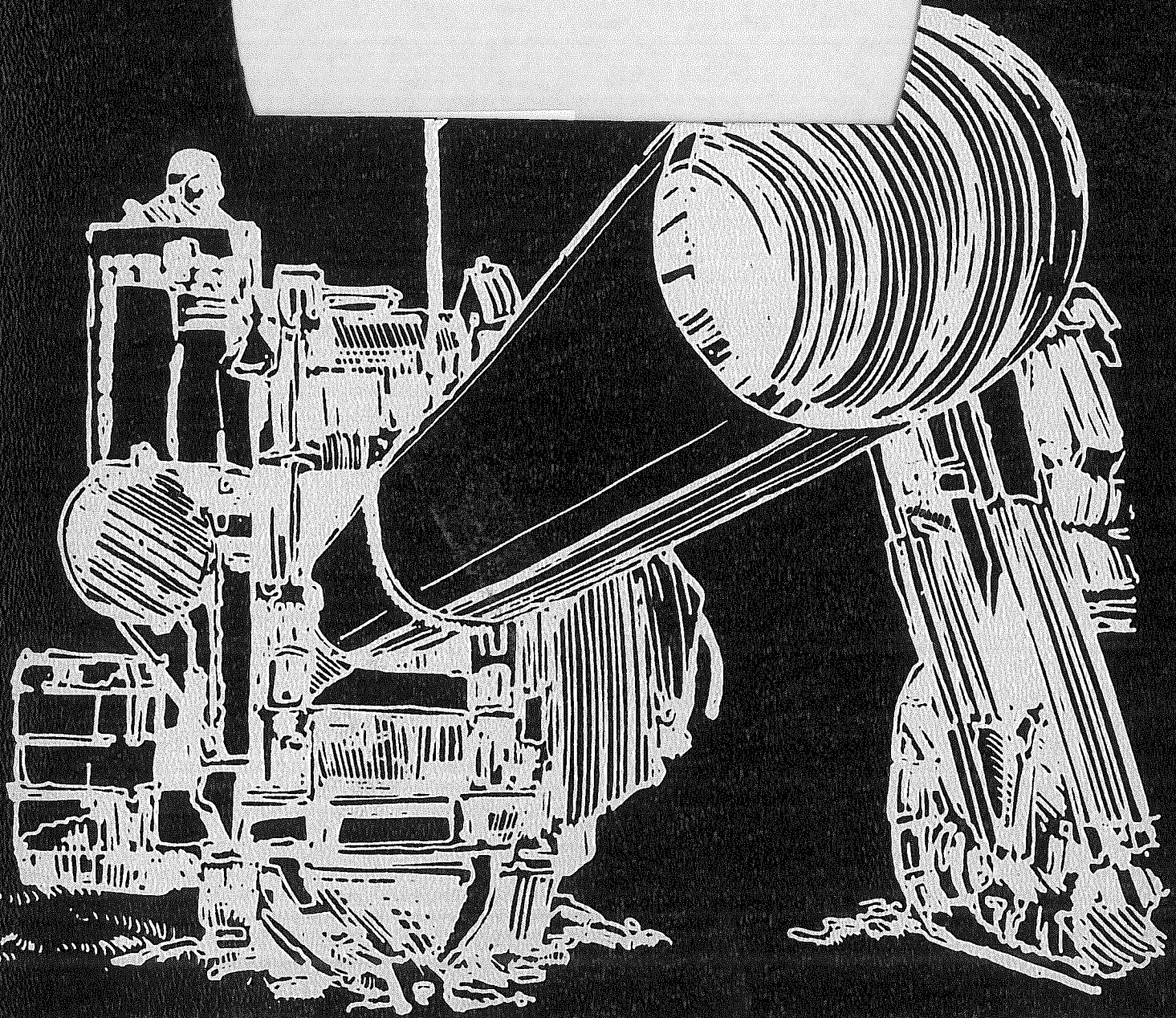


E ALASKA HIGHWAY GAS PIPELINE PROJECT SOUTH B.C. SEGMENT

HYDROSTATIC
TEST PROCEDURE MANUAL
FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.



ALBERTA NATURAL GAS COMPANY LTD

19800930-1

AGENTS FOR FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

HYDROSTATIC ⁶
TEST PROCEDURE MANUAL
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TABLE OF CONTENTS

			<u>PAGE</u>
SECTION	1	INTRODUCTION	1
SECTION	2	PIPELINE CLEANING AND GAUGING	4
SECTION	3	HYDROSTATIC STRENGTH AND LEAK TEST .	7
SECTION	4	TEST RECORDS	18
APPENDIX	I	PIPE SPECIFICATIONS AND TEST PRESSURES	23
APPENDIX	II	TEST SECTIONS	24
APPENDIX	III	TEST FORMS	26
APPENDIX	IV	TEST INSTRUMENTS	34
APPENDIX	V	PIG RUN SEQUENCE	36
DRAWINGS			37

INTRODUCTION

A. PURPOSE AND SCOPE

This manual has been prepared to establish a procedure for hydrostatically testing four prebuild sections of OWNER's 914 mm Pipeline through the southeast corner of British Columbia. This manual is supplemental to the requirements within the pipeline construction contract for Hydrostatic Strength and Leak Test.

All hydrostatic testing shall meet the requirements of Part III of the National Energy Board Act Gas Pipeline Regulations.

B. TERMINOLOGY

OWNER	Foothills Pipe Lines (South B.C.) Ltd., or its designated agents.
MANAGER	Alberta Natural Gas Company Ltd, acting as agent for OWNER and its Resident Manager, his assistants, inspectors, representatives, agents and such other staff as may from time to time be designated as such by written notice given by MANAGER to CONTRACTOR.
CONTRACTOR	The party contracting to perform the hydrostatic testing.
ANSI	American National Standards Institute.
ASTM	American Society for Testing and Materials.
CSA	Canadian Standards Association.

B. TERMINOLOGY (continued)

TEMP	temperature
°C	degrees celsius
I.D.	inside diameter
O.D.	outside diameter
W.T.	wall thickness
s	second
min	minute
h	hour
l	litre
VOL.	volume
MPa	megapascals
kPa	kilopascals
mm	millimeters
m	meters
km	kilometers

PIPELINE CLEANING AND GAUGING

A. PIPELINE CLEANING AND PRELIMINARY GAUGING

In order that the completed pipeline shall be delivered to OWNER free from foreign objects, such as sand and dirt, and defects in workmanship, a cleaning and gauging pig shall be run through the entire length of line after backfilling, and in sections no greater in length than the test sections. The pig shall be supplied and maintained by CONTRACTOR as follows:

Pig: 4 rubber batch pig, without wire brushes.

Gauging Plate: mild steel, 13 mm thick, outside diameter 860 mm.

If, in the opinion of MANAGER, all foreign material has not been removed by one running of the pipeline pig, additional runs shall be made at the CONTRACTOR's expense until MANAGER is satisfied that the pipeline is free from all foreign material. The pig, driven by compressed air, shall be propelled against a back pressure of air in order to control the movement of the pig within the pipeline. After being run the gauging plate shall be free from dents, gouges, or scars. If the gauging plate is deformed, the cause of such deformation will be located and corrected, and the pig and gauging plate shall be rerun to the satisfaction of MANAGER's test

inspector and at CONTRACTOR's expense. If the cleaning and gauging pig becomes stuck CONTRACTOR shall not increase the pressure beyond 350 kPa in an attempt to free the pig. Notwithstanding anything herein contained, it is the sole responsibility of CONTRACTOR to deliver to MANAGER a completed pipeline free from any and all foreign objects and defects in workmanship.

B. FINAL GAUGING

CONTRACTOR shall run an electronic Caliper Pig through the completed sections of the pipeline after hydrostatic testing. Running the Caliper Pig requires that a back pressure of air is maintained on the Caliper Pig as recommended by the manufacturer.

The electronic Caliper Pig shall be supplied by MANAGER, and CONTRACTOR shall demonstrate its correct performance by pulling it through a sample piece of pipe with known defects.

CONTRACTOR shall submit the chart or record of the pigging run to MANAGER. If in MANAGER's opinion the chart or record produced is inconclusive or otherwise unacceptable due to CONTRACTOR's performance, the run shall be repeated at CONTRACTOR's expense until satisfactory results are obtained.

The maximum allowable pipe defects are specified in the latest revision of the CSA Standards Z-184. Any dents which exceed a maximum depth of two (2) per cent of the pipe diameter shall be corrected. If the analysis of the

B. FINAL GAUGING (continued)

Caliper Pig survey shows indications of pipe defects exceeding these allowable limits, CONTRACTOR shall locate and correct the defects and the Caliper Pig shall be rerun to the satisfaction of MANAGER.

HYDROSTATIC STRENGTH AND LEAK TEST

A. GENERAL

The pipeline and its appurtenances shall be hydrostatically tested to prove its strength and tightness.

The hydrostatic test includes:

- (a) filling the test sections with water from the permitted sources.
- (b) adding chemicals if required, to the test water to prevent biological growth, sedimentation, and corrosion.

Note: There shall be no additives to the test medium without prior consent of the National Energy Board or its authorized representative and of any local authority concerned with disposal of the test medium.

- (c) analyzing representative samples of the test water for toxic chemicals and recording the results for MANAGER.
- (d) performing leak test, yield plot, and strength test at specified pressures, recording all test data, and the displacing and disposal of the test water.

A. GENERAL (continued)

(e) performing final methanol runs to dry line.

(f) performing Caliper Pig run.

CONTRACTOR shall be responsible for locating leaks and making necessary repairs, cleaning and drying the pipeline to the satisfaction of MANAGER following water removal and performing all tie-ins of the test sections.

All test sections designated to be hydrostatically tested shall be tested in accordance with the following paragraphs unless otherwise noted in this manual and in accordance with the National Energy Board Gas Pipeline Regulations.

B. NOTICE OF TEST COMMENCEMENT

CONTRACTOR shall keep MANAGER fully informed of its proposed test schedule in order that MANAGER may give proper notification to the National Energy Board.

MANAGER must notify the National Energy Board a minimum of seven (7) days in advance of the performance of the test. The Board shall be notified of any changes in the timing of the test by telephone or telegram as soon as such changes are known and not less than forty-eight (48) hours prior to commencement of the test.

B. NOTICE OF TEST COMMENCEMENT (continued)

MANAGER and CONTRACTOR shall also mutually notify all highway, railroad, municipal, provincial telephone, power, and all other authorities having jurisdiction in the test area, a minimum of forty-eight (48) hours prior to testing any section.

CONTRACTOR shall erect warning signs along the right-of-way at all points where there is exposed pipe or appurtenance. All persons not directly connected with the test or other of MANAGER's operations shall be kept off the pipeline right-of-way.

C. PERMITS

CONTRACTOR shall be responsible for procuring all permits for obtaining, using and disposing of water for testing purposes.

D. PIPE SPECIFICATIONS AND MAXIMUM TEST PRESSURES

The pipe specifications and maximum test pressures for the pipe utilized in this pipeline are listed in Appendix I of this manual.

E. TEST SECTIONS

CONTRACTOR shall divide the pipeline into test sections the chainage length and pipeline kilometer post locations of which are outlined in Appendix II of this manual. Test section ends shall overlap to accommodate tie-ins with tested pipe.

F. TEMPERATURE RECORDERS

Two temperature recorders shall be installed at each end of test section to monitor ground temperature at pipe depth and pipe temperatures at locations as directed by MANAGER. Temperature recorders shall be inspected at least once every six-(6) hours to ensure that the equipment is operating satisfactorily.

G. PRESSURE RECORDER

A pressure recorder shall be connected to the pipeline section being pressure tested at the same location as the deadweight tester to accurately record the pressure during the test. Pressure indicating gauges shall be installed as required. The accuracy of test instruments shall be confirmed by comparing the readings of the pressure recorder and the deadweight tester at 30 minute intervals throughout the test.

H. TEST INSTRUMENT ACCURACY

The accuracy of all test instruments shall be checked and verified, before and after all pressure tests, under the supervision of MANAGER.

I. COMMUNICATIONS

The CONTRACTOR shall ensure that adequate communication facilities are available along the test section to permit the personnel conducting the test to communicate quickly and without interference.

J. FILLING THE TEST SECTION

A 150 m slug of water shall be run ahead of the displacement pig (sphere or poly pig). This in turn will be followed by the test water. If the terrain is such that the pig might run away from the water, a back pressure of air may be required by the MANAGER.

A meter of sufficient size and accuracy shall be used to measure the quantity of fill water pumped into the pipe for any period. If water is transferred from one section to another, MANAGER may require filtering between the sections.

The water intake shall be screened and located at a depth that will not permit air or silt to be drawn in with the water.

To prevent high stresses on the pipe and riser on the test manifolds, there shall be no rigid connections between adjacent section manifolds.

Any mainline valve within a filling section must be fully opened for passage of the filler pig.

When a test section is completely filled, air shall be pressured out at the air relief valves located at section high points.

K. TEMPERATURE STABILIZATION

After the filling operation has been completed a temperature stabilization period of the test medium shall be continued until the temperature-time plot is asymptotic to the ground temperature or when the temperature of the test water is at or near the temperature of the soil along the test section.

L. HYDROSTATIC TEST

After the filling and temperature stabilizing operations have been completed blind flanges and bull plugs shall be installed on all connections that are not being utilized for pressure gauge, deadweight gauge or pump connections. Filling or draining lines shall not remain attached during the temperature stabilization or test periods. The pressure pump shall have a capacity capable of producing a pressurizing rate of approximately 40 Kilopascals per minute and shall be rated to 20,000 Kilopascals.

The test section shall be pressured to 50% of the specified minimum yield of the pipe and held at least one (1) hour to ensure that no major leaks exist.

A yield plot will be performed on each test section to monitor yielding and confirm maximum test pressure. A constant pumping rate must be maintained during the yield plot, and sufficient water shall be provided to complete the test, without stopping. The test chart for yield plot readings in Appendix 3 shall be used to record the

L. HYDROSTATIC TEST (continued)

volume of test medium injected for each 50 Kilopascals increase in pressure from 80% to 110% of the specified minimum yield of the pipe. A calculation will be done by the MANAGER to ensure that the maximum test pressure will not produce a stress in excess of 110% of SMYS at the lowest point in the test section.

The maximum test pressure shall be the lesser of:

1. That pressure corresponding to a pressure at the time when a deviation from the straight line proportionality is 0.2 percent of the volume of the section being tested.
2. That pressure corresponding to a pressure at the lowest point in the test section corresponding to a stress of 110% of SMYS based on the nominal wall thickness.

The pressuring will proceed until one of the above test pressures is reached. Under no circumstances will the pressuring continue once the yield plot has indicated that the pipe is yielding.

Notes:

- (a) Any pressure increase to the test section shall be performed during daylight hours only.

L. HYDROSTATIC TEST (continued)

- (b) The pressure shall not be increased by more than 40 Kilopascals per minute and shall only be increased at a constant pumping rate.

M. TEST ACCEPTANCE

CONTRACTOR is responsible for holding proof tests for a minimum of twenty-four (24) hours and until MANAGER declares the test "acceptable".

When the MANAGER is satisfied that a successful hydrostatic test of the pipeline section has been completed, the test result shall be communicated to the National Energy Board in support of an application for a "Leave-to-Open Order" to permit operation of the pipeline. To be declared "acceptable", the following conditions must be met during the proof test holding period.

- (i) There shall be no leaks.
- (ii) All changes in test pressure must be accounted for, and remain within $\pm 2\frac{1}{2}$ percent of the established 'on test' pressure.
- (iii) If the line pressure drops more than seventy (70) kPa during the first two (2) hours of the twenty-four (24) hours hold, the line must be repressured to 'on test' pressure and the twenty-four (24) hour hold period recommenced.

M. TEST ACCEPTANCE (continued)

- (iv) If the test pressure at the high point in the section drops below the minimum test pressure, the maximum 'on test' pressure must be re-established, and the twenty-four (24) hour test restarted.
- (v) Upon commencement of the twenty-four (24) hour hold period, 'bleeding off' or 'repressuring' to maintain test pressure within limits must be authorized by MANAGER. If pressure is bled down, the volume of water removed must be measured to an accuracy of + 2 litres and noted on the pressure chart. If the line is repressured, the volume of water added to the section must be measured to an accuracy of + 2 litres and noted on the pressure chart. The test section must then be allowed to stabilize for at least one (1) hour, and the twenty-four (24) hour hold period recommenced.
- (vi) Deadweight pressure readings must be taken every thirty (30) minutes throughout the duration of the twenty-four (24) hour hold period.
- (vii) Temperature and pressure chart recorders must be operational throughout the hold period.

N. FAILURES

In the event of a failure during testing, CONTRACTOR shall, under the supervision of MANAGER, complete the pipe failure report in Appendix 3. If the failure is in the seam of the pipe, the entire joint in which the seam

N. FAILURES (continued)

failure exists shall be removed from the pipeline. CONTRACTOR shall remove a minimum of one pipe diameter from each side of a failure. The piece(s) removed shall be marked for orientation with respect to the position in the pipeline and with the approximate chainage location of the failure. CONTRACTOR shall not cut on or damage the failed edge of the pipe during removal, transit or unloading at the storage location. If the failed portion is too long for transport or handling, it may be cut at right angles to the failure edge. All portions are to be retained. After repair of a pipeline failure, the section of pipe shall be re-tested.

O. PIPELINE DEWATERING

After completion of the hydrostatic strength and leak test, the pressure may be bled either into another section to be tested or to atmosphere. When water is discharged from the pipeline to ground or directly into a water course, CONTRACTOR shall at MANAGER's discretion, provide the equivalent of a 100 mesh screen for filtering the water, and if an appreciable concentration of rust particles or colour is evident, CONTRACTOR shall temporarily impound the test water behind straw bales to provide additional filtering.

All pipeline valves shall be left in the fully open position for passing of displacement pigs.

O. PIPELINE DEWATERING (continued)

After displacing the water, an additional poly pig will be run through the section pushed by air until no more water is expelled from the line.

Test sections should be dried immediately after displacement of test water. Following completion of all tie-ins, a batch pig, the proper volume of methanol and a second batch pig with air as propellant will be run. This last run shall be repeated until methanol is discharged at the receiver trap. The complete pig run sequence is shown in Appendix V.

It shall be CONTRACTOR's responsibility to familiarize himself and avoid the concerns related to hydrostatic testing as outlined in "Southern British Columbia Environmental Terms, Conditions and Related Guidelines Alaska Highway Gas Pipeline - Latest Draft" specifically Sections 2.6 and 2.19.

P. SAFETY

Pipeline testing shall be conducted by CONTRACTOR in such a manner as to protect the safety of persons and property in the vicinity of the pipeline.

TEST RECORDS

A. GENERAL

All field test data will be compiled by CONTRACTOR and signed as required by CONTRACTOR, MANAGER and the National Energy Board representative.

For each test section, MANAGER will require originals of the following information for their permanent records:

- 1) test section drawing
- 2) cleaning, gauging and displacement pig run data
- 3) yield plot readings
- 4) yield plot graph
- 5) deadweight readings
- 6) pressure recorder chart
- 7) temperature recorder charts
- 8) failure reports

The data for all tests will be accurately recorded on proper test forms. Sample copies of test forms are included in Appendix III and are hereinafter described:

1) Cleaning and Gauging Pig Run Data

CONTRACTOR will complete this form whenever a cleaning or gauging operation is performed on a test section. MANAGER's inspector and CONTRACTOR's test supervisor will sign the form and keep copies. The original will be delivered to MANAGER.

A. GENERAL (continued)

2) Displacement Pig Run Data

CONTRACTOR will complete this form whenever a displacement operation is performed on a test section. MANAGER's inspector and CONTRACTOR's test supervisor will sign the form and keep copies. The original will be delivered to MANAGER.

3) Daily Testing Report

CONTRACTOR will prepare a daily testing report for each day any test operation is being conducted. The test data compiled on this report will be a brief resume of all tests being conducted on the System, including:

- a) acceptance or rejection of tests completed this date.
- b) progress status of tests underway.
- c) a description providing a documental record of any other events that occurred during testing operations.

The CONTRACTOR's test supervisor and MANAGER's inspector will sign this form. The original will be delivered to MANAGER.

A. GENERAL (continued)

4) Yield Plot Readings

CONTRACTOR will complete this form whenever a yield plot is performed on a test section. The report should be completed for 50 kPa pressure intervals from the 80% SMYS pressure up to the 110% SMYS pressure or the pressure which gives a 0.2% offset (pipe yield point). The CONTRACTOR's test supervisor and MANAGER's engineer will sign this form. The original will be delivered to MANAGER.

5) Yield Plot

CONTRACTOR will complete this form in conjunction with every yield test. As the yield plot readings are recorded they will be transferred to a graph of pressure versus cumulative volume. The pressure should be plotted vertically and the volume (horizontal scale) must be adjusted to give an approximate 2:1 slope to the resulting graph. The CONTRACTOR's test supervisor and MANAGER's engineer will sign this form. The original will be delivered to MANAGER.

6) Twenty-Four Hour Strength Test Data

CONTRACTOR will complete this form for each 24 hour strength test which must be performed on every test section. Sufficient data and supplementary remarks shall be recorded to adequately provide for determination of acceptance or rejection of the test. When

A. GENERAL (continued)

6) Twenty-Four Hour Strength Test Data (continued)

the test is successfully completed, the report will be signed by the CONTRACTOR's test supervisor and MANAGER's engineer and will be initialled by the National Energy Board's authorized representative. The original will be delivered to MANAGER along with originals of the pressure and temperature recorder charts.

7) Pipe Failure Report

CONTRACTOR will prepare this form for each failure that occurs during the testing operations on the System. The information recorded on this form will provide a complete record of test conditions at the time of failure and a detailed description of circumstances surrounding the failure to allow a careful analysis in determining the cause of failure. This form will furnish the basis for claims in case of defective workmanship or materials. Photographs of the failure will be taken and included with the report. CONTRACTOR's test supervisor and MANAGER's engineer will sign this form. The original will be delivered to MANAGER.

B. FINAL TEST REPORT

At completion of testing operations, CONTRACTOR will prepare a testing summary report which will be submitted with all test files to MANAGER.

B. FINAL TEST REPORT (continued)

During the testing operation, the original test forms with all signatures, pressure and temperature recorder charts and record photographs will be transferred, after reviewing, checking and signing, to MANAGER. At the completion of the job, all other copies of the test reports will be transferred to MANAGER.

C. SAMPLE TEST FORMS

Sample copies of test forms, which will be made available to CONTRACTOR upon request during testing operations, are included in Appendix III of this manual.

A P P E N D I X I

PIPE SPECIFICATIONS

AND TEST PRESSURES

PIPE SPECIFICATIONS AND TEST PRESSURES

PIPE DESCRIPTION			Design Factor	Proposed M.O.P. (kPa)	Minimum Mill Test Pressure (kPa)	FIELD TEST DATA				
O.D. (mm)	W.T. (mm)	Spec. CSA Z245.2				Minimum Test Pressure (kPa)	Maximum Test Pressure (kPa)	Yield Plot	%SMYS	%MOP
914	8.89	GR 448 CAT II	0.72	6280	8290	7850	9590	YES	110%	153%
914	10.67	GR 448 CAT II	0.60	6280	9940	7850	9590	YES	92%	153%
914	10.28	GR 483 CAT II	0.80	8690	10320	10860	11950	YES	110%	138%
914	13.71	GR 483 CAT II	0.60	8690	13770	10860	11950	YES	82%	138%

NOTE: 1) Test medium for mill and field testing shall be water.

A P P E N D I X I I

TEST SECTIONS

HYDROSTATIC TEST SECTIONS

Section	Land Description	From (kmP)	To (kmP)	Length (km)	Pipe Description (Pipe Measurements in mm)	Reference Drawing	Yield Plot	Hold Period (Hours)
I-1	From: Alberta To: D.L. 4588 Lot 2*	0.4	1.8	1.4	914 x 10.28 & 914 x 13.71 CSA Z-245.2 GR 483 CAT II	5-08-02-00-EN-0002	YES	24
I-2	From: D.L. 4588 Lot 2* To: D.L. 4588 Lot 2	1.8	2.2	0.4	"	5-08-02-00-EN-0003	"	"
I-3	From: D.L. 4588 Lot 2 To: Lot 1 Plan 4240 DL4588	2.2	3.1	0.9	"	5-08-02-00-EN-0004	"	"
I-4	From: Lot 1 Plan 4240 DL4588 To: Lot A Plan 4458* (Compressor Stn. #1)	3.1	4.5	1.4	"	5-08-02-00-EN-0005	"	"
I-5	From: Lot 1 Plan 9514 D.L. 4589* To: Lot 1 Plan 9514 D.L. 4589 (Leach Creek crossing)	15.2	22.1	6.9	914 x 8.89 & 914 x 10.67 CSA Z-245.2 GR 448 CAT II	5-08-02-00-EN-0006	"	"
I-6	From: Lot 1 Plan 9514 D.L. 4589 (Leach Creek crossing) To: Parcel 82 D.L. 4589*	22.1	28.2	6.1	"	5-08-02-00-EN-0007	"	"
I-7	From: Parcel 82 D.L. 4589* To: Parcel 82 D.L. 4589*	28.2	31.5	3.3	"	5-08-02-00-EN-0008	"	"
I-8	From: Parcel 82 D.L. 4589* To: Parcel 82 D.L. 4589*	31.5	36.5	5.0	"	5-08-02-00-EN-0009	"	"
I-9	From: Parcel 82 D.L. 4589* To: Parcel 82 D.L. 4589*	36.5	38.4	1.9	"	5-08-02-00-EN-0010	"	"
I-10	From: Parcel 82 D.L. 4589* To: Parcel 82 D.L. 4589*	38.4	40.0	1.6	"	5-08-02-00-EN-0011	"	"
I-11	From: Parcel 82 D.L. 4589* To: D.L. 4589	40.0	42.5	2.5	"	5-08-02-00-EN-0012	"	"
I-12	From: D.L. 4589 To: D.L. 4589*	42.5	43.6	1.1	"	5-08-02-00-EN-0013	"	"

* Indicates Test Point

HYDROSTATIC TEST SECTIONS

Section	Land Description	From (kmP)	To (kmP)	Length (km)	Pipe Description (Pipe Measurements in mm)	Reference Drawing	Yield Plot	Hold Period (Hours)
I-13	From: D.L. 4589* To:	43.6	45.3	1.2	914 x 8.89 & 914 x 10.67 CSA Z-245.2 GR 448 CAT II	5-08-02-00-EN-0014	YES	24
I-14	From: D.L. 4589 To:	45.3	46.7	1.4	"	5-08-02-00-EN-0015	"	"
I-15	From: D.L. 4589* To:	46.7	48.5	1.8	"	5-08-02-00-EN-0016	"	"
I-16	From D.L. 6167* To: D.L. 4039	90.8	93.1	2.3	"	5-08-02-00-EN-0017	"	"
I-17	From: D.L. 4039 To: D.L. 4038*	93.1	95.5	2.4	"	5-08-02-00-EN-0018	"	"
I-18	From: D.L. 4038* To: D.L. 6170 (Gold Creek Crossing)	95.5	102.3	6.8	"	5-08-02-00-EN-0019	"	"
I-19	From: D.L. 6170 (Gold Creek Crossing) To: D.L. 4591*	102.3	110.2	7.9	"	5-08-02-00-EN-0020	"	"
I-20	From: D.L. 4591* To: D.L. 4591	110.2	113.9	3.7	"	5-08-02-00-EN-0021	"	"
I-21	From: D.L. 4592 To: D.L. 10753* (Moyie River Crossing #2)	144.0	147.5	3.5	"	5-08-02-00-EN-0022	"	"
I-22	From: D.L. 10753* (Moyie River Crossing #2) To: Unsurveyed Land	147.5	160.2	12.7	"	5-08-02-00-EN-0023	"	"
I-23	From: Unsurveyed Land To: Unsurveyed Land	160.2	161.9	1.7	"	5-08-02-00-EN-0024	"	"
I-24	From: Unsurveyed Land To: D.L. 12976 (Kingsgate Meter Station)	161.9	170.7	8.8	"	5-08-02-00-EN-0025	"	"

* Indicates Test Point

A P P E N D I X I I I

TEST FORMS



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

CLEANING AND GAUGING PIG RUN DATA

JOB: _____

DATE: _____

SECTION: FROM: _____ TO: _____

PURPOSE OF PIG RUN: _____

TYPE OF PIG: _____

TIME: START: _____ END: _____

SECTION LENGTH (m): _____

SPEED OF PIG (m/sec): _____

CONDITION OF PIG:

START: _____

FINISH: _____

MATERIAL PUSHED OUT BY PIG: _____

COMMENTS: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

DISPLACEMENT PIG RUN DATA

JOB: _____

DATE: _____

TEST SECTION NO.: _____

PURPOSE OF PIG RUN: _____

TYPE OF PIG: _____

TIME: START: _____ END: _____

SECTION LENGTH (m): _____

SPEED OF PIG (m/sec.) _____

CONDITION OF PIG: _____

START: _____

FINISH: _____

COMMENTS: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____



ALBERTA NATURAL GAS COMPANY LTD

AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

DAILY TESTING REPORT

JOB: _____

DATE: _____

WEATHER CONDITIONS: _____

TEMPERATURE (°C): HIGH: _____ - LOW: _____

REFERENCE TEST FORMS: _____

REPORT: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____

YIELD PLOT READINGS

JOB: _____

DATE: _____

TEST SECTION NO.:

HYDROSTATIC TEST DRAWING NO.: -

TIME AT START: _____ AT END: _____

% SMYS AT START: AT END:

[illegible][illegible]

TEST SUPERVISOR: _____

TEST ENGINEER:



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

YIELD PLOT

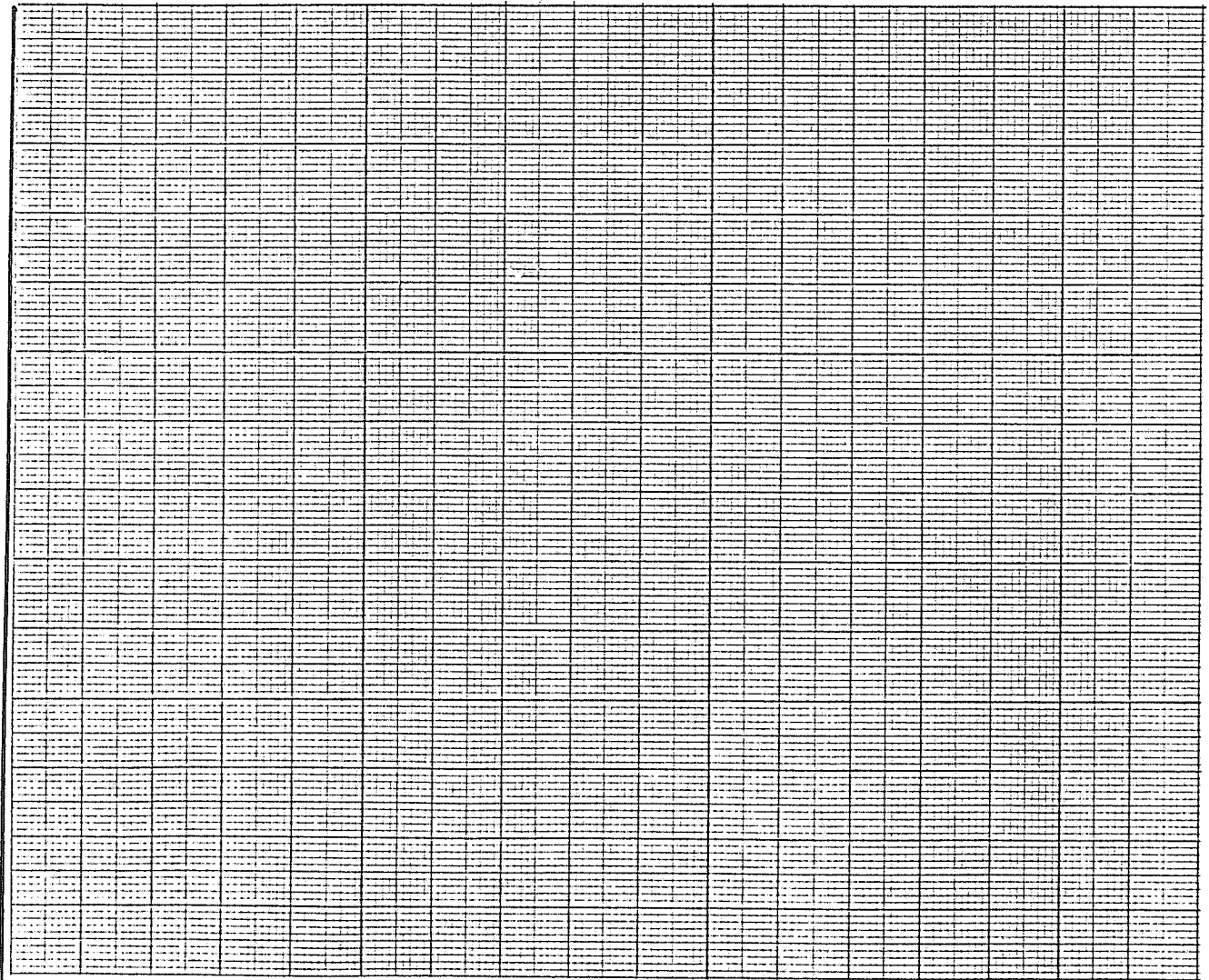
JOB: _____

DATE: _____

TEST SECTION NO.: _____

HYDROSTATIC TEST DRAWING NO.: _____

PRESSURE (kPa)



VOLUME

TEST SUPERVISOR: _____

TEST ENGINEER: _____

TWENTY-FOUR HOUR STRENGTH TEST DATA

TEMPERATURE (°C): START: _____ FINISH: _____

[illegible]

TWENTY - FOUR HOUR STRENGTH TEST DATA

DEAD WEIGHT PRESSURE AND TEMPERATURE READINGS

TEST SUPERVISOR: _____

TEST ENGINEER: _____



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

PIPE FAILURE REPORT

JOB: _____

DATE: _____

TEST SECTION NO.: _____

TIME OF FAILURE: _____

LOCATION OF FAILURE: _____

ELEVATION AT FAILURE: _____

PRESSURE AT FAILURE: _____

FAILED PIPE DATA _____ mm O.D. x _____ mm W.T.

GRADE: _____ SPEC: _____

MFG. BY: _____ JOINT NO.: _____

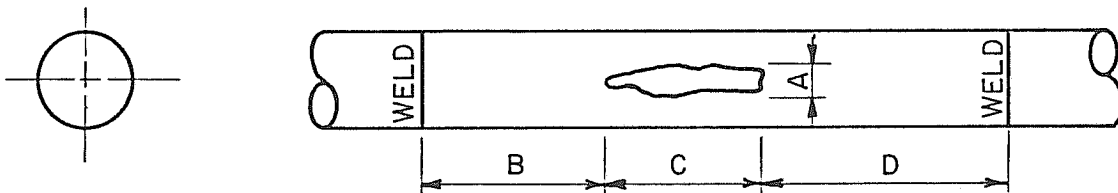
REPLACEMENT PIPE DATA _____ mm O.D. x _____ mm W.T.

GRADE: _____ SPEC: _____

MFG. BY: _____ JOINT NO.: _____

DATE REPAIRED: _____

POSITION AND SIZE OF FAILURE:



NOTE POSITION OF FAILURE AND DIMENSIONS:

A: _____ mm B: _____ mm

C: _____ mm D: _____ mm

DESCRIPTION AND POSSIBLE CAUSE OF FAILURE: _____

DAMAGES OR INJURIES: _____

TEST SUPERVISOR: _____

TEST ENGINEER: _____

A P P E N D I X I V

TEST INSTRUMENTS

TEST INSTRUMENTS

All instruments being used in the test shall have been properly calibrated before the test to ensure accurate results. CONTRACTOR shall have personnel at test site who are capable of operating, maintaining and calibrating the instruments being used for the test. Test instruments, as listed below, shall be furnished by CONTRACTOR. Quantities shown are the minimum for one test crew. If multiple crews are required to avoid delays, each test crew shall be equipped with the instruments listed below:

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
1	2	Deadweight type pressure gauge having a useful range of 0-15,000 kPa and an accuracy of ± 1.0 kPa. One gauge is to be available at the test site as a backup unit.
2	2	Chart type pressure recorder utilizing 24 hour circular charts and a useful range from 0-15,000 kPa. The charts must have a maximum increment size of 200 kPa. One pressure recorder is to be available at the test site as a backup unit.
3	4	Chart type temperature recorders utilizing 24 hour circular charts and a useful range from -5°C to 40°C . The charts must have a maximum increment size of 1°C . One temperature recorder is to be available at the test site as a backup unit.

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
4	2	Thermometer, -40 to 100°C range, accurate and readable to at least 1/2°C.
5	4	Gauge, pressure 0 to 16,000 kPa range, 4 1/2" dial, 1/2" NPT lower connection.

A P P E N D I X V

PIG RUN SEQUENCE

PIG RUN SEQUENCE

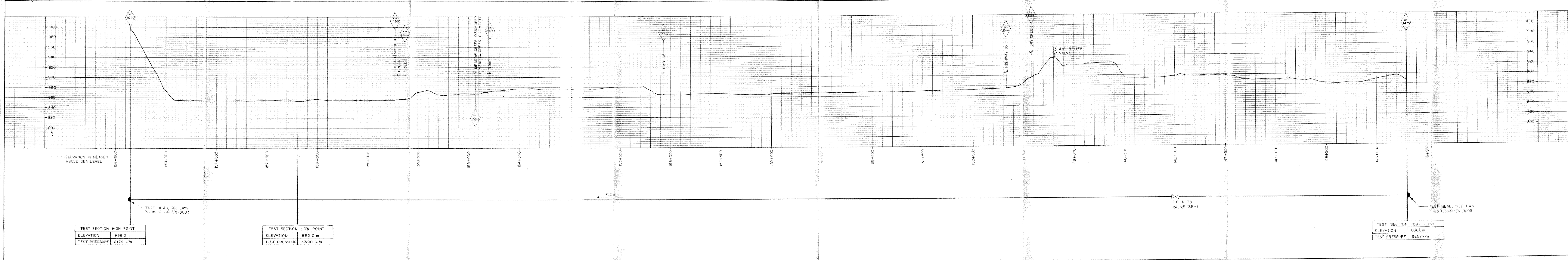
<u>RUN</u>	<u>TYPE</u>	<u>PURPOSE</u>
1	Gauging pig - 4 rubber batch pig without wire brushes but with sizing plate.	Line sizing and cleaning.
2	Displacement pig - sphere or polly pig.	Removal of air during water run. Approximately 150 m of water should be ahead of pig.
3	Displacement pig - sphere.	Displace test water.
4	Displacement pig - polly pig.	Remove water.
5	Displacement pig - 4 rubber batch pig.	Remove air ahead of methanol slug.
6	Displacement pig - 4 rubber batch pig.	Remove methanol.
7	Caliper pig - electronic with chart.	Checking for dents and buckles.

DRAWINGS

DRAWINGS

<u>DRAWING NUMBER</u>	<u>TITLE</u>
<u>HYDROSTATIC TEST DRAWINGS</u>	<u>ALASKA HIGHWAY GAS PIPELINE PROJECT</u> <u>914 mm O.D. GAS PIPELINE</u>
5-08-02-00-HP-0001	Location and Index Map showing Hydrostatic Test Sections
5-08-02-00-HP-0002	Hydrostatic Test Section I-1 Sta. 0+000 to 1+248
5-08-02-00-HP-0003	Hydrostatic Test Section I-2 Sta. 1+248 to 1+676
5-08-02-00-HP-0004	Hydrostatic Test Section I-3 Sta. 1+676 to 2+670
5-08-02-00-HP-0005	Hydrostatic Test Section I-4 Sta. 2+670 to 4+480
5-08-02-00-HP-0006	Hydrostatic Test Section I-5 Sta. 14+650 to 21+515.9
5-08-02-00-HP-0007	Hydrostatic Test Section I-6 Sta. 21+515 to 27+531.7
5-08-02-00-HP-0008	Hydrostatic Test Section I-7 Sta. 27+531 to 30+839.7
5-08-02-00-HP-0009	Hydrostatic Test Section I-8 Sta. 30+839.7 to 35+899.5
5-08-02-00-HP-0010	Hydrostatic Test Section I-9 Sta. 35+899.5 to 37+754.1
5-08-02-00-HP-0011	Hydrostatic Test Section I-10 Sta. 37+754.1 to 39+412.3
5-08-02-00-HP-0012	Hydrostatic Test Section I-11 Sta. 39+412.3 to 41+772.4
5-08-02-00-HP-0013	Hydrostatic Test Section I-12 Sta. 41+772.4 to 42+848
5-08-02-00-HP-0014	Hydrostatic Test Section I-13 Sta. 42+848 to 44+574

<u>DRAWING NUMBER</u>	<u>TITLE</u>
5-08-02-00-HP-0015	Hydrostatic Test Section I-14 Sta. 44+574 to 46+008.3
5-08-02-00-HP-0016	Hydrostatic Test Section I-15 Sta. 46+008.3 to 47+850.4
5-08-02-00-HP-0017	Hydrostatic Test Section I-16 Sta. 89+517 to 91+800
5-08-02-00-HP-0018	Hydrostatic Test Section I-17 Sta. 91+800 to 94+188
5-08-02-00-HP-0019	Hydrostatic Test Section I-18 Sta. 94+188 to 101+100
5-08-02-00-HP-0020	Hydrostatic Test Section I-19 Sta. 101+000 to 108+838.1
5-08-02-00-HP-0021	Hydrostatic Test Section I-20 Sta. 108+838.1 to 112+550
5-08-02-00-HP-0022	Hydrostatic Test Section I-21 Sta. 142+415 to 145+700
5-08-02-00-HP-0023	Hydrostatic Test Section I-22 Sta. 145+700 to 158+350
5-08-02-00-HP-0024	Hydrostatic Test Section I-23 Sta. 158+350 to 160+064
5-08-02-00-HP-0025	Hydrostatic Test Section I-24 Sta. 160+350 to 168+832.5
5-08-02-00-TP-0025	Typical Hydrostatic Test Warning Sign
5-08-02-00-EN-0002	914 mm Hydrostatic Test Head MOP 11950 kPa
5-08-02-00-EN-0003	914 mm Hydrostatic Test Head MOP 9590 kPa
5-08-02-00-EN-0004	914 mm Hydrostatic Test Head Bracket Details



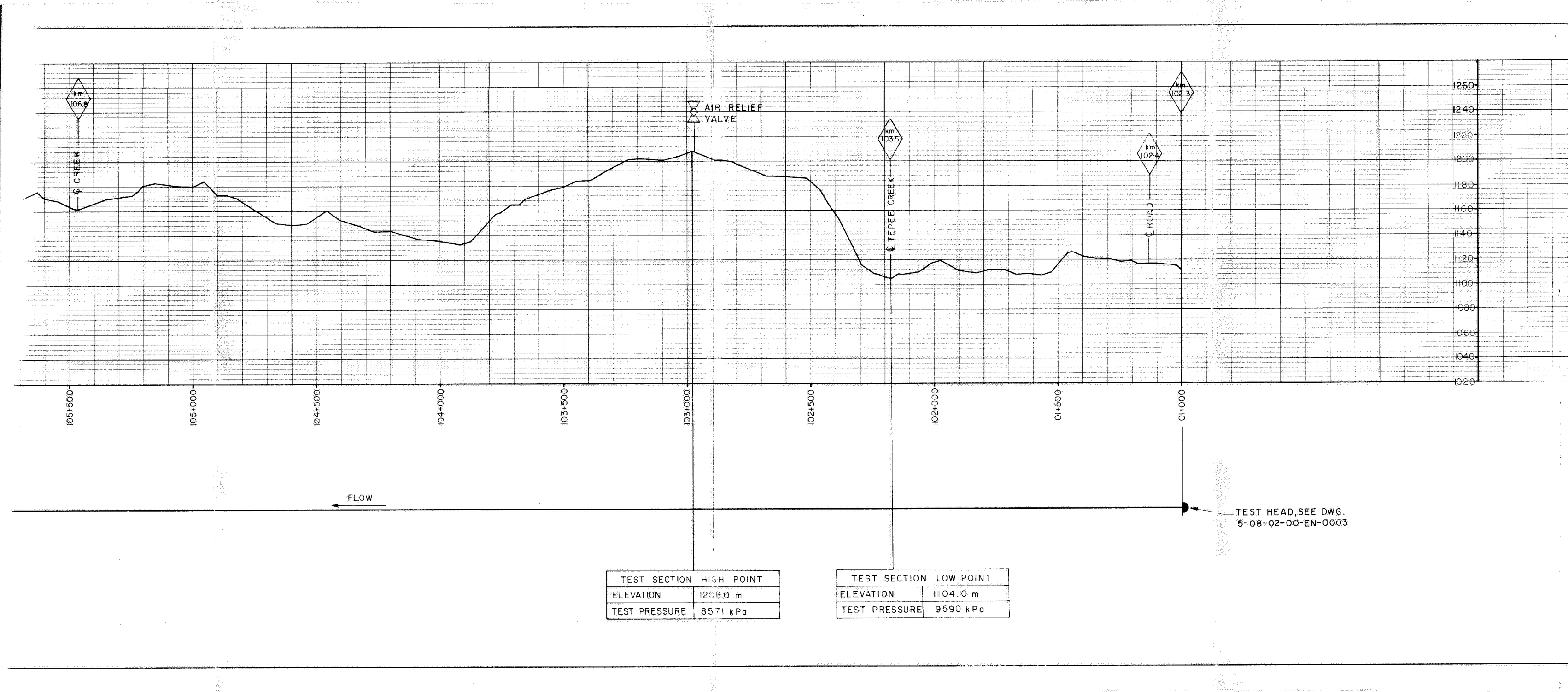
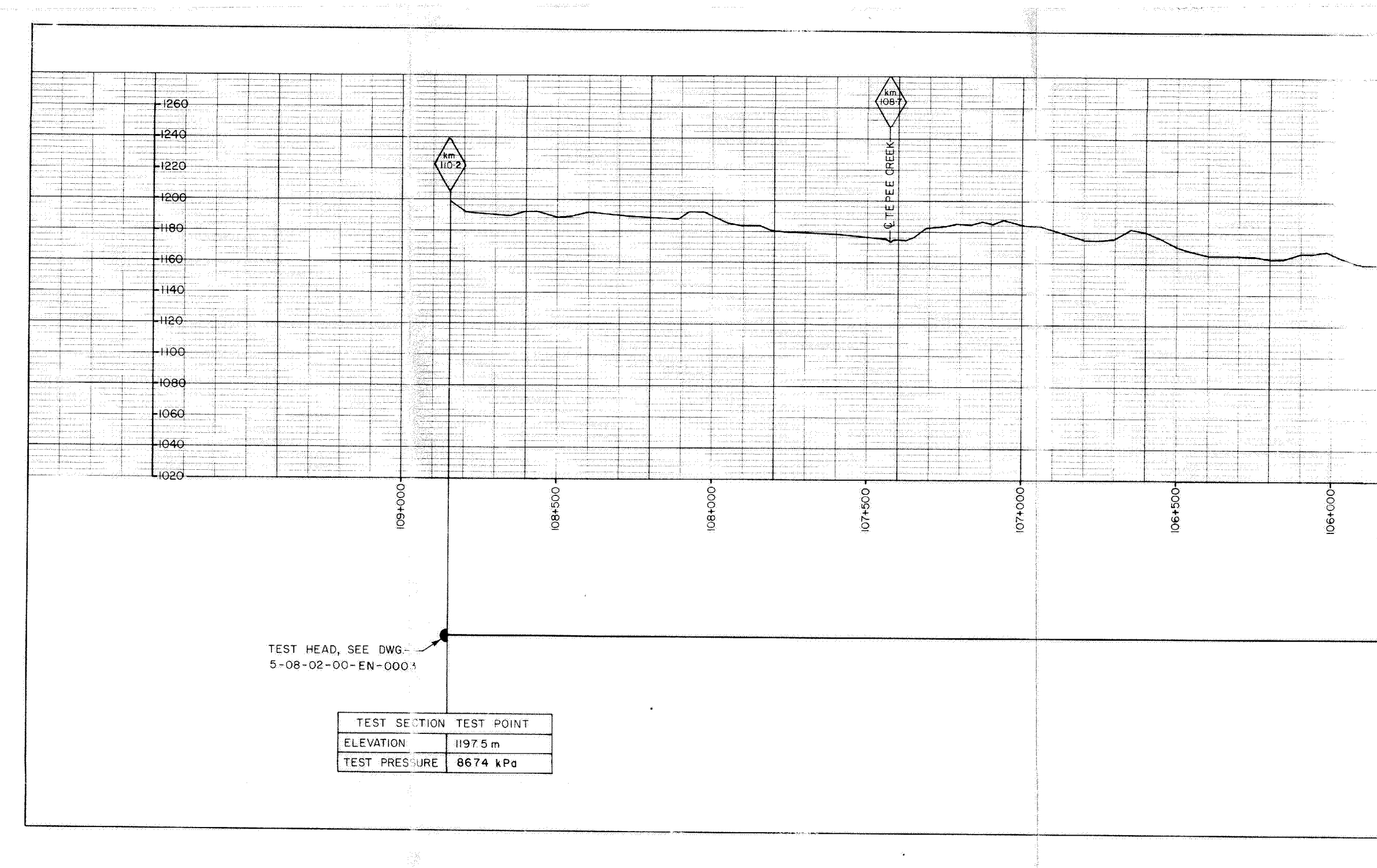
- NOTES
1. TEST MEDIUM IS WATER.
 2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
 3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
 4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
 5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS
 6. THIS SECTION WILL BE FILLED FROM THE MOYIE RIVER AT km 147.4.

- REFERENCE DRAWINGS
- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
 - 5-08-02-00-AL-0018 PLAN AND PROFILE
 - 5-08-02-00-AL-0019 PLAN AND PROFILE
 - 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	12.7 km
VOLUME OF TEST SECTION	8010 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	16.02 m ³

PREPARED BY:
RONIVEN
CONSULTING ENGINEERS LTD.
CALGARY, CANADA

REVISIONS						
NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.	
0	ISSUED FOR APPROVAL	80-7-30	A.C.			
ALBERTA NATURAL GAS COMPANY LTD						
NORTHERN PIPELINE AGENCY CANADA						
ALBERTA NATURAL GAS COMPANY LTD AGENTS FOR FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.						
ALASKA HIGHWAY GAS PIPELINE PROJECT 914 mm O.D. GAS PIPELINE HYDROSTATIC TEST SECTION I-22 STATION 145+700 TO 158+350						
RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						2
						3
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM GOLD CREEK AT km 101.3.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0012 PLAN AND PROFILE
- 5-08-02-00-AL-0013 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	7.9 km
VOLUME OF TEST SECTION	4980 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	9.96 m ³

PREPARED BY:

R. NIVEN

CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD	APPD
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ALBERTA NATURAL GAS COMPANY LTD

[Signature]

CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR

FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

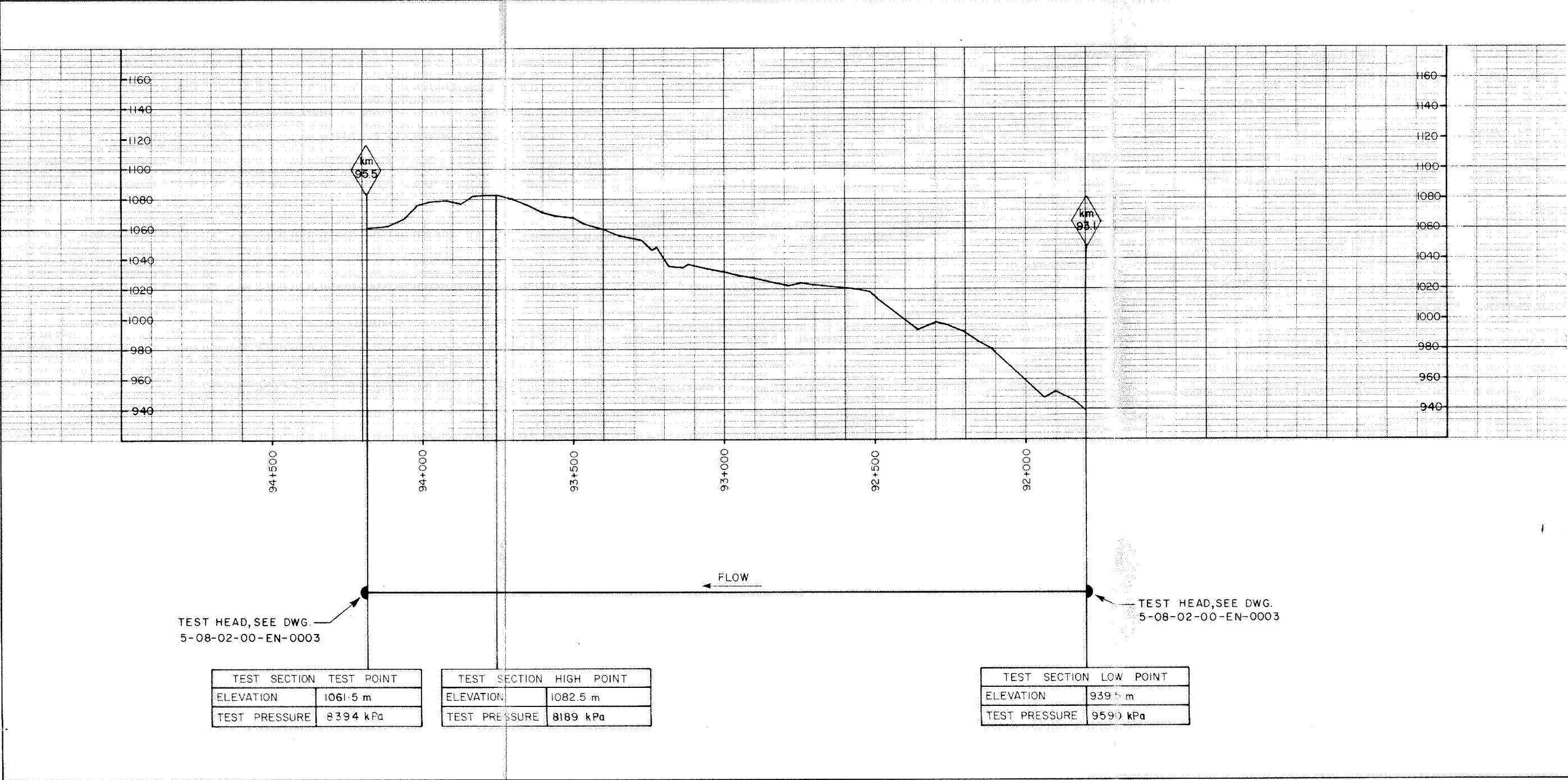
ALASKA HIGHWAY GAS PIPELINE PROJECT

914 mm O.D. GAS PIPELINE

HYDROSTATIC TEST SECTION I-19

STATION 101+000 TO 108+838.1

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0



- NOTES
1. TEST MEDIUM IS WATER.
 2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
 3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
 4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
 5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
 6. THIS SECTION WILL BE FILLED FROM LAKE KOOCANUSA AT km 90.5.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0011 PLAN AND PROFILE

LENGTH OF TEST SECTION	2.4 km
VOLUME OF TEST SECTION	1510 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	3.02 m ³

PREPARED BY:
R. NIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

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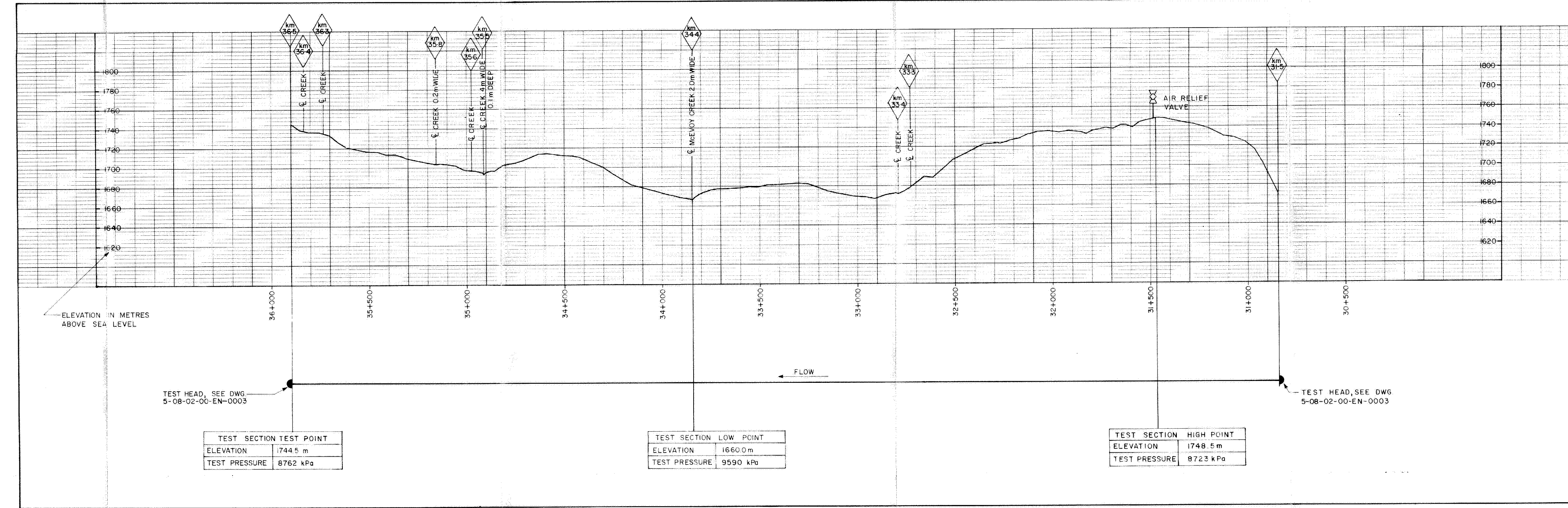
ALBERTA NATURAL GAS COMPANY LTD
[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA

ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-17
STATION 91+800 TO 94+188

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						1
						8
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0004 PLAN AND PROFILE
- 5-08-02-00-AL-0005 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	5.0 km
VOLUME OF TEST SECTION	3150 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	6.30 m ³

PREPARED BY:

RONIVEN
CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
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CHIEF ENGINEER

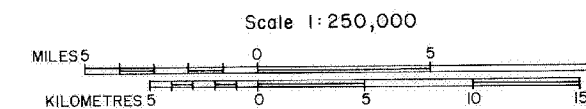
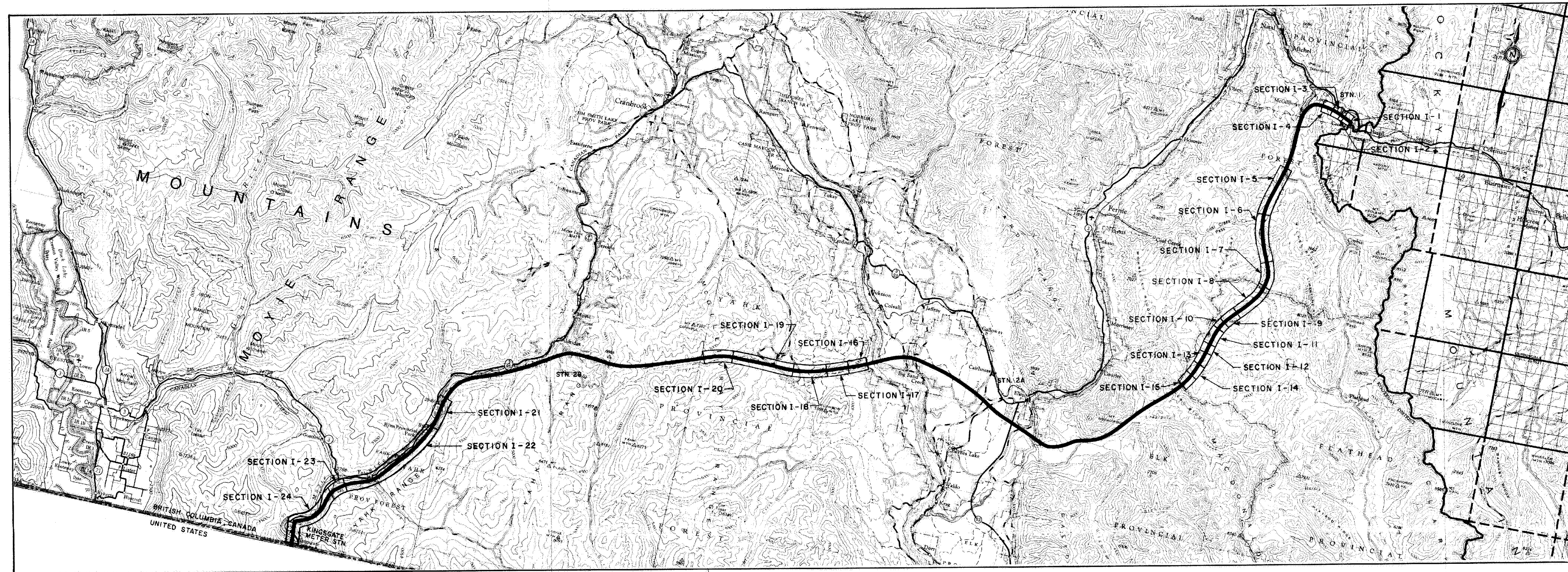
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CANADA



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AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-8
STATION 30+839.7 TO 35+899.5

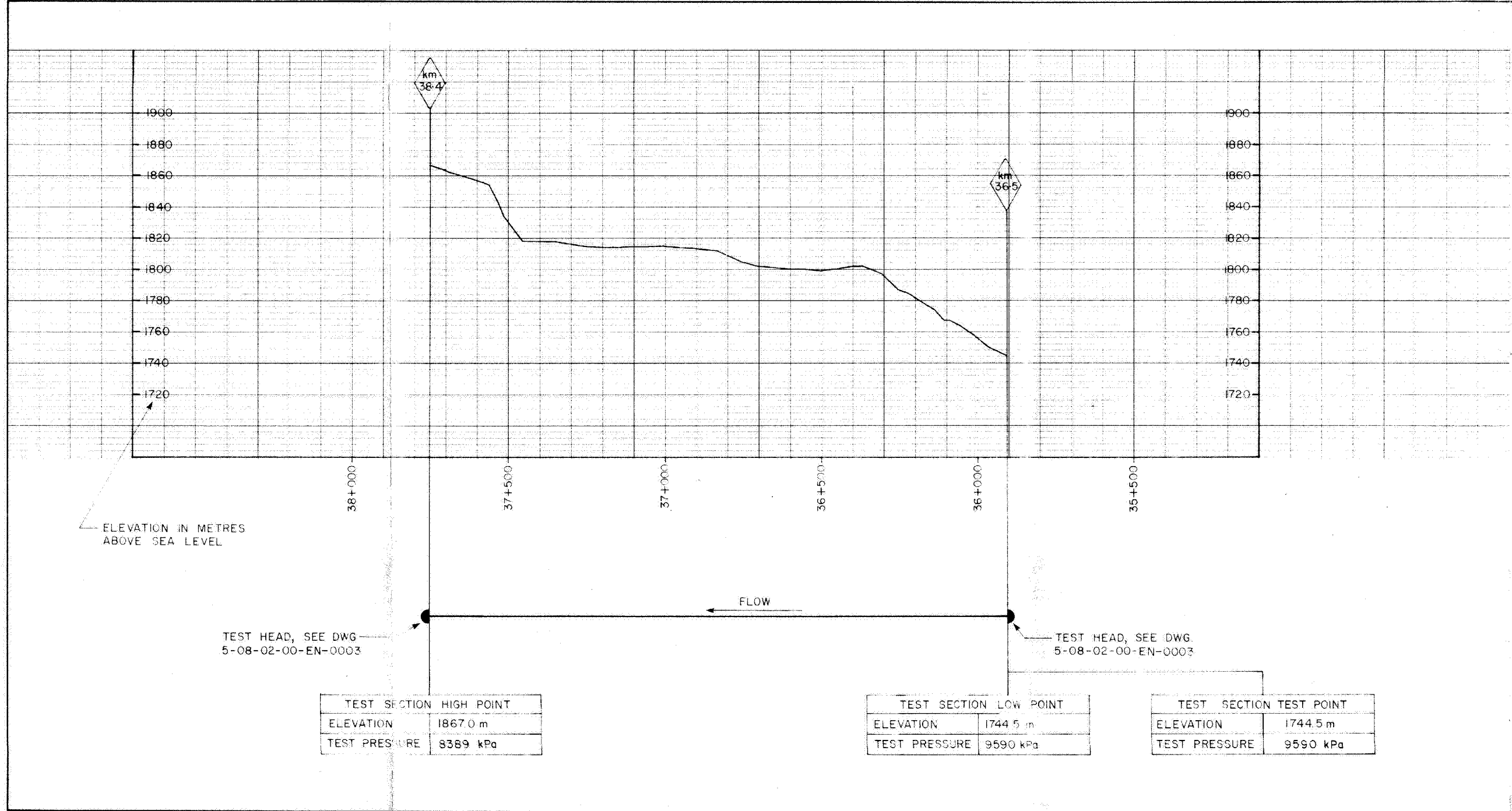
RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						9
						0



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

LOCATION AND INDEX MAP
SHOWING
HYDROSTATIC TEST SECTIONS

RGN.	ZONE	FACILITY	NO.	DWG TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
H	P	0	0	0	1	0



- NOTES
- 1. TEST MEDIUM IS WATER.
 - 2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
 - 3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
 - 4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
 - 5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
 - 6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0005 PLAN AND PROFILE

LENGTH OF TEST SECTION	1.9 km
VOLUME OF TEST SECTION	1200 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	2.40m ³

PREPARED BY:
R.D. NIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
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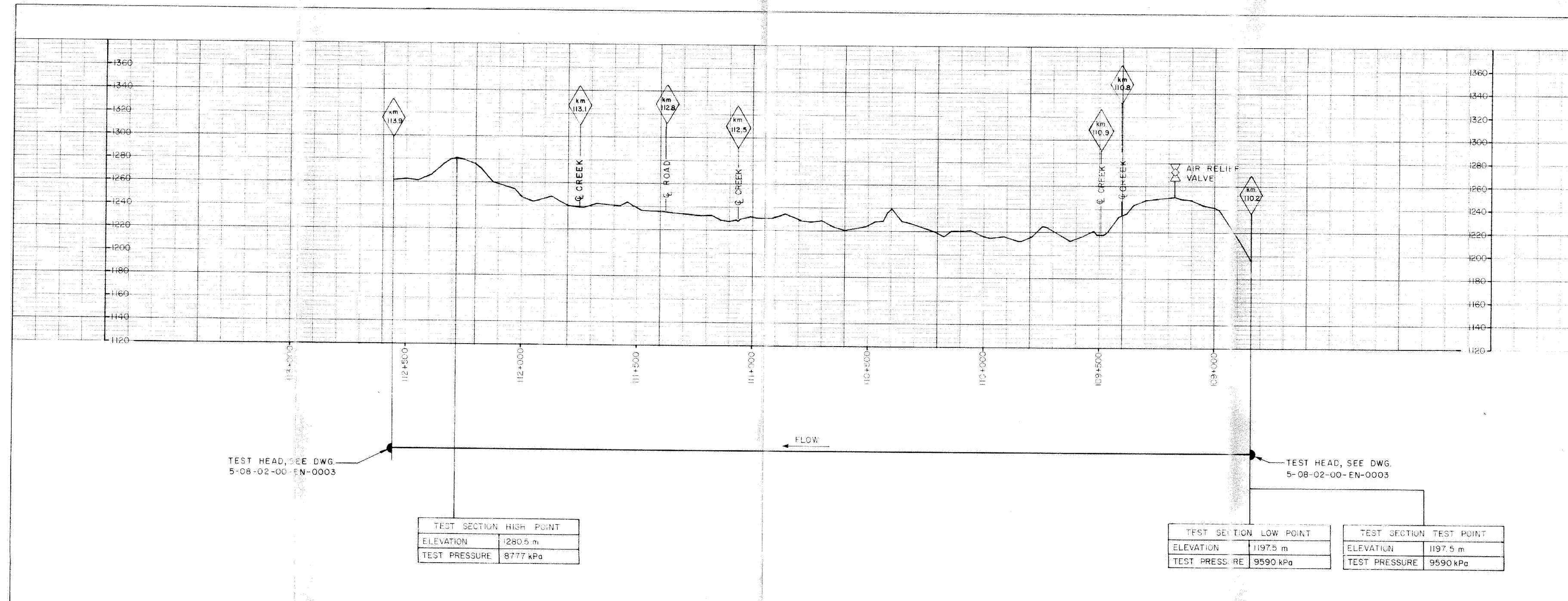
[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA

	ALBERTA NATURAL GAS COMPANY LTD AGENTS FOR FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.
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ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-9
STATION 35+899.5 TO 37+754.1

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						0
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM GOLD CREEK AT km 101.3.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0013 PLAN AND PROFILE
- 5-08-02-00-AL-0014 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	3.7 km
VOLUME OF TEST SECTION	2 330 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	4.66 m ³

PREPARED BY:

RONIVEN

CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

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[Signature]

CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD

AGENTS FOR

FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

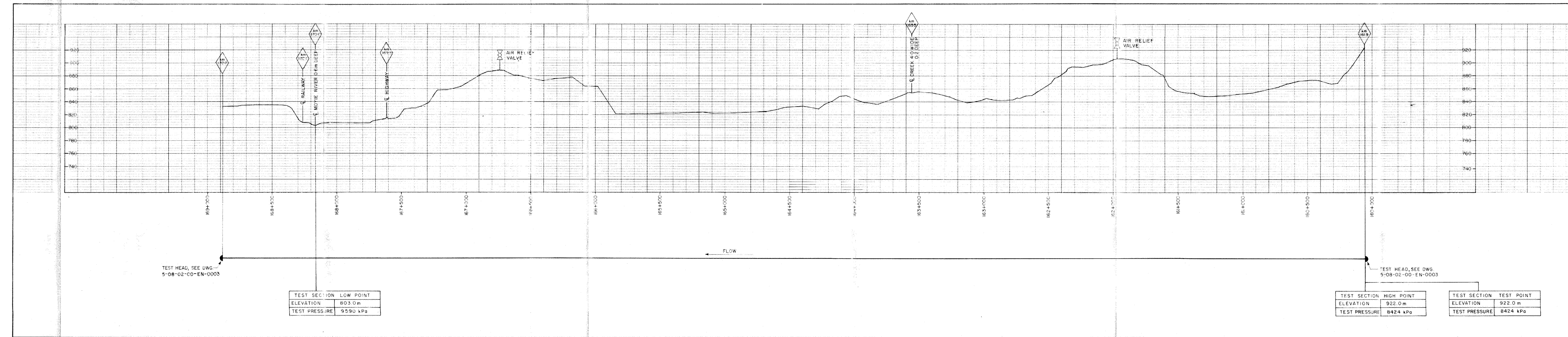
ALASKA HIGHWAY GAS PIPELINE PROJECT

914 mm O.D. GAS PIPELINE

HYDROSTATIC TEST SECTION I-20

STATION 108+838.1 TO 112+550

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						2
						1
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM THE MOYIE RIVER AT km 170.0.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0019 PLAN AND PROFILE
- 5-08-02-00-AL-0020 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	8.8 km
VOLUME OF TEST SECTION	5550 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	11.10 m ³

PREPARED BY:
R. NIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD	APPD.
0	ISSUED FOR APPROVAL	80-7-30	C.B.		

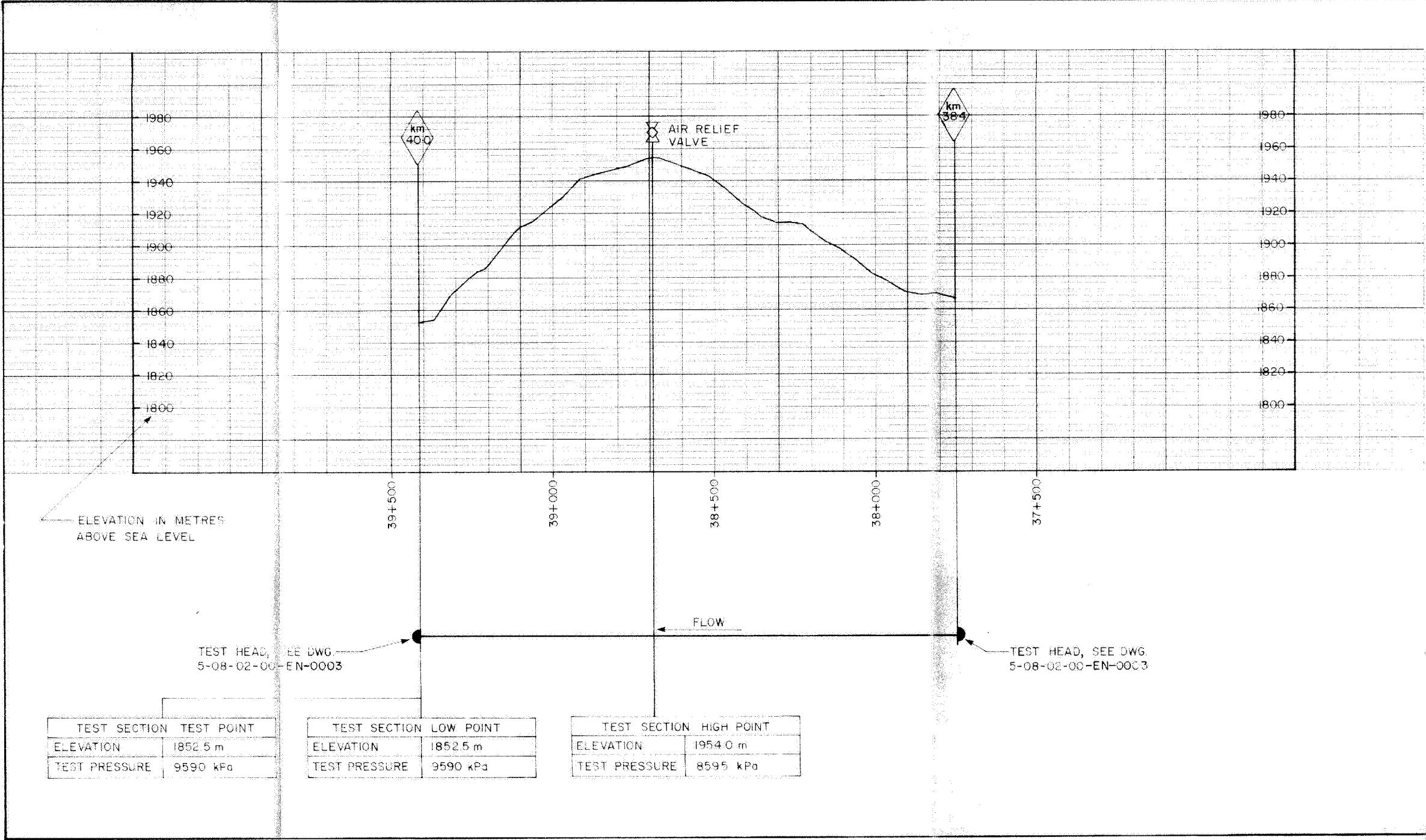
ALBERTA NATURAL GAS COMPANY LTD
[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA

ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-24
STATION 160+064 TO 168+832.5

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						2
						5
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0005 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	1.6 km
VOLUME OF TEST SECTION	1010 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	2.02 m ³

PREPARED BY:
R.D. NIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD	APPD.
0	ISSUED FOR APPROVAL	80-7-30	G.A.		

ALBERTA NATURAL GAS COMPANY LTD

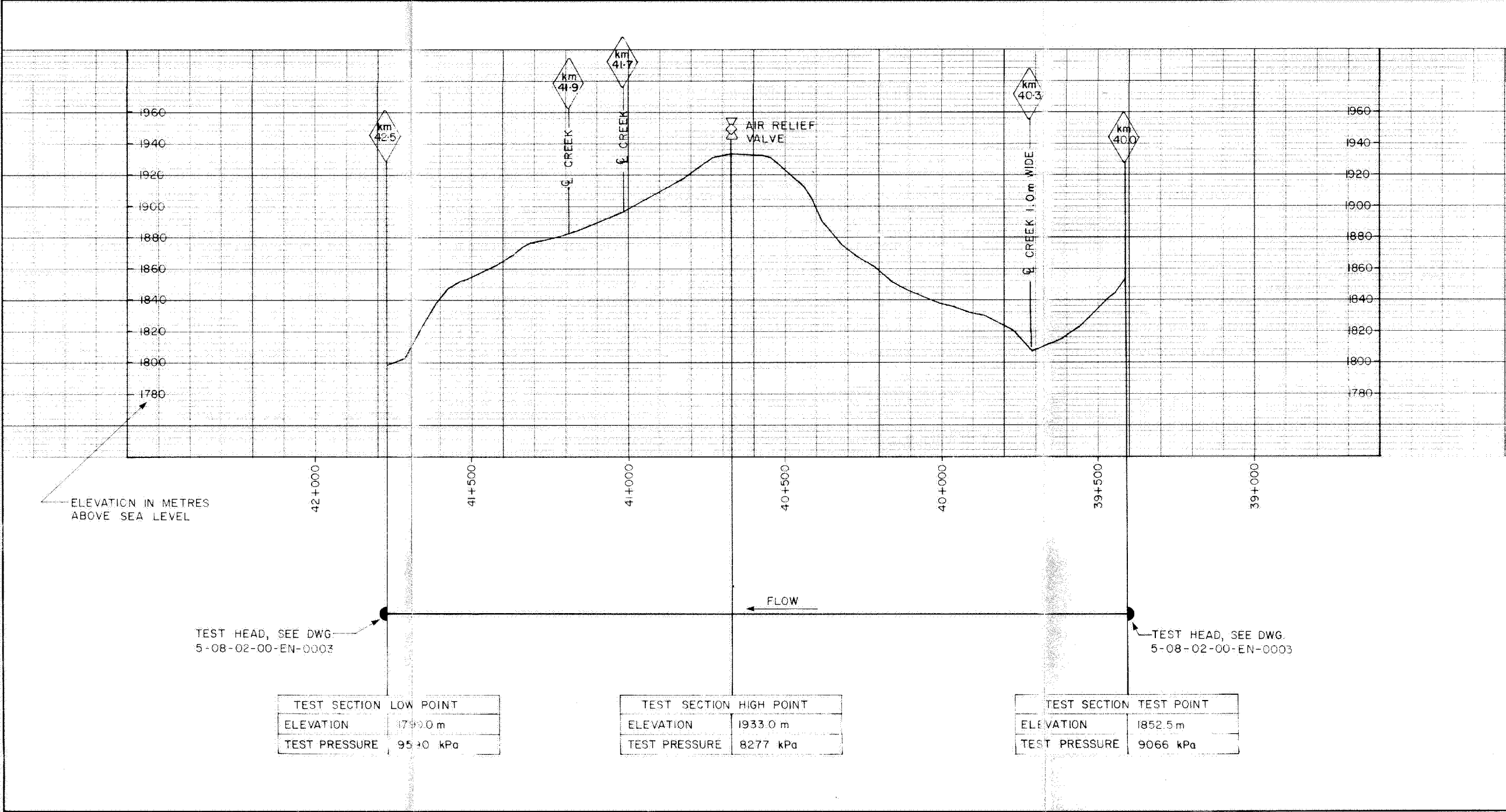
[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA

ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-10
STATION 37+754.1 TO 39+412.3

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	08	02	00	HP	0011	0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS
6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0005 PLAN AND PROFILE
- 5-08-02-00-AL-0006 PLAN AND PROFILE
- 5-08-02-00-TP-0042 AIR RELIEF VALVE

LENGTH OF TEST SECTION	2.5 km
VOLUME OF TEST SECTION	1580 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	3.16 m ³

PREPARED BY:

R.D. NIVEN

CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
0	ISSUED FOR APPROVAL	80-7-30	AZ		

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[Signature]
CHIEF ENGINEER

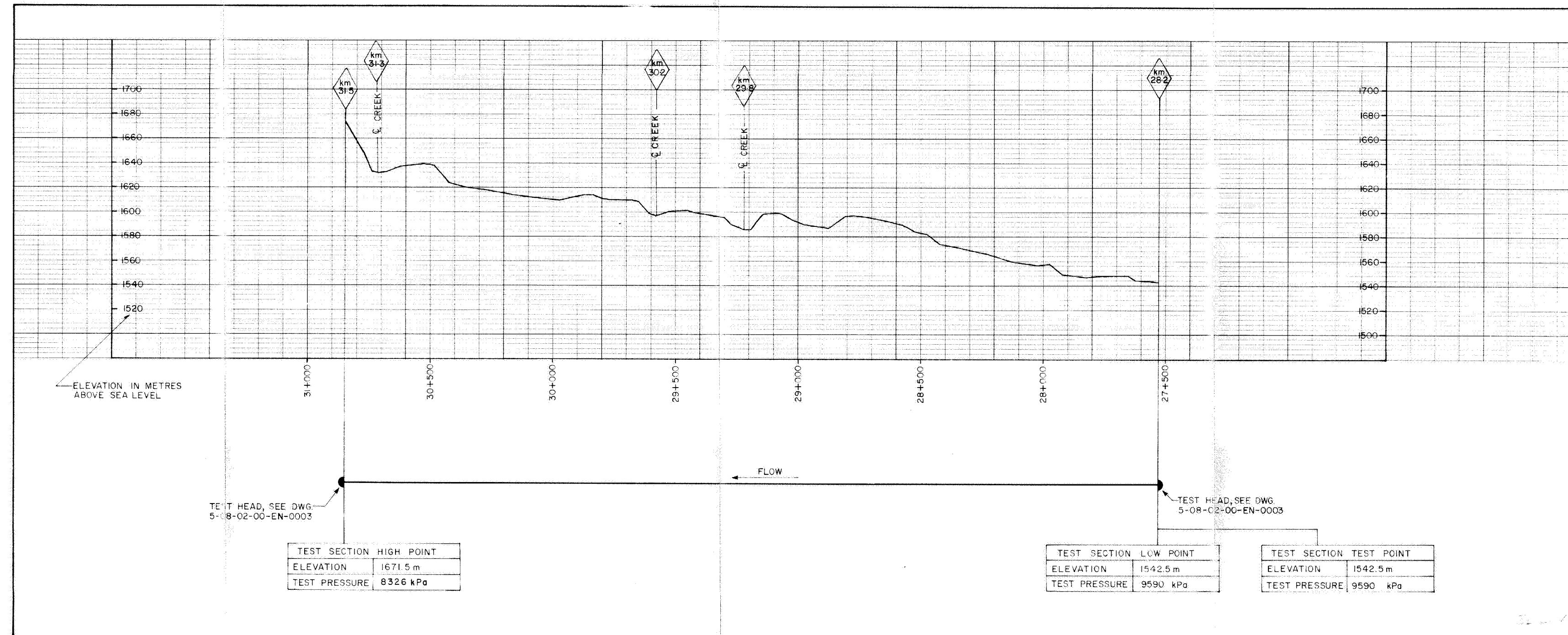
NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-II
STATION 39+412.3 TO 41+772.4

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						1
						2
						0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

REFERENCE DRAWINGS

5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
5-08-02-00-AL-0004 PLAN AND PROFILE

LENGTH OF TEST SECTION	3.3 km
VOLUME OF TEST SECTION	2080 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2% TEST VOLUME	4.16 m ³

PREPARED BY:

R.D.NIVEN

CALGARY, CANADA

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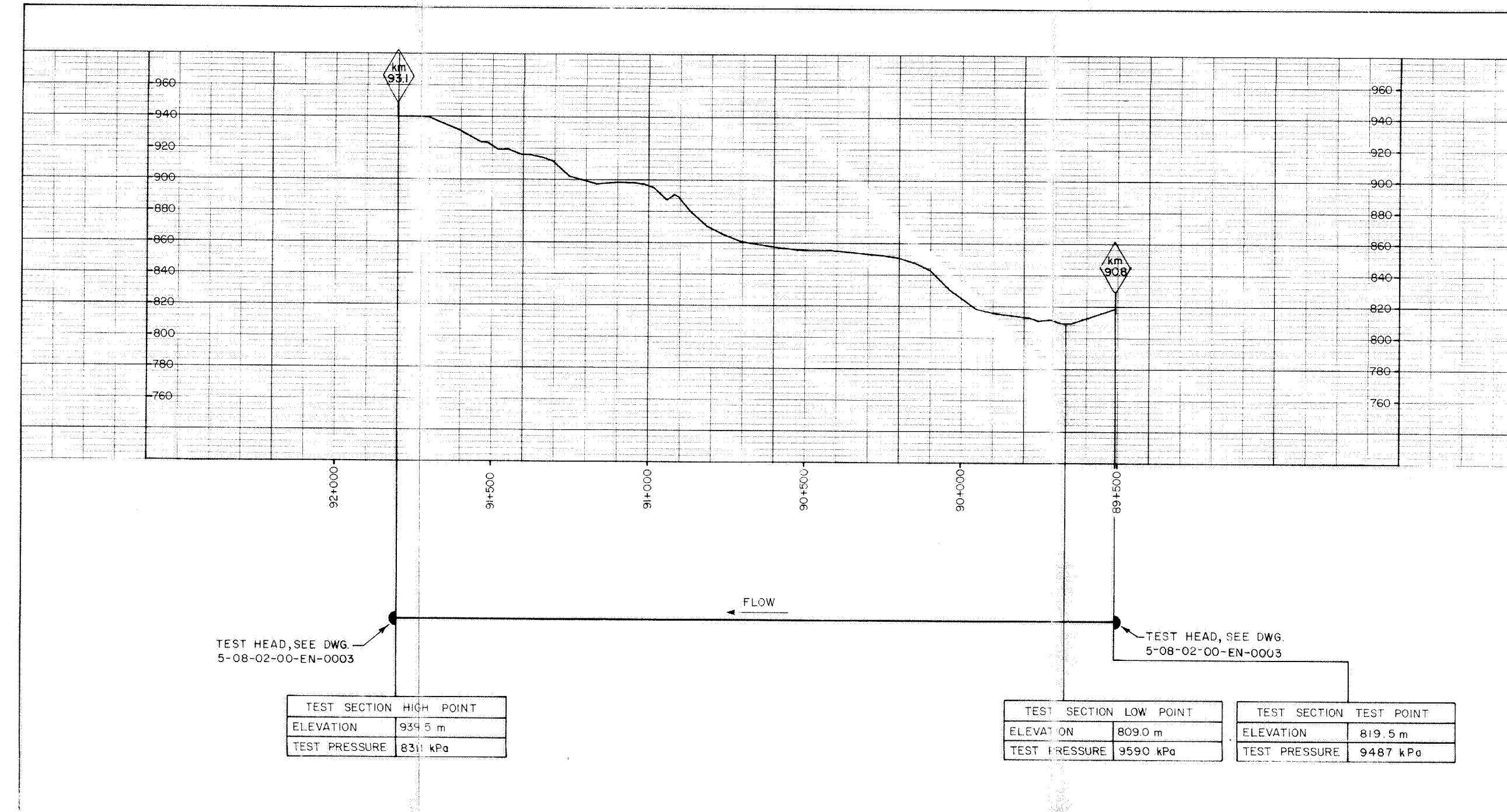
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CANADA

ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-7
STATION 27+531.7 TO 30+839.7



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM LAKE KOOCANUSA AT km 90.5.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
5-08-02-00-AL-0011 PLAN AND PROFILE

LENGTH OF TEST SECTION	2.3 km
VOLUME OF TEST SECTION	1450 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	2.90 m ³

PREPARED BY:

R. D. NIVEN

CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
0	ISSUED FOR APPROVAL	80-7-30	A.C.		

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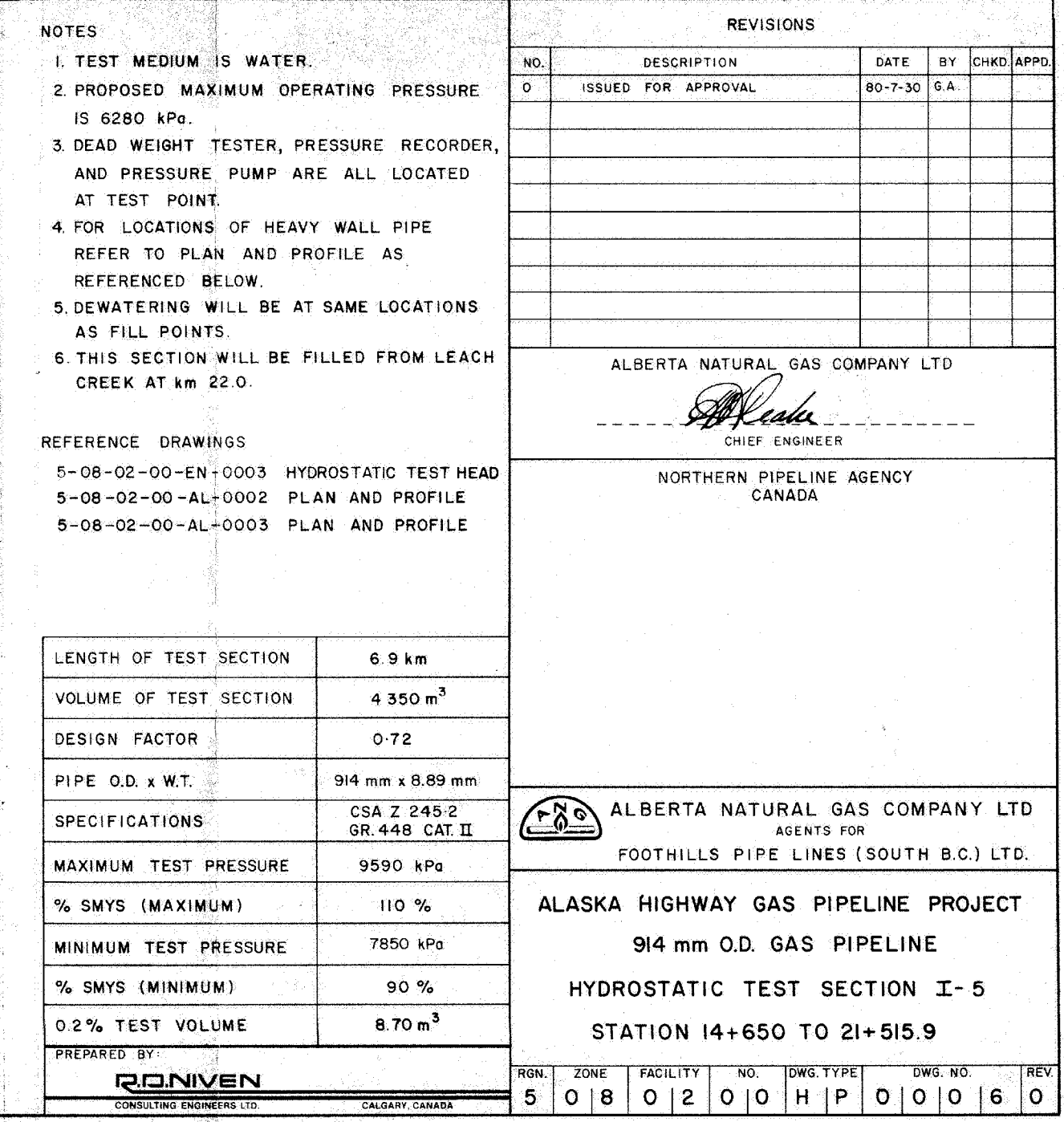
NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-16
STATION 89+517 TO 91+800

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0



NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 8690 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM CREEK AT km 3.2.

REFERENCE DRAWINGS

5-08-02-00-EN-0002 HYDROSTATIC TEST HEAD
5-08-02-00-AL-0001 PLAN AND PROFILE

LENGTH OF TEST SECTION	0.9 km
VOLUME OF TEST SECTION	560 m ³
DESIGN FACTOR	0.80
PIPE O.D. x W.T.	914 mm x 10.28 mm
SPECIFICATIONS	CSA Z 245.2 GR 483 CAT II
MAXIMUM TEST PRESSURE	11950 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	10860 kPa
% SMYS (MINIMUM)	100 %
0.2% TEST VOLUME	1.12 m ³

PREPARED BY:

R.D. NIVEN

CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
0	ISSUED FOR APPROVAL	80-7-30	G.A.		

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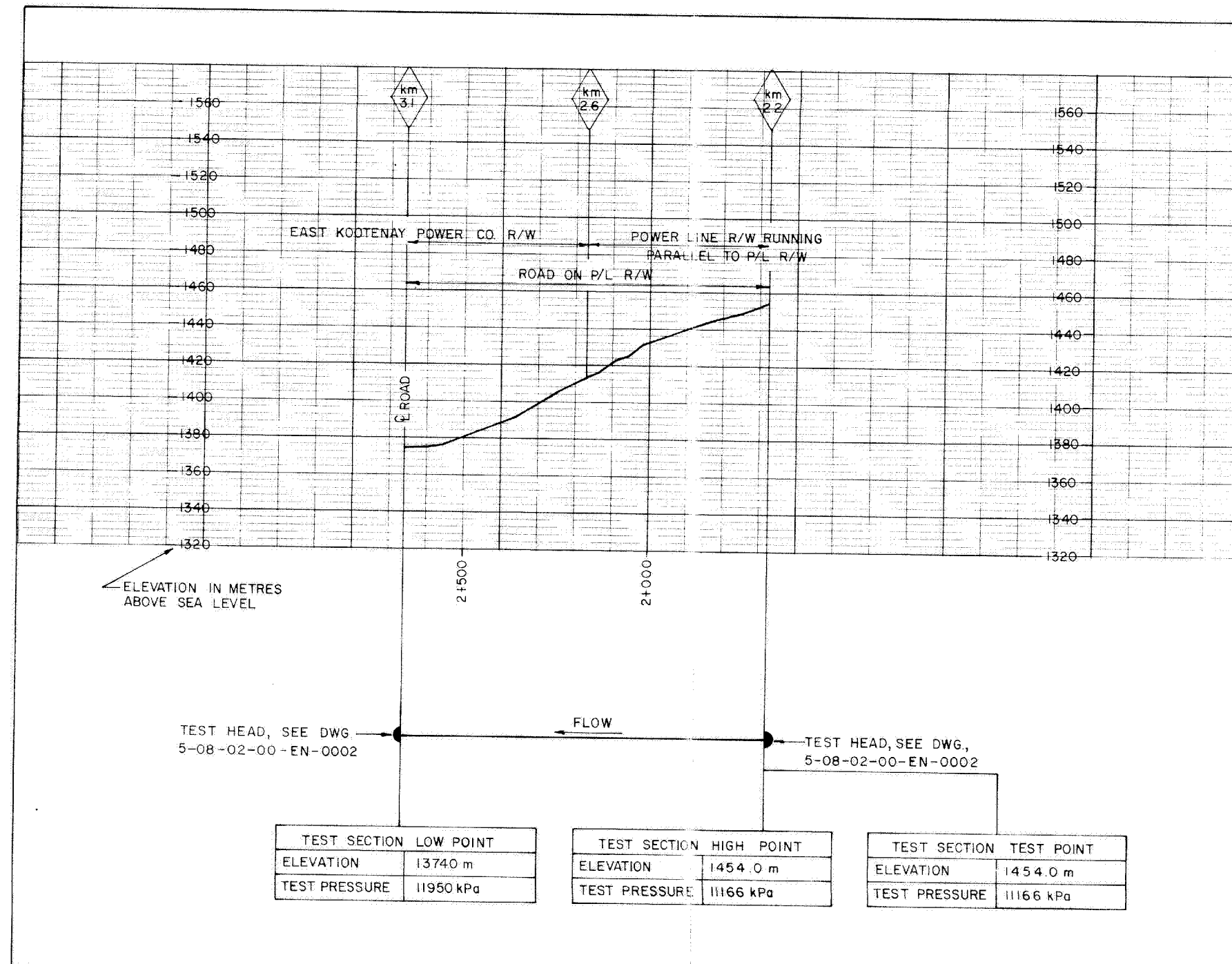
NORTHERN PIPELINE AGENCY
CANADA

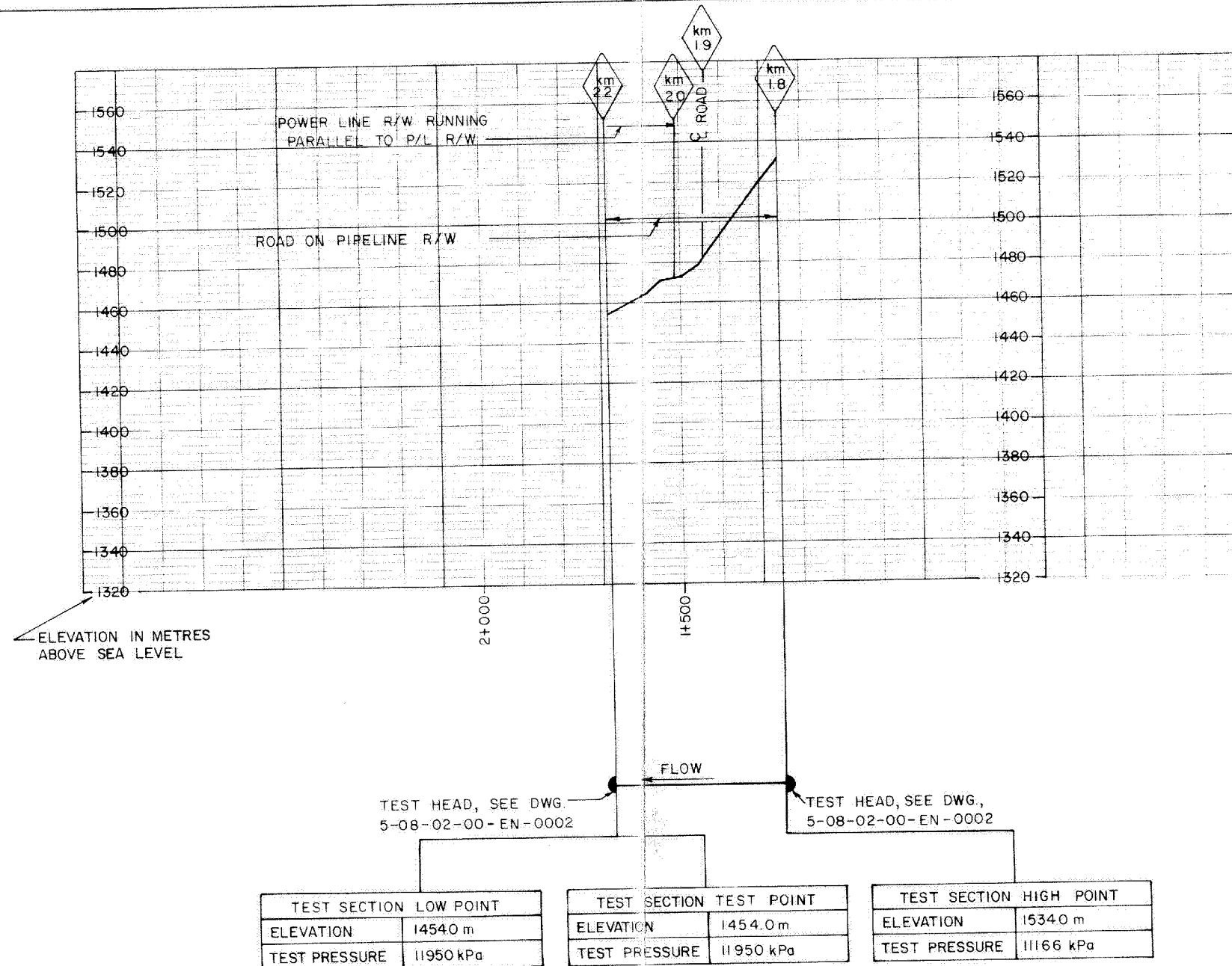


ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-3
STATION 1+676 TO 2+670

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
					0	0
					0	4
						0





NOTES

1. TEST MEDIUM IS WATER.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 8690 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
6. THIS SECTION WILL BE FILLED FROM CREEK AT km 3.2.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0002 HYDROSTATIC TEST HEAD
- 5-08-02-00-AL-0001 PLAN AND PROFILE

LENGTH OF TEST SECTION	0.4 km
VOLUME OF TEST SECTION	250 m ³
DESIGN FACTOR	0.80
PIPE O.D. x W.T.	914 mm x 10.28 mm
SPECIFICATIONS	CSA Z 245.2 GR. 483 CAT. II
MAXIMUM TEST PRESSURE	11950 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	10860 kPa
% SMYS (MINIMUM)	100 %
0.2% TEST VOLUME	0.50 m ³

PREPARED BY:

R.D. NIVEN
CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
0	ISSUED FOR APPROVAL	80-7-30	G.A.		

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[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR

FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

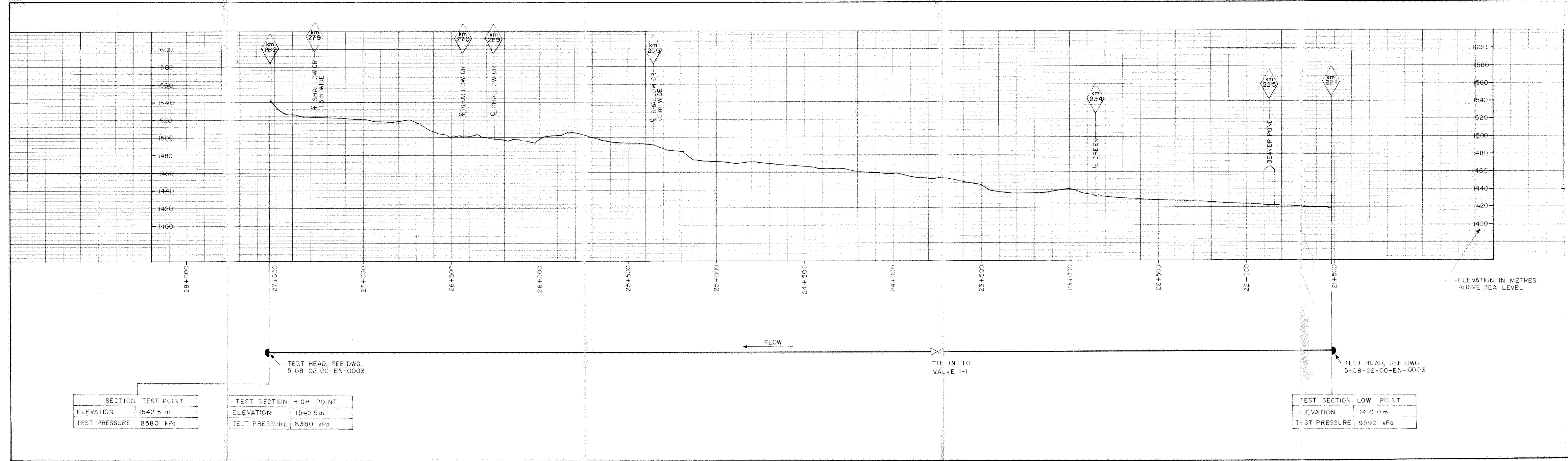
ALASKA HIGHWAY GAS PIPELINE PROJECT

914 mm O.D. GAS PIPELINE

HYDROSTATIC TEST SECTION I-2

STATION 1+248 TO 1+676

RGN.	ZONE		FACILITY		NO.		DWG. TYPE		DWG. NO.			REV.	
5	0	8	0	2	0	0	H	P	0	0	0	3	0



SECTION	TEST POINT
ELEVATION	1542.5 m
TEST PRESSURE	8380 kPa

TEST SECTION	HIGH POINT
ELEVATION	1542.5 m
TEST PRESSURE	8380 kPa

TEST SECTION	LOW POINT
ELEVATION	1419.0 m
TEST PRESSURE	9590 kPa

- NOTES
1. TEST MEDIUM IS WATER.
 2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
 3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
 4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
 5. DEWATERING WILL BE AT SAME LOCATIONS AS FILL POINTS.
 6. THIS SECTION WILL BE FILLED FROM LEACH CREEK AT km 22.0.

- REFERENCE DRAWINGS
- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
 - 5-08-02-00-AL-0003 PLAN AND PROFILE
 - 5-08-02-00-AL-0004 PLAN AND PROFILE

LENGTH OF TEST SECTION	6.1 km
VOLUME OF TEST SECTION	3850 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245-2 GR. 448 CAT. II
MAXIMUM TEST PRESSURE	9590 kPa
% SMYS (MAXIMUM)	110 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %
0.2 % TEST VOLUME	7.70 m ³

PREPARED BY:
R. J. NIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD	APPD.
0	ISSUED FOR APPROVAL	80-7-30	C.B.		

ALBERTA NATURAL GAS COMPANY LTD

Heath
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA

ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
HYDROSTATIC TEST SECTION I-6
STATION 21+515.9 TO 27+531.7

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				H	P	0
						0
						7
						0

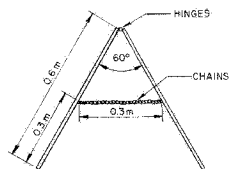
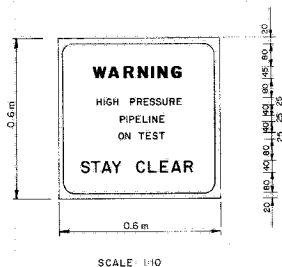
1. WARNING SIGN SHALL BE PLACED NEAR ALL ROADS CROSSING SECTIONS OF THE PIPELINE WHICH ARE ON TEST.

2. WARNING SIGN SHALL HAVE MESSAGE PRINTED ON BOTH SIDES.

3. LETTERING SHALL BE RED ON WHITE BACKGROUND.

4. SIGN SHALL BE CONSTRUCTED OF 19mm PLYWOOD AND SHALL BE HINGED AND CHAINED NEAR BOTH EDGES.

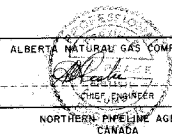
5. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.



SCALE: 1/10"

[illegible]

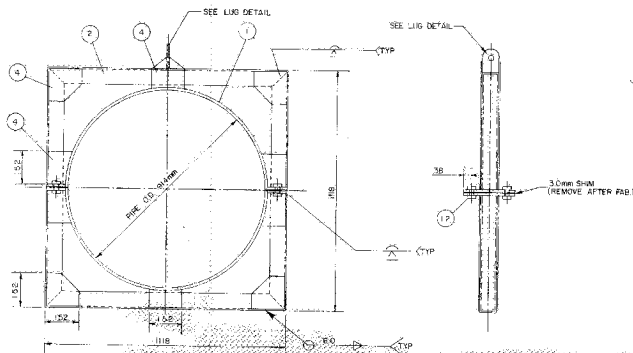
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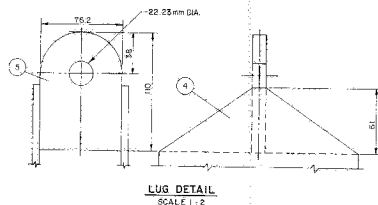
ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

TYPICAL HYDROSTATIC TEST
WARNING SIGN

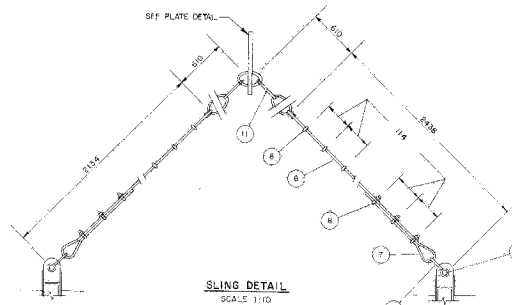
RG#	ZONE	FACILITY	NO	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				T	P	0
					0	0
					2	5
						0



BRACKET DETAILS
SCALE 1:10



LUG DETAIL
SCALE 1:2



SLING DETAIL
SCALE 1/10

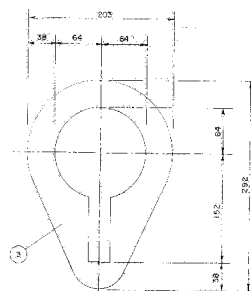


PLATE DETAIL
SCALE 1:3

MATERIAL LIST			
ITEM	DESCRIPTION	QTY	UNIT
	FLAT BAR, 83mm X 12.7mm THICK, W.S. ASTM A-36	8	m
2	75mm CHANNEL AT 7.44 kg/m ASTM A-36	9.4	m
3	PLATE, 304.8mm X 203.2mm X 9.05mm THICK MS. ASTM A-56	1	SACK
4	FLAT BAR, 152.3mm X 6.35mm THICK, W.S. ASTM A-36	3.0	m
5	101.6mm X 76.2mm X 12.7mm THICK, M.S., ASTM A-36	2	EACH
6	9.05mm DIA. ORDINARY LAY WIRE COBE ROPE # 6 X 26	6.2	m
7	19.05mm THICK THIMBLE, EX. NOV., "CROSSBY-LAUGHN" N-G-4.4.	4	EACH
8	19.05mm CHERRY CLIPS	16	SACK
9	9.05mm GALVANIZED ROUND PIN ANCHOR SHACKLE	2	EACH
10	50.8mm DIA. BOLT, -70, C/W NUTS & WASHERS	2	EACH
	19.05mm CHAIN RHN, -70	1.3	m
12	BOLTS, 19.05mm DIA. X 51.4mm LONG, A-307, C/W NUTS & WASHERS	8	EACH

1. MATERIAL IN BILL OF MATERIALS IS LISTED FOR TWO COMPLETE LIFTING BRACKETS
(TWO (2) BRACKETS REQUIRED PER TEST HEAD)
2. ALL DIMENSIONS ARE IN MILLIMETRES
3. ENTIRE BRACKET ASSEMBLY TO BE FABRICATED USING FULL LENGTH 60mm FILLET WELDS
ON ALL SIDES
4. SEE DRAWING 5-08-02-00-EN-0002 AND 5-08-02-00-00-EN FOR 94mm TEST HEAD DETAILS
5. AFTER FABRICATION THE ENTIRE ASSEMBLY SHALL BE PAINTED SILVER OR FLUOROPOLYMER PAINT
6. ADJUST THE DISTANCE BETWEEN BRACKETS AND CABLE LENGTH FOR LIFTING HEIGHT AFTER FABRICATION
7. BRACKETS SHALL BE FABRICATED TO FIT SECURELY AROUND THE CIRCUMFERENCE OF THE TEST HEAD

[illegible]

CHIEF ENGINEER

 **ALBERTA NATURAL GAS COM**
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH

914mm HYDROSTAT
TEST HEAD
BRACKET DETAIL:

PAGE AS SHOWN	
PG#	LINE
5	0 8 0 2 0 0 5 5 0 0

