

**National Transportation Safety Board
Internal Inspection Factual
Bellingham, Washington
Accident DCA99-MP008**

Appendix 9 Caliper tool inspection report

ENDURO

**OLYMPIC PIPE LINE COMPANY
B1296-384C**

**LAUNCH: FERNDALE STATION
RECEIVE: ALLEN STATION
LENGTH: 37.4 MILES
PIPE SIZE: 16 INCH**

OPL 1026449

DOT 0001784

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
1.A		0+00	0+00	Launcher - Ferradok Station
1.B		0+104		HWP - 2.5 Feet - .750 W.T.
1.C		0+12		MLV - Ferradok Station - O.N. ± 8 14.50"
1.I		0+14		.82' Total - .56' Total Sharp - Span 3'
1.O		0+12		Bend - 22° - 3.0 Radius ± 8 15.00" Located in SDO W.T.
1.E		0+34		Bend - 22° - 3.0 Radius ± 8 15.00" Located in .500 W.T.
Page 1	5.120	12+85		ESN
Page 2		37+95		ESN
Pg 3		63+04		ESN
BM	OPL 1026450	72+79	74+10	French Mack - Walfine Rd
Pg 4		88+14		ESN

1.1
1.2

Page 1
Page 2
Page 3
Page 4

DOT 0001785

I.D. No.	Chart Incl.	Enduro No.	Customer No.	Comments
BM		98+44	98+50	Bench Mark - Elder Rd
Page 5	45.120	113+24		ESN
Page 6		138+33		ESN
Page 7		163+43		ESN
BM		179+35	178+29	Bench Mark - Hexton Way
Page 8	75.120	198+52		ESN
Page 9		213+62		ESN
Page 10		238+72		ESN
BM		257+49	257+12	Bench Mark - Fecordale Rd
Page 11	105.120	263+81		ESN
Page 12		288+91		ESN

DOT 0001786

OPL 1026451

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
Page 13		314+01		ESN
Page 14	135.12	339+10		ESN
15.A	142.775	358+32	358+37	MLV ^{OP} - Rural Ave IA 15.14°
Page 15	145.12	364+18		ESN
Page 16	155.12	389+21		ESN
Page 17	165.12	414+23		ESN
BM		418+87	418-48	Ranch Mark - Northwood Ave
Page 18		439+26		ESN
Page 19		464+28		ESN
BM		470+77	489+77	Ranch Mark - Aldrich Rd
Page 20		489+30		ESN

DOT 0001787

DPL 1026452

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
Page 21	205.12	574+32		ESN
BM		523+07	523+47	Bench Mark - Guide Meridiana Rd
Page 22		530+35		ESN
Page 23	DOT 0001788	569+37		ESN
Pg 24		589+39		ESN
Pg 25		614+42		ESN
BM		626+55	625+72	Bench Mark - Van Wyck Rd E side
Page 26		639+44		ESN
BM	OPL 1026453	642+22		Bench Mark
Pg 27		664+46		ESN
Pg 28	275.12	689+49		ESN

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
BM		693+56	693+27	Beach Mark - Bakerview Rd
g 29		714+51		ESN
Pg 30		739+53		ESN
g 31		764+55		ESN
Pg 32		789+58		ESN
Pg 33		814+60		ESN
Pg 34	335.12	839+62		ESN
35.A		840+50		Bend-90° - 30 Radius
35.B		842+00		^{28 15.24} Bend-90° - 30 Radius
35.1		843+69		^{28 15.20} .45 Inch TB
35.C		843+90		Bend-30° - 30 Radius
35.D		847+54		^{15.32} Bend-22° - 30 Radius IO 15.11"
35.2		817+54		^{26°-75} Note: This bend has a rounded expansion then reduction in the span of the bend, or possible mitered bend.

DOT 0001789

OPL 1026454

EQ

Equation: Back 847+58 = Ahead 845+61. Add 198' To overall length

I.D. No.	Chrt Inch.	Enduro No.	Customer No.	Comments
35, E		856+44	854+42	MLV - Lakeway Drive - O.N.
Page 35		864+63		ESN 13 15.15°
BM		889+13		Bench Mark
Page 36		889+65		ESN
Page 37		914+67		ESN
Page 38		939+69		ESN
Page 39		964+71		ESN
1, 40		989+74		ESN
P 41		1014+76		ESN
BM		1017+03	1015+37	Bench Mark - Samish Way
P 42		1039+78		ESN

OPL 1026455

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
Pg 43		1084+80		ESN
Pg 44		1089+82		ESN
Pg 45		1114+84		ESN
Pg 46		1139+86		ESN
BM		1152+01	1151+89	Bench Mark - Drive Way to Parking lot Lake Sunish
Pg 47	DOT 0001791	1164+89		ESN
Pg 48		1189+91		ESN
Pg 49		1214+93		ESN
Pg 50	OPL 1026456	1239+95		ESN
BM		1259+73	1258+48	Bench Mark - Bear Creek Lake
Pg 51		1264+97		ESN

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
P _g 52		1289+99		ESN
P _g 53		1315+01		ESN
P _g 54		1340+03		ESN
BM		1360+48	1359+73	Bench M...k - Barrell Springs Ln
P _g 55		1365+06		ESN
P _g 56	DOT 0001792	1390+08		ESN
P _g 57		1415+10		ESN
BM		1439+76	1437+83	Bench Mark - Lilly Lake Rd
P _g 58	OPL 1026457	1440+12		ESN
P _g 59		1465+14		ESN
BOA		1470+00	1468+05	MLV - O.N - Wood Road 20 15.18"

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
Pg 60		1420+17		ESN
Pg 61		1515+19		ESN
BM		1540+26	1538+54	Bench Mark - Colony Creek Rd
Pg 62		1540+84		ESN
Pg 63		1545+24		ESN
Pg 64	DOT 0001793	1590+27		ESN
BM		1592+68	1590+89	Bench Mark - Base Hill Rd
Pg 65		1615+29		ESN
Pg 66	OPL 1026458	1640+32		ESN
Pg 67		1665+35		ESN
Pg 68		1690+37		ESN

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
BM		1709+45	1707 74	Bench Mark - Chuckanut Dr
Pg 69		1715+40		ESN
Pg 70		1740+42		ESN
BM		1752+94	1751+09	Bench Mark - Allen West Rd
Pg 71		1765+45		ESN
72A		1779+39	1777+43	MLV - O.N. - Bradley Road
Pg 72		1790+49		ESN <small>IS 15.14"</small>
BM		1805+57	1803+72	Bench Mark - Benson Rd
Pg 73		1815+54		ESN
Pg 74		1840+59		ESN
Pg 75		1865+64		ESN
Pg 76		1890+70		ESN

DOT 0001794

OPL 1026459

I.D. No.	Chart Inch.	Enduro No.	Customer No.	Comments
BM		1912+05	1910+16	Bench Mark - Peterson Rd
P _g 77		1915+75		E 5N
P _g 78		1940+80		E 5N
P _g 79		1965+85		E 5N
80.A	DOT 0001795	1970+73		Bend - 45° - 30 Radius - Located in .562 W.T. <small>± 14.86"</small>
80.B		1973+54		Bend - 22° - 30 Radius - Located in 500 <small>± 014.86"</small>
80.1		1973+54		.52° - 75 - Located at bend
80.C		1973+68		Bend - 22° - 30 Radius - Located in .500 <small>± 0 14.90"</small>
80.2		1973+68		.48° - 75 - Located at bend
80.D		1973+83	1971+85	
80.E	1973+83			Hub - 2' - .750 W.T.
80.F	OPL 1026460	1973+88	1	Receiver - Allen Station

B1296-384C
16" x 37.4 MI.
SCALE: 250
BELOW W.T.: 312

CALIBRATION
1/2" = .140" 3.571
1" = .262" 3.731
1 1/2" = .362" 4.140

ANOMALIES

PAGE 1

STATION 0+06

.88 INCH TOTAL FLAT - SPAN 2 FEET - LOCATED AT ML
INTERNAL BORE 14.50 INCH
APPROX MLU IS LOCATED IN .750 W.T.
MLU - OPERATOR IS NORMAL

STATION 0+14

.82 INCH TOTAL - .56 INCH SHARP - SPAN 3 FEET - LOCATED AT P/SIC
INTERNAL BORE 14.56 INCH

STATION 0+19

.43 INCH TOTAL - ~~.25 INCH SHARP~~ - ~~SPAN 2 FEET~~ - LOCATED AT BRUN
INTERNAL BORE 14.95 INCH
BEND - 22 DEGREE - 3 D RADIUS
~~APPROX BEND IS~~ LOCATED IN .500 W.T.

0+34

.48" TOTAL SHARP - LOCATED AT BRUN
INTERNAL BORE 15.0 INCH
BEND - 22 - DEGREE - 3 D RADIUS - LOCATED IN 500 W.T.

509' 843+72

.45" TOTAL SHARP
INTERNAL BORE 14.92 INCH
LOCATED 1,275' UPSTREAM MLU - STATION 854+49 (856+47)
LOCATED 20' U/S BRUN 30" - STATION 844+04 (843+92)

1970+75

.52" TOTAL FLAT
INTERNAL BORE 14.86 INCH
BEND - 45 DEGREE - 3 D RADIUS - LOCATED IN .562 W.T.

1971+56

.52" TOTAL FLAT SHARP OPL 1026461
INTERNAL BORE 14.86 INCH
BEND - 22" - 3 D RADIUS - LOCATED IN .500 W.T.

1971+70

.48" TOTAL FLAT SHARP DOT 0001796
INTERNAL BORE 14.90 INCH
BEND - 22" - 3 D RADIUS - LOCATED IN 500 W.T.

OLYMPIC PIPE LINE COMPANY

January 15, 1997

Job Number: B1296-384C

Launch: FERNDALE STATION

Receive: ALLEN STATION

Pipe Size: 16 INCH

Line Length: 37.4 MILES

OPL 1026462

DOT 0001797

**OLYMPIC PIPE LINE COMPANY
B1296-384C**

DATE: January 15, 1997
LAUNCH: FERNDAL STATION
RECEIVE: ALLEN STATION
TOTAL ANOMALIES: 4

LENGTH: 37.4 MILES
PIPE SIZE: 16 INCH
PRODUCT: GASOLINE
NOMINAL W.T.: .312

The purpose of this inspection was to determine the geometrical condition of the pipeline. Any bend potentially hazardous to the running of a corrosion survey tool will be sized and located. Bend bore is extremely important, both bore and radius will be sized in the following report. (Bend requirements of the corrosion tool have been supplied by CUSTOMER, as corrosion tool selection is determined by CUSTOMER.) Field bends and extremely long radius bends will be identified by location only, as they present no immediate problem to running of corrosion tool inspection.

Line anomalies will also be sized and located identifying SHARP and FLAT SPOT anomaly off or greater than the larger of .500 inch or 3% pipeline O.D and OVALITY - the larger of .500 or 5% pipe O.D. A SHARP anomaly is defined as a reduction in pipeline diameter, occurring within a span of 2 feet or less. FLAT SPOT anomaly is defined as a reduction in pipe diameter having a span exceeding 2 feet but, not greater than 5 feet. OVAL anomaly is defined as exceeding a span of 5 feet and having no part thereof exceeding SHARP or FLAT SPOT specification.

This tool was run in gasoline at an average speed of 5.52 mph. It traversed the 37.4 mile pipeline in 6 hours and 47 minutes, recording good and accurate information. There were no problems encountered during the running of the tool and it performed as expected recording numerous bends and anomalies.


ANOMALIES: The largest of four anomalies identified by this survey is a .82 inch total, .56 inch sharp located at the side tee at the launcher. This type of indication is also seen when bars across a side tee are not recessed far enough. For a complete list and location of these anomalies please see the Index Of Anomalies.

BENDS: Two of the ten bends logged by this survey are 90 degree 3 D radius, located downstream of Whatcom Creek. There is one 45 degree 3 D radius and one 30 degree 3 D radius. There are five 22 degree 3 D radius. One of the 22 degree 3 D radius bends located downstream of Whatcom Creek maybe wrinkled or miter bend. The remaining nine bends are field radius bends. For the exact location of this bend and the others please refer to the Index Of Bends

Known points or benchmarks are identified by letters of the alphabet. Any unknown point or line reduction exceeding specifications will be identified numerically.

We at ENDURO thank you for the opportunity to work with you. Should you have further needs in this area, we hope you will call on us.

Respectfully Submitted;
ENDURO PIPELINE SERVICES, INC.


Eric Boshuizen
Field Engineer

Scott Coats
Chart Analysis

OPL 1026463

DOT 0001798



Pipeline Services, Inc.

OLYMPIC PIPE LINE COMPANY
B1296-384C
FERNDAL STATION To ALLEN STATION
Index Of Anomalies - Sorted By Size

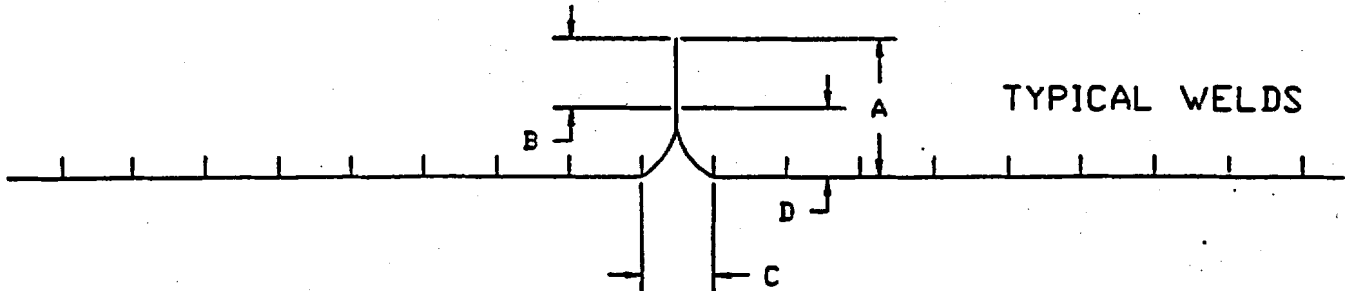
I.D.	Station	Description
1.1	0+14	.82 INCH TOTAL - .56 INCH SHARP - SPAN 3 FEET
80.1	1973+54	.52 INCH TOTAL SHARP - LOCATED AT BEND
35.1	843+69	.45 INCH TOTAL SHARP
35.2	847+54	.26 INCH TOTAL SHARP

There Are 4 Anomalies Located In This Line Section

OPL 1026464

DOT 0001799

Anomaly Analysis Breakdown



- (A) **TOTAL ANOMALY:** Is calculated from base line to the peak.
 - (B) **SHARP:** Is that portion of an anomaly occurring within a span of two (2) feet.
 - FLAT :** A reduction in pipe diameter having a span exceeding two (2) feet but, not greater than five (5) feet.
 - (C) **OVALITY SPAN:** Is given to show the longitudinal distance of an anomaly exceeding a span of five (5) feet.
 - (D) **OVALITY MAGNITUDE:** To determine, subtract *SHARP* portion from *TOTAL ANOMALY*.
- OVERBURDEN RELIEF:** *Soil removal during excavation of anomalies will relieve a large portion of the ovality. (The larger the ovality span the more relief.)*

Sample

ENDURO PIPELINE SERVICES

<u>I.D. No.</u>	<u>STATION</u>	<u>COMMENTS</u>	OPL 1026465
29.1	3701+71	1.53 INCH TOTAL - .95 SHARP - SPAN 17 FEET	

DOT 0001800

OLYMPIC PIPE LINE COMPANY
B1296-384C
FERNDALE STATION To ALLEN STATION
Index Of Bends - Listed In Page Order

<u>I.D.</u>	<u>Station</u>	<u>Description</u>
1.D	0+19	BEND - 22 DEGREE - 3 D RADIUS
1.E	0+33	BEND - 22 DEGREE - 3 D RADIUS
2.A	32+97	BEND - FIELD RADIUS
2.B	36+22	BEND - FIELD RADIUS
23.A	561+50	BEND - FIELD RADIUS
27.A	649+18	BEND - FIELD RADIUS
29.A	691+69	BEND - FIELD RADIUS
35.A	840+43	BEND - 90 DEGREE - 3 D RADIUS
35.B	842+03	BEND - 90 DEGREE - 3 D RADIUS
35.C	844+05	BEND - 30 DEGREE - 3 D RADIUS
35.D	847+58	BEND - 22 DEGREE - 3 D RADIUS
79.A	1949+30	BEND - FIELD RADIUS
79.B	1950+49	BEND - FIELD RADIUS
79.C	1951+56	BEND - FIELD RADIUS
80.A	1967+30	BEND - FIELD RADIUS
80.B	1972+73	BEND - 45 DEGREE - 3 D RADIUS
80.C	1973+54	BEND - 22 DEGREE - 3 D RADIUS
80.D	1973+68	BEND - 22 DEGREE - 3 D RADIUS

There Are 18 Bends Cataloged In This Line Section

DOT 0001801

OPL 1026466

ENDURO PIPELINE SERVICES

<u>I.D. NO.</u>	<u>ENDURO STATION</u>	<u>CUSTOMER STATION</u>	<u>COMMENTS</u>
1.A	0+00	0+00	LAUNCHER - FERNDALE STATION
1.B	0+04		HWP- 2.5 FEET - .750 W.T.
1.C	0+08	0+08	MLV - FERNDALE STATION - OPERATOR NORMAL INTERNAL BORE 14.50 INCHES LOCATED IN .750 W.T. PIPE
1.I	0+14		.82 INCH TOTAL - .56 INCH SHARP - SPAN 3 FEET INTERNAL BORE 14.56 INCH - POSSIBLE PIG SIGNAL HIT
1.D	0+19		BEND - 22 DEGREE - 3 D RADIUS LOCATED IN .500 W.T. PIPE INTERNAL BORE 15.00 INCHES
1.E	0+33	0+33	BEND - 22 DEGREE - 3 D RADIUS LOCATED IN .500 W.T. PIPE INTERNAL BORE 15.00 INCHES
PAGE 1	12+85		END STATION NUMBER

OPL 1026467

DOT 0001802

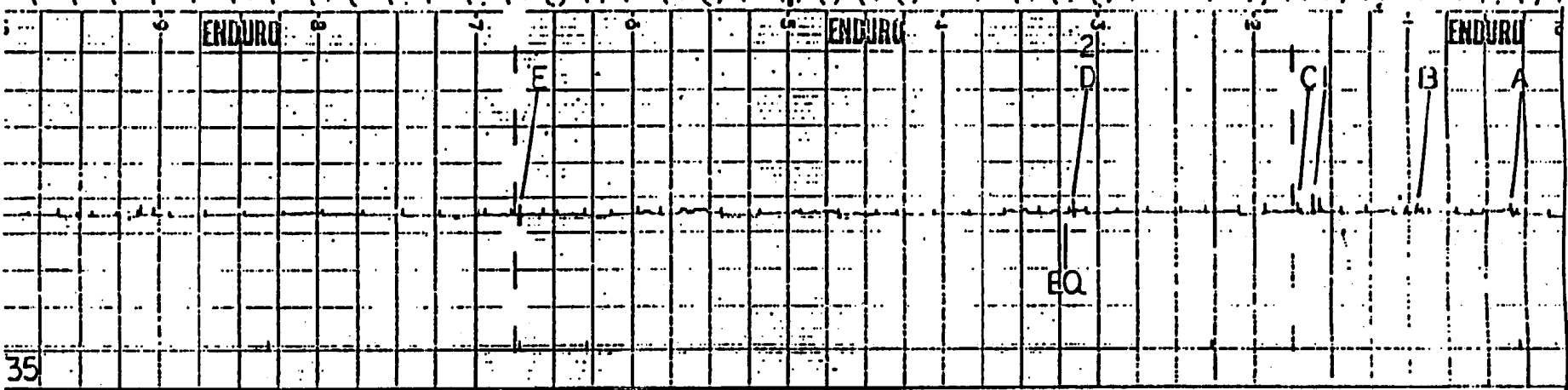
ENDURO PIPELINE SERVICES

I.D. NO.	ENDURO STATION	CUSTOMER STATION	COMMENTS
35.A	840+43	840+43	BEND - 90 DEGREE - 3 D RADIUS INTERNAL BORE 15.24 INCHES
35.B	842+03	842+03	BEND - 90 DEGREE - 3 D RADIUS INTERNAL BORE 15.20 INCHES
35.1	843+72		.45 INCH TOTAL SHARP INTERNAL BORE 14.92 INCHES
35.C	844+05	844+05	BEND - 30 DEGREE - 3 D RADIUS INTERNAL BORE 15.32 INCHES
35.D	847+58	847+58	BEND - 22 DEGREE - 3 D RADIUS INTERNAL BORE 15.11 INCHES
35.2	847+54		.26 INCH TOTAL SHARP NOTE: THIS BEND HAS A RECORDED EXPANSION THEN REDUCTION IN THE SPAN OF THE BEND WRINKLED BEND OR POSSIBLE MITTRED BEND
		EQUATION:	BACK 847+59 = 845+61 ADD 198 FEET TO OVERALL LENGTH NOTE: EQUATION IN MAP IS REVERSED
35.E	856+47	854+49	MLV - LAKEWAY DRIVE - OPERATOR NORMAL INTERNAL BORE 15.15 INCHES
PAGE 35	864+63		END STATION NUMBER

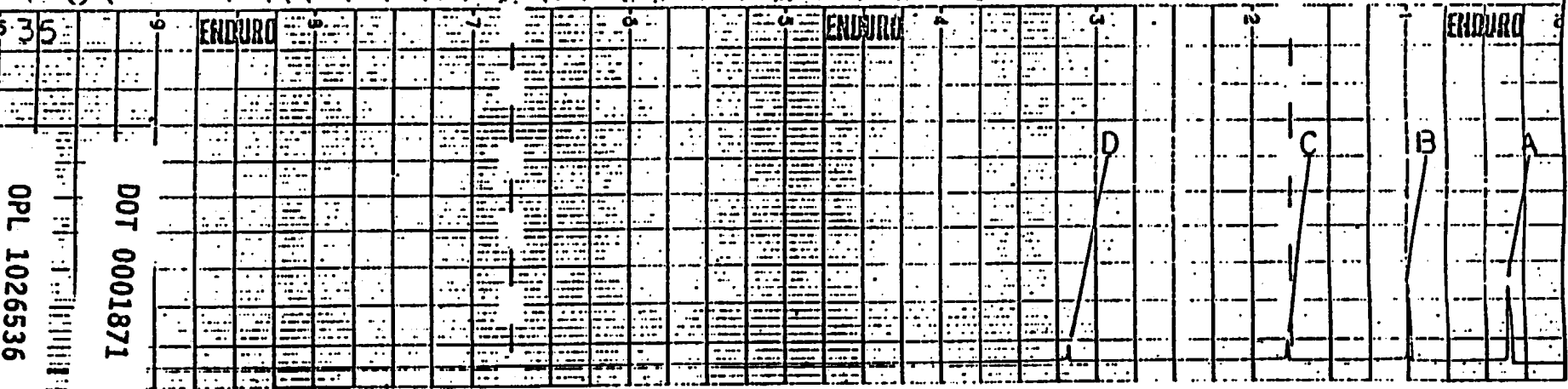
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OPL 1026535

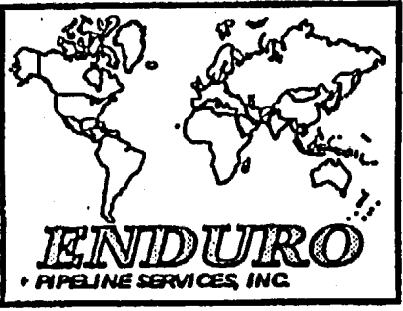
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OPL 1026536
DOT 0001871



PIPELINE GEOMETRY STATUS REPORT

JOB NUMBER: B1296-384C

Company: Olympic Pipe Line Company Date: January 15 1997

Location - Launch: Ferndale Station Receive: Allen Station

Pipe Size: 16 Inch Length: 37.4 Miles Scale: 250 Feet = 1 Inch

Enduro Representative: E. Boshuizen

FIELD REPORT

Customer: Olympic Pipe Line Company	Job Number: B1296-384C
Date: January 15 1997	Average Speed: 5.52 MPH
Launch: Femdale Station	Launch Time: 09:45 AM
Receive: Allen Station	Receive Time: 16:32 PM
RUN STATUS	

SPREAD #	PIPE DIA.	LENGTH	TEST SEC.	AIR	WATER	TOTAL CFM
	16 Inch	37.4 Miles			Gasoline	

COMMENTS: This Report will have Benchmark placements to help locate anomalies. The anomalies sized in this Field Report will be 3 % for Sharp Anomalies - occurring in a span of two feet or less, except if the anomaly is located in a bend, and 5 % for Ovality - occurring in a span five feet or greater.

* The sizing of anomalies and station number on the Field Report are subject to change in the Final Report.

ID. #	STATION #	DESCRIPTION - ANOMALY BREAKDOWN
1	0+08	.88 Inch Total Flat - Span 2 Feet - Located at Valve
		Internal Bore 14.50 Inch
		Appears MLV is Located in .750 W.T.
		MLV - Operator is Normal
2	0+14	.82 Inch Total - .56 Inch Sharp - Span 3 Feet
		Internal Bore 14.56 Inch
		Possible Pig Signal Hit
3	0+19	.43 Inch Total Sharp - Located at Bend
		Internal Bore 14.95 Inch
		Bend - 22 Degree - 3 D Radius - Located in .500 W.T.
		Continued on next Page

ENDURO REP. SIGNATURE : Lu. Bohannon

CUSTOMER REP. SIGNATURE : R.J. Kleen

DATE: 1-27-97

ENDURO



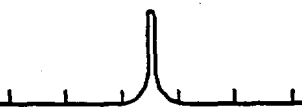


Pipeline Services, Inc.

* The sizing of anomalies and station number on the Field Report are subject to change in the Final Report.

ID. #	STATION #	DESCRIPTION - ANOMALY BREAKDOWN
4	0+34	.48 Inch Total Sharp - Located at Bend Internal Bore 15.00 Inch Bend - 22 Degree - 3 D Radius - Located in .500 W.T.
5	843+72	.45 Inch Total Sharp Internal Bore 14.92 Inch Located 1,275 Feet Upstream From MLV - Station 854+49 Located 20 Feet Upstream Bend - 30 Degree - Station - 844+03
6	1970+75	.52 Inch Total Flat - Span 3 Feet - Located at Bend Internal Bore 14.88 Inch Bend - 45 Degree - 3 D Radius - Located in .582 W.T.
7	1971+66	.52 Inch Total Sharp - Located at Bend Internal Bore 14.88 Inch Bend - 22 Degree - 3 D Radius - Located in .500 W.T.
8	1971+70	.48 Inch Total Sharp - Located at Bend Internal Bore 14.90 Inch Bend - 22 Degree - 3 D Radius - Located in .500 W.T.
9	1971+85	.88 Inch Total Flat - Span 2 Feet - Located at Valve Internal Bore 14.60 Inch Appears MLV is located in .750 W.T. Operator Normal

0000081
~~CONFIDENTIAL~~
DO NOT COPY

Anomaly Conformation Sheet

OVALITY	COMBINATION	FLAT	SHARP
			
Has a span of more than 5 feet but contains no sharp	Has a span of more than 5 feet but contains some sharp within	Has a span of more than 2 feet but less than 5 feet	Has a span of less than 2 feet
			
LINE WELDS		DIRECTION OF FLOW:	

Station Number 843+69
 Distance To Benchmark No distance needed
 From 1275 feet upstream of MLV at Lakeway Drive

Anomaly Type Total sharp
 Overall Size .45 inch
 Sharp/Flat Size .45 inch
 Ovality Size _____
 Span _____

Distance From Upstream Weld 15 feet
 Downstream Weld 25 feet

Additional Comments: _____

