C.A.M.C.
ROSE CREEK DAM INVESTIGATION
OPERATIONS REPORT

B. Berzins
H.E. McRae
1985-11-15

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ROSE CREEK DAM INVESTIGATION

OPERATIONS REPORT

Background

In August of 1984, the Frontier Engineering Group prepared a preliminary engineering plan and cost estimate for the raising of the Rose Creek Dam at Faro, Y.T., in order to improve the economics of the Cyprus Anvil Mine. By the summer of 1985, pursuant to the sale of the property, it was deemed necessary to establish the feasibility of raising the Rose Creek Dam some 20 feet to increase freshwater storage capacity. In order to assess the current state of the existing dam and to gain first-hand knowledge of the engineering properties of the earth-fill structure, a limited exploration program was undertaken. This report briefly summarizes the results of that program.

Program Objectives

In light of schedule and budget constraints, the focus of the program was directed toward defining the following areas of concern:

1. Establish the nature of the materials used to construct the existing dam, and define their engineering properties.
2. Examine the foundation materials in the "seepage window" under the dam and assess the hydraulic performance of these materials.
3. Determine the phreatic level within the structure, as an indirect method of assessing Zone 3 material properties.
4. Assess abutment rock quality and permeability in the area of the proposed spillway relocation.
5. Establish the relationship between the elevation datum for the dam and regional survey network.
6. Locate and evaluate potential impervious borrow sources.

In order to achieve these objectives as efficiently as possible, the field program was laid out as follows:

1. Establish a transverse section through the maximum height section of the dam by drilling holes at the crest, on top of the rockfill toe berm, and in the foundation downstream of the dam. Take representative samples of all materials encountered, and install standpipe piezometers to monitor phreatic levels.

2. Establish a transverse section through the maximum overburden thickness section of the dam by the methods described above. Install a thermistor string in the crest borehole to monitor frost penetration over the winter period.

3. Drill at least one hole in rock on the north or south abutment to establish rock quality and pressure test to establish permeabilty.

4. Extend the dam centerline profile up both abutments and confirm bedrock depth with test pits if necessary.

5. Survey the elevation of the spillway structure, boreholes, and abutment grades.

6. Test pit in the area of the existing impervious borrow pit adjacent to the C.I.L. plant to confirm the presence of additional till borrow.

Program Team

Midnight Sun Drilling Co. Ltd. of Whitehorse Y.T. was selected as drilling contractor and provided an ATV-mounted CME-750 drill complete with solid and hollow-stem augers, rock coring equipment, and all associated sampling tools and consumables. Inspection and supervision services were provided by Dome Petroleum Limited geotechnical staff, in cooperation with a representative of Acres Consulting Services, Niagara Falls, Ontario. Personnel and equipment were mobilized to Faro, Yukon Territory on Monday, September 9 and the sampling program was initiated on September 10.

Program

Borehole 85-1, located on the foundation materials downstream of the maximum height section (see attached location plan and sections), was drilled with hollow-stem auger to hard refusal on assumed bedrock at a depth of 21.8 feet. For details of materials encountered and samples obtained, see attached graphic log. Upon completion, a standpipe piezometer was installed to the full depth of the hole, but appreciable artesion flow in the hole made auger removal and peltonite placement very difficult, and only a partial seal was achieved around the piezometer tubing. The piezometer pipe was extended to a height of 7.5 feet above ground surface, and a trickle flow was noted over the top of the pipe at this height.

On September 11, Borehole 85-2 was collared at the location shown on the attached plan, in order to sample the Zone 2 material of the dam shell, and investigate the phreatic level in the foundation "seepage window." Test pitting prior to drilling (see attached log) indicated that the Zone 2 material was dry to at least six feet depth, but significant moisture was noted at 15 feet depth. During driving of the last sample, at 19.8 feet depth, an artesian flow of about 1 gpm was noted from the foundation materials. Attempts were made to control the flow with bentonite mud, but the artesian continuously bailed the hole. It was decided to terminate the hole in order to prevent piping of shell material into the rockfill toe berm. The hollow-stem augers were removed and a galvanized grout pipe was installed to a depth of some 12 feet. When artesian was noted from the grout nipple, a P.V.C. standpipe was installed in the galvanized pipe and extended to a height of 6.5 feet above ground surface.

In light of the problems encountered in 85-2, it was decided to move on to Section B-B^1 and drill only to the water table with solid shaft auger at a location on the toe berm similar to 85-2. This was accomplished in the afternoon of September 11, and Borehole 85-3 was advanced to a total depth of 13.1 feet. Upon completion, a standpipe piezometer was installed to a depth of 12 feet. Due to poor trafficability downstream of the dam on Section B-B^1, a borehole at the west end of that section was deferred until a rockfill pad could be constructed for drill access.

On September 12, the rig was moved to the crest of the dam and commenced drilling Borehole 85-4 on Section A-A'. This hole was drilled with an HW casing advancer and Revert drilling medium to a depth of 31.8 feet, where the casing refused on a boulder. Sampling was commenced below the crest rockfill and was carried out at 5 foot intervals in Zones 1 and 3 material. Upon completion on September 13, a standpipe piezometer was installed to full depth and the installation was completed by a steel protective cap.

Borehole 85-5 on Section B-B' was collared on September 13 and drilled to refusal on a boulder at a depth of 37.5 feet on September 15. Slow progress in the hole, due mainly to the presence of boulders in Zone 3 and an inappropriate casing bit design, led to a decision to install both a standpipe piezometer and a thermistor string in the single borehole. Thermistor String No. 621 was taped to the standpipe with wooden stand-offs and the piezometer installed to full depth in the hole. The hole was backfilled, sealed, and completed with a steel protective cap.

On the afternoon of September 15, the rig was moved to a rockfill drill pad at the west end of Section B-B', and Borehole 85-6 was collared. Numerous attempts were made to advance the hole with the HW casing advancer, but boulders prevented penetration below 10 feet. The rig was relocated slightly, and open hole was advanced with continuous flight auger to a depth of 20 feet where the bit refused on a boulder. Although the hole caved upon auger removal, a standpipe piezometer was installed by jetting to a depth of 18 feet. The hole was sealed with peltonite and a protective steel cap installed.

On the morning of September 16, while the drill rig was setting up to drill Borehole 85-7 on the north abutment, topographical surveys were carried out on the two dam sections and along the dam centerline up both abutments. The results of these surveys are shown on Sections A-A' through D-D', attached.

Borehole 85-7 was collared on rock on the north abutment, at about the elevation of the relocated spillway. It was originally intended to drill this hole to a depth equal to the full dam head (some 85 feet) but mechanical problems with the drill resulted in significantly reduced drilling rates. The hole was drilled (HQ-3) through competent biotite - muscovite-andalusite schist to a depth of 60.5 feet, and was terminated at this depth on September 19. Pressure tests, using a single pneumatic packer, were performed on the zones 40 to 60.5 feet and 20 to 60.5 feet. A summary log of the borehole and pressure test results are attached. Upon completion of the pressure testing, Borehole 85-7 was filled with sand-cement grout and abandoned. The drilling program was terminated at 14:00, September 19.

Post-Program

1. All samples from the drill rig and test-pitting programs were delivered to the laboratory of EBA, Whitehorse, to await a decision on a testing program. A list of samples and sample locations is attached.

2. Instructions were left with C.A.M.C. security staff to read all installed instruments on a semi-monthly basis, and to report the readings to the Dome geotechnical group. A sample set of readings is attached.

3. The drilling rig was de-mobilized on September 20 following drive-train repairs and the drilling of several auger holes for the installation of security gates on the mine access road.

Data Evaluation

See the attached memo from Acres Consulting Services regarding drilling program and observations.

Evaluation of Elevation Survey

The surveys of the dam, abutments and borehole elevations was completed in two stages to determine:

(1) the elevation of the spillway structure relative to the regional survey grid
(2) the elevation of boreholes and sections relative to the spillway

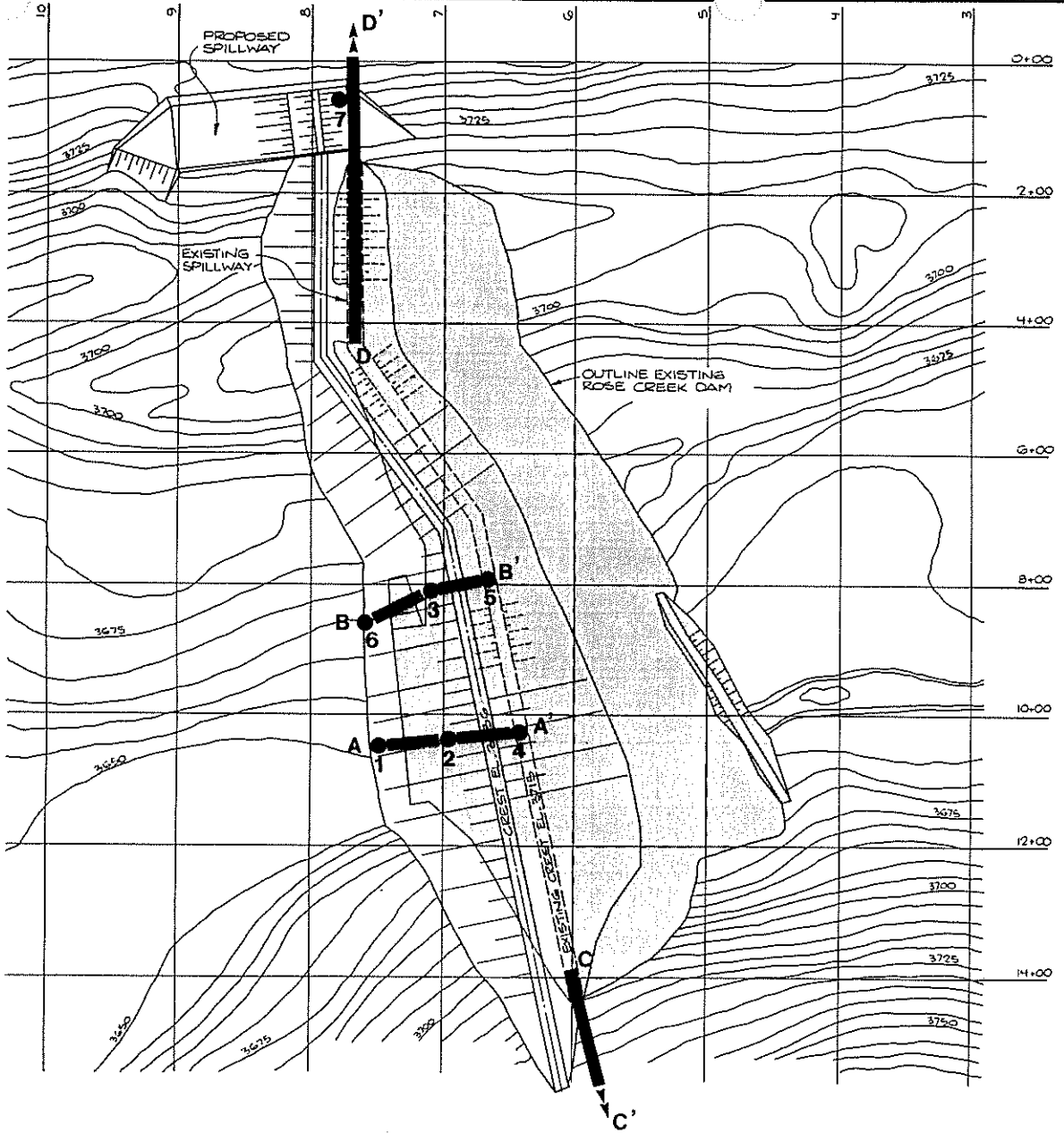
For the purpose of consistency with historical documentation, elevations reported in the attachments are based upon a spillway wingwall elevation of 3715 feet.

The first stage of the survey, however, indicated a discrepancy between the dam datum and true geodetic datum such that:

true spillway wingwall elevation ≈3606
elevation from dam datum ≈3715

This discrepancy should be satisfactorily resolved and documented such that further field work can be properly correlated.

ATTACHMENT A - LOCATION PLAN & SECTIONS



NOTES:-

1 TOPOGRAPHIC REF. DWG. Nº D1575-058-006 A

2 ALL ELEVATIONS & DIMENSIONS SHOWN ARE IMPERIAL MEASURE.

3 FOR METRIC DATUM CONVERSION, READ:-

IMPERIAL − 109.25
3.2808

LEGEND :-

- EXISTING STRUCTURE
- PROPOSED STRUCTURE
- 1985 BOREHOLE
- TOPOGRAPHIC SECTION

E DRAWINGS	REV	REVISION DESCRIPTION	BY	DATE	CHKD	APP	DOME APP
ARGED DAM-SECTION	A						

ENGINEER'S STAMP

ENGINEERING RECORD

DRAWN BY D.G.B.	DATE 84-08-07
CHKD BY H.E.M.	84-08-07
ENGINEER B.E.B.	84-08-07
DOME APP.	

CYPRUS ANVIL MINING CORP.
FARO Y.T.

PROJECT ROSE CREEK WATER STORAGE RESERVOIR DAM MOD.

PREPARED BY DOME PETROLEUM LIMITED, CALGARY, CANADA

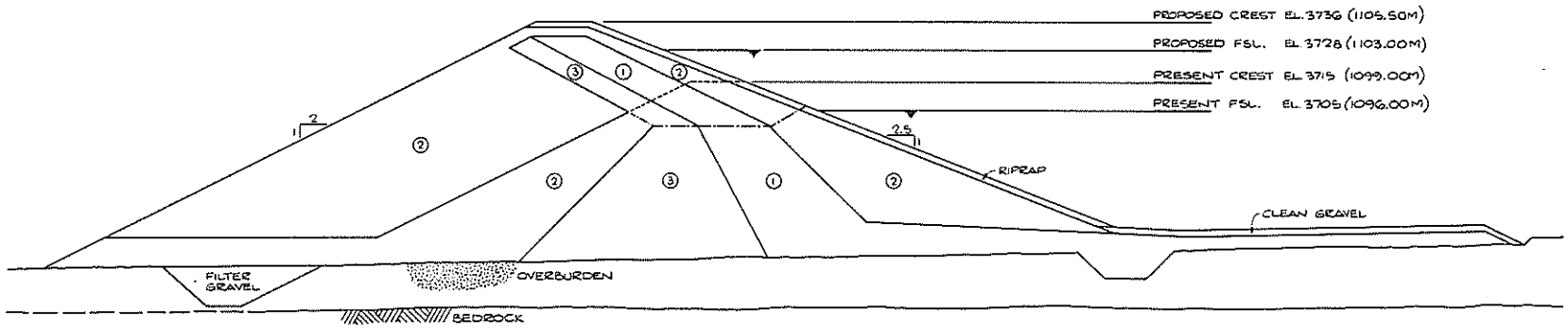
TITLE
EXISTING + ENLARGED DAM
PLAN VIEW

SCALE 1" : 100'

CONTR. DWG. NO.

DOME DWG. NO. D- FIGURE 3

REV 0



LEGEND:-
------ PRESENT CREST LEVEL
-·-·- MAX. EXCAVATION DEPTH
ZONE (1) IMPERVIOUS CORE
ZONE (2) PERVIOUS SHELL
ZONE (3) FILTER ZONE

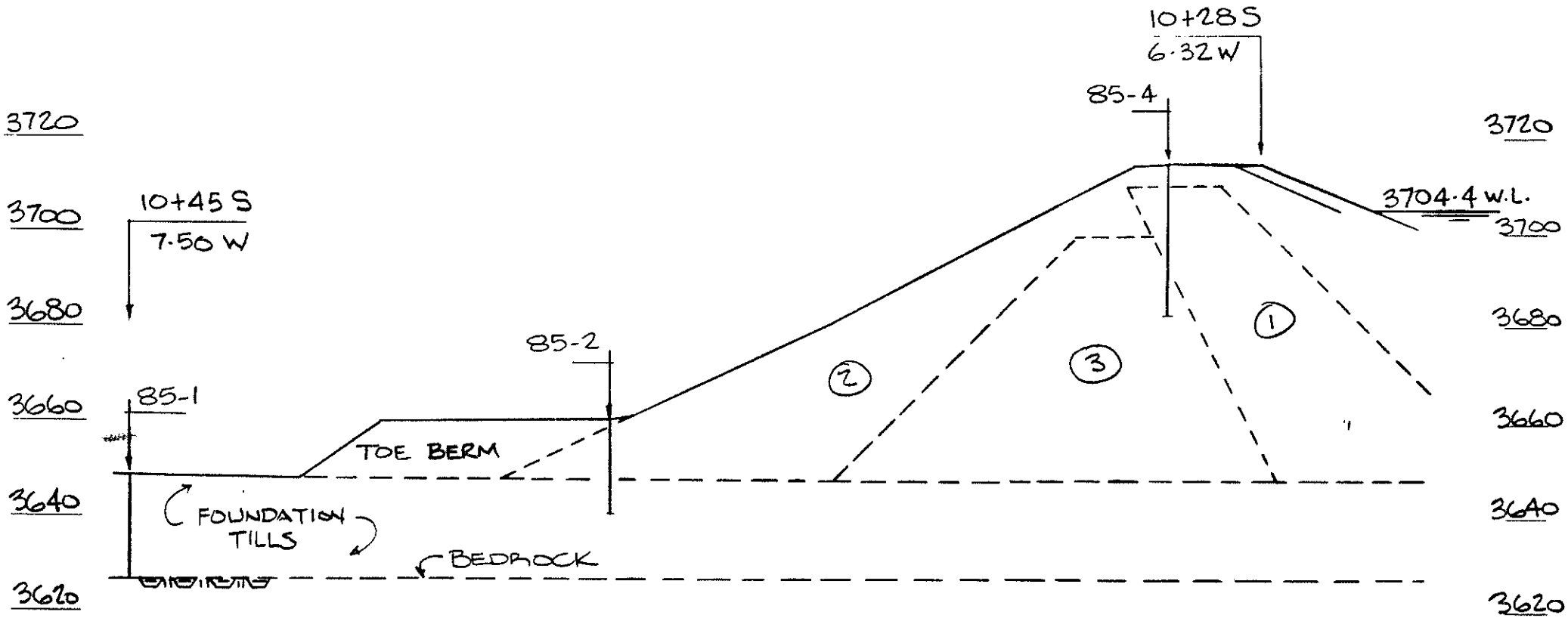
NOTES:-
1 ALL ELEVATIONS & DIMENSIONS SHOWN ARE IMPERIAL MEASURE.
2 FOR METRIC DATUM CONVERSION, READ:-
IMPERIAL - 109.25 / 3.2808

DRAWING NO.	REFERENCE DRAWINGS	REV	REVISION DESCRIPTION	BY	DATE	CHKD	APP	DOME APP.
FIGURE 3	EXISTING & ENLARGED DAM PLAN VIEW							

ENGINEER'S STAMP

ENGINEERING RECORD		
DRAWN BY	D.G.B.	DATE 84-08-07
CHKD BY	H.E.M.	84-08-07
ENGINEER	B.E.B.	84-08-07
DOME APP.		

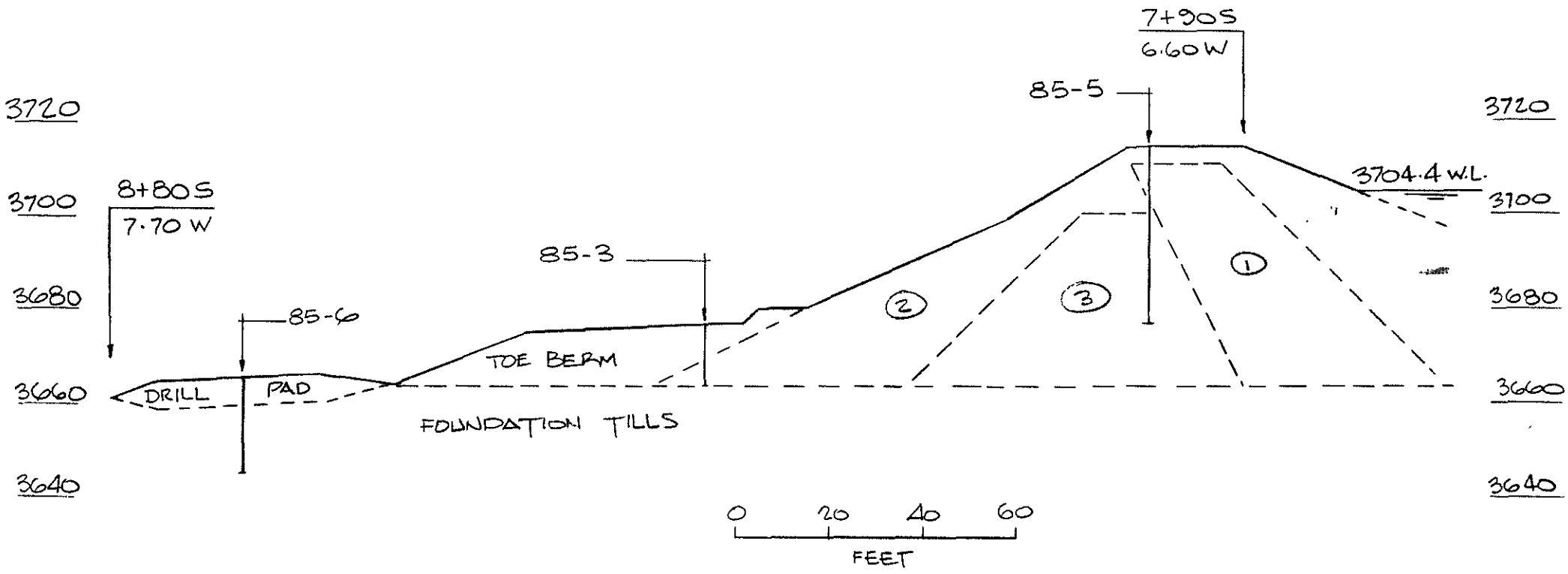
CYPRUS ANVIL MINING CORP.
FARO Y.T.
PROJECT ROSE CREEK WATER STORAGE RESERVOIR DAM MOD.
PREPARED BY DOME PETROLEUM LIMITED, CALGARY, CANADA
TITLE
EXISTING & ENLARGED DAM SECTION
SCALE 1" : 100'
CONTR. DWG. NO.
DOME DWG. NO. D- FIGURE 4
REV 0



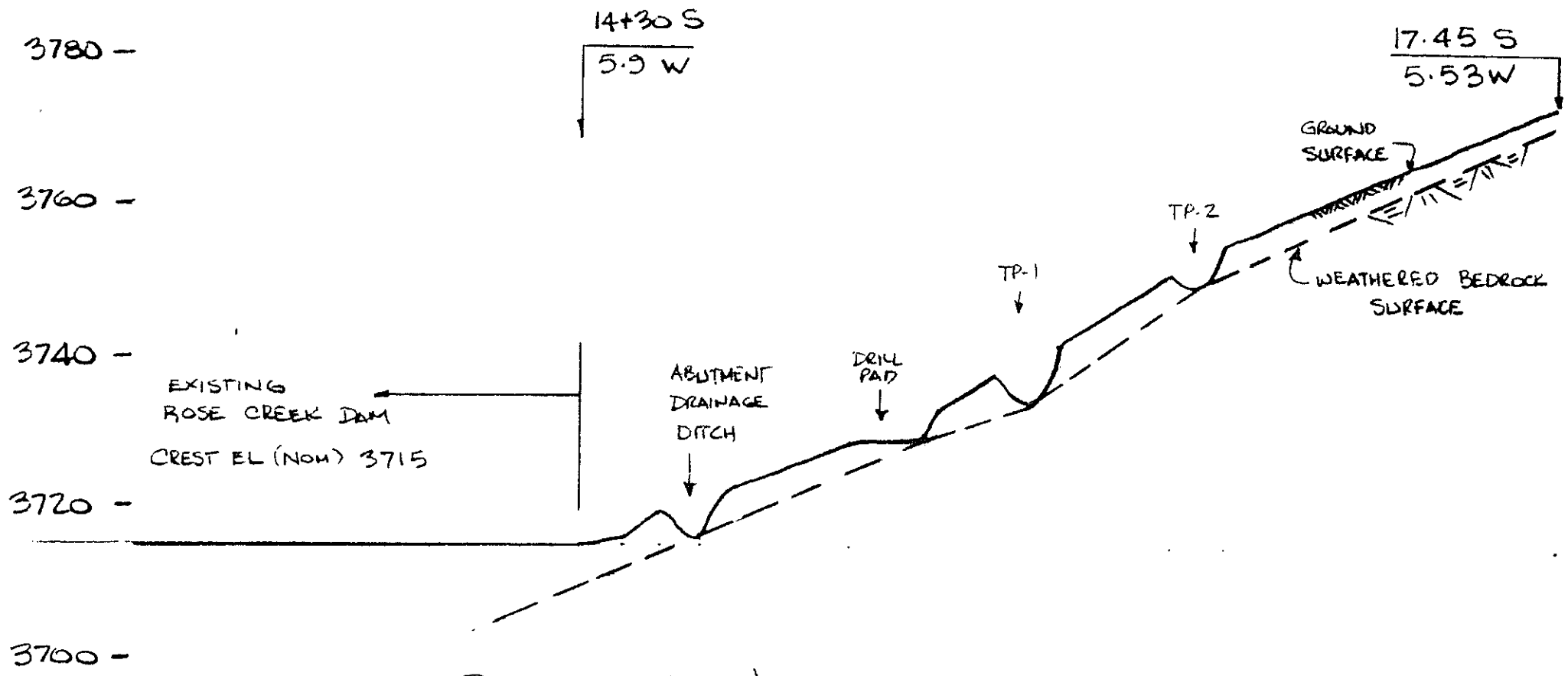
0 20 40 60

FEET

SECTION A - A'

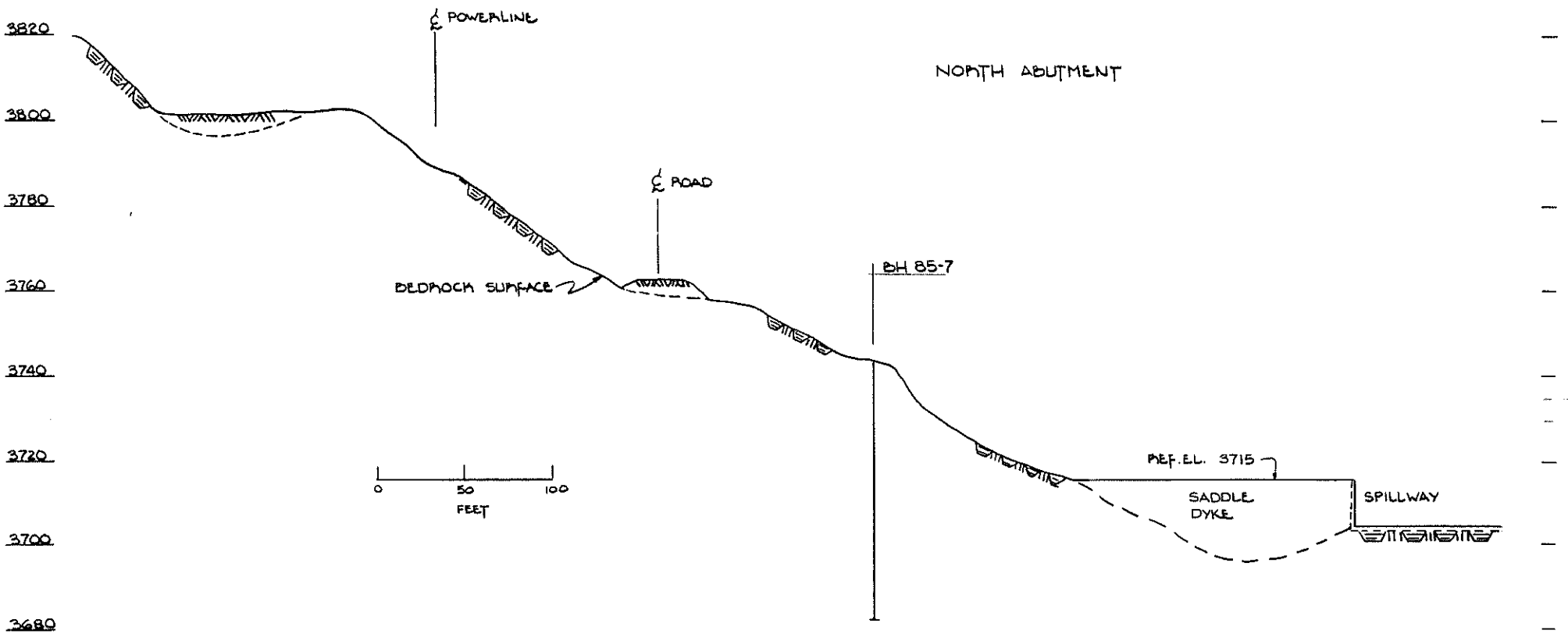

7+90S
6.60W
85-5
3720
3704.4 W.L.
3700
8+80S
7.70 W
85-3
3680
85-6
TOE BERM
2
3
1
DRILL
PAD
3660
FOUNDATION TILLS
3640
0
20
40
60
FEET

SECTION B-B'

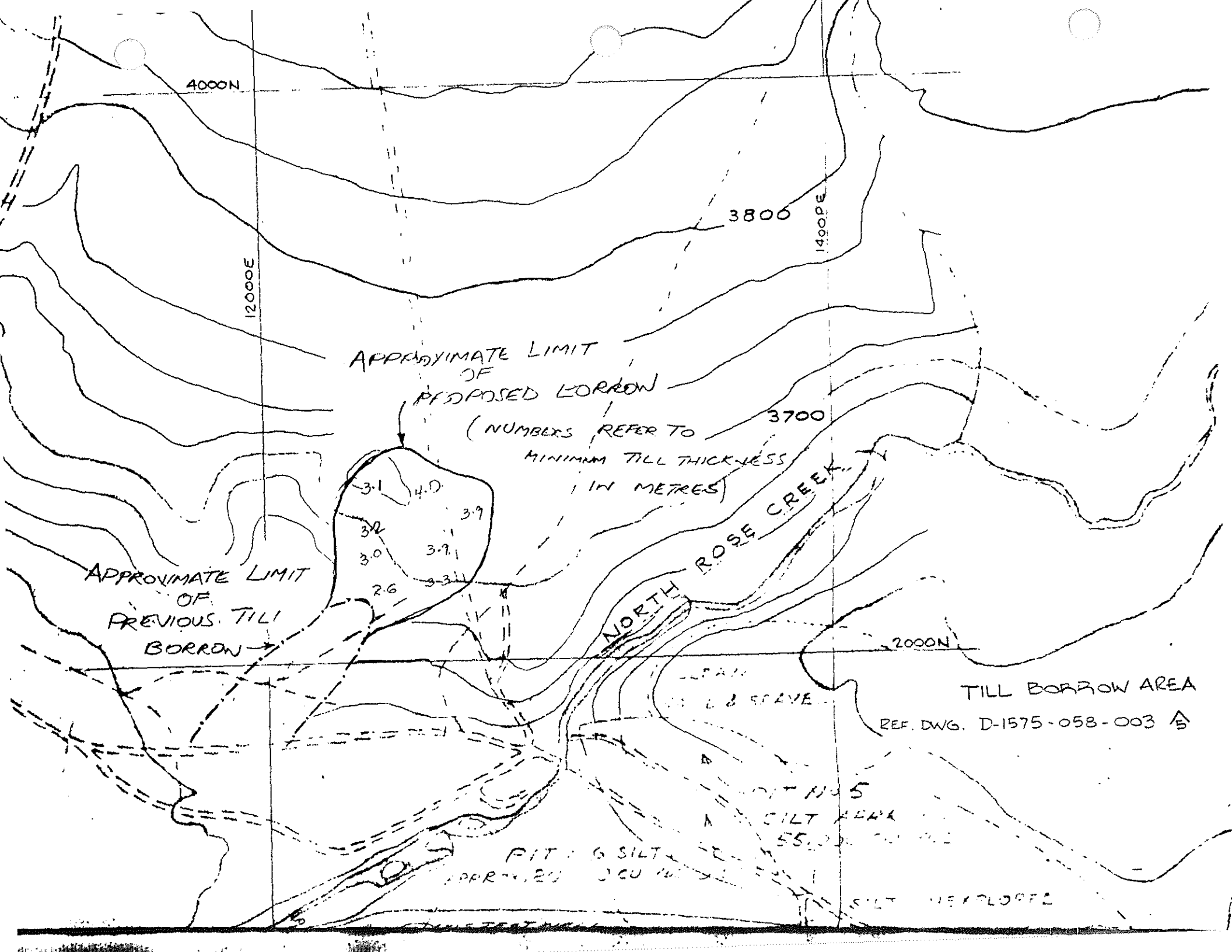


SECTION - C - C'
SCALES - 1": 50' H
1": 20' V

SOUTH ABUTMENT


3820
3800
3780
3760
3740
3720
3700
3680
℄ POWERLINE
NORTH ABUTMENT
℄ ROAD
BH 85-7
BEDROCK SURFACE
REF. EL. 3715
SADDLE DYKE
SPILLWAY
0
50
100
FEET

SECTION D-D'


4000N
3800
12000E
14000E
APPROXIMATE LIMIT OF PROPOSED BORROW
(NUMBERS REFER TO MINIMUM TILL THICKNESS IN METRES)
3700
3.1
4.0
3.9
3.2
3.0
3.9
3.1
2.6
APPROXIMATE LIMIT OF PREVIOUS TILL BORROW
NORTH ROSE CREEK
2000N
TILL BORROW AREA
REF. DWG. D-1575-058-003 5

B

ATTACHMENT B - GRAPHIC LOGS AND FIELD TEST DATA

DOME PETROLEUM LIMITED

COST CENTRE OR AFE No 09851 AB

CALCULATION SHEET

594
79-08

TITLE/PROJECT ROSE CREEK DAM INVESTIGATION

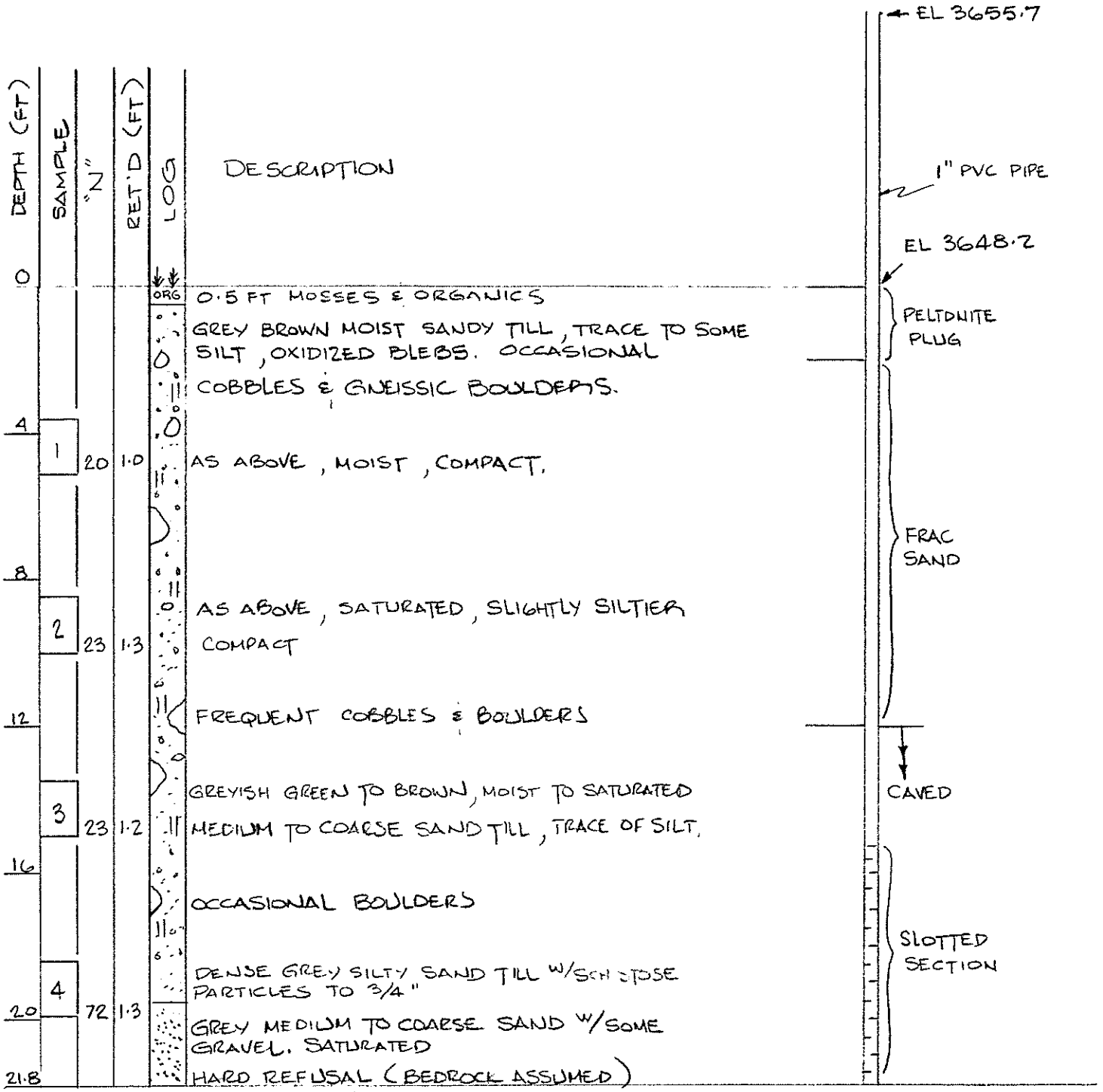
DATE 85 09 10 (YEAR MONTH DAY)

GRAPHIC LOG

BH - 85-1 (HOLLOW STEM AUGER)

PREPARED BY HEM

CHECKED BY



NOTES: ① DRILLED WITH HOLLOW STEM AUGER, SPLIT SPOON SAMPLED

② HOLE MADE WATER UPON COMPLETION WITH 3.5 FT AUGER STICKUP

③ HOLE HAS TRICKLE FLOW OVER TOP OF PVC AND SOME WEEPING AROUND THE PELTONITE PLUG. DIFFICULT TO SEAL.

DOME PETROLEUM LIMITED

COST CENTRE OR AFE No 09851 AB

CALCULATION SHEET

594
79-08

DATE 85 09 11 (YEAR MONTH DAY)

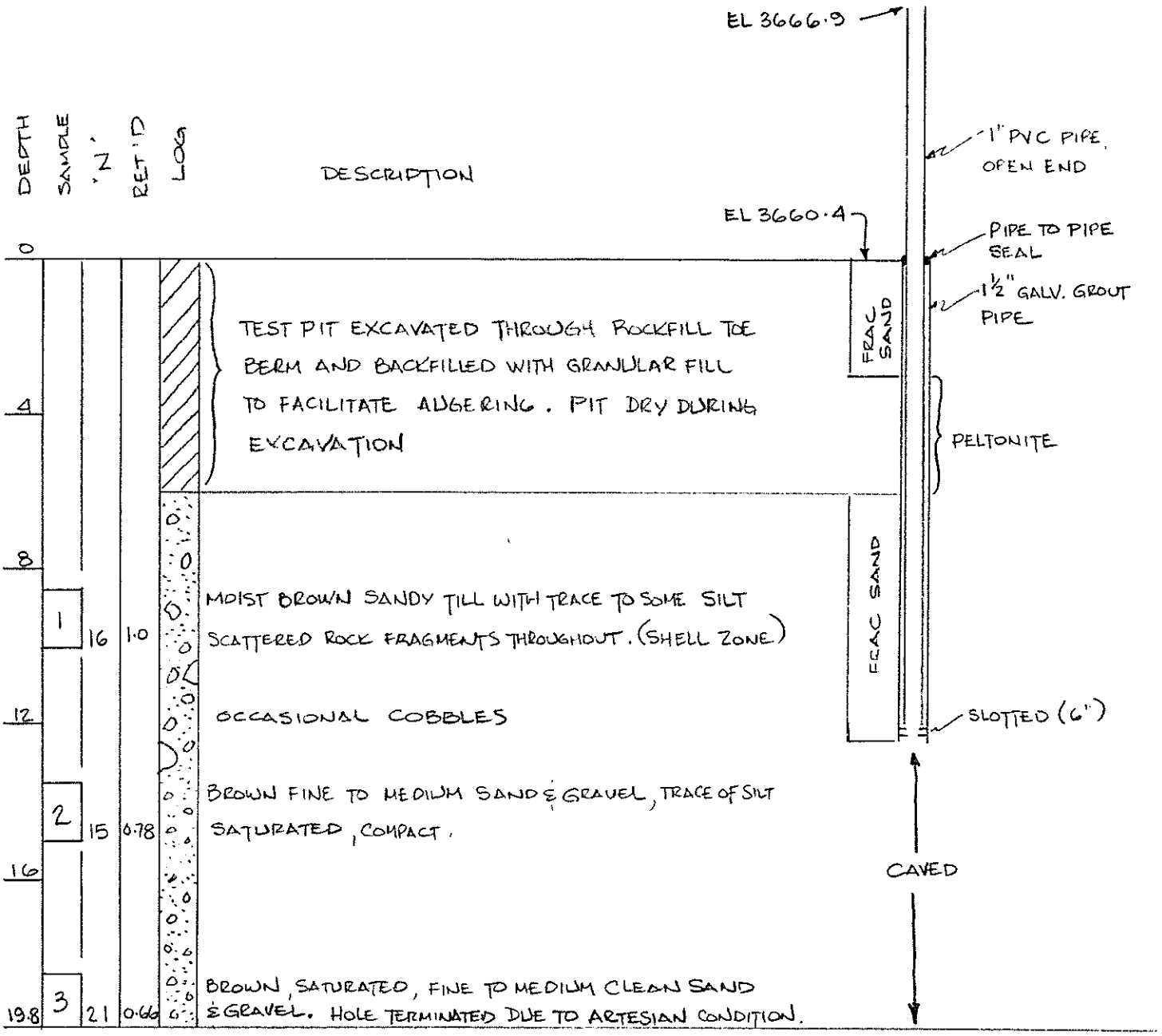
TITLE/PROJECT ROSE CREEK DAM INVESTIGATION

GRAPHIC LOG

BH - 85-2 (HOLLOW STEM AUGER)

PREPARED BY HEM

CHECKED BY



NOTES: ① HOLE FLOWED (± 1gpm) UPON COMPLETION OF SAMPLE #3.

② ATTEMPTED TO SEAL WITH BENTONITE SLURRY, BUT WATER FLOW BAILED BENTONITE FROM HOLE

③ PLACED GALVANIZED PIPE IN AUGERS PRIOR TO WITHDRAWAL, AND NOTED FLOW FROM SAME

④ BACKFILLED HOLE & PLACED PELTONITE SEAL, THEN INSERTED PVC PIPE IN GALVANIZED PIPE AND SEALED AS STANDPIPE

COST CENTRE OR AFE No 09851 AB

DOME PETROLEUM LIMITED
CALCULATION SHEET

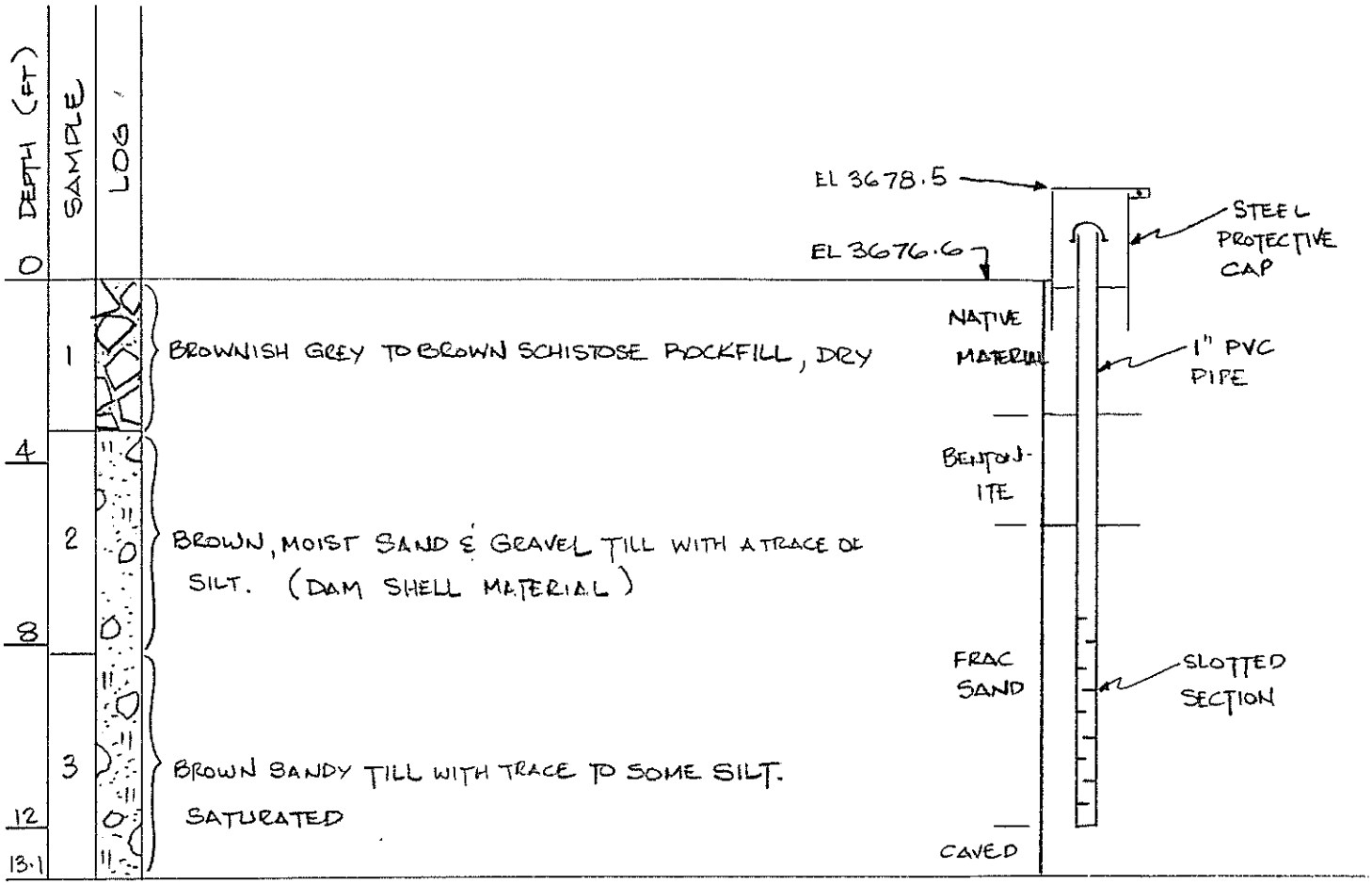
594
79 08

TITLE/PROJECT ROSE CREEK DAM INVESTIGATION
GRAPHIC LOG
BH-85-3 (6" FLIGHT AUGER)

DATE 85 09 11 (YEAR MONTH DAY)

PREPARED BY HEM

CHECKED BY



NOTES: ① HOLE DRILLED WITH SOLID AUGER TO WATER TABLE AND TERMINATED BEFORE PENETRATING TOO DEEPLY INTO PRESSURIZED FOUNDATION MATERIALS.

② 3 SAMPLES TAKEN FROM AUGER FLIGHT, ONE AT END OF EACH STROKE. THOUGHT TO BE REPRESENTATIVE OF THE ZONES INDICATED.

③ SLOTTED PIPE PIEZOMETER INSTALLED AFTER REMOVAL OF AUGER STEM. ALL READINGS REFERENCED TO TOP LIP OF STEEL PROTECTIVE CAP.

DOME PETROLEUM LIMITED

COST CENTRE OR AFE No 09851 AB

CALCULATION SHEET

594
79 08

DATE 85 09 12/13
YEAR MONTH DAY

TITLE/PROJECT ROSE CREEK DAM INVESTIGATION

GRAPHIC LOG

BH-85-4 (HW CASING ADVANCER & REVERT FLUID)

PREPARED BY HEM

CHECKED BY

DEPTH	SAMPLE	N	RET'D	LOG	DESCRIPTION
0					EL. 3716.2 — STEEL PROTECTIVE CAP; EL 3714.5 — GROUT
					COARSE ANGULAR ROCKFILL COMPRISED OF SCHISTOSE & CALC-SILICATE FRAGMENTS FROM 8" TO 20" ∅
4					BELOW 3.0 FT, ROCK IS COMPACTED IN A MATRIX OF BROWN SILTY SAND TILL WITH OCCASIONAL COBBLES — NATIVE MATERIAL
8					
	1	11	0.9		COMPACT BROWN MOIST SILTY TILL WITH SHISTOSE PARTICLES TO 1" ∅ — PELTONITE
12					OCCASIONAL COBBLES
	2	21	0.8		AS ABOVE, MOIST — 1" ∅ PVC PIPE
16					
	3	66	1.1		DENSE BROWN MOIST SILTY TILL WITH GRANITIC & CHLORITIC PARTICLES TO 1" ∅. SOME OXIDATION.
20					COBBLES SCATTERED THROUGHOUT — FRAC SAND
24	4	34	0.8		AS ABOVE, MOIST
					BOULDER 26' TO 27' — SLOTTED SECTION
28					
	5	47	0.8		MOIST BROWN SILTY TILL AS ABOVE
31.8					ADVANCE STOPPED BY BOULDER. EOH. — CAVED

DOME PETROLEUM LIMITED

COST CENTRE OR AFE No 09851 AB

CALCULATION SHEET

DATE 85 09 13/15 (YEAR MONTH DAY)

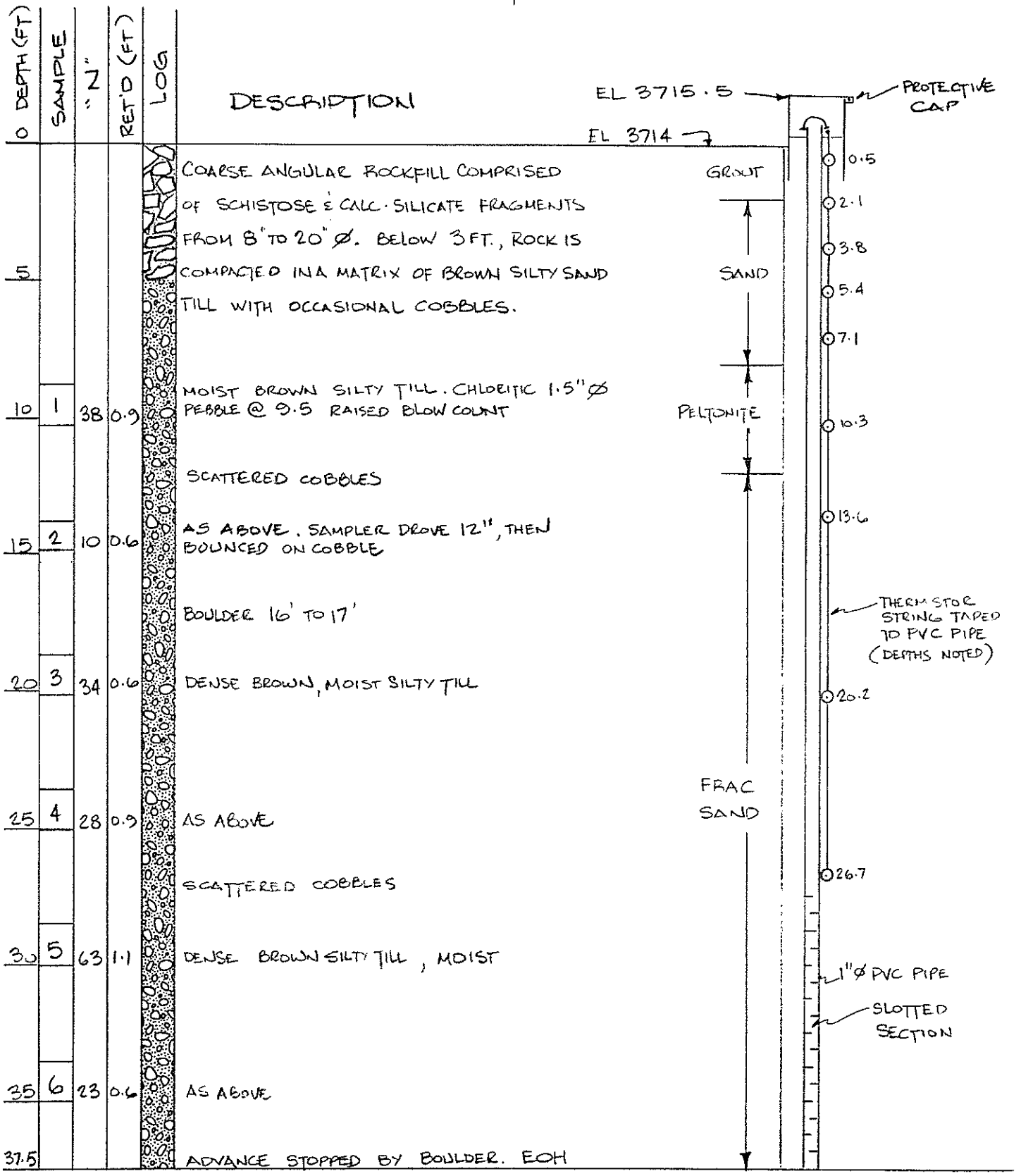
TITLE/PROJECT ROSE CREEK DAM INVESTIGATION

GRAPHIC LOG

BH-85-5 (HW CASING ADVANCER & REVERT)

PREPARED BY HEM

CHECKED BY



COST CENTRE OR AFE No. 09851 AE

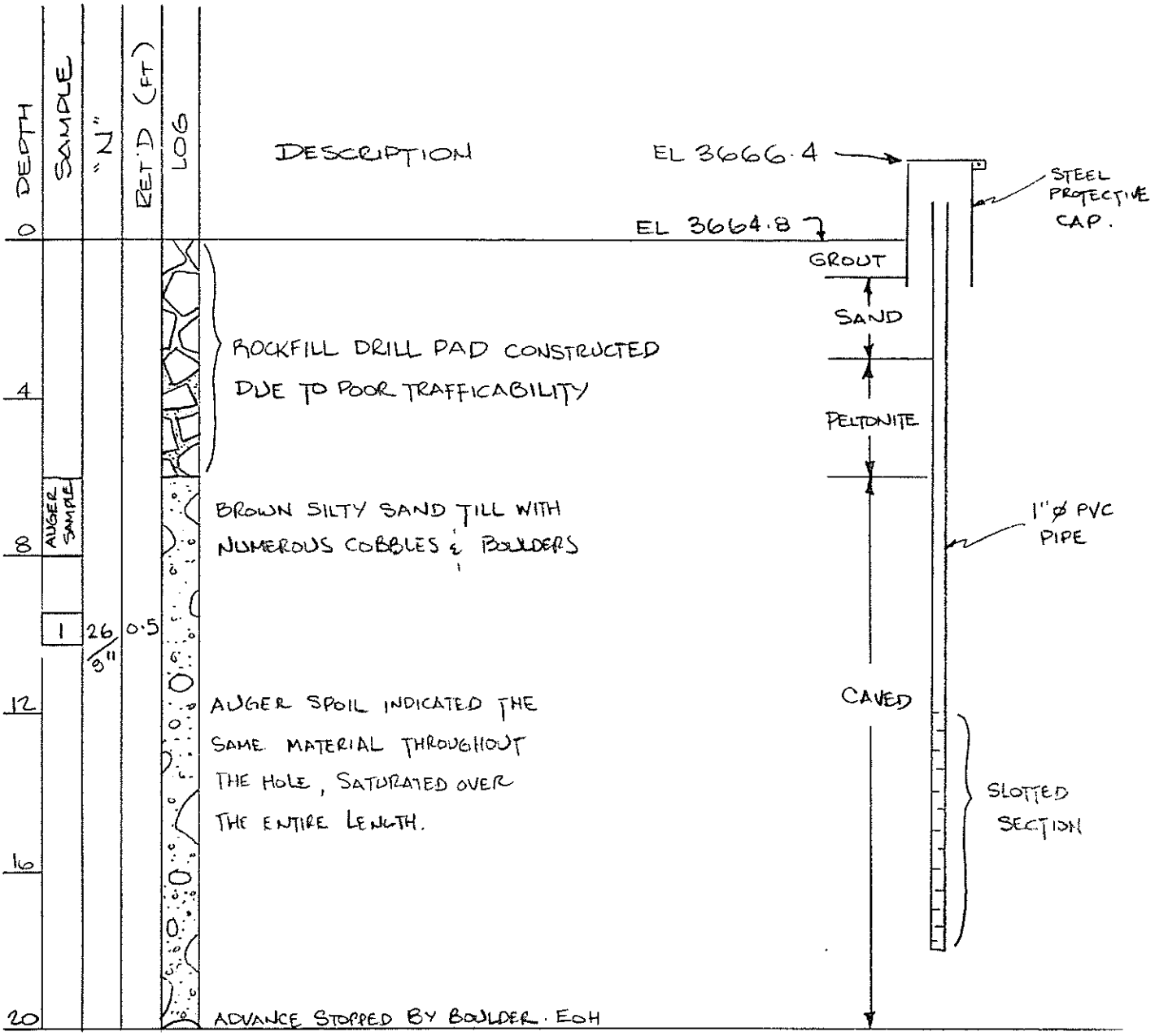
CALCULATION SHEET

DATE 85 03 15 (YEAR MONTH DAY)

TITLE/PROJECT ROSE CREEK DAM INVESTIGATION
GRAPHIC LOG
BH-85-6

PREPARED BY HEM

CHECKED BY



NOTES- ① SEVERAL ATTEMPTS WERE MADE TO ADVANCE THE HOLE WITH HW CASING ADVANCER, BUT NUMEROUS BOULDERS HINDERED PENETRATION, HOLE RELOCATED SEVERAL TIMES, AND FINALLY ADVANCED TO REFUSAL WITH 6" FLIGHT AUGER

② PIEZOMETER INSTALLED IN CAVED HOLE BY JETTING WITH REVERT.

SOIL SAMPLE SHIPMENT RECORD

CLIENT CAMC

PROJECT ROSE CREEK DAM INVESTIGATION JOB 09851 AB

DATE SHIPPED 85/09/20 SHIPMENT

DATE RECEIVED 85/09/20 CONTAINER CARD. BOX

DESCRIPTION	HOLE or PIT NO.	SAMPLE DATA			DEPTH (FT)	
		NO.	TYPE*	RET'D (IN)	FROM	TO
FOUNDATION TILL D/S OF DAM	BH-85-1	1	AS	12.6	3.6	5.1
"	"	2	"	15.7	8.5	10.0
"	"	3	"	14.9	13.5	15.0
"	"	4	"	15.7	18.4	19.9
D/S ZONE 2 MATERIAL	BH-85-2	1	"	12.2	8.5	10.0
FOUNDATION MATERIAL UNDER D/S TOE	"	2	"	9.4	13.5	15.0
"	"	3	"	7.9	18.4	19.9
TOE BERM MATERIAL	BH-85-3	1	ES	-	0.0	3.3
D/S ZONE 2 MATERIAL	"	2	"	-	3.3	8.2
"	"	3	"	-	8.2	13.1
PROBABLE ZONE 1 MATERIAL	BH-85-4	1	AS	11.0	8.8	10.3
"	"	2	"	9.8	13.8	15.3
"	"	3	"	13.0	18.7	20.2
PROBABLE ZONE 3 MATERIAL	"	4	"	10.2	23.6	25.1
"	"	5	"	9.8	28.5	30.0
PROBABLE ZONE 1 MATERIAL	BH-85-5	1	AS	11.4	8.8	10.3
PROBABLE ZONE 3 MATERIAL		2	"	7.5	13.8	14.8

*SAMPLING METHOD
A-SPLIT TUBE
B-THIN WALL TUBE
C-PISTON SAMPLER
D-CORE BARREL
E-AUGER
F-WASH
G-SHOVEL
H-CARVED BLOCK

*SHIPPING CONTAINER
N-INSERT
O-TUBE
P-WATER CONTENT TIN
Q-GLASS JAR
R-CLOTH BAG
S-PLASTIC BAG
T-METAL CAN
U-WOODEN BOX

CARRIER & ROUTE DELIVERED BY HAND TO EBA - WHITEHORSE

SHIPPED BY BEB & HEM

INSTRUCTIONS: 1. Fill out a separate record sheet for samples in each container.

2. One copy to accompany container, one copy to be mailed to the Geotechnical Engineer, and one copy to be retained at the site.

DOME

SOIL SAMPLE SHIPMENT RECORD

CLIENT _____

PROJECT _____ JOB _____

DATE SHIPPED _____ SHIPMENT _____

DATE RECEIVED _____ CONTAINER _____

DESCRIPTION	HOLE or PIT NO.	SAMPLE DATA			DEPTH (FT)	
		NO.	TYPE*	RET'D (IN)	FROM	TO
PROBABLE ZONE 3 MATERIAL	BH 85-5	3	AS	7.5	18.7	20.2
"	"	4	"	11.8	23.6	25.1
"	"	5	"	12.9	28.5	30.0
"	"	6	"	7.9	33.5	35.0
FOUNDATION TILL D/S OF DAM	BH-85-6	-	ES	-	6.0	8.0
"	"	1	AS	7.2	9.0	10.25
IMPERVIOUS BORROW AREA	TP-10	1	GS	-	0.5	8.5
"	TP-14	1	GS	-	0.5	12.8
"	TP-18	1	GS	-	0.5	10.0

*SAMPLING METHOD

A-SPLIT TUBE
B-THIN WALL TUBE
C-PISTON SAMPLER
D-CORE BARREL
E-AUGER
F-WASH
G-SHOVEL
H-CARVED BLOCK

*SHIPPING CONTAINER

N-INSERT
O-TUBE
P-WATER CONTENT TIN
Q-GLASS JAR
R-CLOTH BAG
S-PLASTIC BAG
T-METAL CAN
U-WOODEN BOX

CARRIER & ROUTE _____

SHIPPED BY _____

INSTRUCTIONS: 1. Fill out a separate record sheet for samples in each container.

2. One copy to accompany container, one copy to be mailed to the Geotechnical Engineer, and one copy to be retained at the site.

Drilling Report

JOB 09851 AB
HOLE 85-7
SHEET 1 OF 1

DEPTH	ROCK TYPE	DESCRIPTION	DEPTH OF RUN	CORE REC'Y AND RQD*
0.0	Biotite/ Muscovite/ Andalusite Schist (Unit 1-D)	Bluish to greenish grey, varying to pale grey near quartz intrusions. Hard and competent, with weathering restricted to joint surfaces in the upper 20 feet. Major jointing occurs along the schistosity at 30° to 60° to the core axis, and is generally tight below 20 feet depth. While no slickensides were observed, several joints showing evidence of alteration (to hydrous aluminum silicates) were observed at the following depths:	0.0-5.5	73 0*
			5.5-10.7	51 0*
			10.7-16.0	89 38*
			16.0-20.9	100 59*
		19.0 - 1/8 in. thick 32.5 - 1/2 in. thick 42.5 - 1/8 in. thick 54.0 - 1 in. thick	20.9-22.0	55 0*
			22.0-26.5	94 61*
		A secondary, discontinuous, sub-vertical joint was observed from 16 ft. to 18 ft. and from 57 to 60.5 ft. depth. This joint was open and hematite stained near surface, and reheated with calcite at depth. This joint accounted for the lowered RQD's in the last 2 runs. Jointing was distributed as follows.	26.5-31.0	93 89*
			31.0-36.0	100 92*
		Depth / No. of Joints 0-10 / >36 10-20 / 36 20-30 / 16 30-40 / 7 40-50 / 12 50-60 / 9	36.0-41.0	100 100*
			41.0-42.8	100 74*
			42.8-43.2	100 100*
		NOTE: While coring was carried out with HQ-3 equipment, mechanical problems during drilling accounted for poor recovery and re-grinding in runs 5,6&10. It would appear that most of the joints below 20 ft. depth are tight, and that some of the features noted as joints are actually machine breaks along subtle weaknesses in schistosity.	43.2-45.3	100 71*
			45.3-50.4	100 82*
			50.4-54.4	100 93*
60.5		End of Hole		
			54.4-58.9	100 37*
			59.8-60.5	100 23*

ROSE CREEK DAM INVESTIGATION
SUMMARY OF PRESSURE TESTING DATA
BH-85-7

Item	Test No. 1	Test No. 2
Hole Diameter	HQ	HQ
Length Tested (ft.)	40-60.5	20-60.5
Depth to Static WL (ft.)	4	4
Height of Gauge (ft.)	6.5	6.5
Gauge Pressure (psi)	25	20
Total Take (I gals.)	0.25	0.60
Duration of Test (min)	10	10
Unit Take (IGPM)	0.025	0.06

NOTE: Tests performed with 2 7/8" Ø pneumatic single packer at end of drilling.
Pump discharge Ø = 2.0"
Injection pipe Ø = 1.5"

Due to short length of setup and low takes, no friction loss calibration was performed.

Hole grouted with Portland/sand slurry upon completion of tests.

1985-10-10
09851AB

C

ATTACHMENT C - INSTRUMENTATION READINGS

1985-09-30
12:45
TELE. MSG.

FROM: RED EAGLES CAMC
TO: B. BERZINS

RE: HOLE READINGS

85-1 FULL
85-2 6.2 FT. ABOVE GROUND
85-3 8.3 FT.
85-4 25.0 FT.
85-5 32.0 FT.
85-6 10 INCHES

} BELOW TOP OF PROTECTIVE CAP

BEB: MR. EAGLES SAID HE WOULD CALL YOU THIS AFT. OR IF YOU HAVE ANY QUESTIONS BEFORE HE CALLS HE CAN BE REACHED AT 994-2717.

RLI

1985-10-15
13:48
TO: BEB CC: HEM

FROM: RED EAGLES (667-4806)

READINGS TAKEN ON OCTOBER 13, 1985

HOLE 81-5	FULL
-2	5.8' ABOVE GROUND
-3	7.9'
-4	24'
-5	33.3'
-6	9"

MSG. TAKEN BY RLI

1985-10-28
14:18
TO: BEB CC: HEM

FROM: RED EAGLES (667-4806)

READINGS TAKEN:

HOLE 85-1	Frozen
-2	Frozen
-3	8.5'
-4	24'
-5	33.8'
-6	Frozen

NOTE: NO FLOW ON SPILLWAY (BECAUSE FROZEN)

MSG. TAKEN BY RLI

DOME PETROLEUM LIMITED

COST CENTRE OR AFE No. 09851 AB

CALCULATION SHEET

594
79 08

DATE 85/11/12 (YEAR MONTH DAY)

TITLE/PROJECT ROSE CREEK DAM

INSTRUMENTATION READINGS.

(BY PHONE FROM RED EAGLES)

PREPARED BY HEM

CHECKED BY

W.L.'s -

85-1 - FROZEN
85-2 - FROZEN
85-3 - 8.5'
85-4 - 25.0'
85-5 - 35.2'
85-6 - FROZEN

THERMISTORS - (85-5)

DEPTH (FT)	THERM. N°	KOHMS	APPARENT TEMP °C	± ERROR TEMP °C	TRUE TEMP °C
0.5	1	7.72	+ 15.5	.03	NOT FUNCTIONING.
2.1	2	16.38	− 0.22	.02	−0.24
3.8	3	15.52	+ 0.82	.03	+0.79
5.4	4	14.92	+ 1.60	.02	+1.58
7.1	5	14.62	+ 1.90	−.02	+1.92
10.3	6	13.56	+ 3.50	−.02	+3.52
13.6	7	13.84	+ 2.95	.03	+2.92
20.2	8	13.83	+ 2.95	.02	+2.93
26.7	9	13.81	+ 3.05	−.01	+3.06

NOTE - AMBIENT AT TIME OF READING - −18°C, ∴ THERMISTOR N° 1 IS N.F.G.

D

ATTACHMENT D - ACRES CONSULTING SERV. EVALUATION

ACRES

RECEIVED
NOV - 5 1985

October 30, 1985
P7591.00

Dome Petroleum Ltd
Box 200
Calgary, Alberta
T2P 2H8

Attention: Mr. L. Evans

Gentlemen:

Rose Creek Water Supply Dam
Faro, Yukon

As per our letter of September 5, 1985, outlining our scope of work on the Rose Creek water supply dam investigations, we enclose a suggested table of contents for the site investigation report and a recommended laboratory testing program. Our Dr. A.Z. Ahmed visited the site in early September 1985 and reviewed the exploration program and advised on drilling techniques.

Also included is a preliminary report which deals, in a general way, with some aspects of the raising. It is our conclusion that raising of the Rose Creek Water Supply Dam by about 20 ft is feasible. The method of raising will ultimately depend on cost of construction, scheduling of work, and plant requirements during construction. These considerations will have to be studied in the engineering of dam raising.

We have enjoyed working with Messrs. B.E. Berzins and H.E. McRae, and look forward to serve you in the future. Please let us know if you have any questions arising from this work.

Yours very truly,

AZAE:pc

Anthony H. Tawil
Head
Geotechnical Department

Encls.

cc: J.E.Cowley

ACRES INTERNATIONAL LIMITED
5th Floor, 10201 Southport Road S.W., Calgary, Alberta T2W 4X9
Telephone 403-253-9161 Telex 03-825582
Vancouver, Winnipeg, Toronto, Burlington, Niagara Falls, Halifax, Sydney, St. John's

PRELIMINARY REPORT ON GEOTECHNICAL ASPECTS OF DAM RAISING

1 - INTRODUCTION

This report discusses some geotechnical aspects related to the raising of the Rose Creek Water Supply Dam. The findings are preliminary and are based on a brief review of available information. Further study of the final site exploration report will be necessary to consolidate the conclusions of this report.

2 - EMBANKMENT DAM AND FOUNDATIONS

The Rose Creek dam is a 65-ft high earth-fill structure composed of an upstream inclined impervious core of glacial till (Zone 1), a central section (Zone 3) of glacial till with some boulders, and possibly granular fill. The upstream and downstream dam shells (Zone 2) are composed of dirty sands and gravels (possibly lean glacial till) with slopes of 2.5H:1V and 2H:1V respectively. The dam incorporates an upstream glacial till blanket 120 ft in length and a downstream weighting berm of mine waste and rock fill. A stop-log spillway is located on the right abutment and a concrete encased steel pipe for water supply is located on the left abutment.

The dam is founded on overburden in its midsection and on bedrock at the abutments. The overburden foundation is composed of glacial till with horizons of sands and gravels, and occasional boulder pockets overlying bedrock. The bedrock is a biotite schist and is considered competent and tight.

3 - PRELIMINARY FINDINGS

The results of recent explorations have indicated that there are two separate piezometric surfaces, one within the embankment fill, the other in the overburden foundation. Piezometers installed within the Zone 3 fill have indicated high piezometric heads. It is noted that Zone 3 fill is composed of a silty till comparable in gradation to Zone 1. Thus, the central zone of the dam (Zones 1 and 3), together with the silty nature of portions of the downstream Zone 2 fill, indicate that the dam is a near-homogeneous fill embankment.

Piezometers installed in the foundation at the toe of the dam and some distance downstream have indicated extremely high piezometric heads above the existing ground surface. These piezometric heads are such that a near-perfect straight line can be traced through them

to the reservoir at the upstream end of the impervious blanket. This suggests a relatively pervious connection in the foundation. This consideration is reinforced by the presence of granular horizons in the foundation, which may have been exposed upstream of the impervious blanket.

4 - METHODS OF DAM RAISING

Based on the findings of recent site investigations, the major area to be addressed in raising the dam relates to control of foundation underseepage and the provision of internal drainage within the embankment.

The proposed raising of the dam requires that attention be given to remedial action in the foundation either by means of a total cutoff to bedrock or by the addition of pressure relief drains at the downstream toe of the dam or both. The method of raising the dam core as proposed by Dome appears feasible, however, the following is noted.

(a) Due to the geometry of the existing fill, the proposed raising scheme results in a narrow core that may crack due to settlement of the downstream shell. Widening of the base of the proposed core zone to incorporate both the existing Zone 1 and Zone 3 fill zones may be considered.

(b) A filter zone needs to be incorporated along the existing downstream slope of the dam and connected to a horizontal drainage blanket under the proposed Zone 2 fill.

(c) Foundation treatment to reduce and/or control the high piezometric heads downstream of the dam will be required. This may be accomplished by the installation of a pressure relief system or a total cutoff to bedrock or both.

A total cutoff could be constructed by means of a slurry trench at the upstream toe of the dam through the key trench in the upstream blanket. Alternatively, a new core excavated to bedrock could be constructed on the downstream side of the dam. The first alternative requires that the reservoir be drawn down during construction. The second will require an extensive dewatering program. In the event that schedule restrictions do not allow reservoir drawdown, the construction of a cutoff on the upstream side would be difficult and probably uneconomical.

(d) The new spillway that would be required as part of the proposed raising of the dam could be constructed on either the left or right abutment.

5 - CONCLUSIONS

Based on information to date, it is concluded that raising of the Rose Creek Water Supply Dam is feasible. The single most important aspect in the engineering of the dam raising is related to foundation underseepage and internal drainage of the embankment.

Several methods of raising can be considered, with the final solution dependent on costs, scheduling and plant requirements during construction.

ROSE CREEK WATER SUPPLY DAM
FARO, YUKON

DOME PETROLEUM LTD

SITE INVESTIGATIONS REPORT
PROPOSED TABLE OF CONTENTS

SUGGESTED LABORATORY TESTING PROGRAM

1) Zones 1 and 3 Fills and Overburden Foundation (Glacial Till)

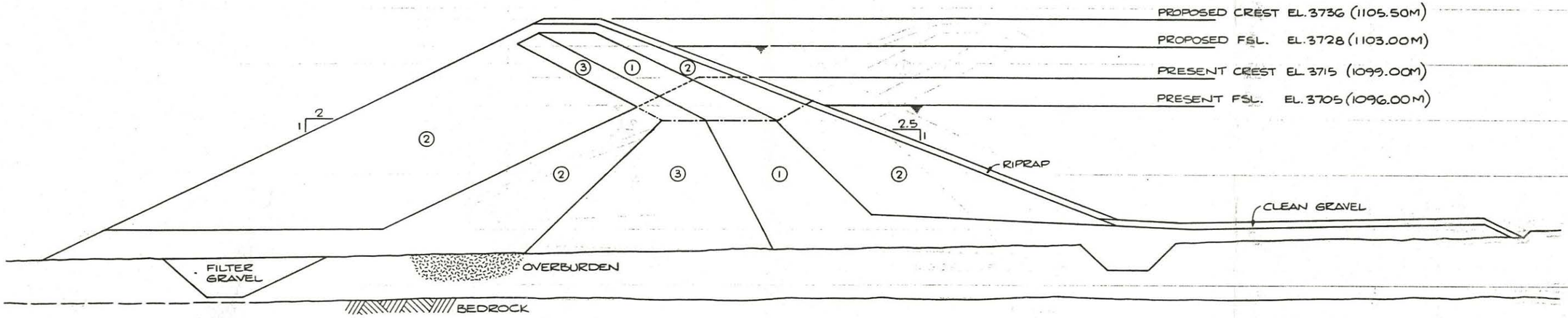
- Sieve analysis, inclusive of hydrometer
- Atterberg Limits
- Moisture content

2) Zone 2 Fill

- Sieve analysis

3) Glacial Till from Test Pits

- Sieve analysis, inclusive of hydrometer
- Atterberg Limits
- Moisture content
- Standard Proctor compaction (5-point)



LEGEND :-

------- PRESENT CREST LEVEL

-·-·- MAX. EXCAVATION DEPTH

ZONE (1) IMPERVIOUS CORE

ZONE (2) PERVIOUS SHELL

ZONE (3) FILTER ZONE

NOTES :-

1 ALL ELEVATIONS & DIMENSIONS SHOWN ARE IMPERIAL MEASURE.

2 FOR METRIC DATUM CONVERSION, READ :-

$$\frac{\text{IMPERIAL} - 109.25}{3.2808}$$

DRAWING NO.	REFERENCE DRAWINGS	REV	REVISION DESCRIPTION	BY	DATE	CHKD	APP	DOME APP
FIGURE 3	EXISTING & ENLARGED DAM PLAN VIEW	0						

ENGINEER'S STAMP

ENGINEERING RECORD		
DRAWN BY	D.G.B	DATE 84-08-07
CHKD BY	H.E.M.	84-08-07
ENGINEER	B.E.B.	84-08-07
DOME APP.		

CYPRUS ANVIL MINING CORP.
FARO Y.T.

PROJECT ROSE CREEK WATER STORAGE RESERVOIR DAM MOD.

PREPARED BY DOME PETROLEUM LIMITED, CALGARY, CANADA

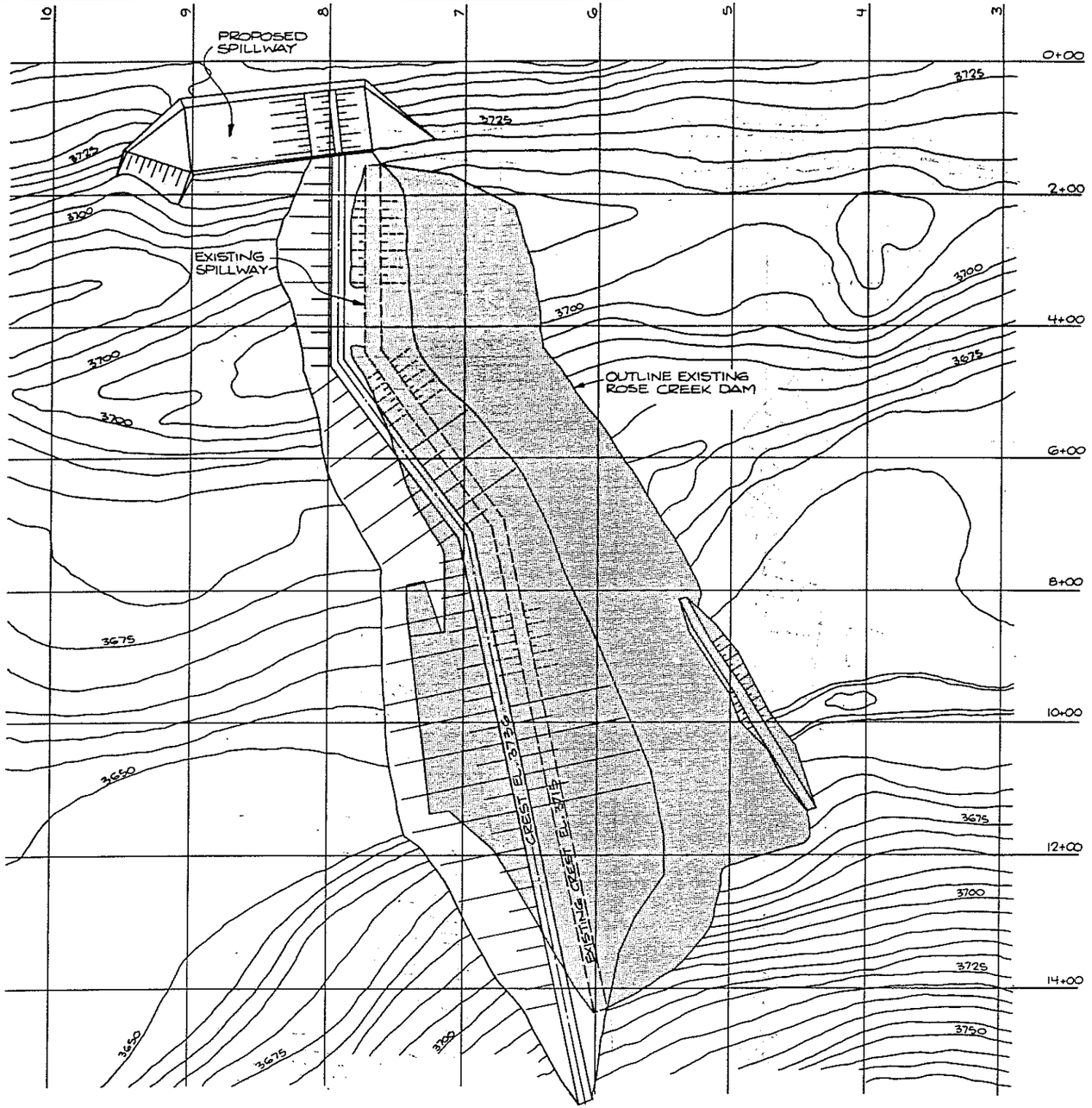
TITLE
EXISTING & ENLARGED DAM SECTION

SCALE 1" : 100'

CONTR. DWG. NO.

DOME DWG. NO. D- FIGURE 4

REV 0



NOTES:-

1 TOPOGRAPHIC REF. DWG. No. D1575-058-006 (A)

2 ALL ELEVATIONS & DIMENSIONS SHOWN ARE IMPERIAL MEASURE.

3 FOR METRIC DATUM CONVERSION, READ:-

IMPERIAL - 109.25
3.2808

LEGEND :-

EXISTING STRUCTURE

PROPOSED STRUCTURE

DRAWING NO.	REFERENCE DRAWINGS	REV	REVISION DESCRIPTION	BY	DATE	CHKD	APP	DOME APP
URE 4	EXISTING + ENLARGED DAM-SECTION							
	—							

ENGINEER'S STAMP

ENGINEERING RECORD		
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DOME APP.		

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FARO Y.T.

PROJECT ROSE CREEK WATER STORAGE RESERVOIR DAM MOD.

PREPARED BY DOME PETROLEUM LIMITED, CALGARY, CANADA

TITLE
EXISTING + ENLARGED DAM
PLAN VIEW

SCALE 1" : 100'

CONTR. DWG. NO.

DOME DWG. NO. D- FIGURE 3

REV 0