TEP Rocky Mountain LLC
Clough NR 22-3
Casing Integrity Report

Reliance Oilfield Services
2100 S. Utica Ave, Suite 202
Tulsa, OK 74114
(877) 909-5823
www.relianceofs.com

Casing Integrity Interpretation

TEP Rocky Mountain LLC
Clough NR 22-3
API # 05-045-23904
October 06, 2018

Casing Description	Size (in)	Casing Weight (lb/ft)	Depth Interval (ft)
Surface Casing	9 5/8	36	Surface – 1126
Production String	4 1/2	11.6	Surface – 10241

Objective

Inspect the casing condition in the 4 1/2-inch casing.

Operation

Reliance Oilfield Services utilized a 40-finger Sondex Multifinger Imaging Tool (MIT) for internal casing inspection. The MIT was logged on October 06, 2018.

Interpretation Summary

The MIT casing inspection data was evaluated in WIPER from 6238.34 – 10168.26 feet. In total, 90 joints were analyzed on a joint-by-joint basis. The area immediately surrounding the collars was ignored during processing.

For this well, the maximum penetration values were calculated from the mode ID, which is the measured ID of the joint, estimated from "good areas of pipe." The mode ID of the joints range from 3.92 – 4.02 inches. The nominal ID of this well (4 1/2 -inch 11.6-pound casing) is 4.0 inches.

The largest anomaly in the well has a maximum penetration value of 100% at a depth of 7794.5 feet. This is a repeatable multi-finger anomaly and is classified as a possible hole. A "possible hole" is any anomaly with a penetration value larger than 80%. Even though only the largest anomaly for this joint is listed in the report, it's important to note that the ID of the entire joint is very inconsistent with average ID values, ranging from 3.98 – 4.21 inches (not including the hole). In fact, approximately half of the joint has ID values greater than 4.11 inches. The log data showing this anomaly is shown in Figure 1, the cross section is shown in Figure 2, and 3D images of this anomaly are shown in Figure 3 and Figure 4.

The second largest anomaly in the well has a maximum penetration value of 21.01% at a depth of 9176.2 feet. The log data showing this anomaly is shown in Figure 5, the cross section is shown in Figure 6, and 3D images of this anomaly are shown in Figure 7 and Figure 8.

All other joints have maximum penetration values under 13%.

Please see the attached Joint Tabulation Table at the end of the report for more information.

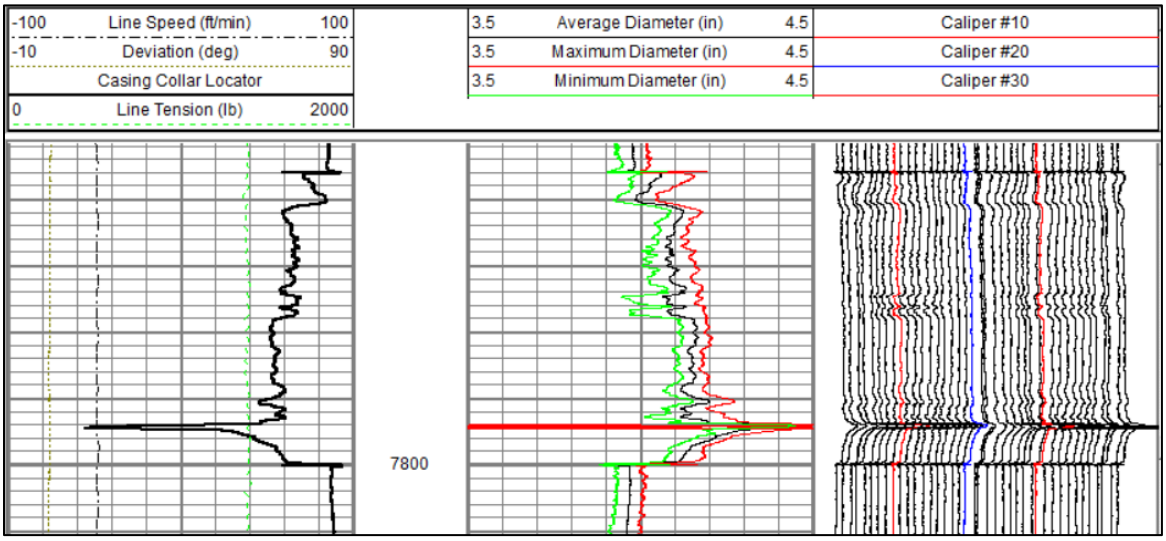

Figure 1. Log data of the anomaly at 7794.5 feet.

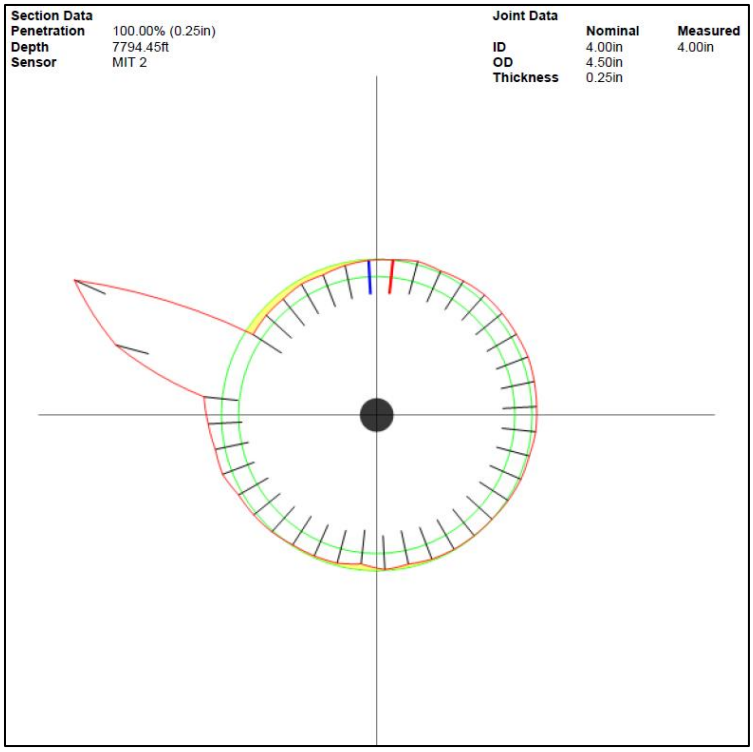

Figure 2. Cross-section of the anomaly at 7794.5 feet.

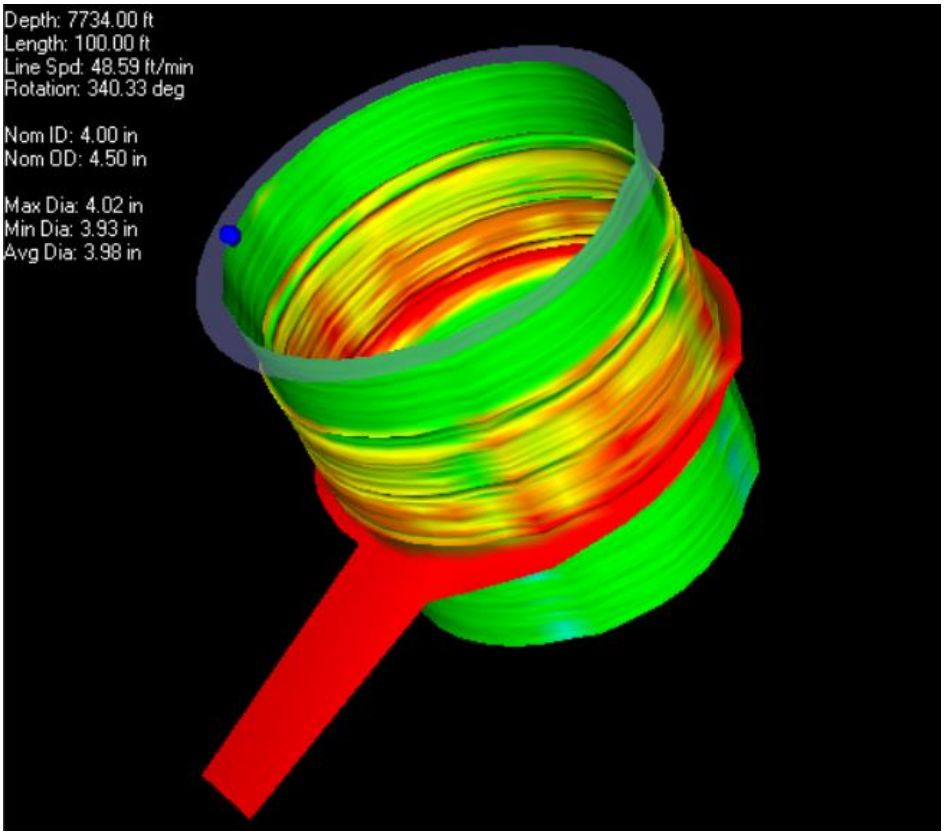

Figure 3. 3D image of the anomaly at 7794.5 feet.

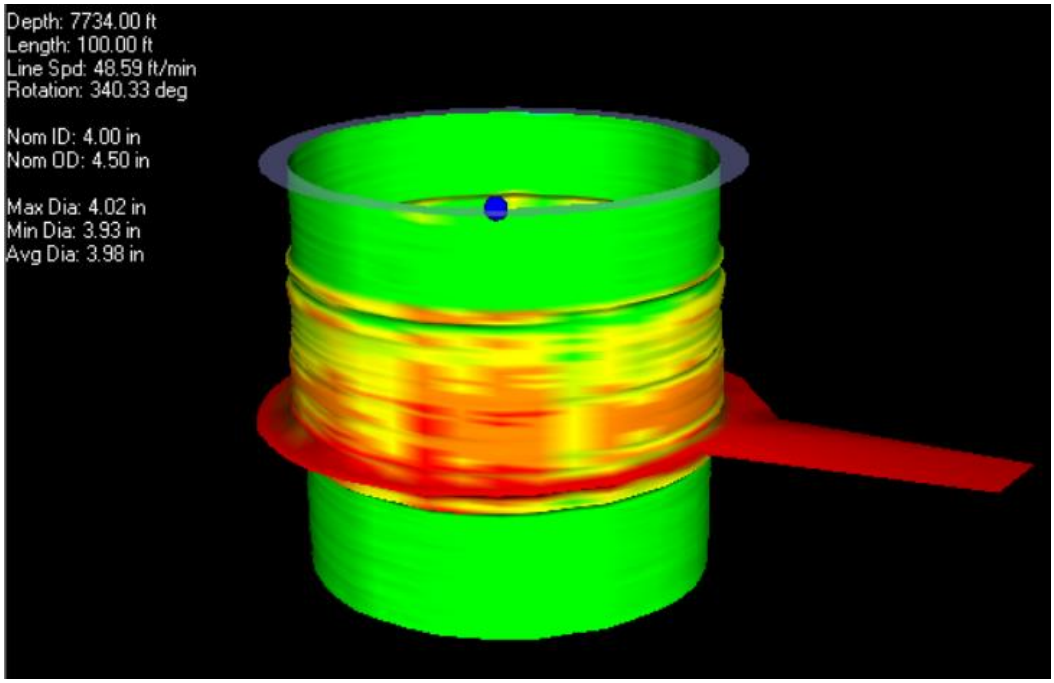

Figure 4. 3D image of the anomaly at 7794.5 feet.

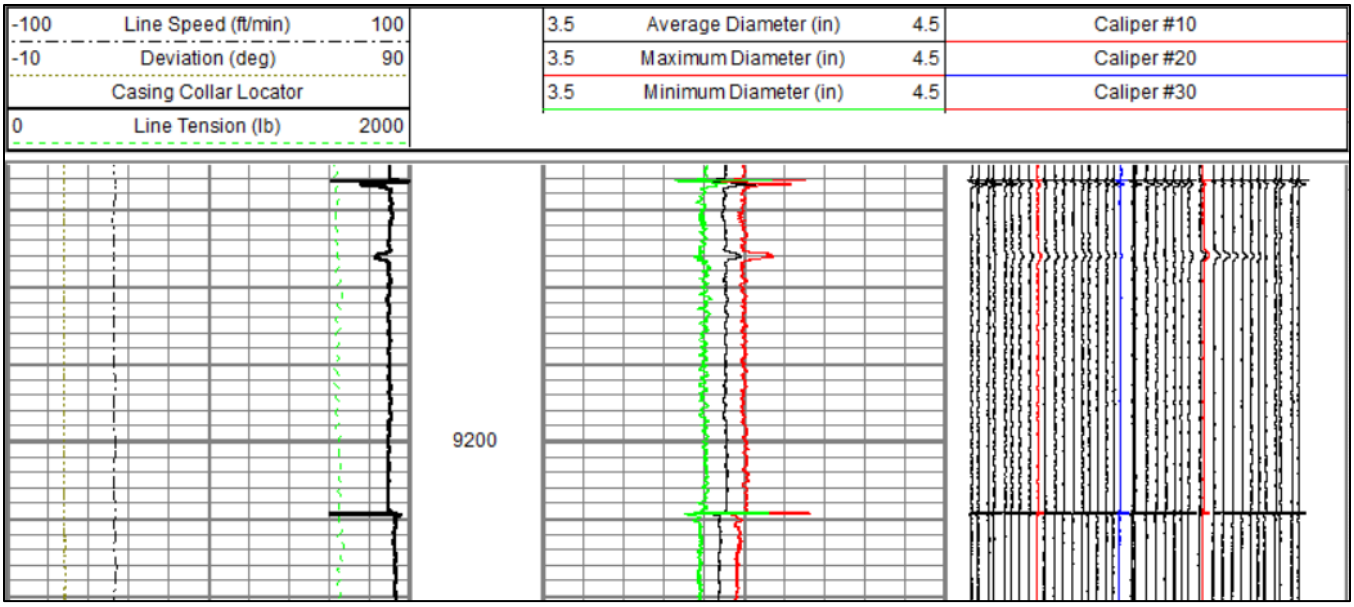

Figure 5. Log data of the anomaly at 9176.2 feet.

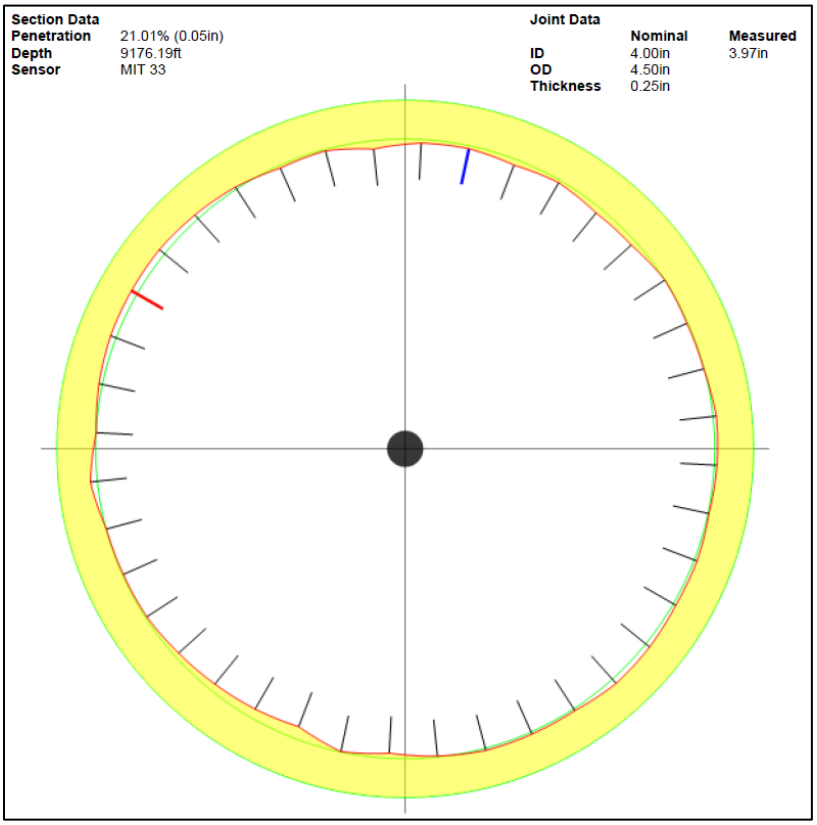

Figure 6. Cross-section of the anomaly at 9176.2 feet.

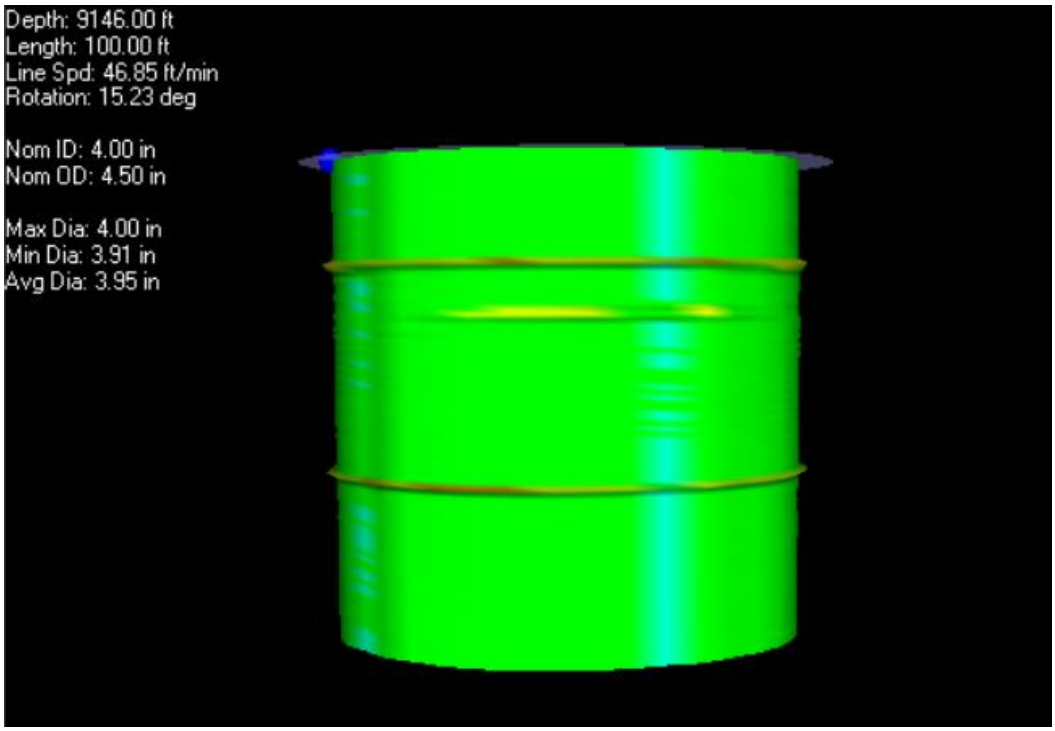

Figure 7. 3D image of the anomaly at 9176.2 feet.

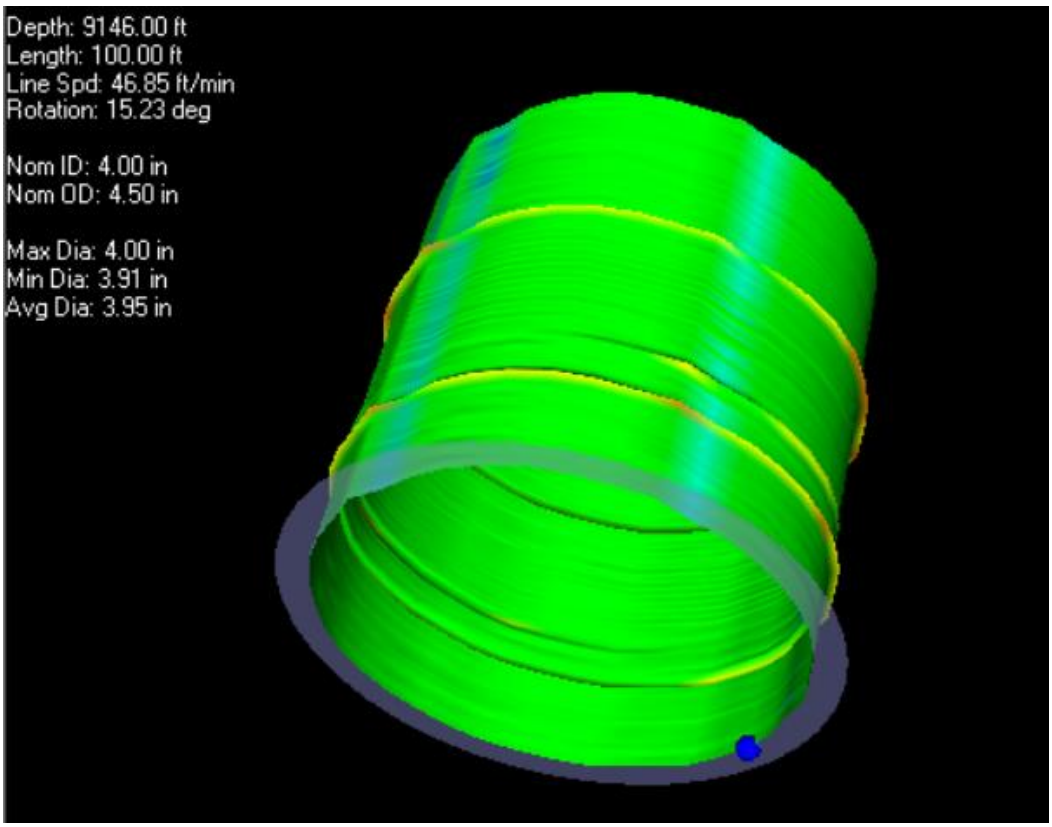

Figure 8. 3D image of the anomaly at 9176.2 feet.

Casing Inspection Report

Company	TEP Rocky Mountain LLC
Field	Rulison
Well	Clough NR 22-3
Country	USA
County	Garfield
State	Colorado
Analysed By	E. Siegel
Survey Date	06-OCT-2018

Tools Used in Analysis

Serial No:

Zone	Size (in)	Weight (lb/ft)	Length (ft)	Nom ID (in)	Grade
1	4.500	11.600	3982.8	4.000	UNKNOWN

Analysis Overview

Joints Analysed = 90
Reported depth range = 6238.34ft - 10168.26ft
Joints with possible hole = 1

V-3.18

Casing Inspection Report

Company	TEP Rocky Mountain LLC
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Analysed By	E. Siegel
Survey Date	06-OCT-2018

Tools Used in Analysis

Serial No:

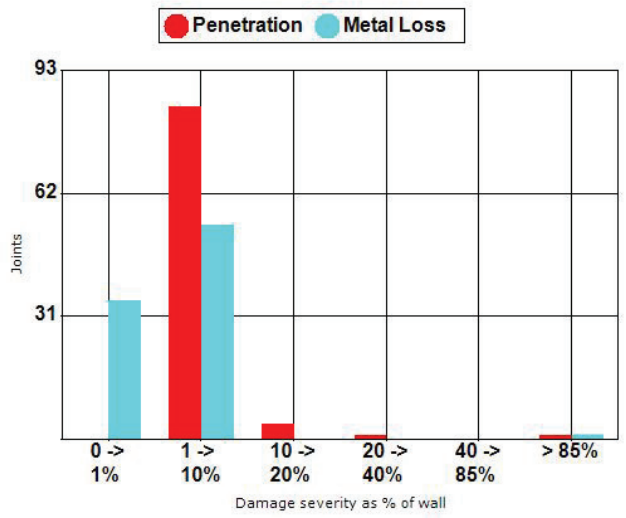
Most penetrated joints

Penetration of 100.00% (0.25in) in Joint 37 at depth 7794.5ft
Penetration of 21.01% (0.05in) in Joint 69 at depth 9176.2ft
Penetration of 12.74% (0.03in) in Joint 63 at depth 8948.6ft
Penetration of 12.62% (0.03in) in Joint 53 at depth 8502.7ft
Penetration of 11.09% (0.03in) in Joint 14 at depth 6775.1ft

MIT Report Overview
Body Region Penetrations

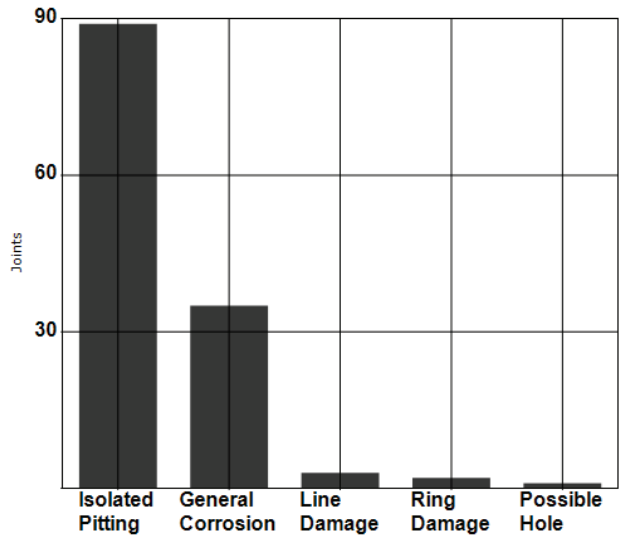
Company	TEP Rocky Mountain LLC
Field	Rulison
Well	Clough NR 22-3
Country	USA
County	Garfield
State	Colorado
Analysed By	E. Siegel
Survey Date	06-OCT-2018

Penetration and Metal Loss



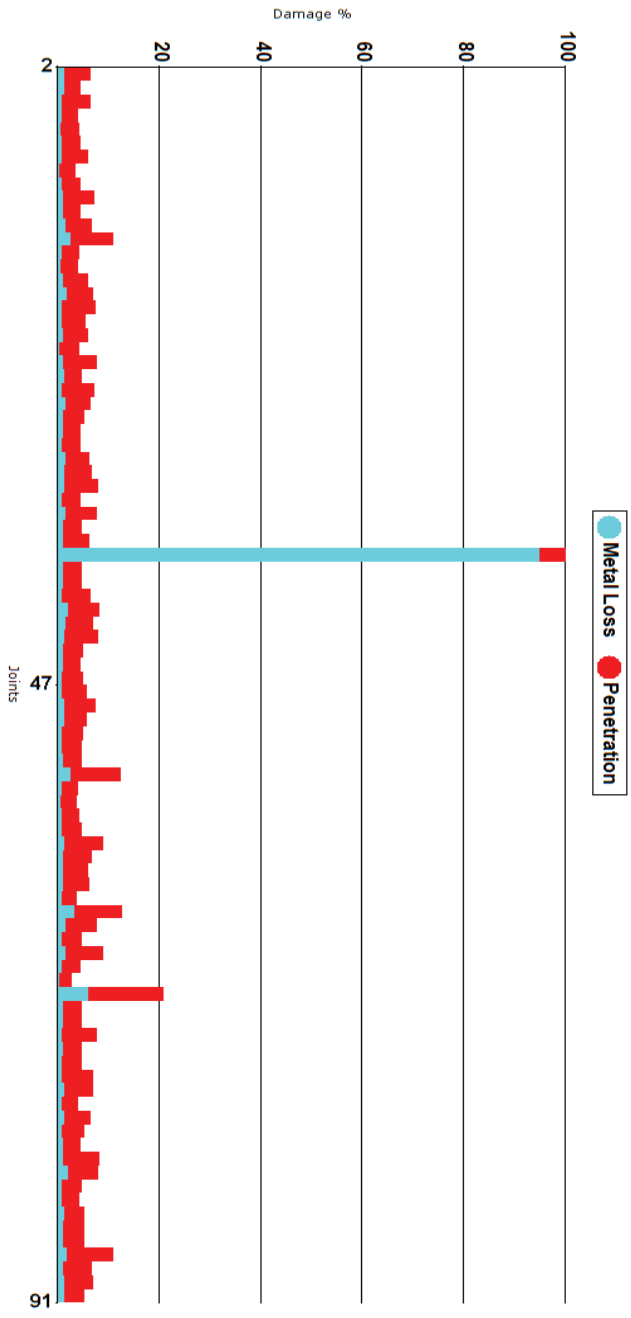
Number of joints analysed (Total =90)						
Pens	0	84	4	1	0	1
Loss	35	54	0	0	0	1

Damage Configuration



Number of joints damaged (Total =89/90)					
	89	35	3	2	1

Damage Profile (% Wall)



MIT Joint Tabulation Sheet (Penetration)

Data: field/well/run1/Merge Survey Date: 06-OCT-2018
Location: USA

MIT Grade 1[0%-19%] 2[20%-39%] 3[40%-59%] 4[60%-79%] 5[80%-100%]

Penetration
Metal Loss

Joint	Depth ft	Nom ID in	Mode ID in	Penetration Body in	Penetration Body %	Metal Loss %	Grade	Damage Description	Profile (%) 0 100
2	6238.3	4.000	3.99	0.02	6.5	1.4	1	Light Corrosion	
3	6281.8	4.000	3.99	0.01	4.7	1.3	1	Light Pitting	
4	6325.1	4.000	4.01	0.02	6.7	0.9	1	Light Pitting	
5	6371.1	4.000	4.01	0.01	4.0	0.8	1	Light Pitting	
6	6393.9	4.000	4.00	0.01	4.2	0.7	1	Light Pitting	
7	6438.4	4.000	4.01	0.01	4.5	0.8	1	Light Pitting	
8	6484.6	4.000	3.98	0.01	6.0	0.9	1	Light Pitting	
9	6529.1	4.000	4.01	0.01	3.7	0.4	1	Light Pitting	
10	6572.4	4.000	3.98	0.01	4.6	0.8	1	Light Pitting	
11	6616.2	4.000	4.00	0.02	7.2	1.2	1	Light Corrosion	
12	6659.7	4.000	3.99	0.01	4.5	1.0	1	Light Pitting	
13	6704.2	4.000	4.00	0.02	6.8	1.5	1	Light Corrosion	
14	6746.4	4.000	4.02	0.03	11.1	2.6	1	Moderate Line Damage	
15	6789.2	4.000	4.01	0.01	4.3	0.9	1	Light Pitting	
16	6835.4	4.000	3.99	0.01	4.0	0.6	1	Light Pitting	
17	6875.9	4.000	4.02	0.02	6.1	1.0	1	Light Pitting	
18	6920.3	4.000	3.96	0.02	7.0	1.8	1	Light Pitting	
19	6964.1	4.000	4.01	0.02	7.5	0.8	1	Light Pitting	
20	7008.5	4.000	3.99	0.01	5.6	0.8	1	Light Pitting	
21	7052.8	4.000	4.00	0.02	6.0	1.2	1	Light Corrosion	
22	7097.0	4.000	4.00	0.01	4.2	0.4	1	Light Pitting	
23	7138.3	4.000	3.98	0.02	7.8	1.2	1	Light Corrosion	
24	7182.3	4.000	4.00	0.01	4.7	1.4	1	Light Corrosion	
25	7225.4	4.000	3.96	0.02	7.4	0.9	1	Light Pitting	
26	7269.8	4.000	3.98	0.02	6.6	1.5	1	Light Corrosion	
27	7313.6	4.000	4.00	0.01	5.3	1.1	1	Light Corrosion	
28	7357.9	4.000	3.97	0.01	4.6	1.1	1	Light Pitting	
29	7402.4	4.000	3.98	0.01	4.6	0.9	1	Light Pitting	
30	7446.7	4.000	3.98	0.02	6.4	1.6	1	Light Corrosion	
31	7490.5	4.000	3.98	0.02	6.8	1.4	1	Light Corrosion	
32	7535.0	4.000	4.00	0.02	8.0	1.4	1	Light Corrosion	
33	7578.3	4.000	3.98	0.01	4.5	0.8	1	Light Pitting	
34	7622.8	4.000	3.99	0.02	7.8	1.6	1	Light Corrosion	
35	7666.3	4.000	3.95	0.01	4.8	1.0	1	Light Pitting	
36	7709.7	4.000	3.98	0.02	6.2	1.2	1	Light Corrosion	
37	7755.9	4.000	4.00	0.25	100	95.0	5	Multiple possible holes	
38	7800.2	4.000	3.98	0.01	4.7	1.1	1	Light Pitting	
39	7844.4	4.000	3.98	0.01	4.9	1.2	1	Light Corrosion	
40	7889.0	4.000	3.98	0.02	6.5	0.9	1	Light Pitting	
41	7933.4	4.000	3.97	0.02	8.2	2.1	1	Light Corrosion	
42	7975.7	4.000	3.98	0.02	7.2	1.5	1	Light Corrosion	
43	8018.8	4.000	3.95	0.02	8.0	1.3	1	Light Corrosion	
44	8063.2	4.000	4.00	0.01	5.0	1.2	1	Light Pitting	
45	8107.7	4.000	3.99	0.01	4.6	1.0	1	Light Pitting	
46	8152.3	4.000	3.97	0.01	5.0	1.0	1	Light Pitting	
47	8198.4	4.000	4.00	0.01	5.7	0.8	1	Light Pitting	
48	8244.7	4.000	4.00	0.02	7.5	1.3	1	Light Corrosion	
49	8288.9	4.000	3.96	0.01	5.9	1.3	1	Light Corrosion	
50	8332.6	4.000	3.97	0.01	5.1	0.8	1	Light Pitting	
51	8377.0	4.000	3.97	0.01	4.8	0.9	1	Light Pitting	
52	8421.5	4.000	3.97	0.01	4.9	1.2	1	Light Pitting	
53	8464.8	4.000	3.99	0.03	12.6	2.7	1	Moderate Corrosion	
54	8506.1	4.000	3.99	0.01	4.1	0.9	1	Light Pitting	
55	8550.4	4.000	3.96	0.01	3.9	0.7	1	Light Pitting	
56	8596.5	4.000	3.96	0.01	4.4	0.8	1	Light Pitting	
57	8640.9	4.000	3.98	0.01	4.9	0.9	1	Light Pitting	

MIT Joint Tabulation Sheet (Penetration)

Data: field/well/run1/Merge Survey Date: 06-OCT-2018
Location: USA

MIT Grade 1[0%-19%] 2[20%-39%] 3[40%-59%] 4[60%-79%] 5[80%-100%]

Penetration
Metal Loss

Joint	Depth ft	Nom ID in	Mode ID in	Penetration Body in	Penetration Body %	Metal Loss %	Grade	Damage Description	Profile (%) 0 100
58	8684.5	4.000	3.98	0.02	9.1	1.4	1	Light Corrosion	
59	8728.3	4.000	3.98	0.02	6.8	1.2	1	Light Pitting	
60	8772.7	4.000	3.96	0.02	6.2	1.1	1	Light Pitting	
61	8817.2	4.000	3.97	0.02	6.2	1.2	1	Light Pitting	
62	8861.0	4.000	3.96	0.01	3.9	0.8	1	Light Pitting	
63	8905.5	4.000	4.00	0.03	12.7	3.3	1	Moderate Line Damage	
64	8949.8	4.000	3.95	0.02	7.7	1.7	1	Light Corrosion	
65	8992.9	4.000	3.98	0.01	4.8	0.8	1	Light Pitting	
66	9037.3	4.000	3.98	0.02	9.1	1.5	1	Light Corrosion	
67	9080.7	4.000	3.95	0.01	4.5	0.8	1	Light Pitting	
68	9125.1	4.000	3.98	0.01	2.7	0.5	1	-	
69	9166.4	4.000	3.97	0.05	21.0	6.1	2	Light Ring Damage	
70	9209.4	4.000	3.97	0.01	4.9	1.1	1	Light Pitting	
71	9252.5	4.000	3.98	0.01	4.9	1.0	1	Light Pitting	
72	9296.9	4.000	3.95	0.02	7.8	0.8	1	Light Pitting	
73	9343.1	4.000	3.96	0.01	4.8	1.1	1	Light Pitting	
74	9387.6	4.000	3.97	0.01	4.8	0.8	1	Light Pitting	
75	9432.1	4.000	3.95	0.02	7.0	0.9	1	Light Pitting	
76	9476.7	4.000	3.94	0.02	7.2	1.4	1	Light Corrosion	
77	9520.1	4.000	3.96	0.01	4.0	0.8	1	Light Pitting	
78	9561.8	4.000	3.96	0.02	6.7	1.3	1	Light Corrosion	
79	9603.1	4.000	3.95	0.01	5.2	0.8	1	Light Pitting	
80	9647.4	4.000	3.97	0.01	4.6	1.0	1	Light Pitting	
81	9691.9	4.000	3.94	0.02	8.3	1.2	1	Light Corrosion	
82	9735.2	4.000	3.95	0.02	7.9	2.0	1	Light Corrosion	
83	9778.4	4.000	3.94	0.01	4.9	0.9	1	Light Pitting	
84	9822.9	4.000	3.96	0.01	4.4	0.9	1	Light Pitting	
85	9861.8	4.000	3.93	0.01	5.3	1.3	1	Light Corrosion	
86	9905.1	4.000	3.94	0.01	5.3	1.1	1	Light Pitting	
87	9949.5	4.000	3.92	0.01	5.2	1.1	1	Light Pitting	
88	9992.9	4.000	3.95	0.03	10.9	1.8	1	Moderate Corrosion	
89	10036.4	4.000	3.94	0.02	6.9	1.0	1	Light Pitting	
90	10080.8	4.000	3.92	0.02	7.0	1.4	1	Light Corrosion	
91	10122.8	4.000	3.96	0.01	5.4	1.3	1	Light Corrosion	

Glossary of Terms

Company	TEP Rocky Mountain LLC
Field	Rulison
Well	Clough NR 22-3
Country	USA
County	Garfield
State	Colorado
Analysed By	E. Siegel
Survey Date	06-OCT-2018

Analysis Information

Field	Name of oil field
Well	Name of the well
Company	Company owning the well
Country	Location of well or company
Analysed By	Name of log analysist
Survey Date	Date of survey
MIT	Multifinger Imaging Tool

Pipe Information

Zone	Area of the well, containing pipe of the same grade
Joint	A single section of pipe
Size	Outer diameter of pipe
Nom OD	Nominal (expected) outer diameter of pipe, identical to 'Size'
Nom ID	Nominal (expected) inner diameter of pipe
Nom Thickness	Nom Thickness Nominal (expected) wall thickness of pipe
Weight	Weight of pipe
Grade	Grade of pipe

Damage Types

Penetration	Point damage, measured as absolute units or as a % of nominal wall thickness
Projection	Scale in the inside of the pipe, measured as absolute units or as a % of nominal wall thickness
Metal Loss	Circumferential damage, weakening the pipe. Measured as a % of cross-sectional wall area
Pitting	Small, isolated points of penetration
Corrosion	Large areas of penetration, may be any shape
Line Damage	A narrow area of penetration running along the length of the pipe
Ring Damage	Penetration damage that is spread around the circumference of the pipe
Possible Hole	A penetration that may be deep enough to have caused a hole through the pipe wall

Results Tables

Joint	The number of the joint in the well
Depth	The depth of the top of the joint
Nom ID	The Nominal ID of the joint
Mode ID	The measured ID of the joint, estimated from 'good' areas of pipe
Modal Change %	The % difference between Measured and nominal ID
Penetration	The worst penetration point in the region as absolute value and % of nominal wall thickness
Projection	The worst projection point in the region as absolute value and % of nominal wall thickness
Body	Damage in the body region of the joint (between coupling regions)
Coupling	Damage in the coupling regions of the joint
Metal Loss	The worst % loss of wall area in the joint
Min ID	The smallest ID measurement made in the joint
Area Loss	Worst % loss of flowing area in the joint
Description	Text description of and damage within the joint
Damage Profile	Graph of damage within the joint
Avg Dev	The average deviation in the joint