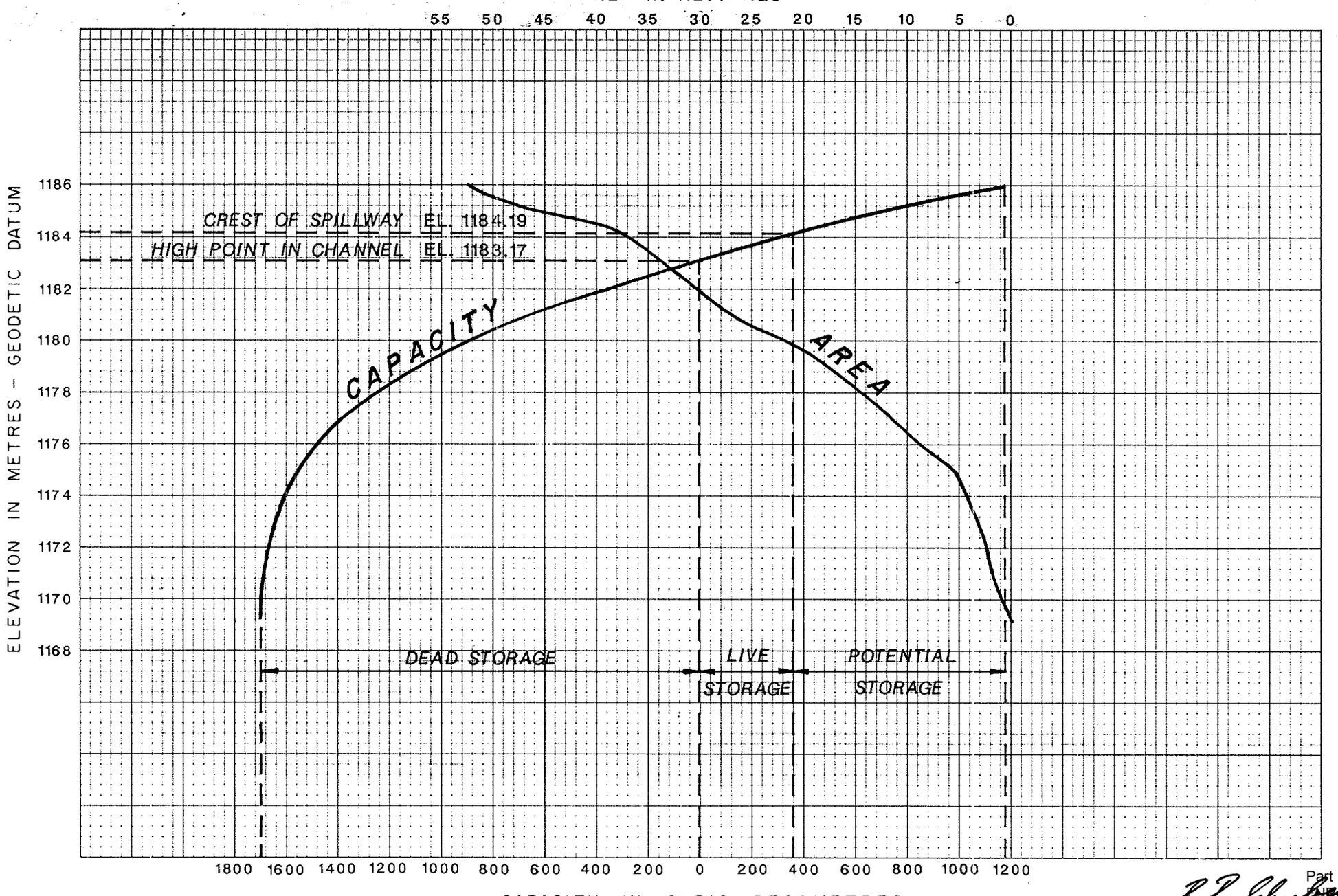
MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area in Hectares	Depth of Storage in Metres	Area in Hectares	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum				Net	Gross	
			- 0.7	31.7		230	
					32		
			- 0.6	32.1		198	
					32		
			- 0.5	32.4		166	
					32		
			- 0.4	32.7		134	DEAD STORAGE
					33		
			- 0.3	33.1		101	
					33		
			- 0.2	33.4		68	
					10		
1183.0		33.5				58	
					24		
			- 0.1	33.7		34	
					34		
1183.17			0.0	34.0		0	High Point in Channel
					34		
			0.1	34.4		34	
					35		
			0.2	34.7		69	
					35		
			0.3	35.0		104	
					35		
			0.4	35.3		139	
					35		
			0.5	35.6		174	
					36		
			0.6	35.9		210	
					36		
			0.7	36.2		246	
					36		
			0.8	36.5		282	
					37		
			0.9	36.8		319	
					37		
			1.0	37.2		356	
					7.4		
1184.19		37.2	1.02			363	Crest of Spillway
					30		
			1.1	38.0		393	
					39		
			1.2	38.9		432	
					39		
			1.3	39.8		471	
					40		
			1.4	40.7		511	
					41		
			1.5	41.6		552	
					42		
			1.6	42.5		594	
					43		
			1.7	43.4		637	
					44		
			1.8	44.3		681	
					14		
1185.0		44.6				695	
					31		
			1.9	45.1		726	
					46		
			2.0	45.9		772	
					46		
			2.1	46.6		818	
					47		
			2.2	47.4		865	
					48		
			2.3	48.2		913	
					49		
			2.4	48.9		962	
					49		
			2.5	49.7		1011	
					50		
			2.6	50.4		1061	
					51		
			2.7	51.2		1112	
					51		
			2.8	52.0		1163	
					16		
1186.0		52.2	2.83			1179	

LIVE STORAGE

POTENTIAL STORAGE

STORAGE CAPACITY AND AREA CURVES

CHUTE LAKE (High Point As Control)



PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS, WATER MANAGEMENT BRANCH

DATE : APRIL 1988

F. R. Schultz

HEAD, SURVEYS SECTION

STORAGE CAPACITY TABLE

Chute Lake (High Point as Control)

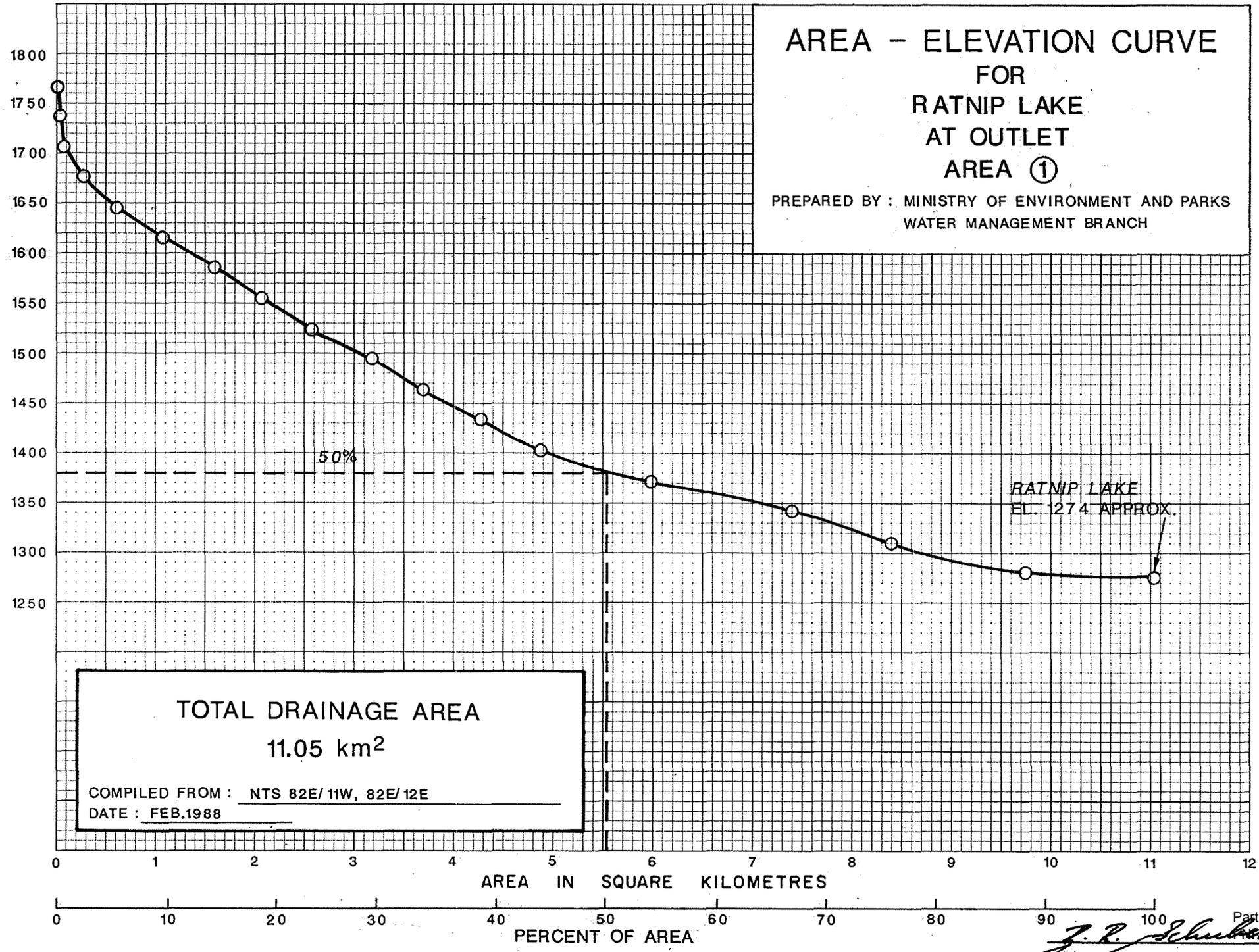
MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area	Depth of	Area	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum	In Hectares	Storage in Metres	In Hectares	Net	Gross	
1169.2		0.01	-13.97			1701	Low Point in Lake
					1.2		
			-13.5	0.50		1700	
					2.2		
1170.0		0.85				1698	
					1.6		
			-13.0	1.00		1696	
					6.1		
			-12.5	1.45		1690	
					5.3		
1171.0		1.75				1685	
					3.1		
			-12.0	1.84		1682	
					9.8		
			-11.5	2.10		1672	
					7.2		
1172.0		2.27				1665	
					4.0		
			-11.0	2.39		1661	
					13		
			-10.5	2.76		1648	
					10		
1173.0		3.00				1638	
1173.0		3.12					
					5.5		
			-10.0	3.31		1633	
					18		
			- 9.5	3.87		1615	
					14		
1174.0		4.24				1601	
					7.3		
			- 9.0	4.41		1594	
					23		
			- 8.5	4.90		1571	
					17		
1175.0		5.22				1554	
					9.4		
			- 8.0	5.82		1545	
					33		
			- 7.5	7.59		1512	
					27		
1176.0		8.75				1485	
1176.0		8.85					
					16		
			- 7.0	9.26		1469	
					49		
			- 6.5	10.5		1420	
					36		
1177.0		11.3				1384	
1177.0		11.4					
					20		
			- 6.0	11.9		1364	
					63		
			- 5.5	13.4		1301	
					46		
1178.0		14.4				1255	
					25		
			- 5.0	15.0		1230	
					79		
			- 4.5	16.4		1151	
					56		
1179.0		17.4				1095	
					30		
			- 4.0	18.1		1065	
					95		
			- 3.5	20.0		970	
					68		
1180.0		21.3				902	
					37		
			- 3.0	22.2		865	
					118		
			- 2.5	25.0		747	
					86		
1181.0		26.9				661	
					46		
			- 2.0			615	
					141		
			- 1.5	29.1		474	
					29		
			- 1.4	29.4		445	
					30		
			- 1.3	29.8		415	
					30		
			- 1.2	30.1		385	
					9.0		
1182.0		30.2				376	
					21		
			- 1.1	30.4		355	
					31		
			- 1.0	30.7		324	
					31		
			- 0.9	31.1		293	
					31		
			- 0.8	31.4		262	
					32		

DEAD STORAGE

STORAGE CAPACITY TABLE

Chute Lake (Invert as Control)

MAPPING DATA			STORAGE CAPACITY				
CONTOUR ELEVATION		Area	Depth of	Area	STORAGE IN DECAMETRES^3		REMARKS
Geodetic Datum	Local Datum	in Hectares	Storage in Metres	in Hectares	Net	Gross	
			- 0.6	31.1	31	192	DEAD STORAGE
			- 0.5	31.4	31	161	
			- 0.4	31.7	31	130	
			- 0.3	32.1	32	98	
			- 0.2	32.4	32	66	
			- 0.1	32.7	33	33	
1182.87			0.0	33.1	33	0	Invert of Intake
			0.1	33.4	33	33	
1183.0		33.5			10	43	
			0.2	33.7	24	67	
			0.3	34.0	34	101	
			0.4	34.4	34	135	LIVE STORAGE
			0.5	34.7	34	169	
			0.6	35.0	35	204	
			0.7	35.3	35	239	
			0.8	35.6	36	275	
			0.9	35.9	36	311	
			1.0	36.2	36	347	
			1.1	36.5	36	383	
			1.2	36.8	37	420	
			1.3	37.2	37	457	
1184.19		37.2	1.32		7.4	464	Crest of Spillway
			1.4	38.0	30	494	
			1.5	38.9	39	533	
			1.6	39.8	39	572	
			1.7	40.7	40	612	
			1.8	41.6	41	653	
			1.9	42.5	42	695	
			2.0	43.4	43	738	
			2.1	44.3	44	782	
1185.0		44.6			13	795	POTENTIAL STORAGE
			2.2	45.1	32	827	
			2.3	45.9	45	872	
			2.4	46.6	46	918	
			2.5	47.4	47	965	
			2.6	48.2	48	1013	
			2.7	48.7	49	1062	
			2.8	49.7	49	1111	
			2.9	50.4	50	1161	
			3.0	51.2	51	1212	
1186.0		52.2	3.13		67	1279	

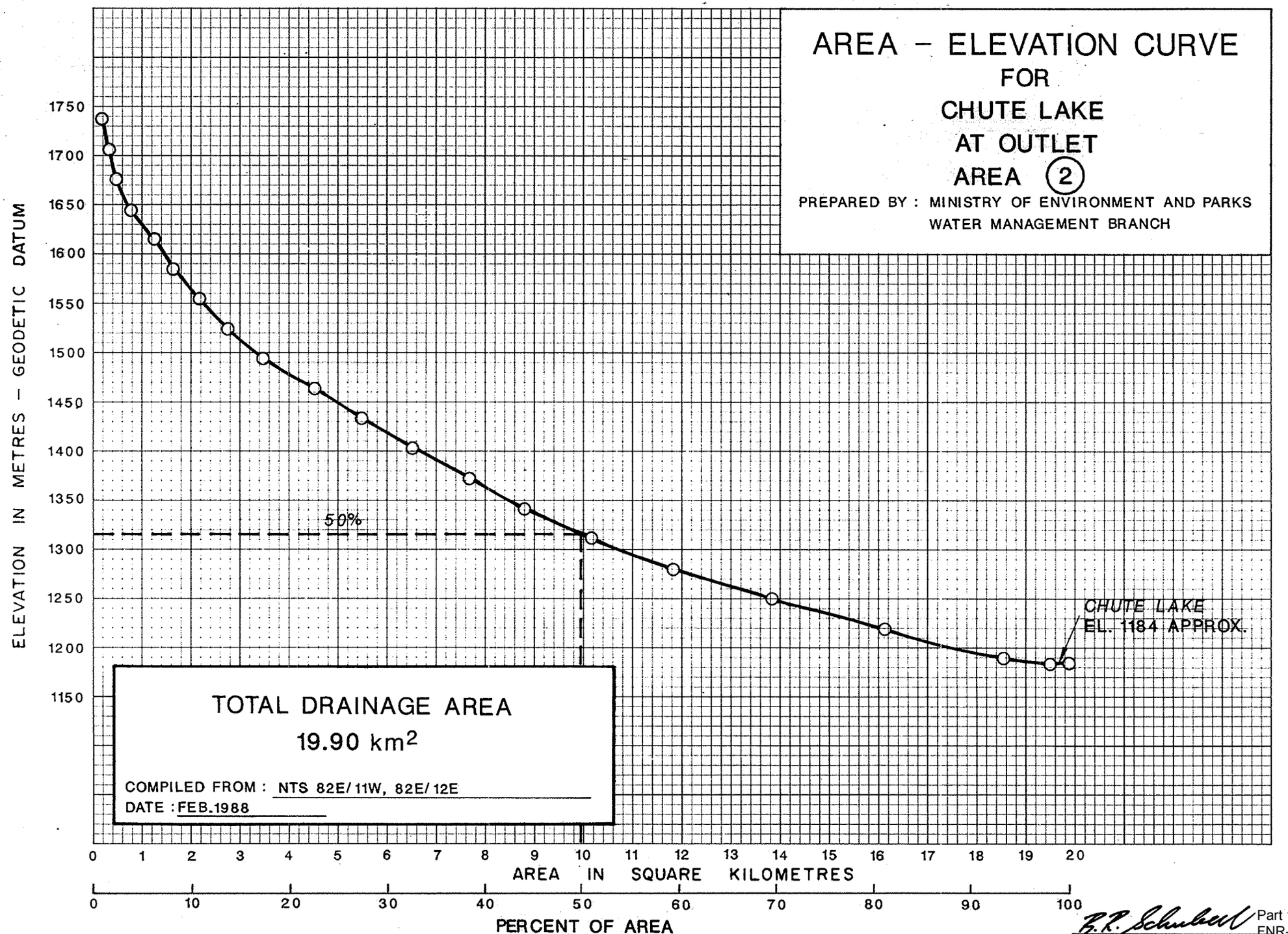


2012-00301

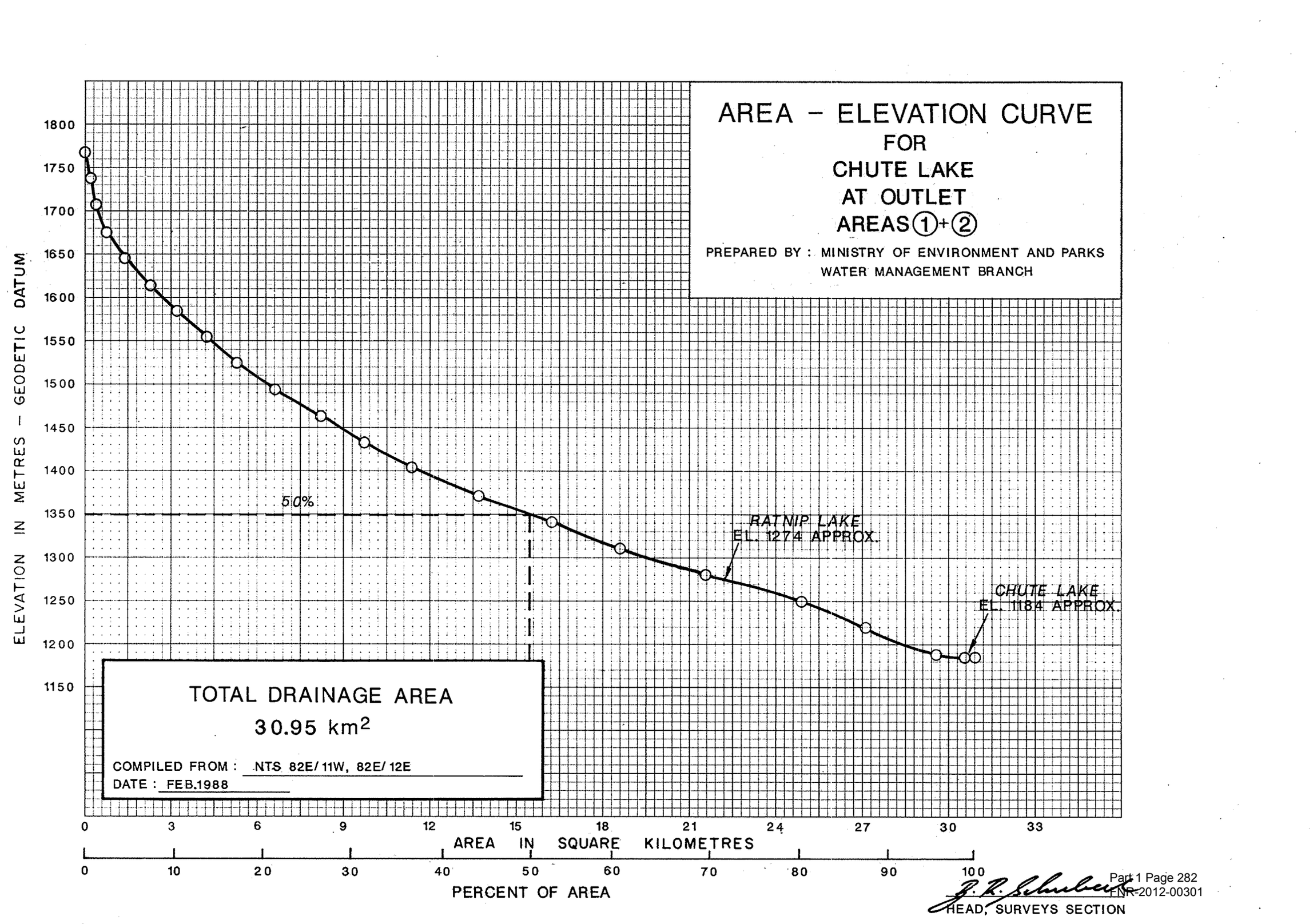
HEAD, SURVEYS SECTION

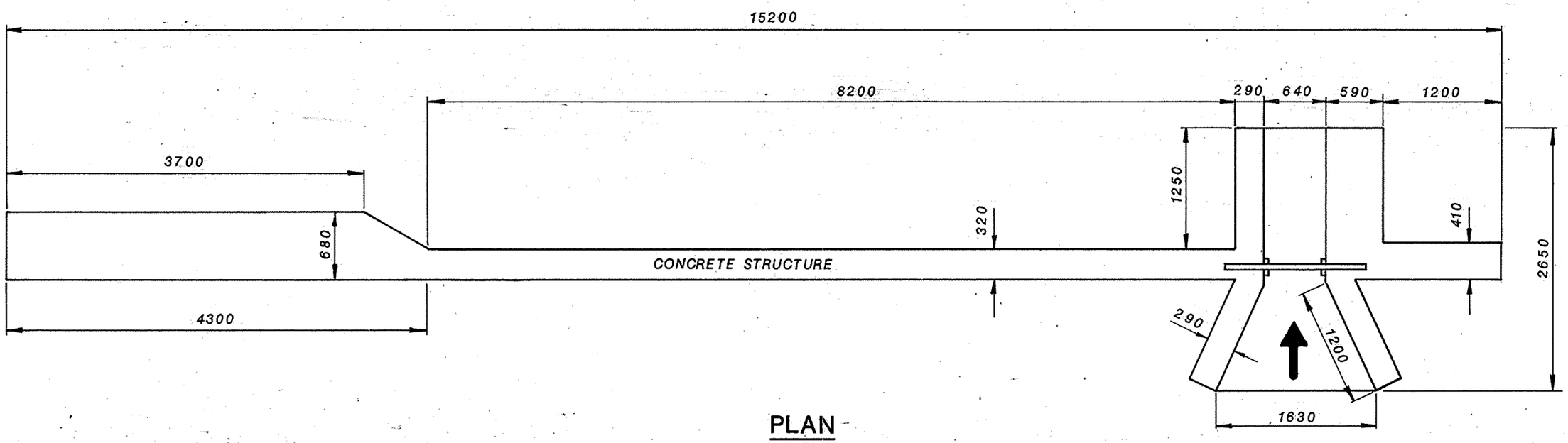
AREA – ELEVATION CURVE
FOR
CHUTE LAKE
AT OUTLET
AREA (2)

PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

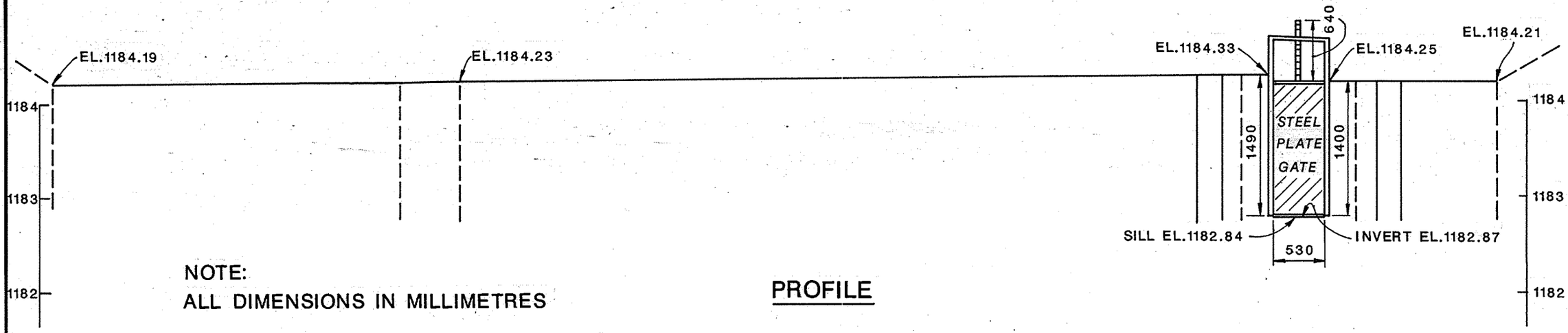


B.R. Schubert
HEAD, SURVEYS SECTION


AREA - ELEVATION CURVE
FOR
CHUTE LAKE
AT OUTLET
AREAS ①+②
PREPARED BY : MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH
ELEVATION IN METRES - GEODETIC DATUM
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
1300
1250
1200
1150
50%
RATNIP LAKE
EL. 1274 APPROX.
CHUTE LAKE
EL. 1184 APPROX.
TOTAL DRAINAGE AREA
30.95 km²
COMPILED FROM : NTS 82E/11W, 82E/12E
DATE : FEB.1988
0 3 6 9 12 15 18 21 24 27 30 33
AREA IN SQUARE KILOMETRES
0 10 20 30 40 50 60 70 80 90 100
PERCENT OF AREA
HEAD, SURVEYS SECTION



PLAN



NOTE:
ALL DIMENSIONS IN MILLIMETRES

PROFILE

Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

CHUTE LAKE RESERVOIR
DAM AND SPILLWAY STRUCTURE

SCALE: VERT. 1 : 50
HOR. 1 : 50

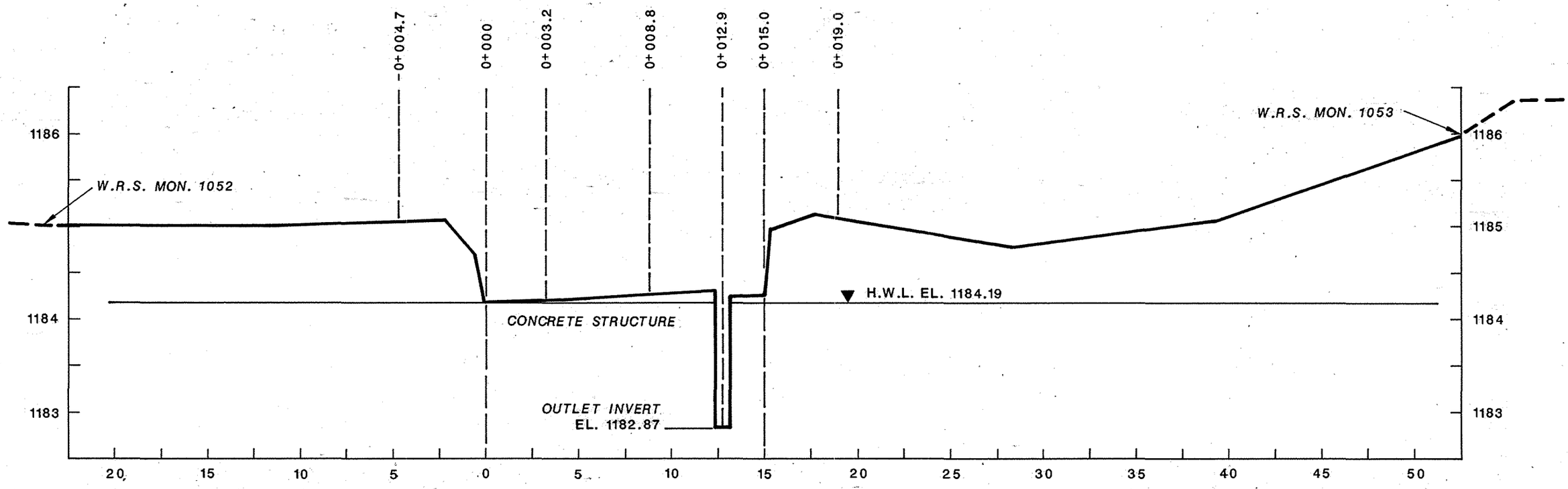
DATE
APR.1988

F. R. Schubert

FILE No. _____ DWG No. 4567-9C

Part 4 Page 283
FNR-2002-00301

VANCAL-10263



CHUTE LAKE
LONGITUDINAL SECTION
OF
DAM AND SPILLWAY

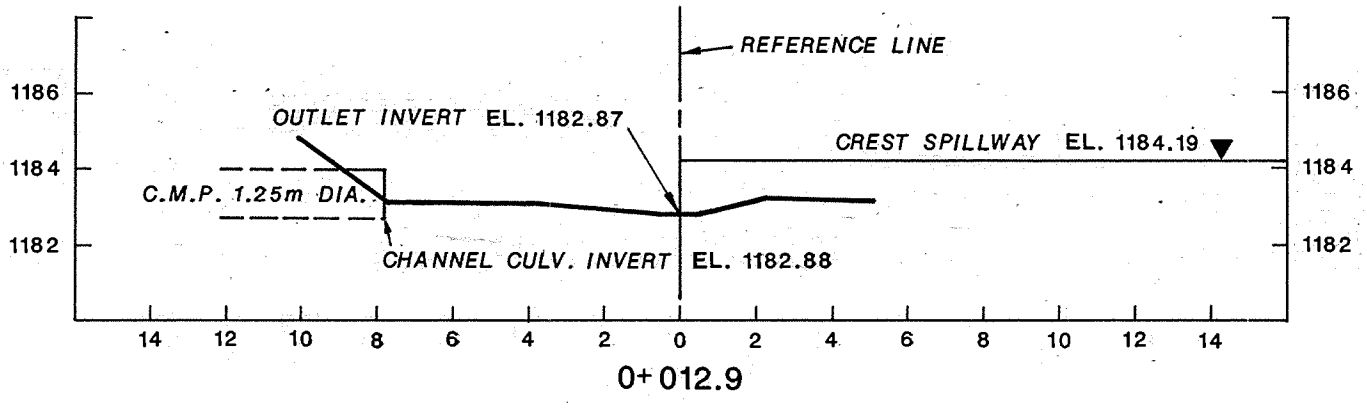
SCALE
HORIZONTAL 1:250 VERTICAL 1:50

ELEVATION IN METRES — GEODETIC DATUM

DATE : FEB.1988

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

G. P. Schubert
HEAD, SURVEYS SECTION



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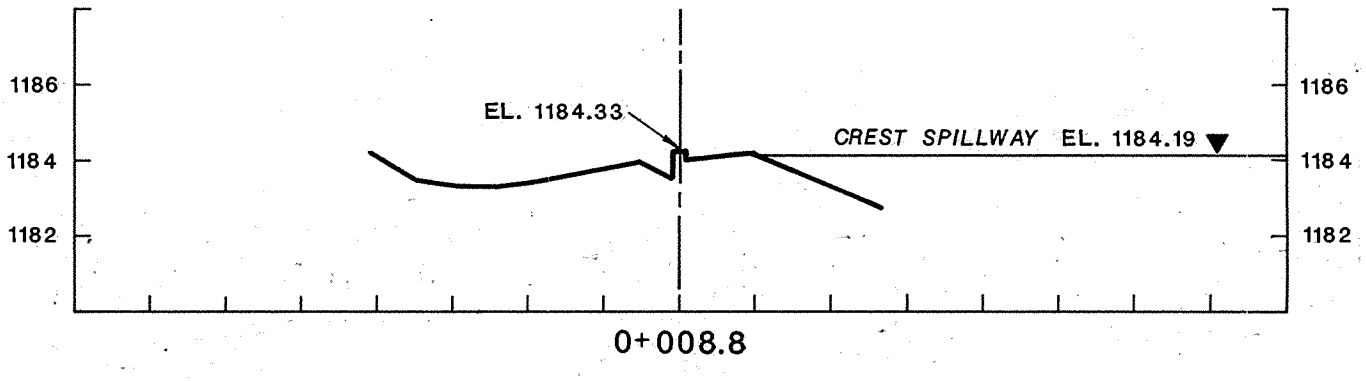

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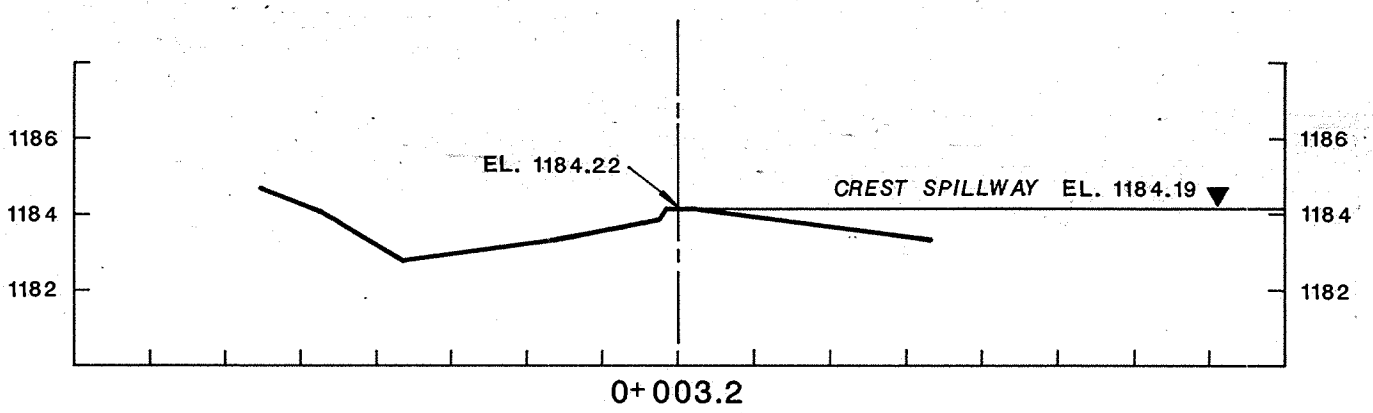

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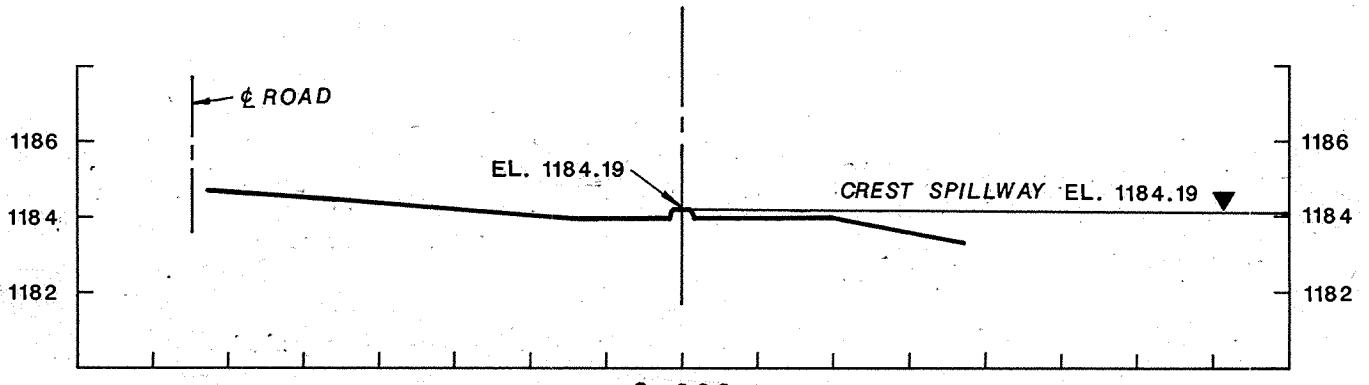

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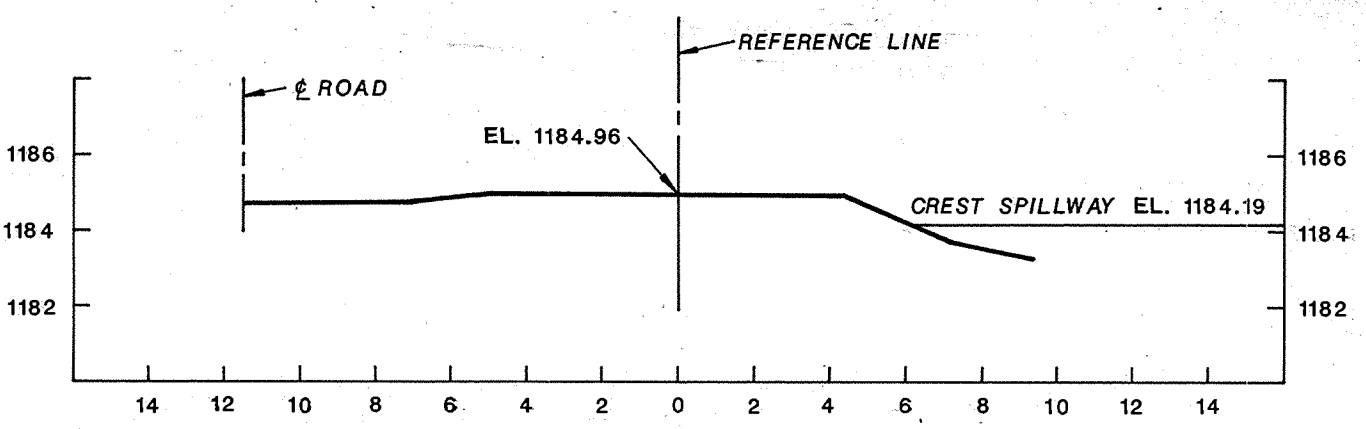


−0+004.7

CHUTE LAKE
CROSS SECTIONS OF DAM

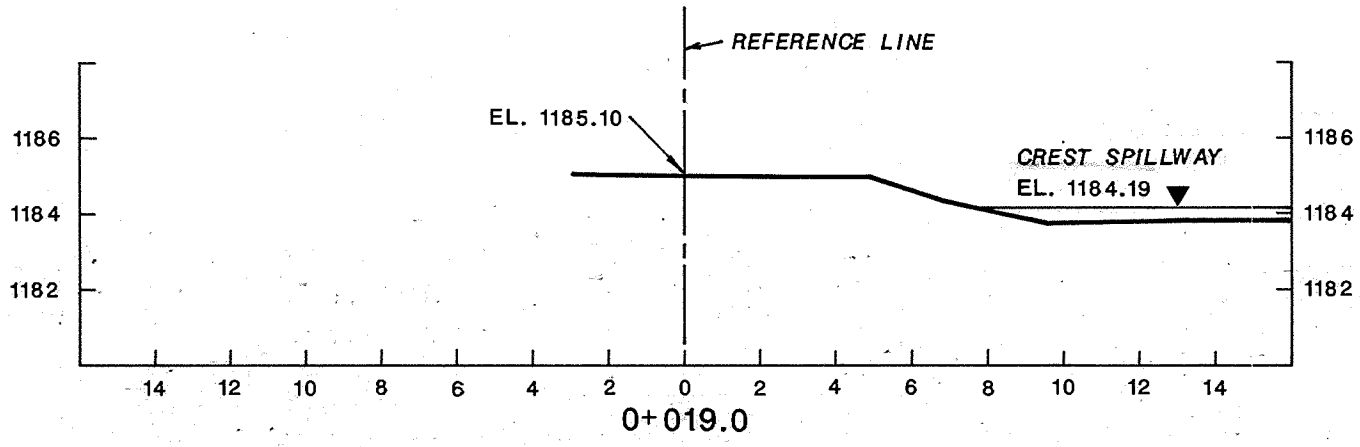
SCALE HORIZONTAL 1:200
VERTICAL 1:200

ELEVATION IN METRES - GEODETIC DATUM

DATE : FEB.1988 PAGE 1 OF 2

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION



CHUTE LAKE
CROSS SECTIONS OF
DAM

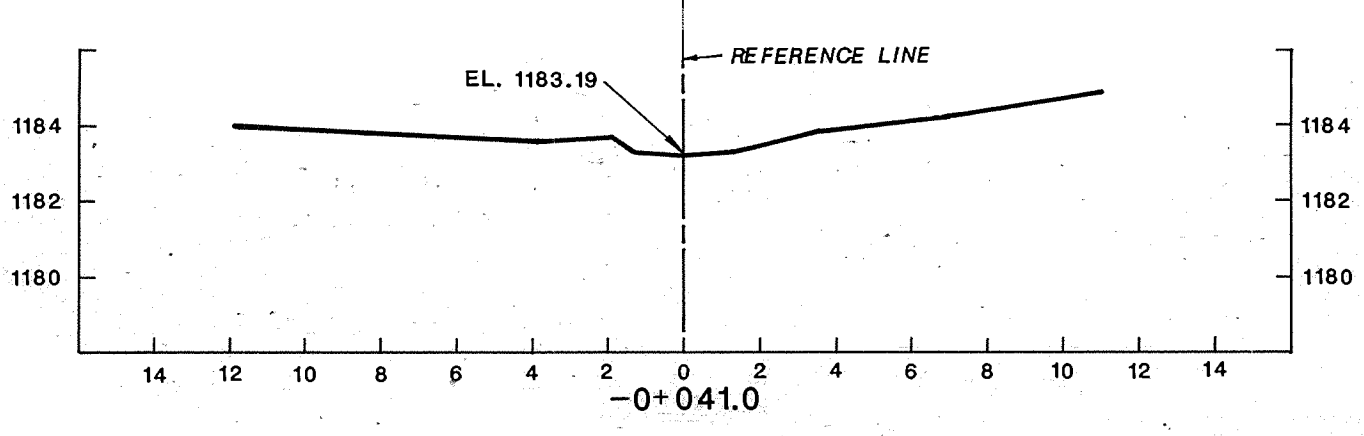
SCALE HORIZONTAL 1:200
VERTICAL 1:200

ELEVATION IN METRES - GEODETIC DATUM

DATE : FEB.1988 PAGE 2 OF 2

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION



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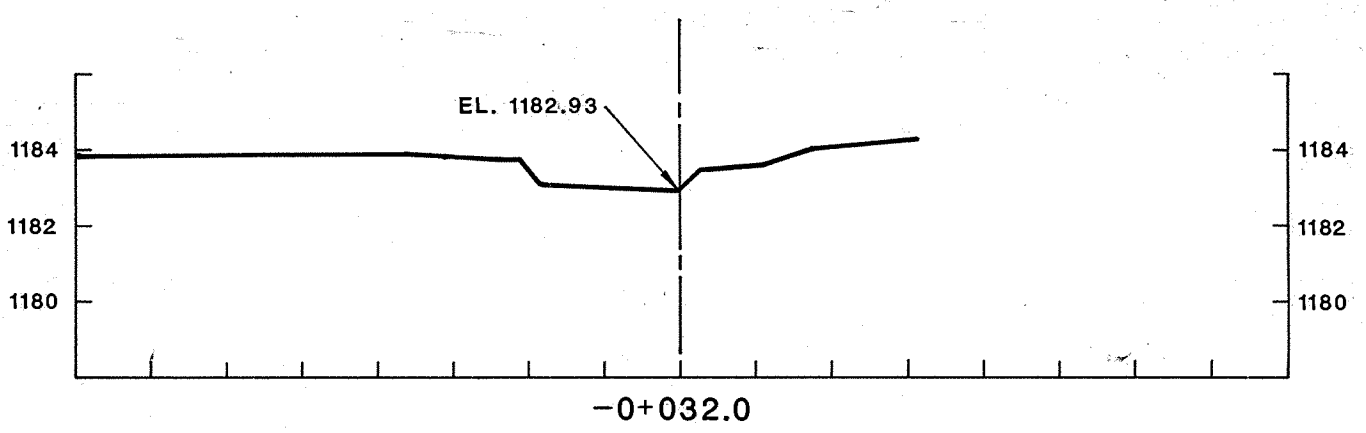

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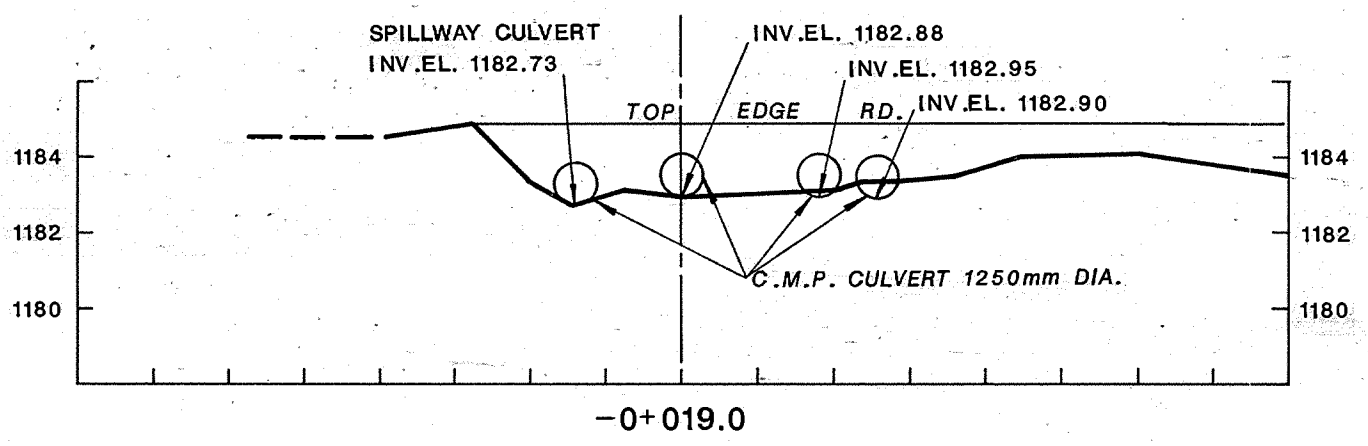

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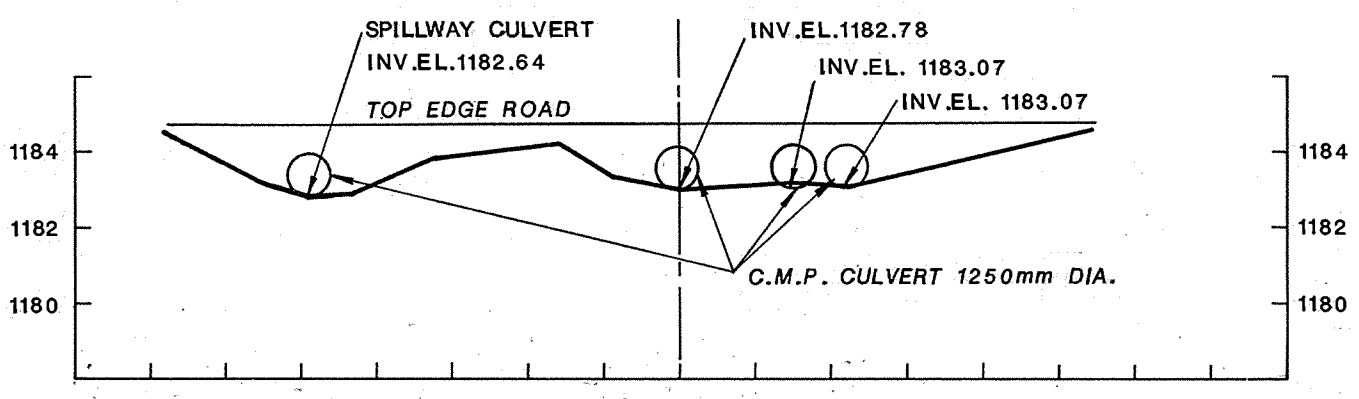

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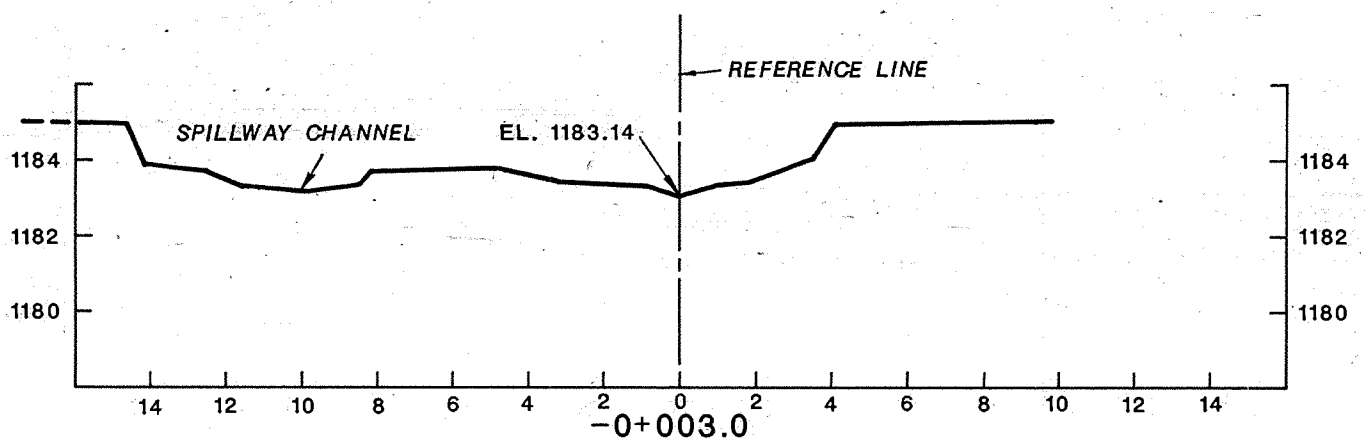

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CHUTE LAKE
CROSS SECTIONS OF
OUTLET CHANNEL

(FOR LOCATIONS SEE DWG. NO. 4567−9A)

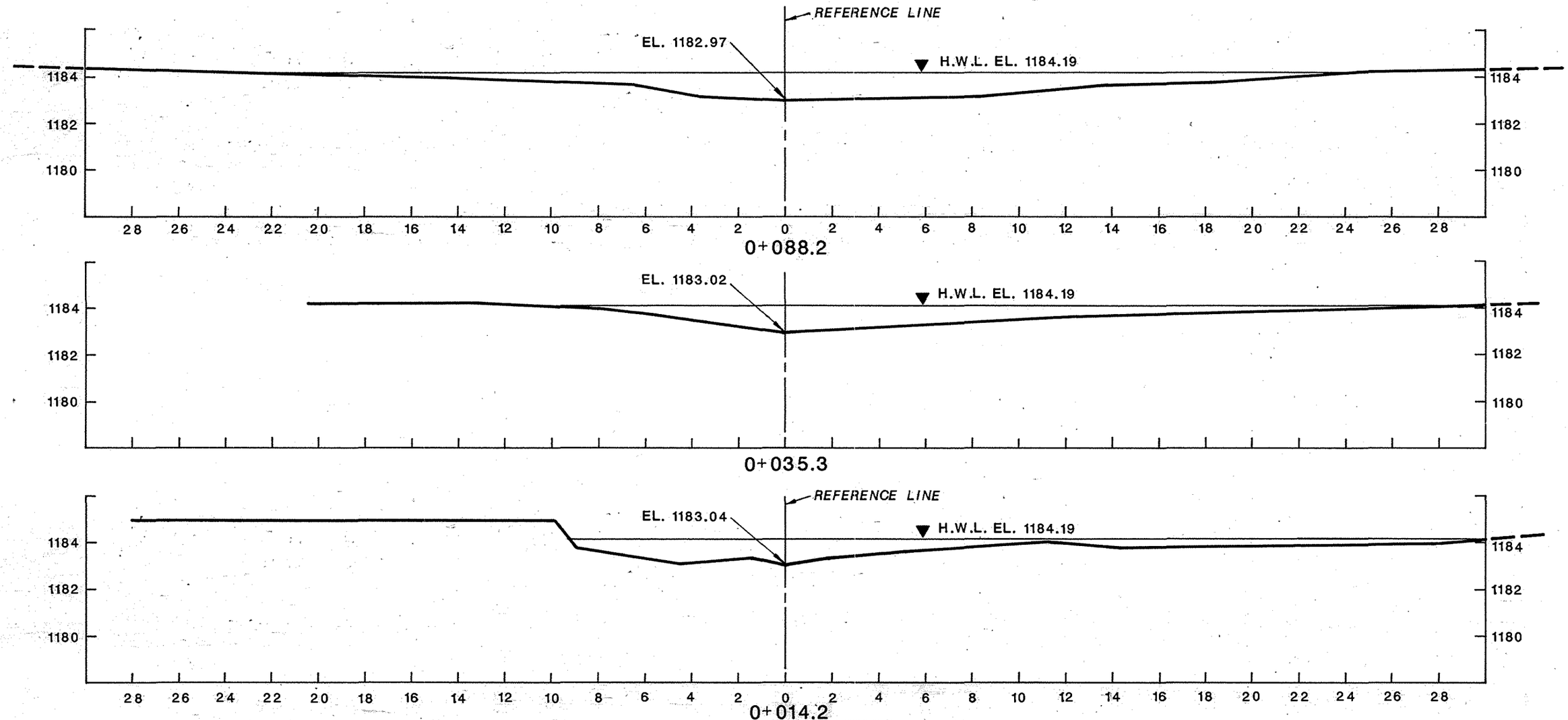
SCALE HORIZONTAL 1:200
VERTICAL 1:200

ELEVATION IN METRES − GEODETIC DATUM

DATE : FEB.1988 PAGE 1 OF 3

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION



CHUTE LAKE
CROSS SECTIONS OF OUTLET CHANNEL

(FOR LOCATIONS SEE DWG. NO. 4567-9A)

SCALE

HORIZONTAL 1:200 VERTICAL 1:200

ELEVATION IN METRES – GEODETIC DATUM

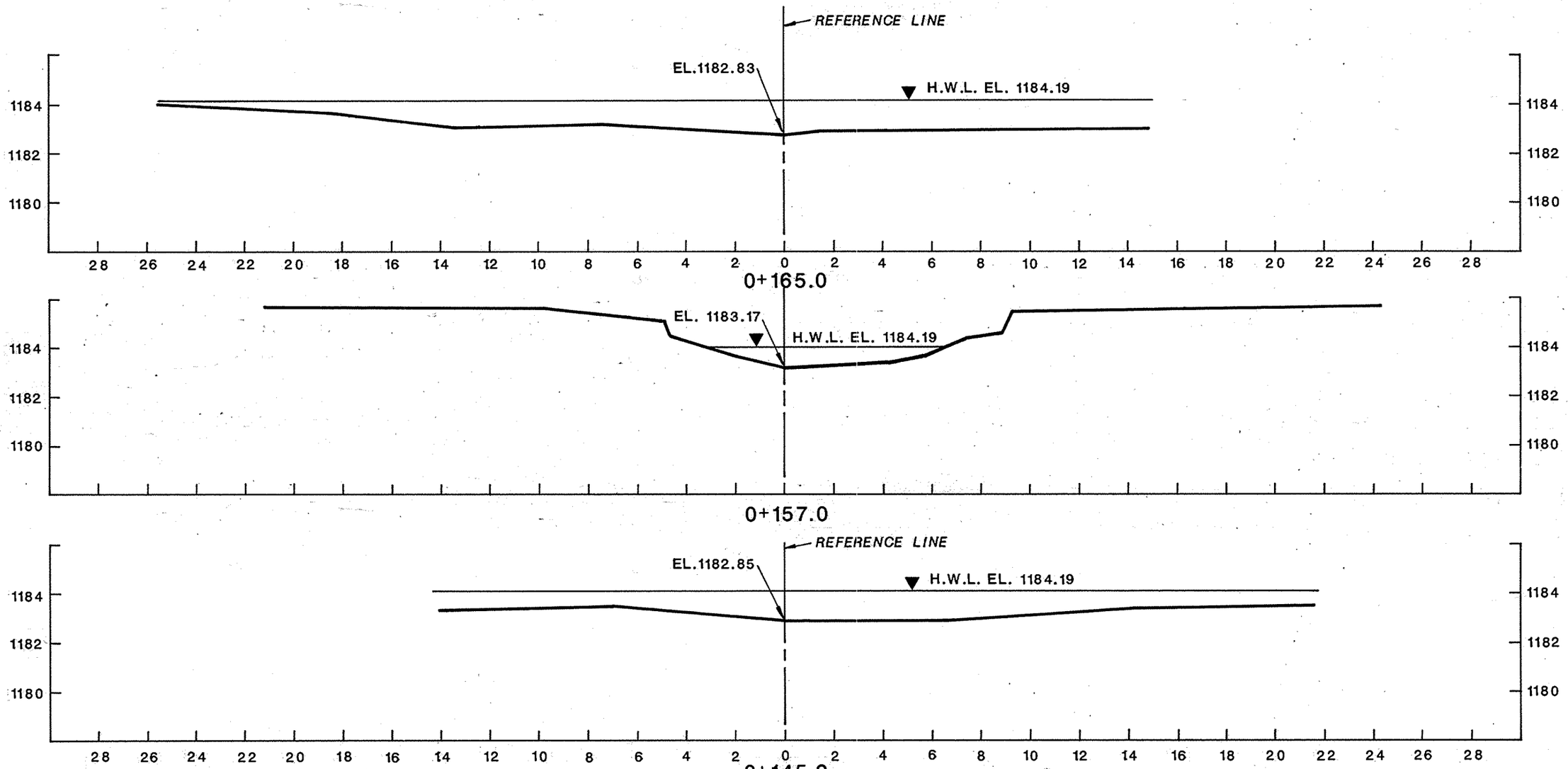
DATE : FEB.1988 PAGE 2 OF 3

MINISTRY OF ENVIRONMENT AND PARKS

WATER MANAGEMENT BRANCH

HEAD, SURVEYS SECTION

Part 1 Page 288
ENR-2012-00301



CHUTE LAKE
CROSS SECTIONS
OF
OUTLET CHANNEL

SCALE

HORIZONTAL 1:200 VERTICAL 1:200

ELEVATION IN METRES — GEODETIC DATUM

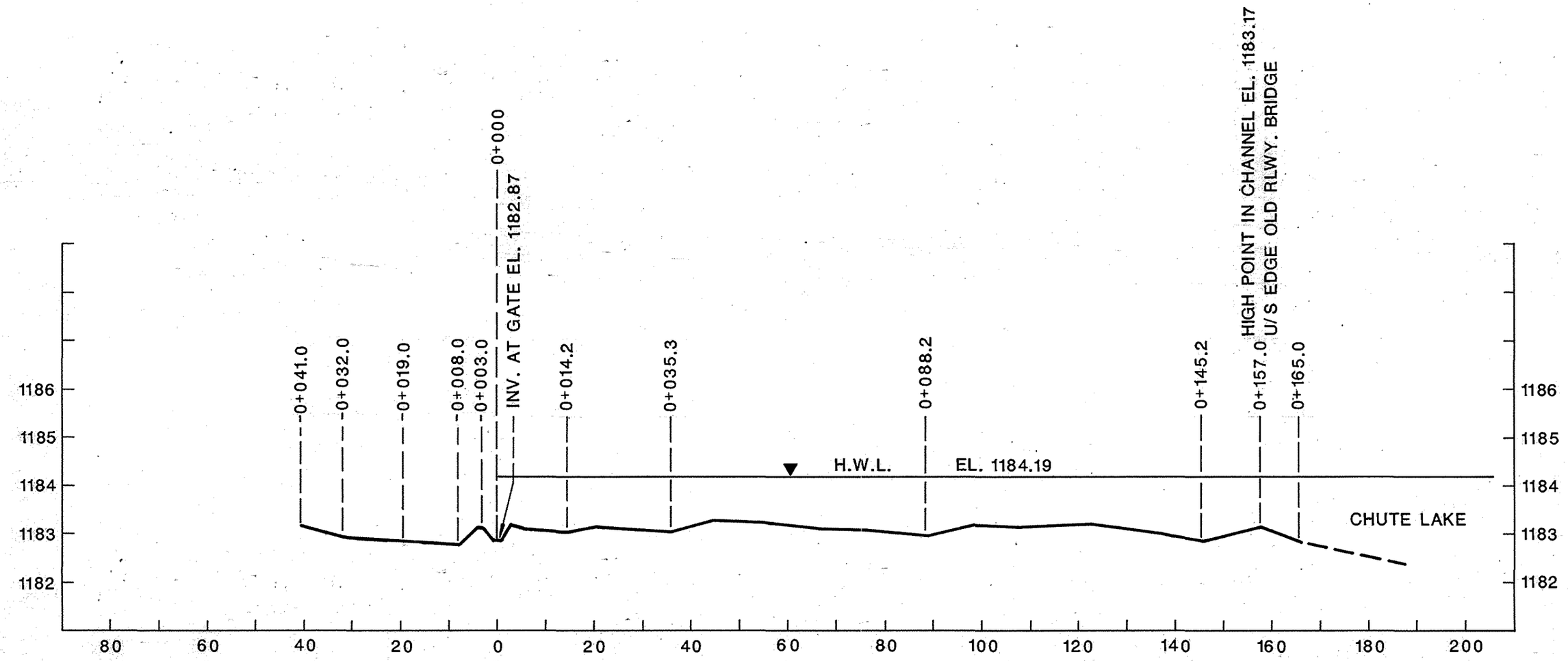
DATE : FEB.1988 PAGE 3 OF 3

MINISTRY OF ENVIRONMENT AND PARKS

WATER MANAGEMENT BRANCH

J. R. Schmidt

HEAD, SURVEYS SECTION



CHUTE LAKE
LONGITUDINAL SECTION
OF OUTLET CHANNEL

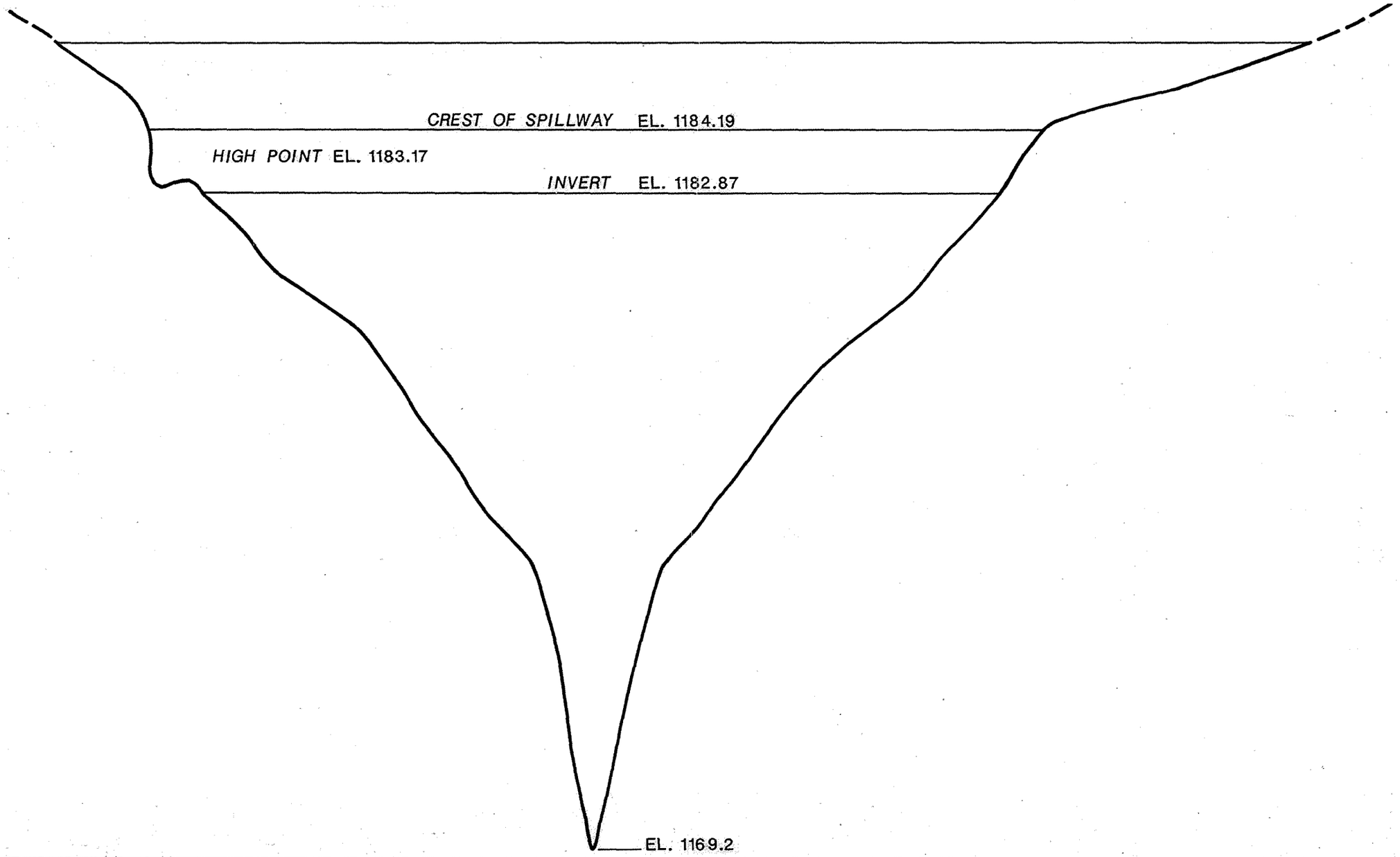
SCALE
HORIZONTAL 1:1000 VERTICAL 1:100

ELEVATION IN METRES — GEODETIC DATUM

DATE : FEB.1988

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH

J. R. Schubert
HEAD, SURVEYS SECTION



Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

CHUTE (LEQUIME) LAKE RESERVOIR
STORAGE COMPUTATION SKETCH

SCALE: VERT. _____
HOR. _____

DATE
APRIL 1988

_____ ENGINEER

FILE No. _____ DWG No. _____

VANCAL-10263

ENR-2012-00304

Peachland 3 km

49° 45'

119° 40'

OKANAGAN MOUNTAIN PROVINCIAL PARK

OKANAGAN LAKE PROVINCIAL PARK

OKANAGAN

Rattlesnake Island

Trailer Park

Antlers Beach Provincial Park

Lookout

Squally Point

Wild Horse Creek

Commando Bay

Greata

Mount Eneas

Wild Horse Mountain

Norman Lake

Baker Lake

Okanagan Mountain

Mtr/wave

Tank Sta

Glenfir

Television

CANADIAN PACIFIC

POINT OF DIVERSION

Chute L

Gemmill Lake

Radio

Pk

Water

1123±

AREA-ELEVATION CURVE
FOR
ROBINSON CREEK
AT
PUMPHOUSE
AREAS ③+④+⑤+⑥+⑦+⑧

ELEVATION IN FEET - GEODETIC DATUM

7000
6000
5000
4000
3000
2000
1000

BIG MEADOW LAKE
EL. 5292 APPROX.

50%

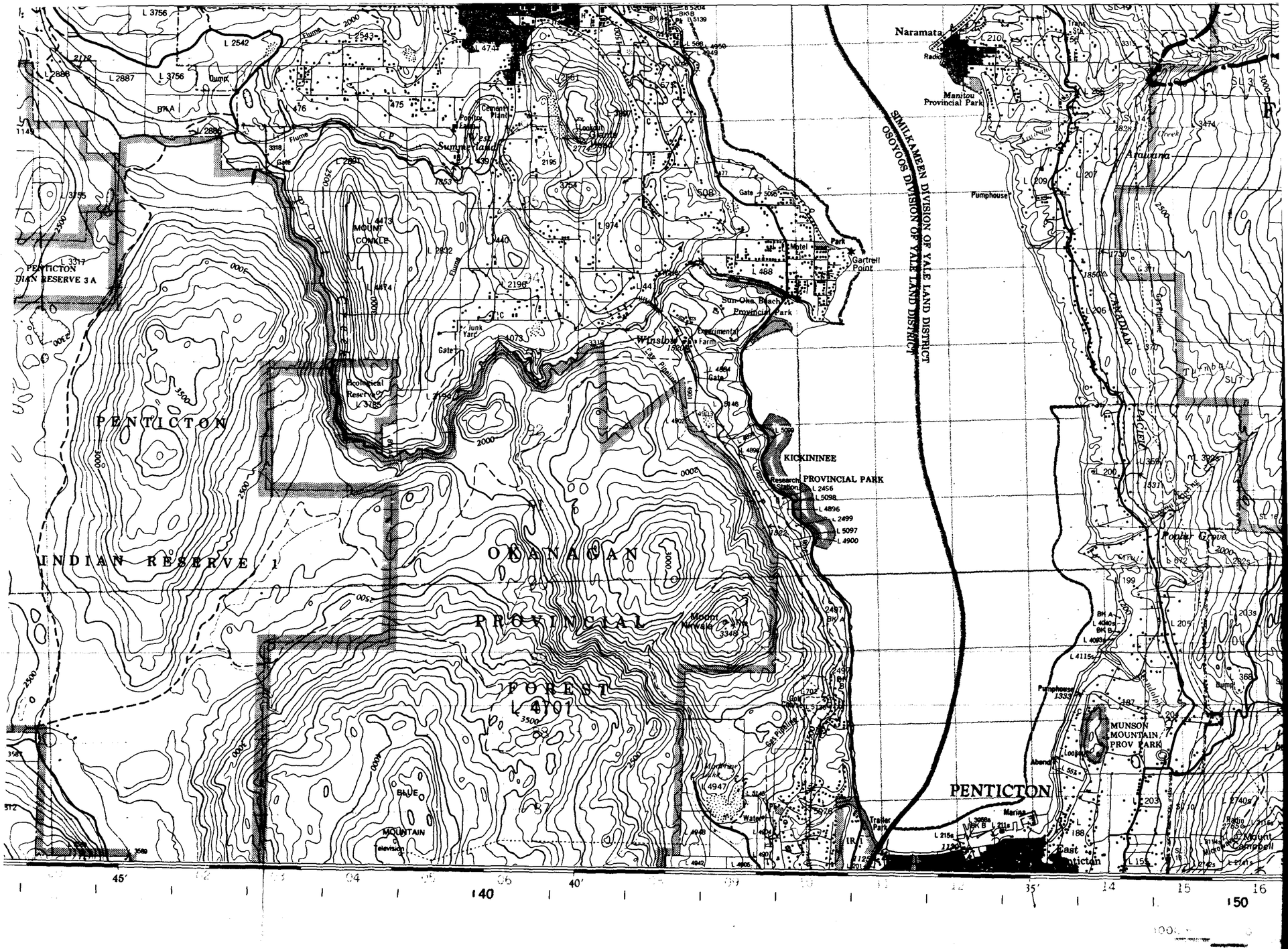
DIVERSION
EL. 4360 APPROX.
DIVERSION
EL. 4200 APPROX.
ELINOR LAKE
EL. 4188 APPROX.
NARAMATA LAKE
EL. 4172 APPROX.

PUMPHOUSE
EL. 1650 APPROX.

TOTAL DRAINAGE AREA
14.3 SQUARE MILES

0 2 4 6 10 12 14 16
UARE MILES
0 10 20 30 40 70 80 90 100
OF AREA

OKANAGAN
PROVINCIAL
POINT OF DIVERSION
L 205s
Greyback Lake
L 271 l
Mount Robinson
GREYBACK MOUNTAIN
Robinson Creek
Bellevue Creek
E. Nuccier Cr.
Lagoon Cr.
Gillard Creek
Mt. Nuttall
Mt. Kentucky-Alleyne
Mt. Riordan
Mt. Dewdney
Mt. Kobau
Mt. Baldy
Mt. Kruger
Mt. Fosthall
Mt. Kilpatrick
Mt. Lawless
Mt. Kennedy
Mt. Kane
Mt. Kane
Mt. Kane



NOTES

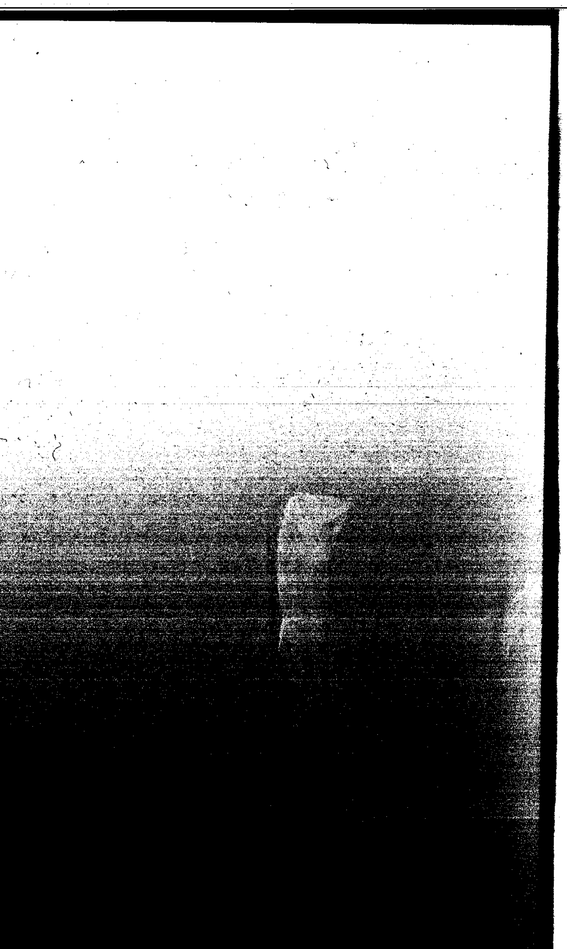
1) This plan has been prepared by the Surveys Section, Planning and Surveys Division, Water Investigations Branch, Ministry of Environment, Province of British Columbia.

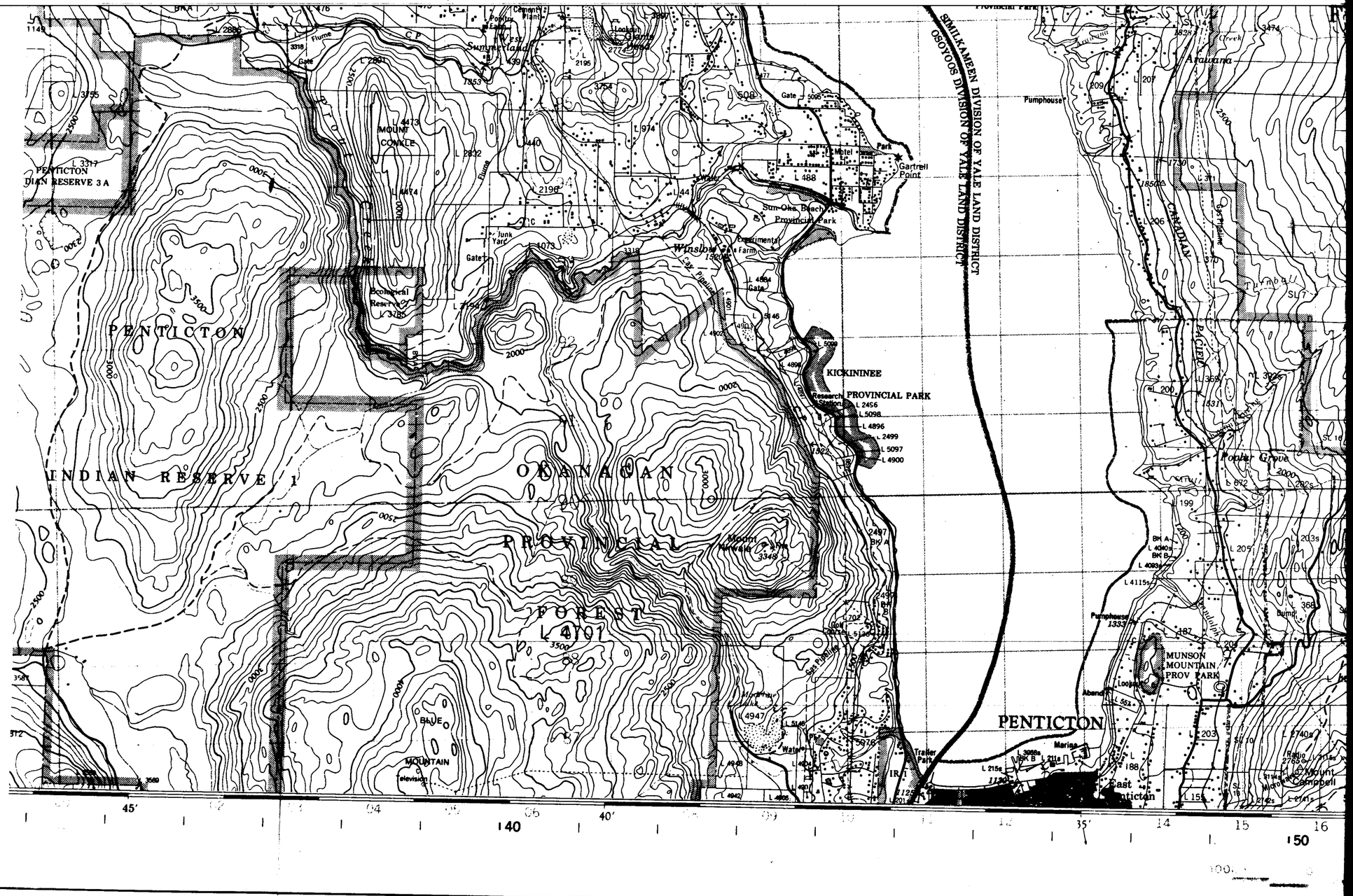
2) a) Data compiled from National Topographic Series, scale = 1:50000.
   b) Boundary checked, using Air Interim Map sheets 82E/11W and 82E/12E, scale: 1 inch = 2640 feet.

3) Data for ...

LEGEND

- TRIANGULATION STATION
- REFERENCE MONUMENTS: P. CON. OR P. ROCK
- ROAD, TRAIL, 00003
- CREEK INTERMITTENT





NOTES

1) This plan has been prepared by the Surveys Section, Planning and Surveys Division, Water Investigations Branch, Ministry of Environment, Province of British Columbia.

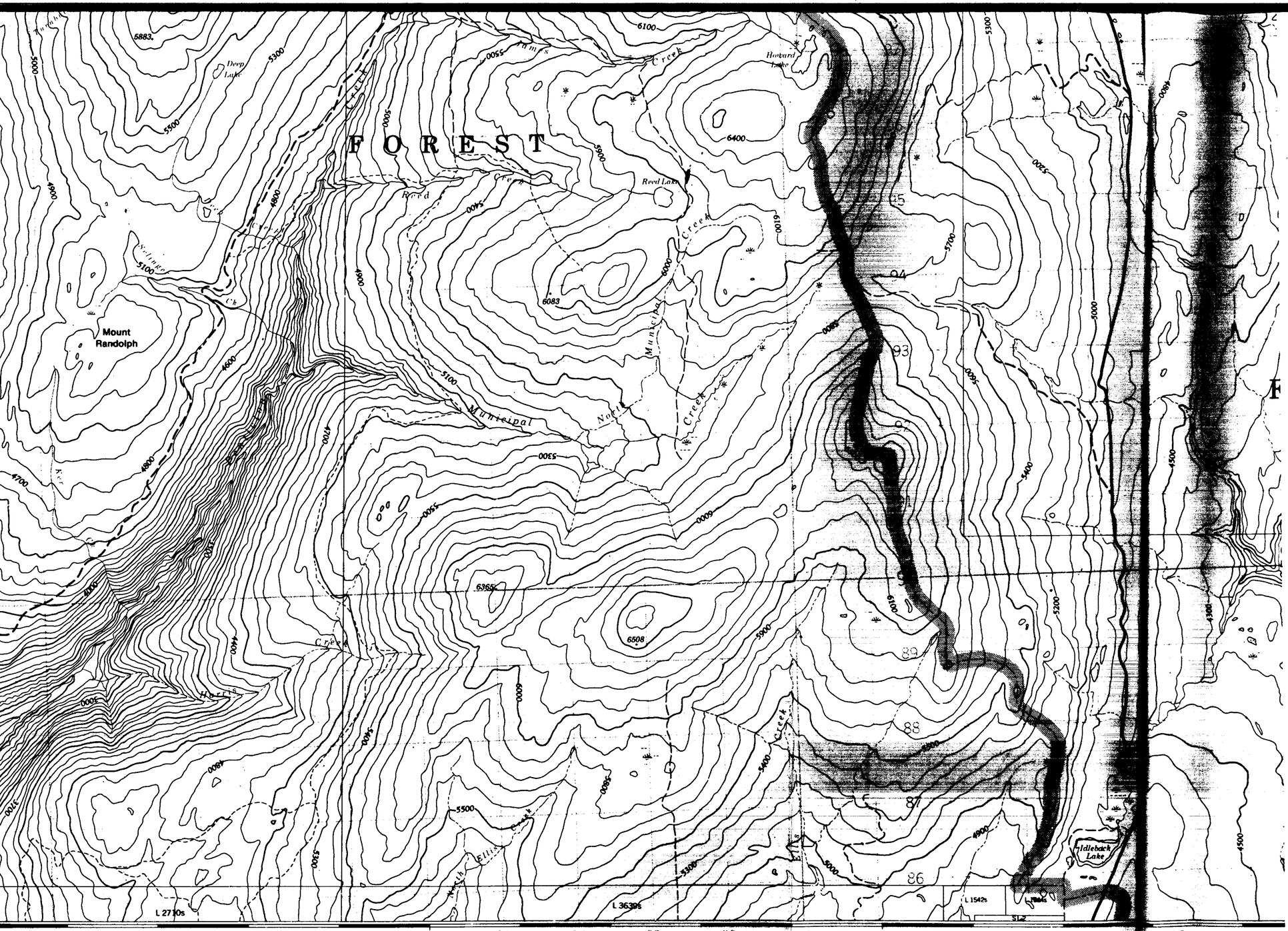
2) a) Data compiled from National Topographic Series, scale = 1:50000.
   b) Boundary checked, using Air Interim Map sheets 82E/11W and 82E/12E, scale: 1 inch = 2640 feet.

3) Data for area elevation curves obtained and checked using a Digitizer and d Hewlett-Packard Calculator, Model 9825A.

LEGEND

- TRIANGULATION STATION
- REFERENCE MONUMENTS: P. CON. OR P. ROCK
- ROAD, TRAIL,
- CREEK INTERMITTENT
- SWAMP
- BOUNDARIES:
  - BASINS
  - AREAS

00004



LICENCES

AUTHORIZED ACRE - FEET	DEVELOPED ACRE - FEET

REFERENCES

DWG. No.	DESCRIPTION	DATE
4567B-15 SHT 2&3	PLAN SHOWING AREA-ELEVATION CURVES	JAN. 1980
SHEET 4	AREA-ELEVATION CURVES	MARCH 1982

REVISIONS

No.		
		1982
		1982

SURVEYS SECTION

SURVEYED:

DATE:

COMPILED: M. KOVATS

Province of British Columbia

Ministry of the Environment
ENVIRONMENTAL AND ENGINEERING SERVICE
WATER INVESTIGATIONS BRANCH

STORAGE INVENTORY PROGRAMME
OKANAGAN BASIN - COLUMBIA SYSTEM

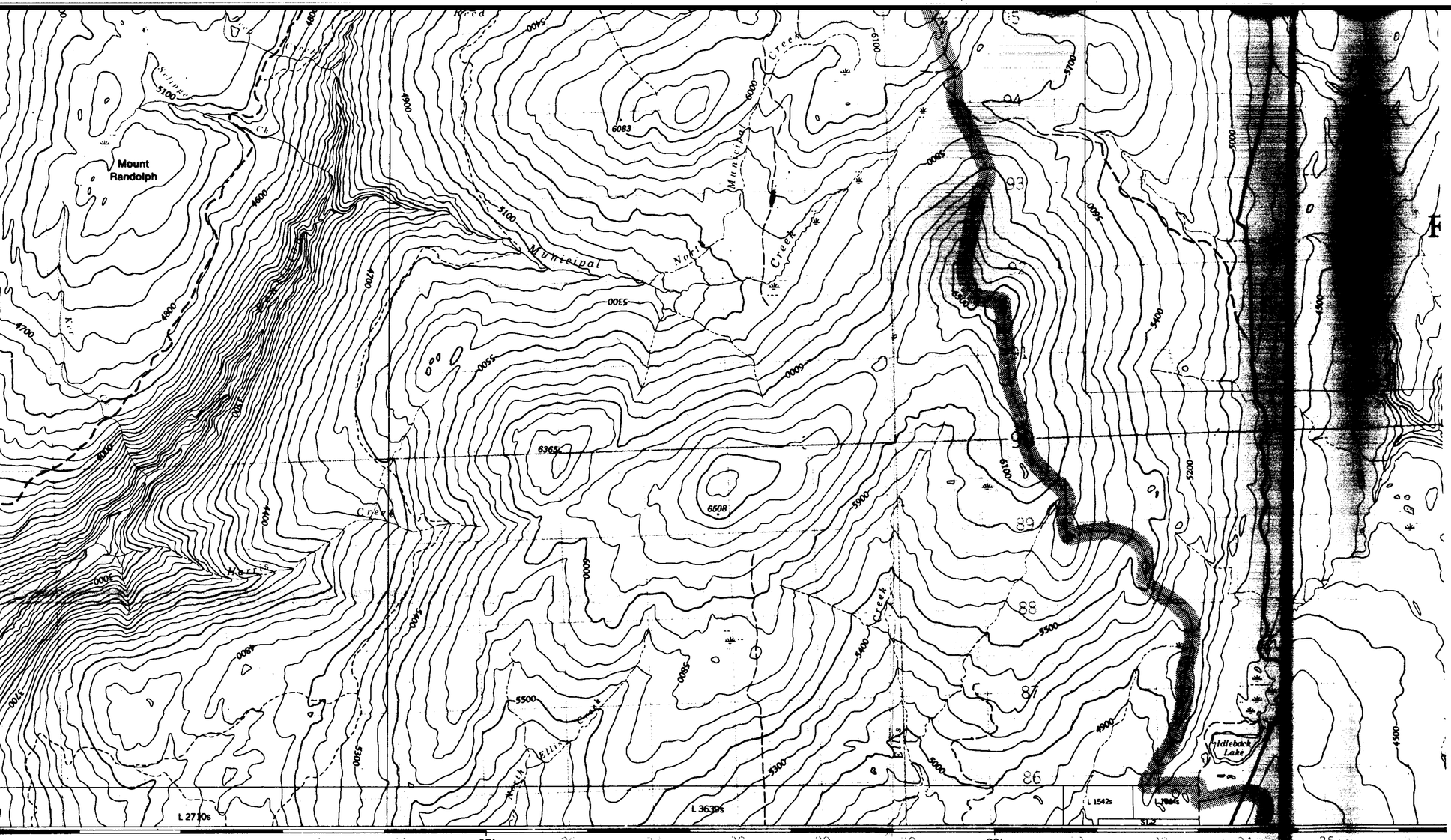
FILE

Bra

Inven 05080-1
00005

SCALE

1:50 000



LICENCES

AUTHORIZED ACRE - FEET	DEVELOPED ACRE - FEET

REFERENCES

DWG. No.	DESCRIPTION	DATE
4567B-15 SHT. 2&3	PLAN SHOWING AREA-ELEVATION CURVES	JAN. 1980
SHEET 4	AREA-ELEVATION CURVES	MARCH 1982

REVISIONS

No.	DESCRIPTION	DATE
1	BOUNDARY OF AREA 3	MARCH 1982
2	ADDED NARAMATA BASIN	MARCH 1982

SURVEYS SECTION

SURVEYED:

DATE:

COMPILED: M. KOVATS

CHECKED: J. Wakeham

DATE: JANUARY 1980

DRAUGHTING SECTION

DRAWN: B. McInnes

CHECKED: [illegible]

DATE: DEC. 1979

Province of British Columbia

Ministry of the Environment
ENVIRONMENTAL AND ENGINEERING SERVICE
WATER INVESTIGATIONS BRANCH

[illegible] INVENTORY PROGRAMME
[illegible] BASIN - COLUMBIA SYSTEM

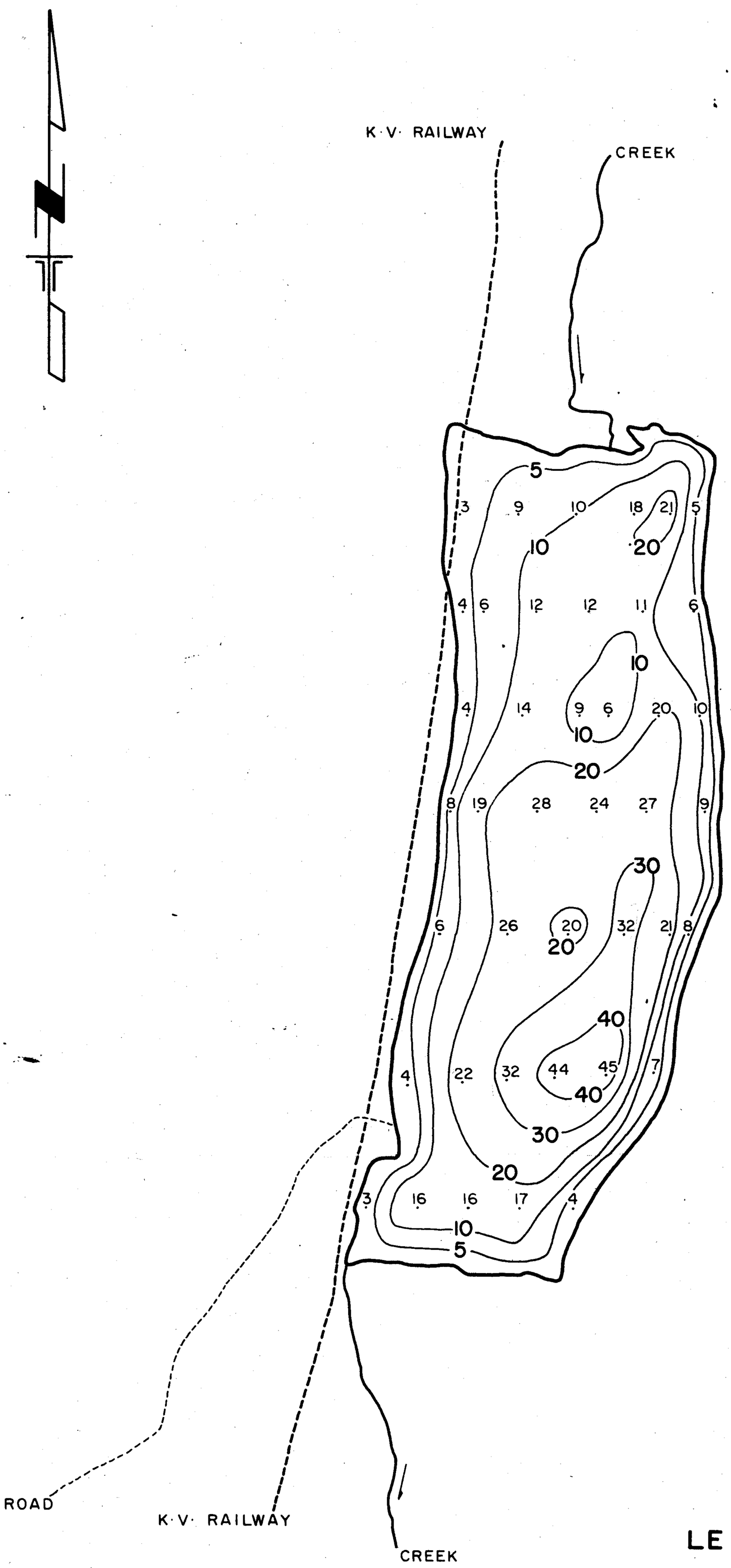
CHUTE, ROBINSON AND NARAMATA CREEK BASINS

MAP SHOWING DRAINAGE AREAS

APPROVED Robert S. Harris DATE JAN. 1980
HEAD, SURVEYS SECTION, PLANNING & SURVEYS DIVISION

FILE No.
Branch
Inventory 0305080-1
SCALE 1:50 000
SURVEY PROJECT No.
DRAWING No. 4567B-15
SHEET 1 of [illegible]

272 085



LEQUIME LAKE

SCALE· 1" = 482'

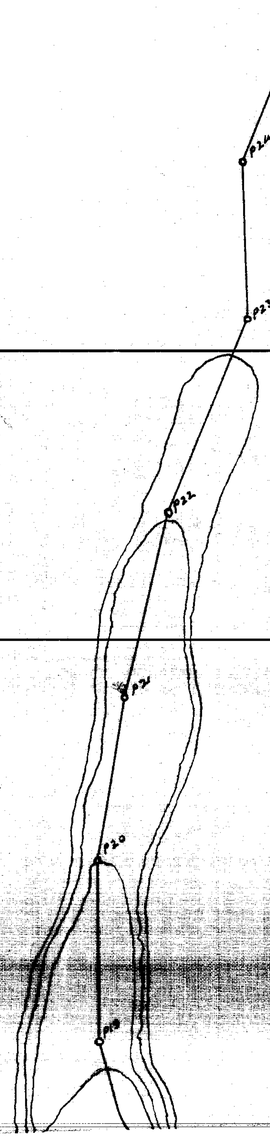
DEPTH CONTOURS IN FEET

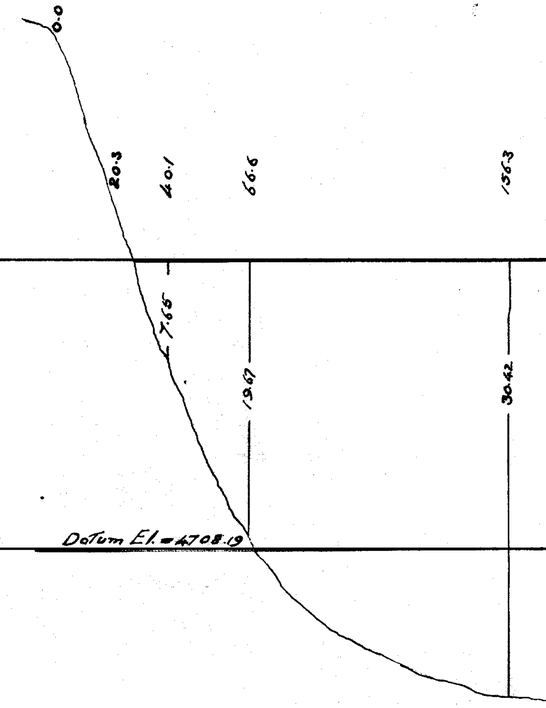
B·C· GAME DEPARTMENT
FISHERIES RESEARCH GROUP

Part 2 Page 7
FNR-2012-00301

LEQUIME

FIRST MEADOW ON SHOOT CREEK

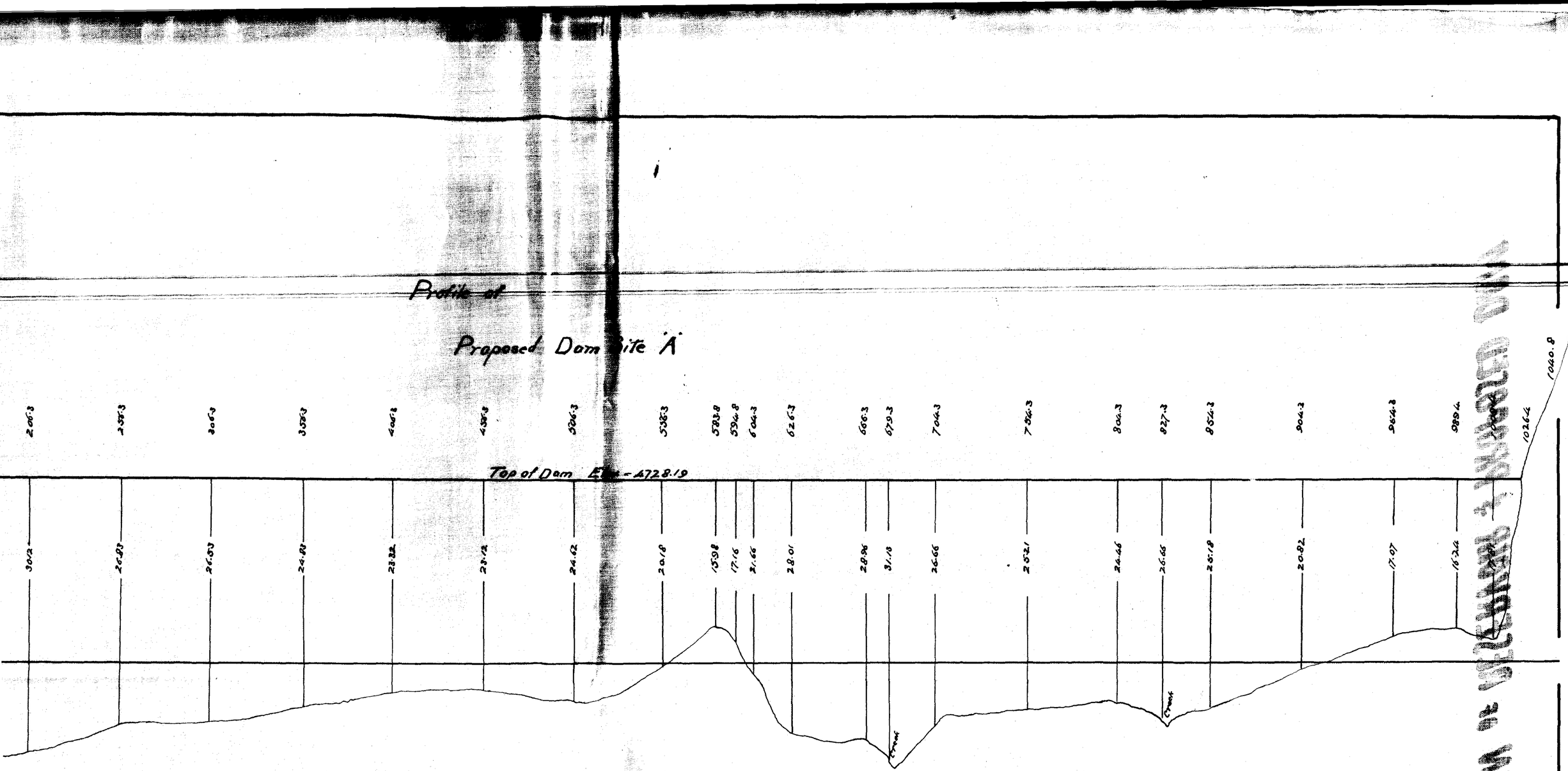




TRAPEZOIDAL AREA DOWN TO "B" DAM LINE = 23.4 AC
D° D° D° "A" D° D° = 14.6 AC
5 Foot drop = 156 cy
10 — — = 347 cy
15 — — = 526 — —
20 — — = 840 — —
These are down to "B" Dam line

Profile of

Proposed Dam Site A



Profile of

Proposed Dam Site B

at

Meadow No.1 Shoot Creek

BLM ELKO DISTRICT OFFICE

MEADOW No. 1 "HOT"

Elev 4708

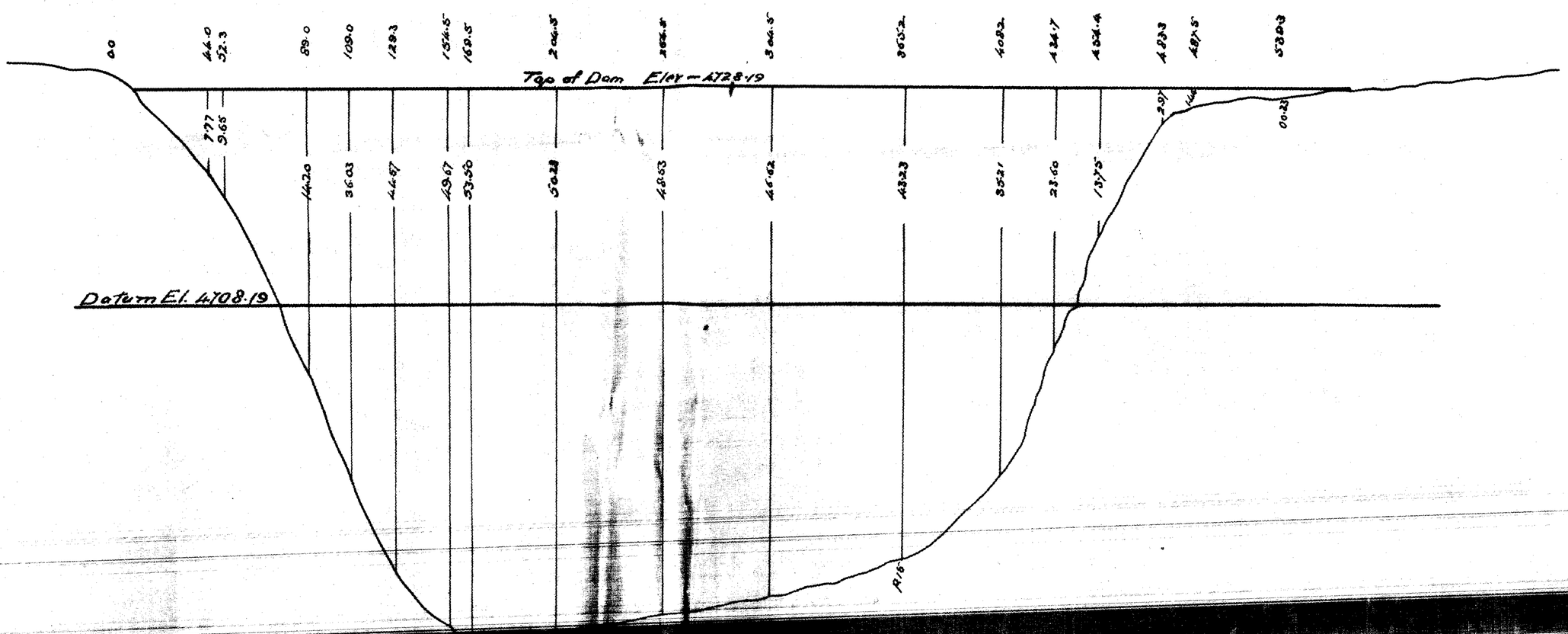
Dam Site #1

Dam Site #2

Trail To Mammoth

N

00003



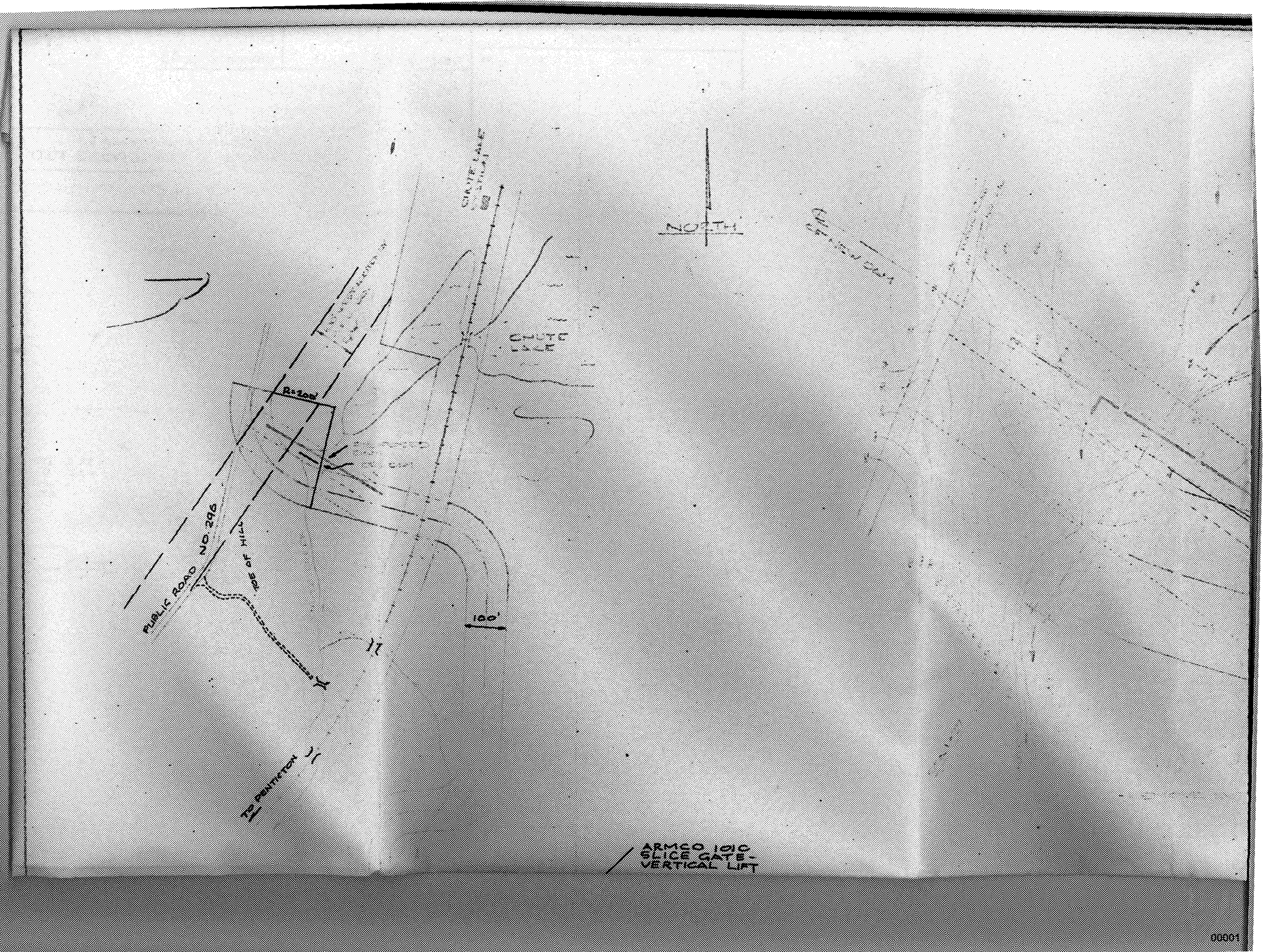
Scale { Vertical 1 inch = 10 ft
Horizontal 1 inch = 50 ft

4

Fairview Water District
Penticton Precinct

2

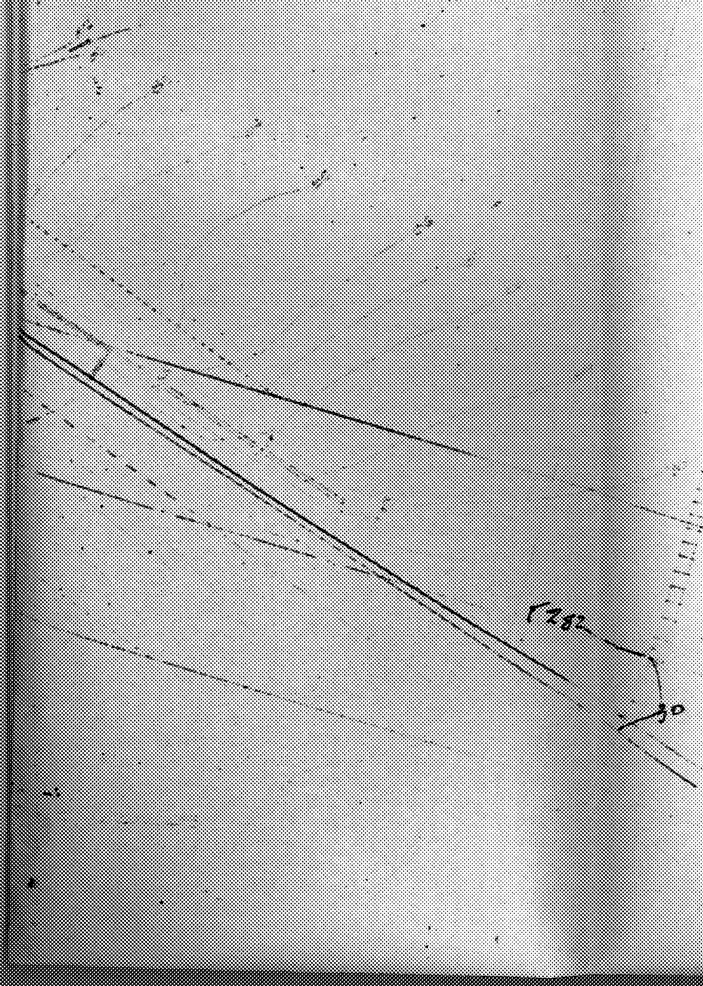
Exhibit No. 1 CHOATE

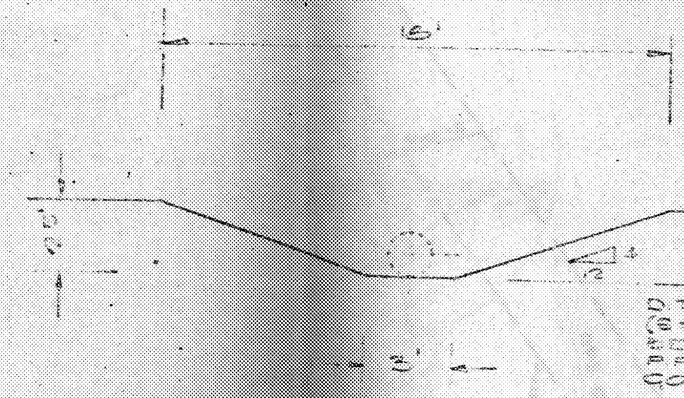

NORTH
CHUTE LAKE
CHUTE LAKE
R-1 zone
PUBLIC ROAD NO. 296
TO PENTICTON
100'
ARMCO 10IC SLICE GATE - VERTICAL LIFT

00001

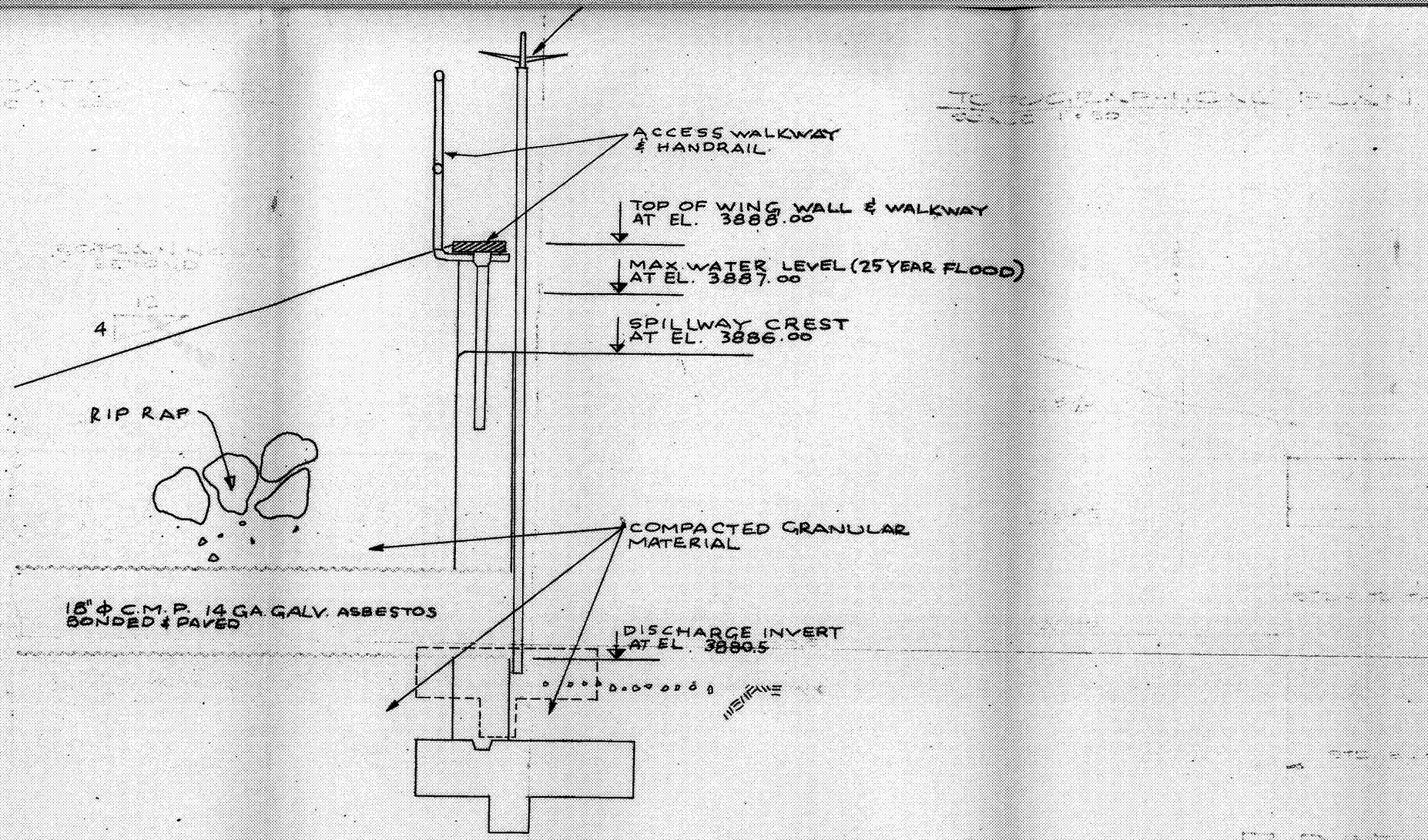
NORTH

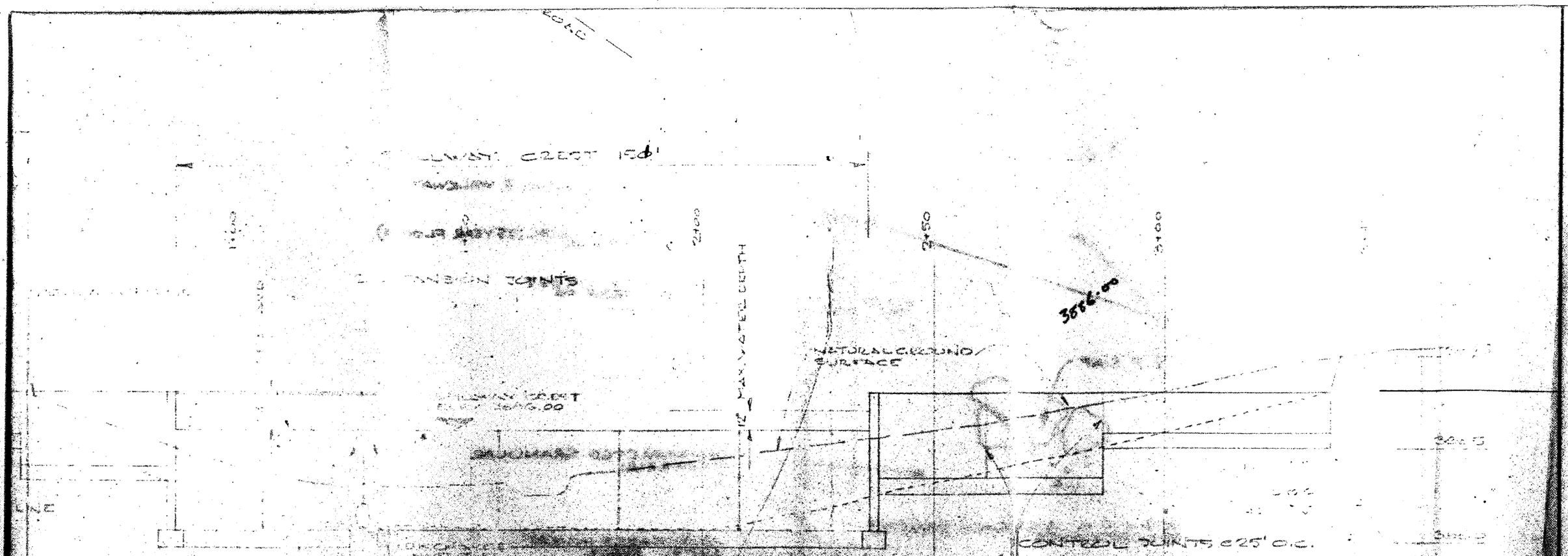
CUTE LAKE





TYP. DITCH CROSS SECTION
SCALE 1"=2'


ACCESS WALKWAY & HANDRAIL
TOP OF WING WALL & WALKWAY AT EL. 3888.00
MAX. WATER LEVEL (25 YEAR FLOOD) AT EL. 3887.00
SPILLWAY CREST AT EL. 3886.00
4
RIP RAP
COMPACTED GRANULAR MATERIAL
18" ϕ C.M.P. 14 GA. GALV. ASBESTOS BONDED & PAVED
DISCHARGE INVERT AT EL. 3880.5



A CONVERSION TO F.C.B. 1971			CD
MK	DETAIL	DATE	BY
REVISIONS			

E. KENT - V. WILSON - E. HINDSON - C.G. HOLE

R. C. WANNOP & ASSOCIATES LTD.
CONSULTING ENGINEERS, KELOWNA, B.C.

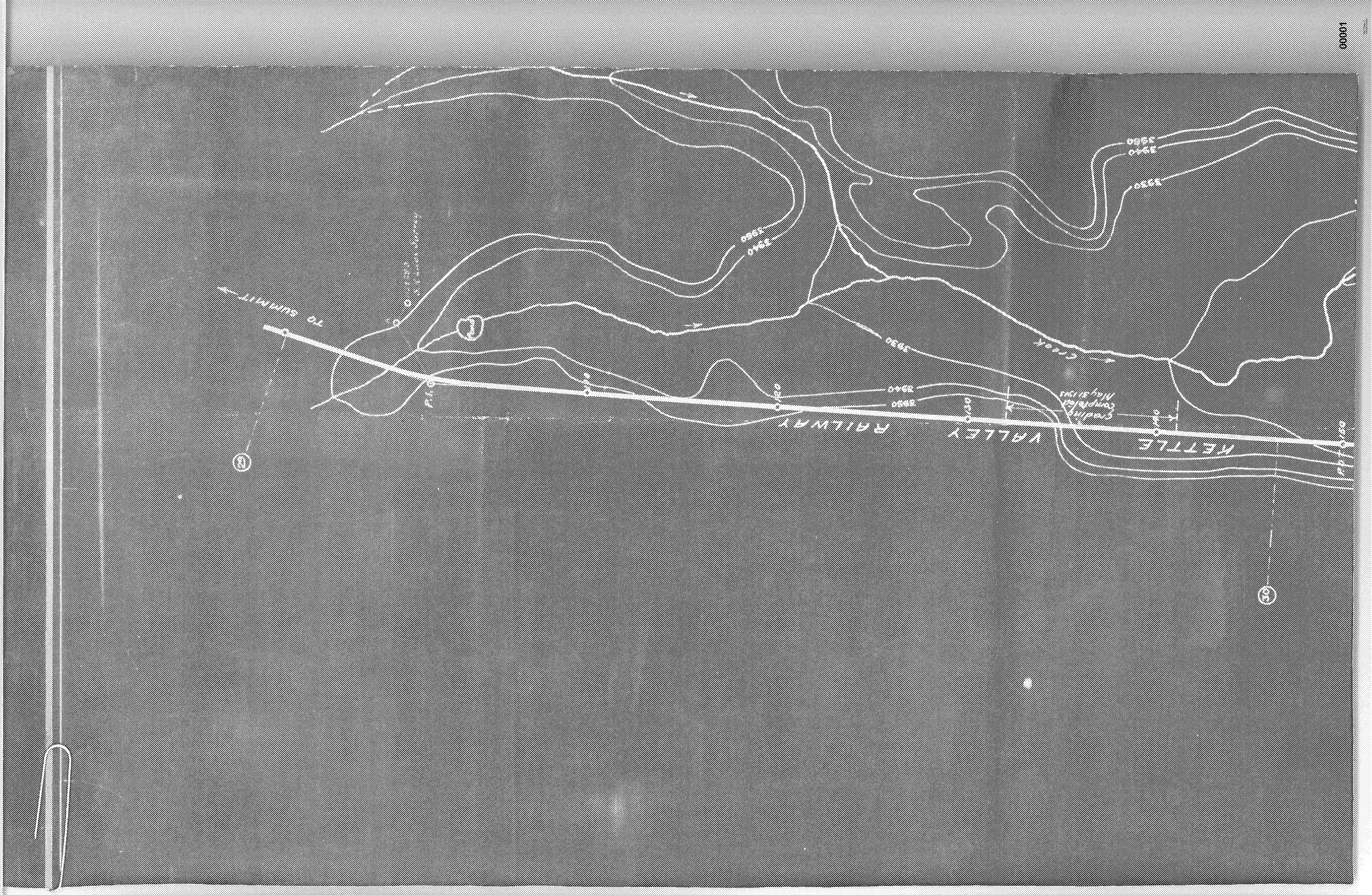
CHUTE LAKE DAM
PRELIMINARY

DATE: MAY 1971 | DRAWN: C.P.C.
SCALE: AS NOTED | CHECKED:

JUL - 7 1971

5A

00004


RAILWAY
VALLEY
METTLE
TO SUMMIT
3560
3540
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200
180
160
140
120
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80
60
40
20
0
00001

— SHOOT LAKE —

— CONTOUR PLAN —
& — PROPOSED RESERVOIR SITE —

— Scale —
400' = 1 Inch

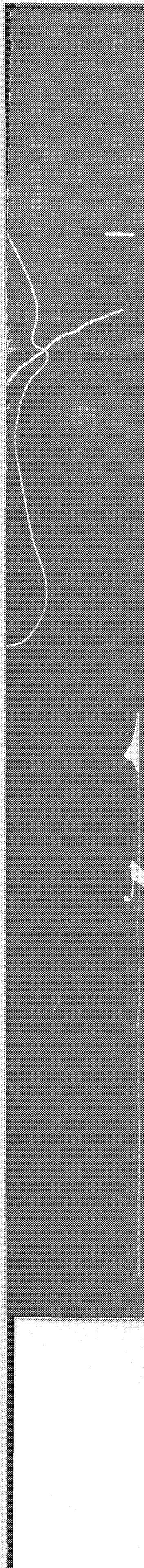


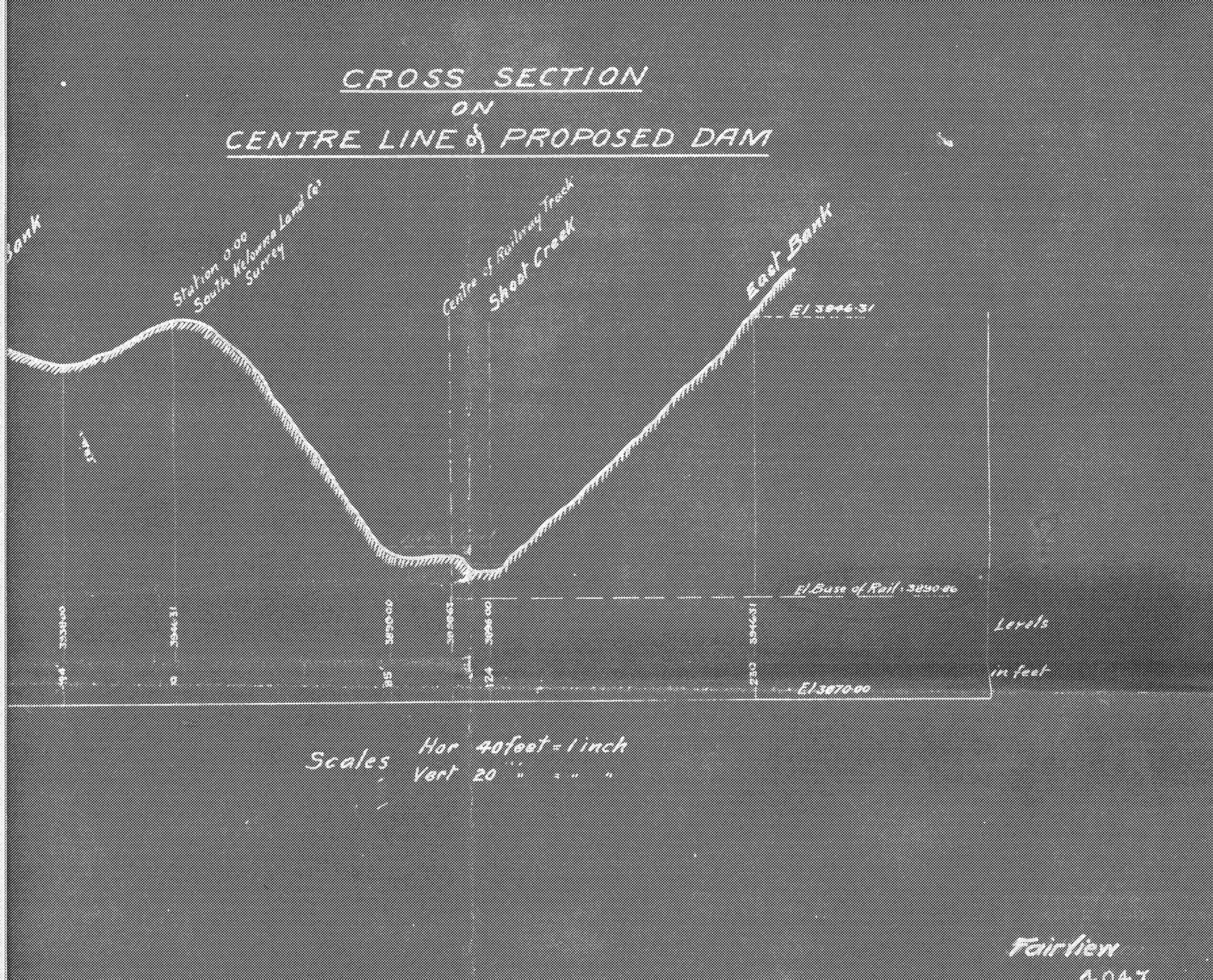
TABLE
& RESERVOIR CONTENTS

Elevation above Sea Level	Square Feet of Surface Area	Area of Contour Enclosed	Capacity of Reservoir	Capacity of Reservoir
		Square Feet	Cubic Feet	Acre Feet
3890	8.07	6821	0	0.00
3892	7.35	8916	15437	0.35
3894	6.63	10487	31860	0.73
3896	5.91	11981	49308	1.13
3898	5.21	13403	67692	1.55
3900	4.52	14750	87013	1.99
3902	3.85	16025	107270	2.46
3904	3.20	17228	128463	2.94
3906	2.58	18359	150592	3.45
3908	1.98	19418	173657	3.98
3910	1.42	20405	197658	4.53
3912	0.89	21320	222595	5.10
3914	0.41	22163	248468	5.70
3916	0.00	22934	275277	6.31
3918	0.00	23633	303022	6.95
3920	0.00	24260	331703	7.61
3922	0.00	24815	361320	8.29
3924	0.00	25298	391873	8.99
3926	0.00	25709	423362	9.72
3928	0.00	26048	455787	10.46
3930	0.00	26315	489148	11.23
3932	0.00	26510	523445	12.01
3934	0.00	26633	558678	12.82
3936	0.00	26684	594846	13.65
3938	0.00	26663	631950	14.51
3940	0.00	26570	669989	15.38
3942	0.00	26405	708963	16.27
3944	0.00	26168	748872	17.19
3946	0.00	25859	789716	18.13
3948	0.00	25478	831495	19.09
3950	0.00	25025	874208	20.07

PENTICTON PRECINCT
SIMILKAMEEN WATER DISTRICT

Accompaniment to my Report on proposed Reservoir on Shoot Lake dated June 10

CROSS SECTION
ON
CENTRE LINE & PROPOSED DAM



Scales Hor 40 feet = 1 inch
Vert 20 " = " "

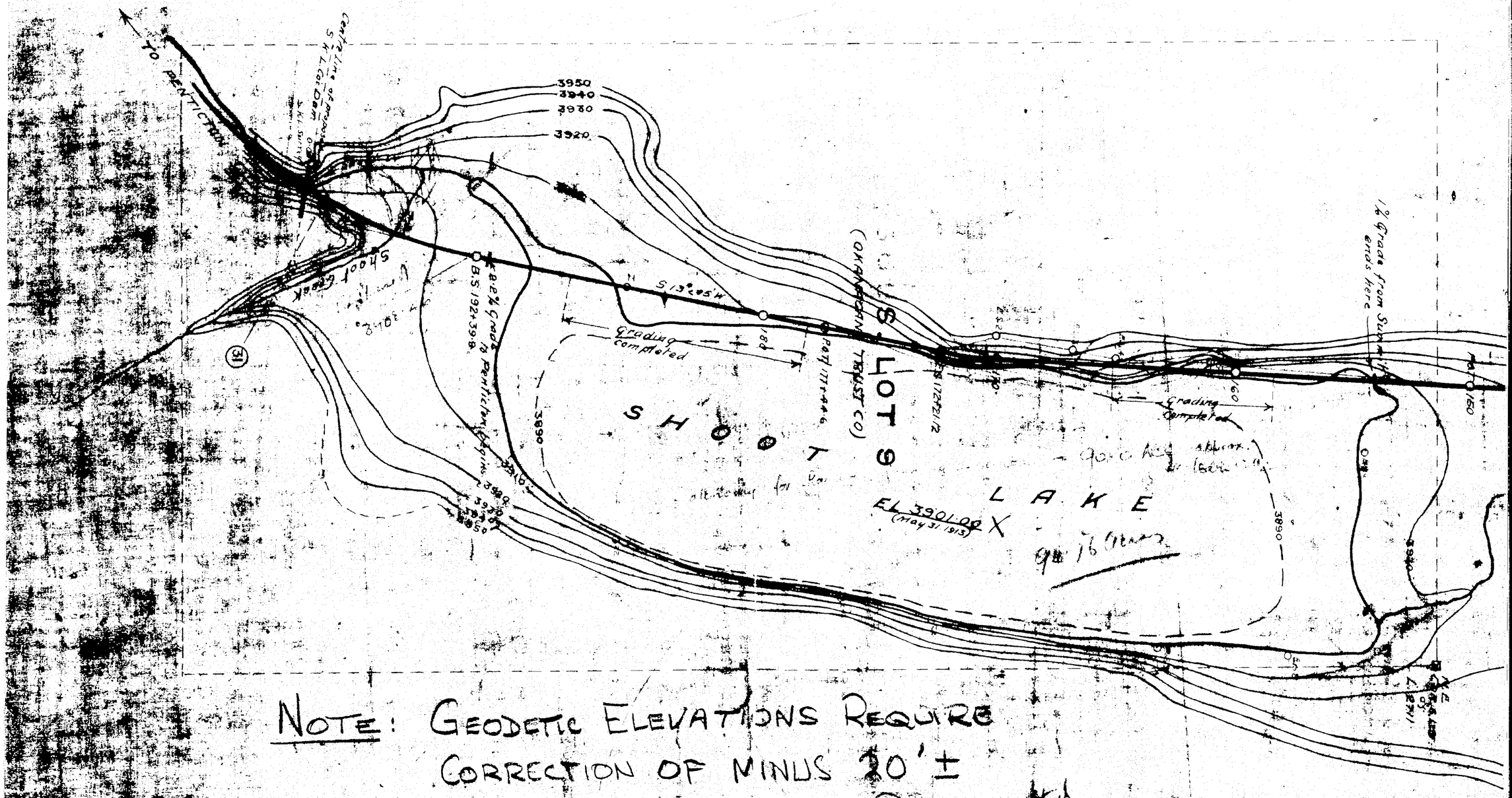
Fairview
4047
T38

This plan has been made from The South Kelowna Land Co Survey of Shorts Creek, The Kettle Valley Railway Co Right of Way Plan & Survey made by me

Kelowna, B.C.
June 10th 1913.

P. Rattenbury
Engr
Water Rights Branch
Dept of Lands

00004



NOTE: GEODETIC ELEVATIONS REQUIRE CORRECTION OF MINUS 10' ±

Logic suggests B-L ft. obtained by
Oh, Hell to it. No Notes. Hanger
Mch. 8/29

Scale 400ft = 1 Inch

30

145+396

3950

3930

3940

S 55° 05' W

140

Grading completed

130

120

110

100

90

80

70

TO SUMM

Creek

3930

3940

3950

3940

3930

3940

3950

O. J. D. Normington

Naramata June 1913.

00002