Cenovus Foster Creek in-situ oil sands scheme (8623) update for 2015

Appendices
Calgary | May 2016

cenovus ENERGY

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Pad plots

Subsection 3.1.1 – 7 h)

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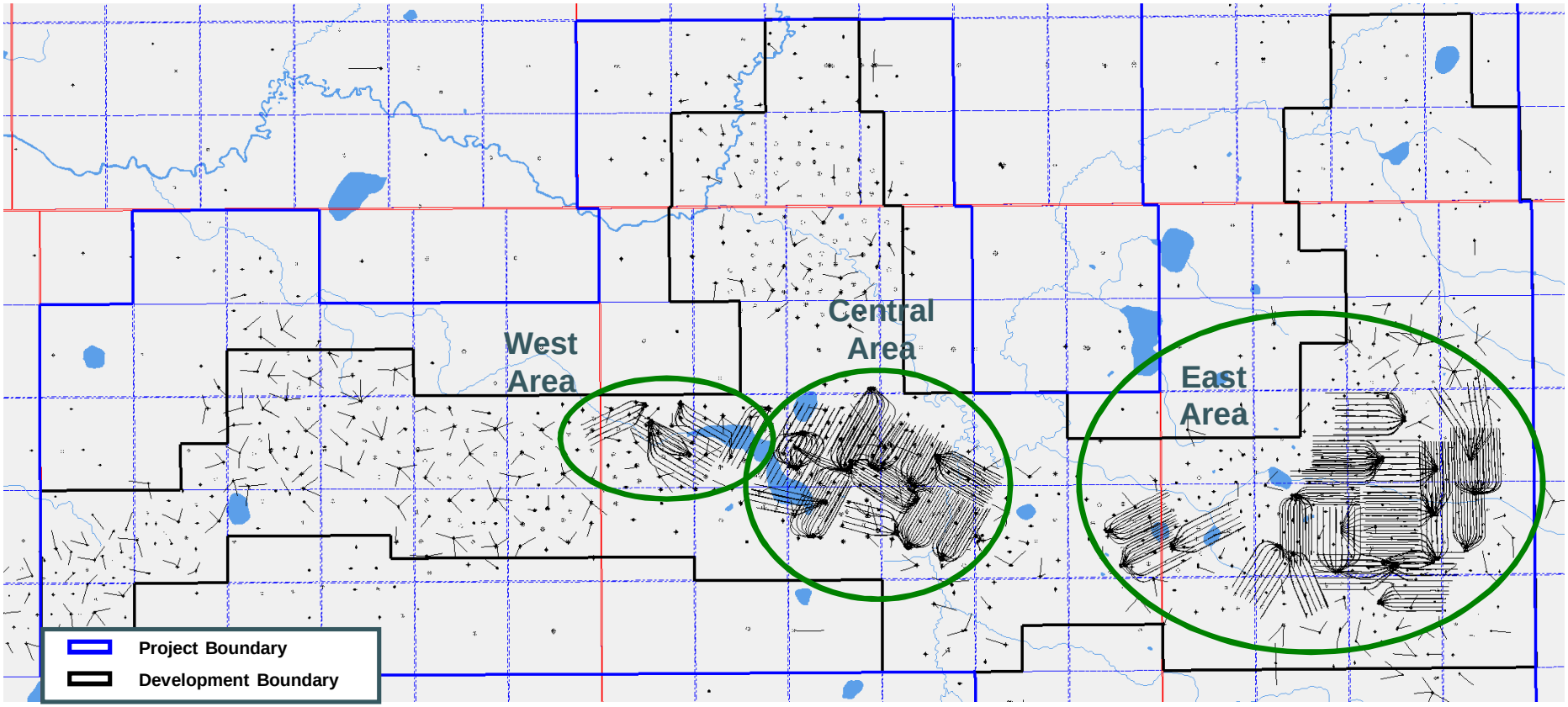

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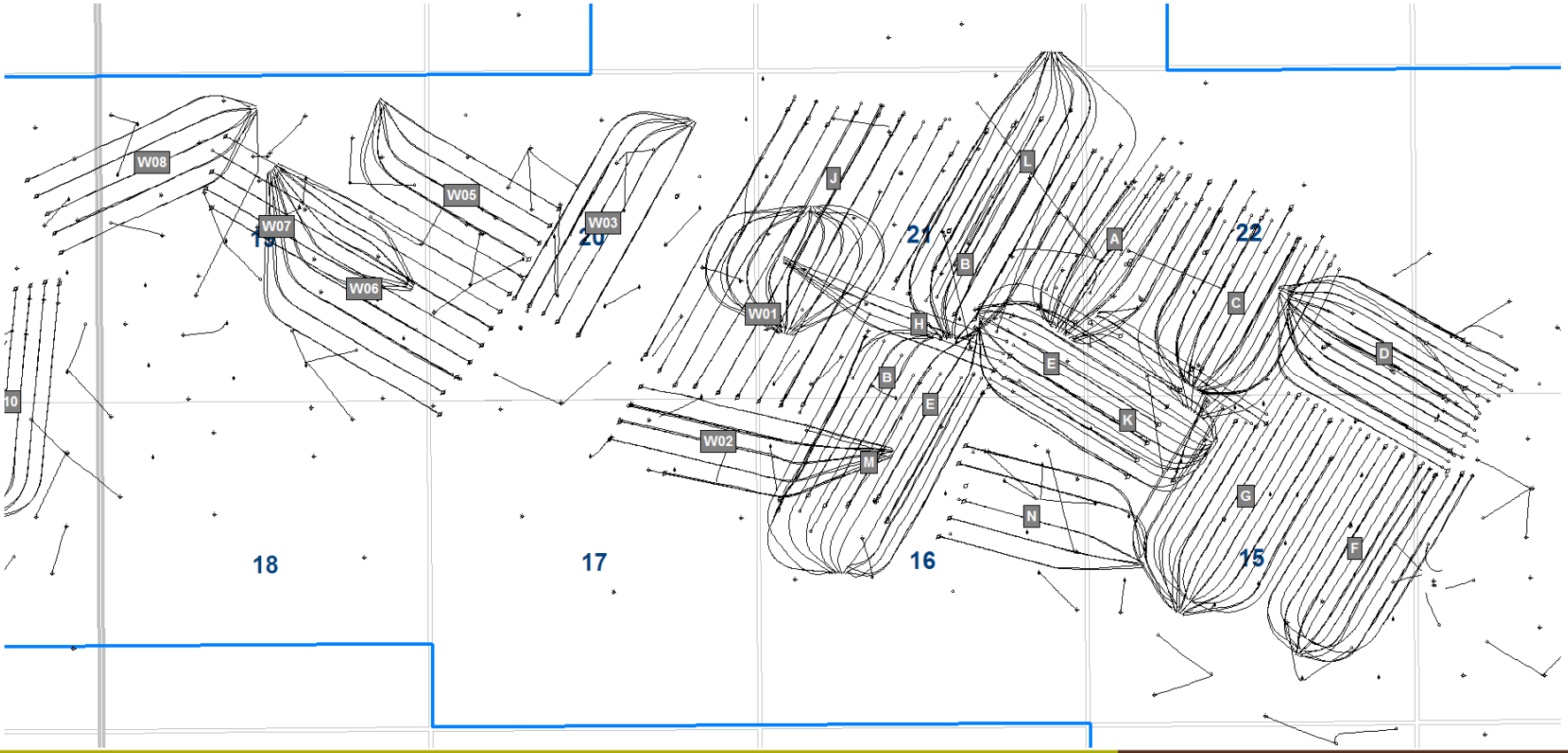
Foster Creek central



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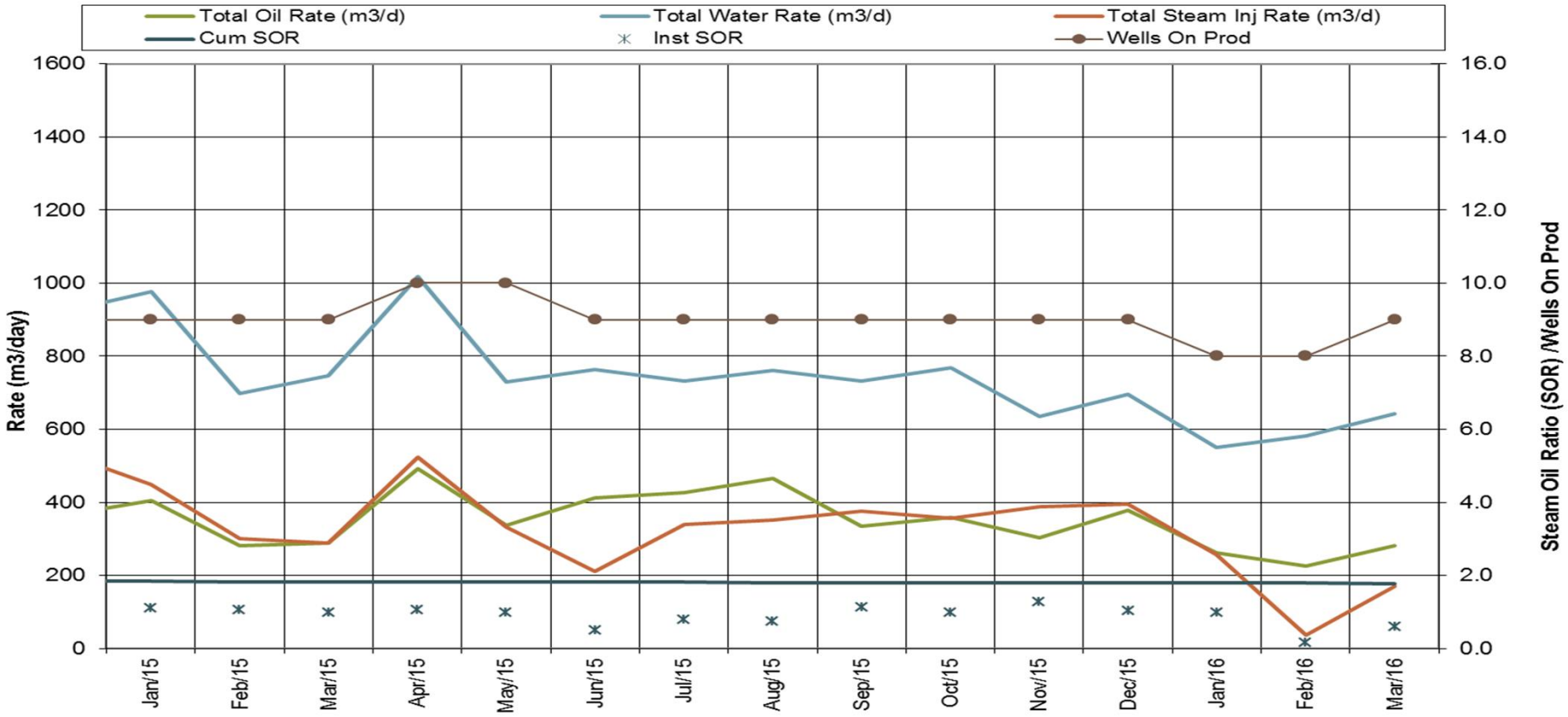
FOSTER CREEK
A PAD & A Wedge Wells™ Performance



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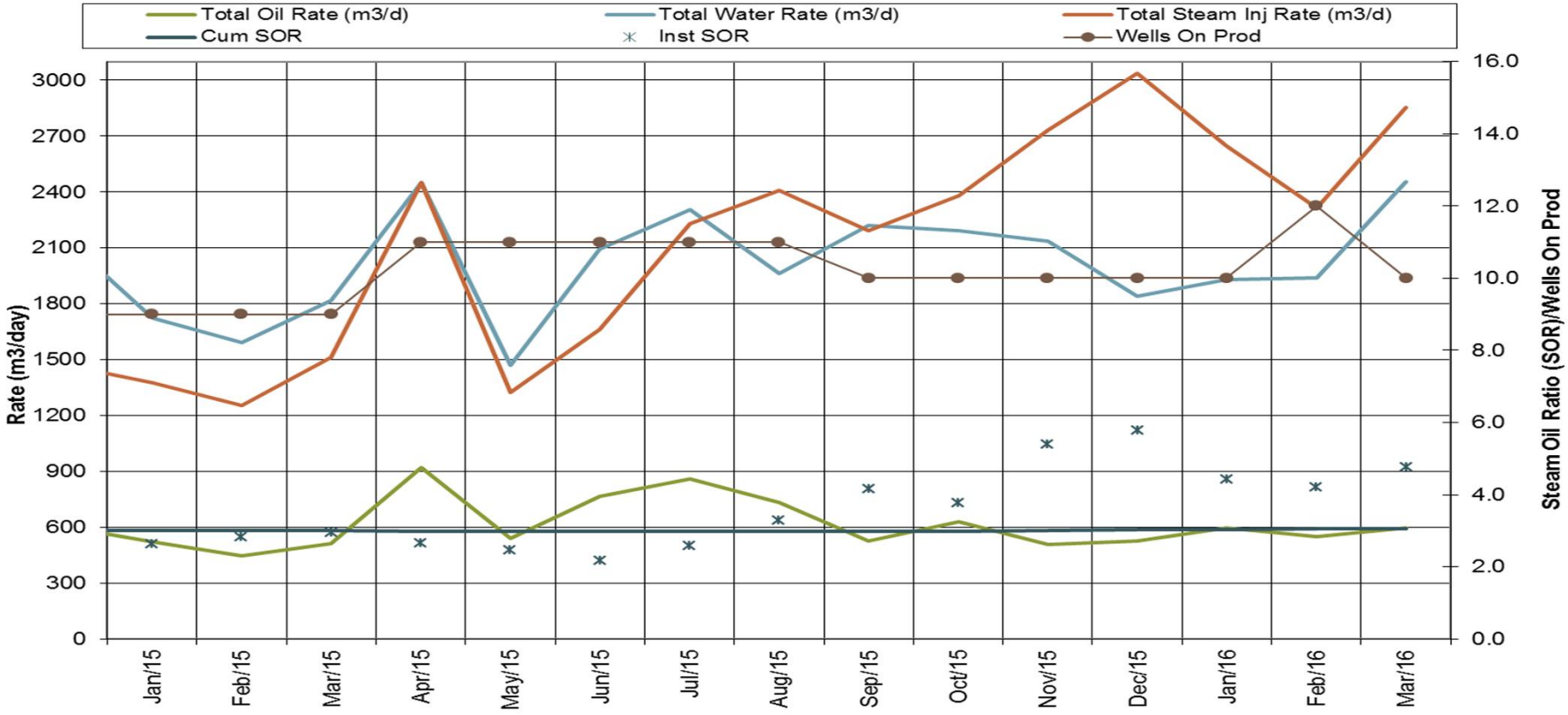
FOSTER CREEK
B_L PAD & B_L Wedge Wells™ Performance



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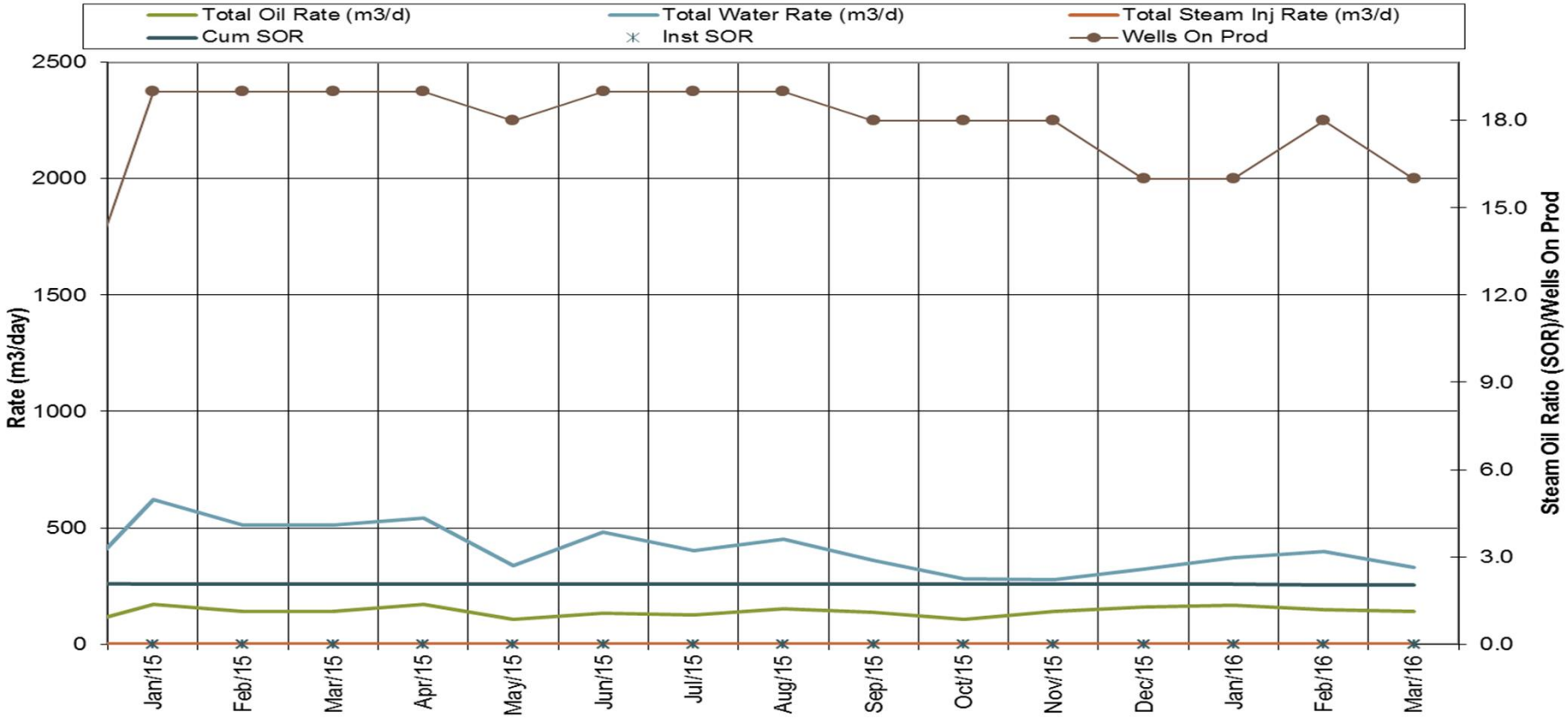
FOSTER CREEK
C PAD & C Wedge Wells™ Performance



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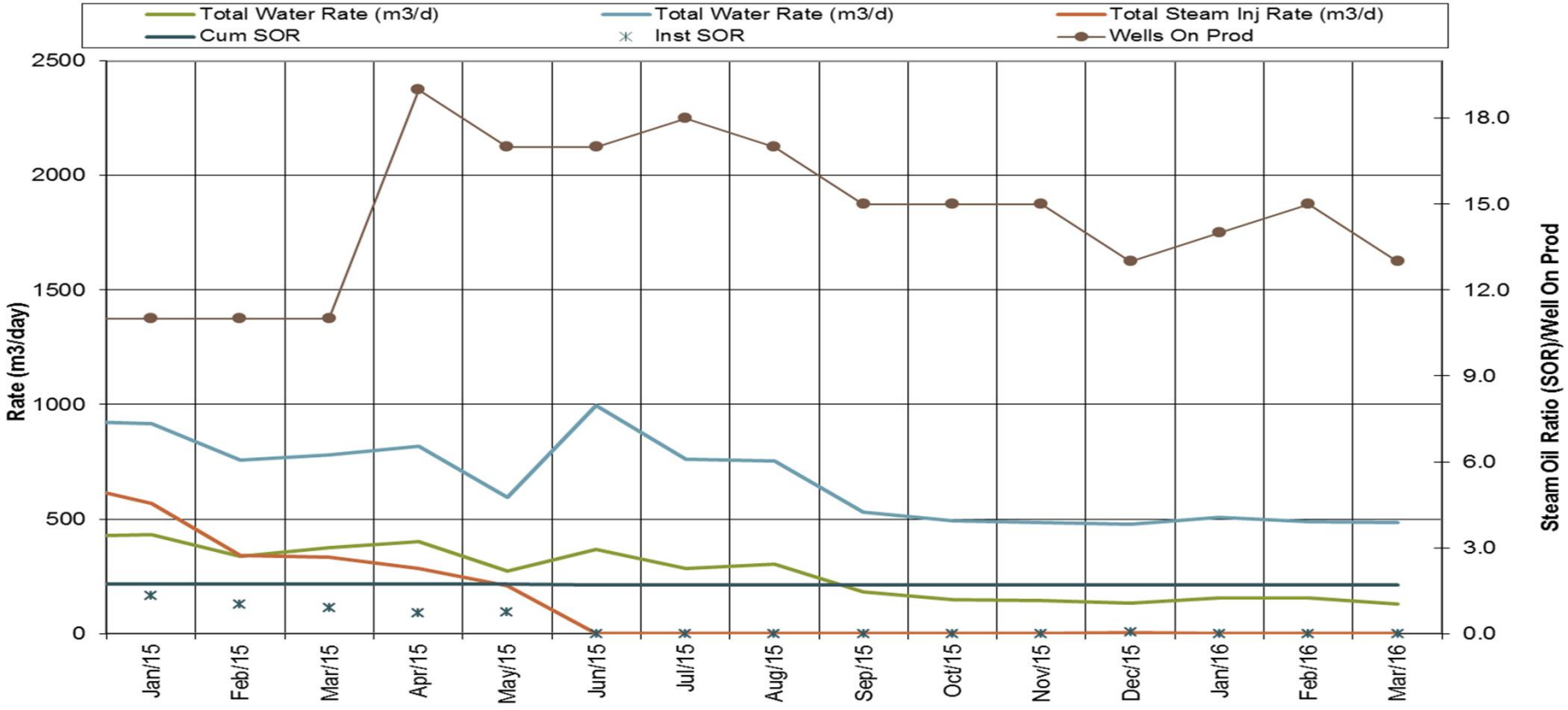
FOSTER CREEK
D PAD & D Wedge Wells™ Performance



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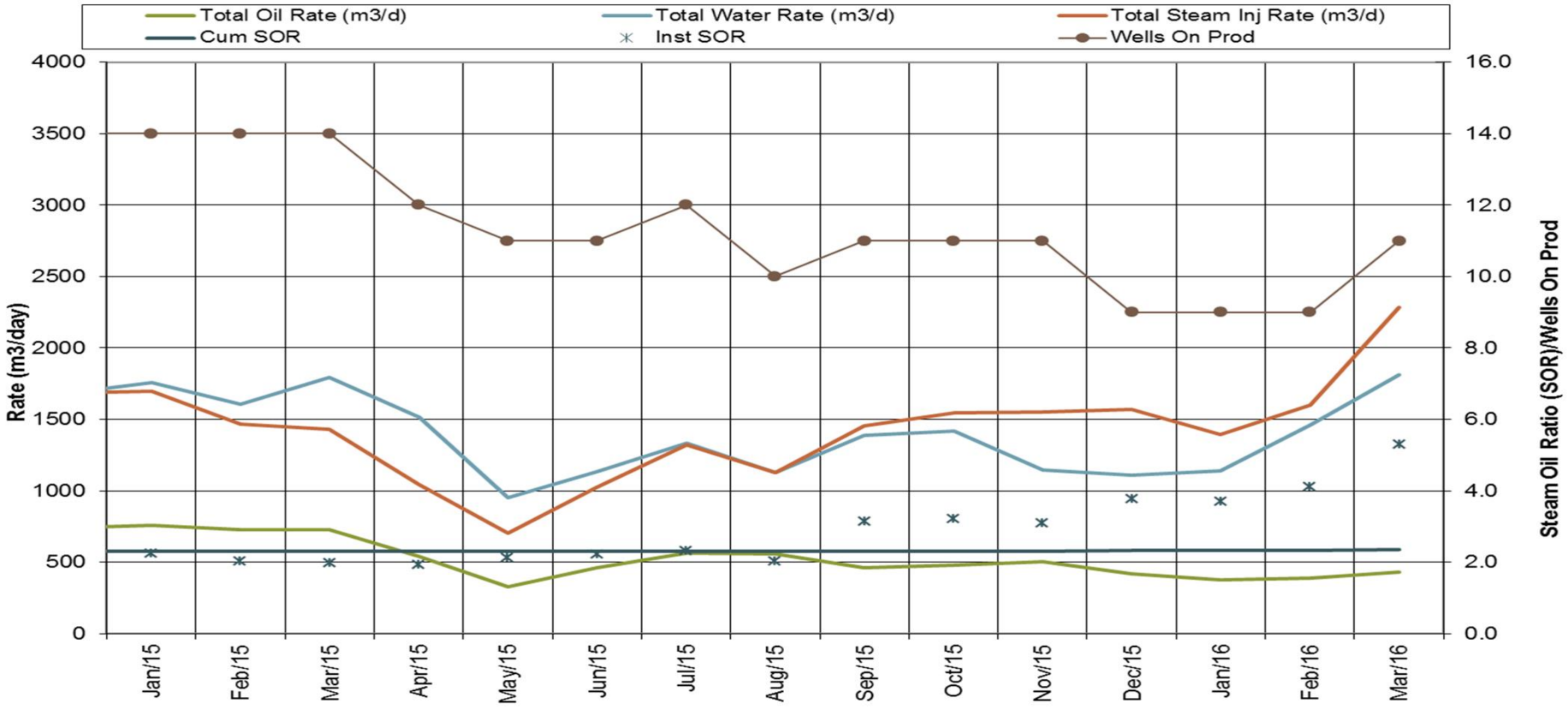
FOSTER CREEK
E_K PAD & E_K Wedge Wells™ Performance



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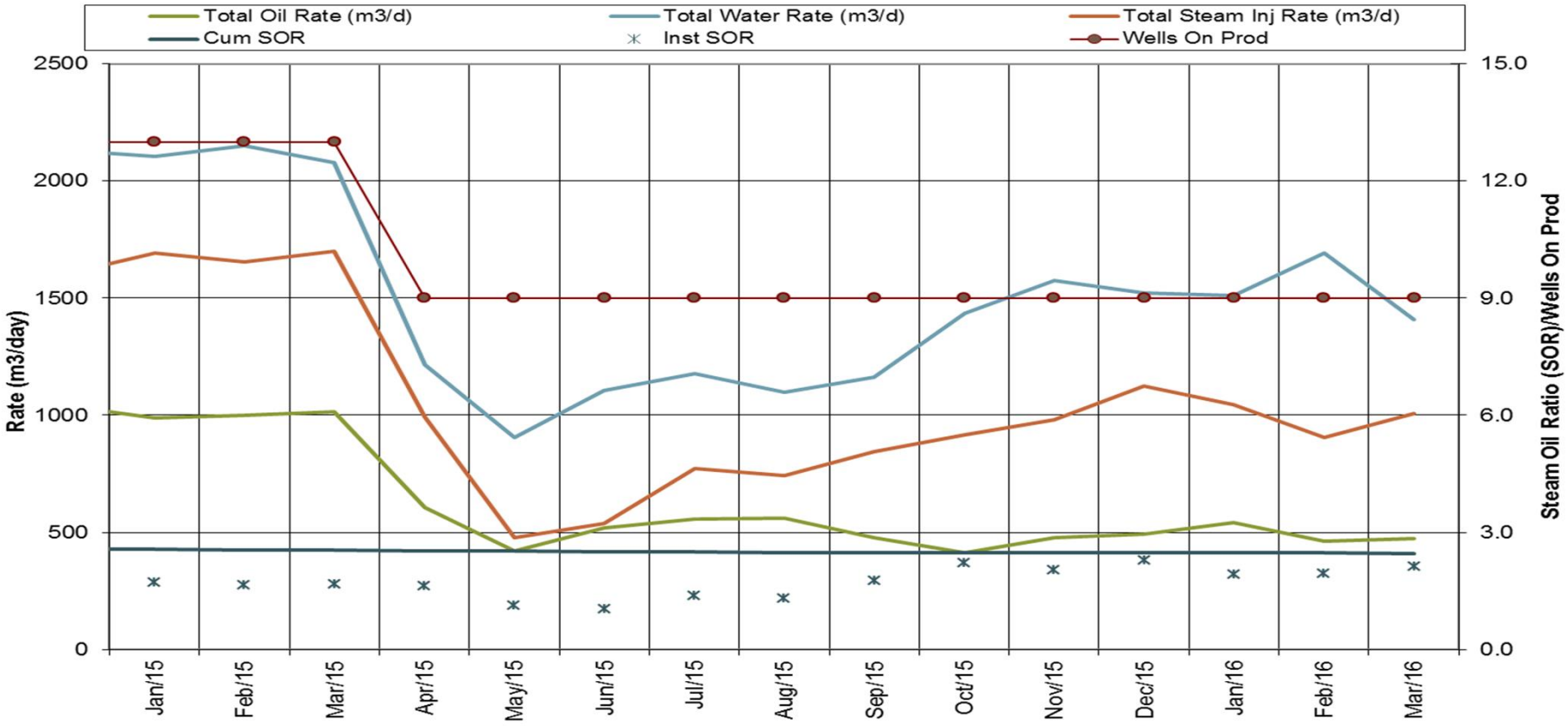
FOSTER CREEK
EXP_M PAD & M Wedge Wells™ Performance



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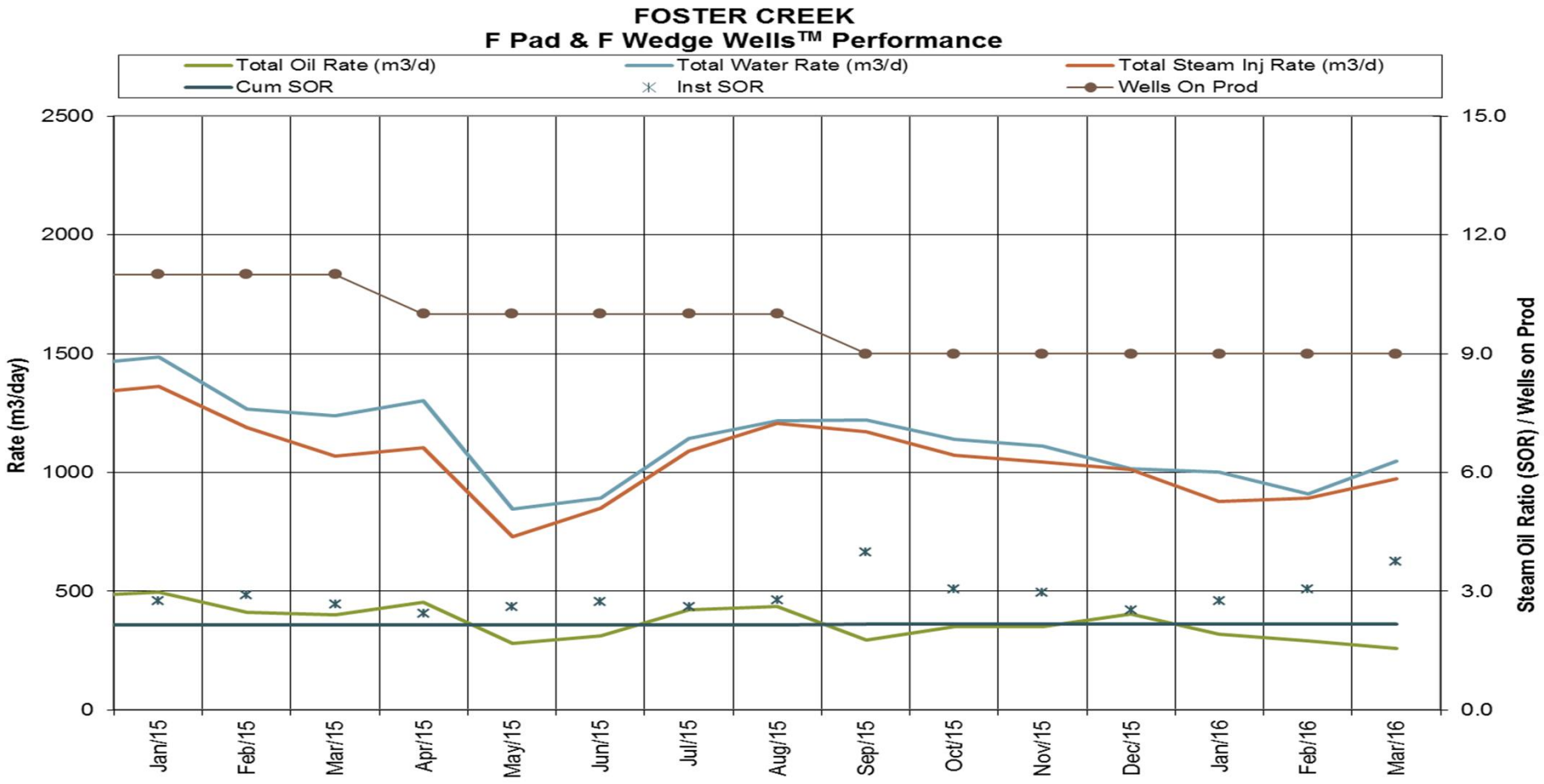

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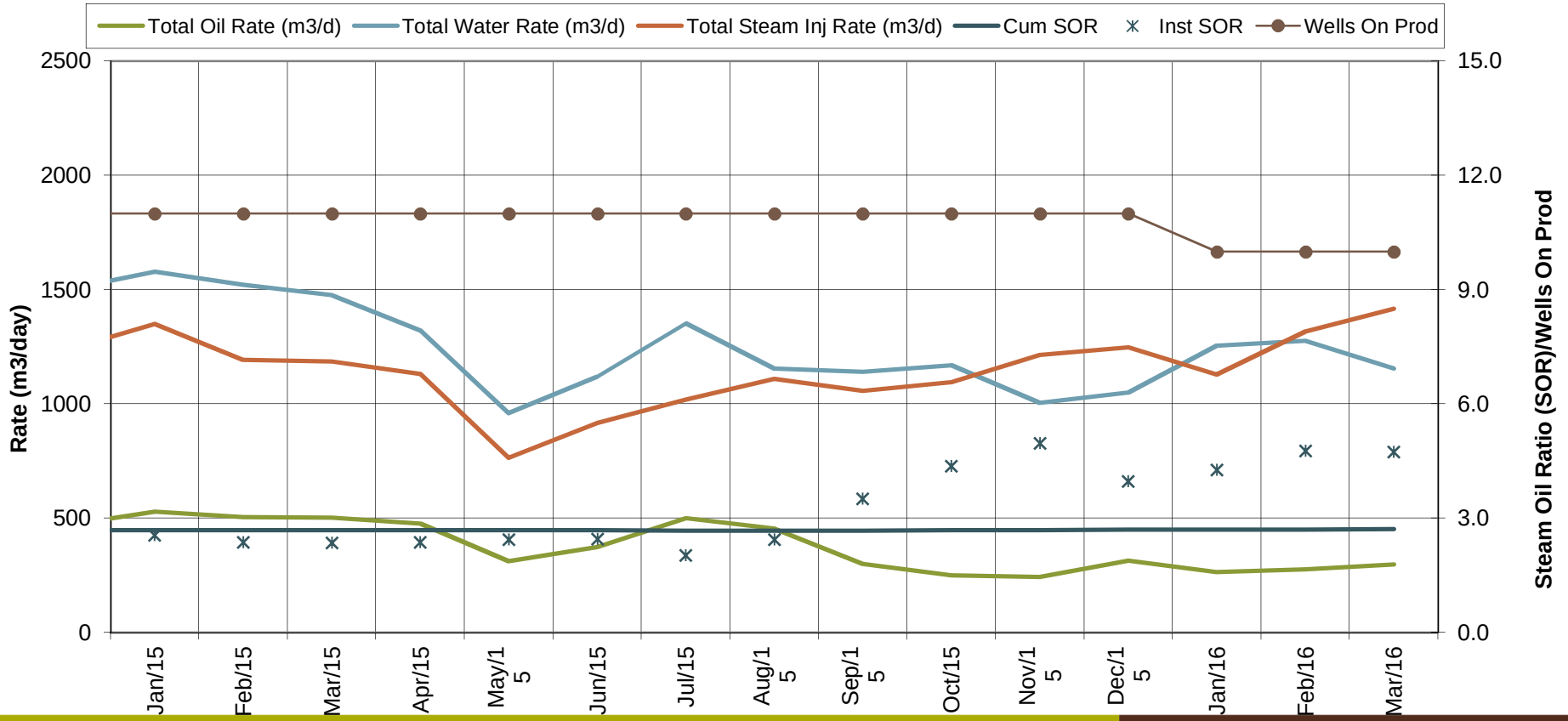
FOSTER CREEK
G PAD & G Wedge Wells™ Performance



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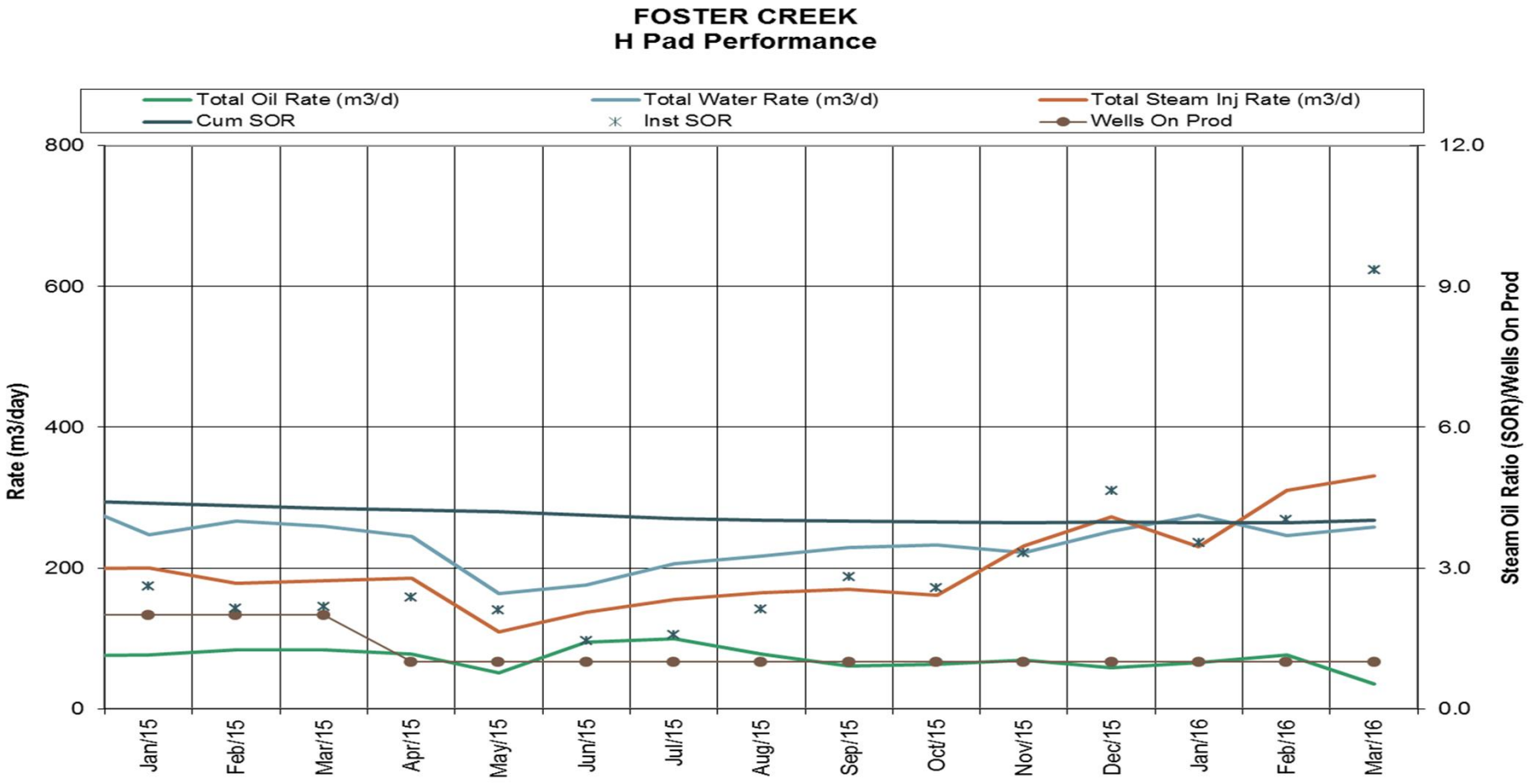

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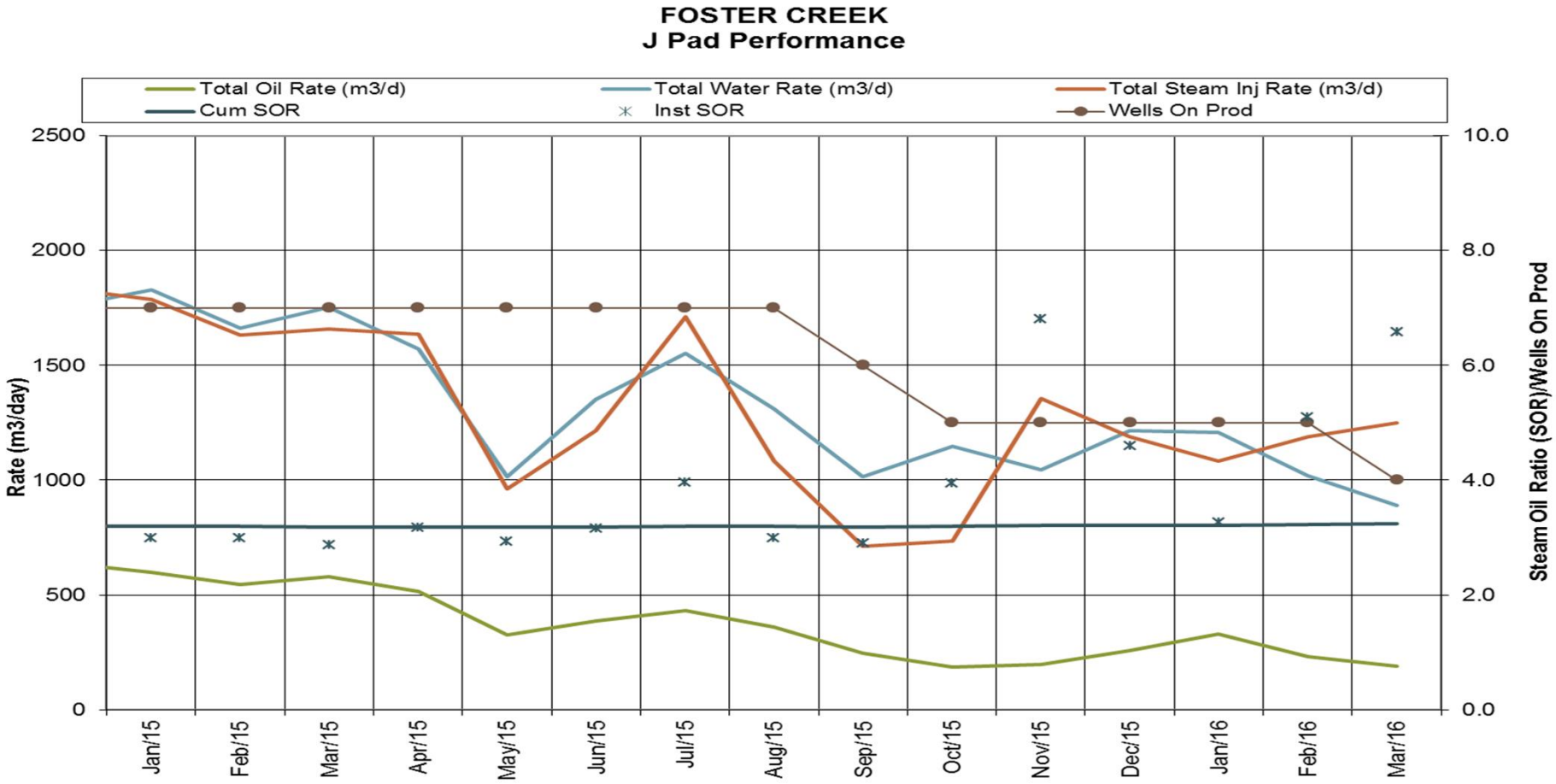

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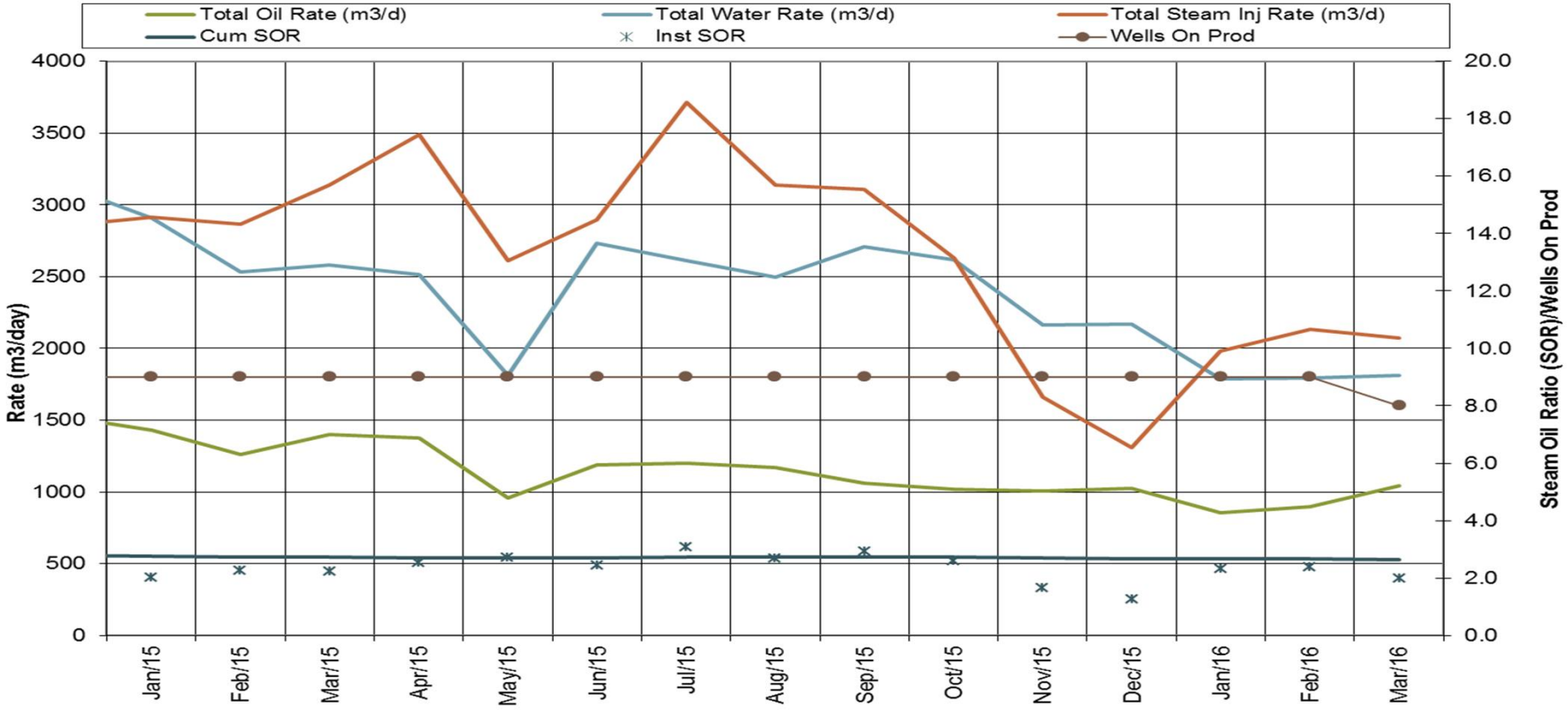
FOSTER CREEK
W01 Pad Performance



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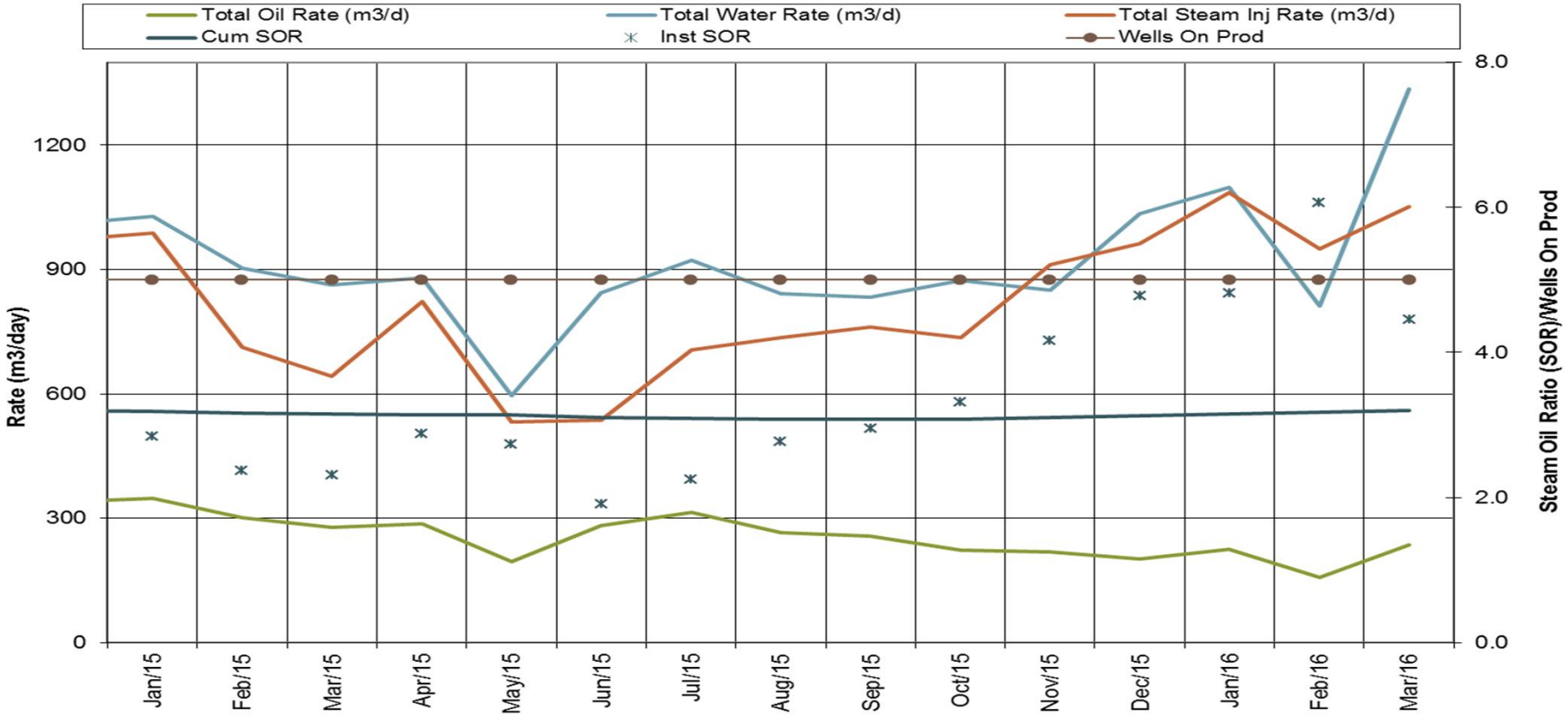
FOSTER CREEK
W02 Pad Performance



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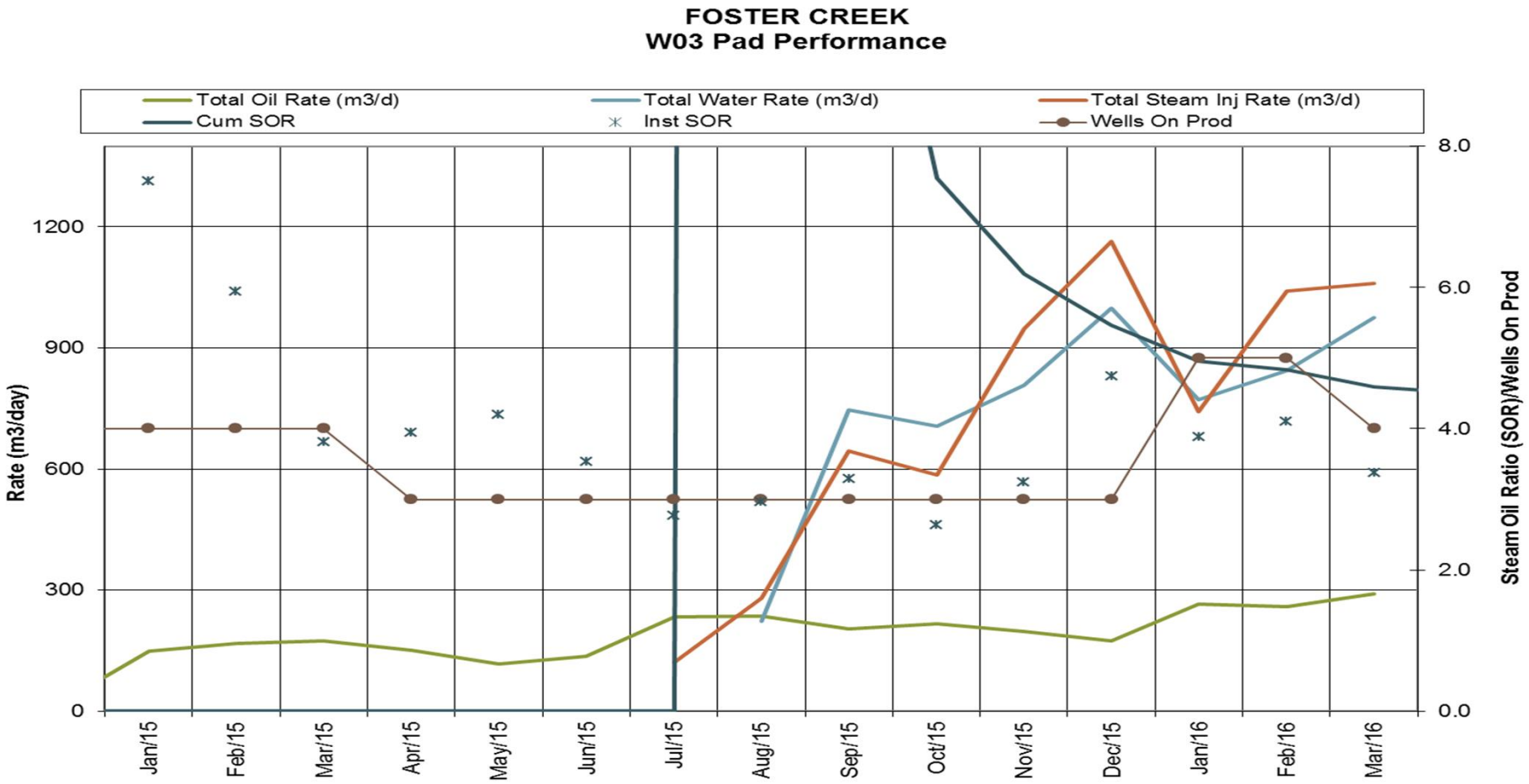

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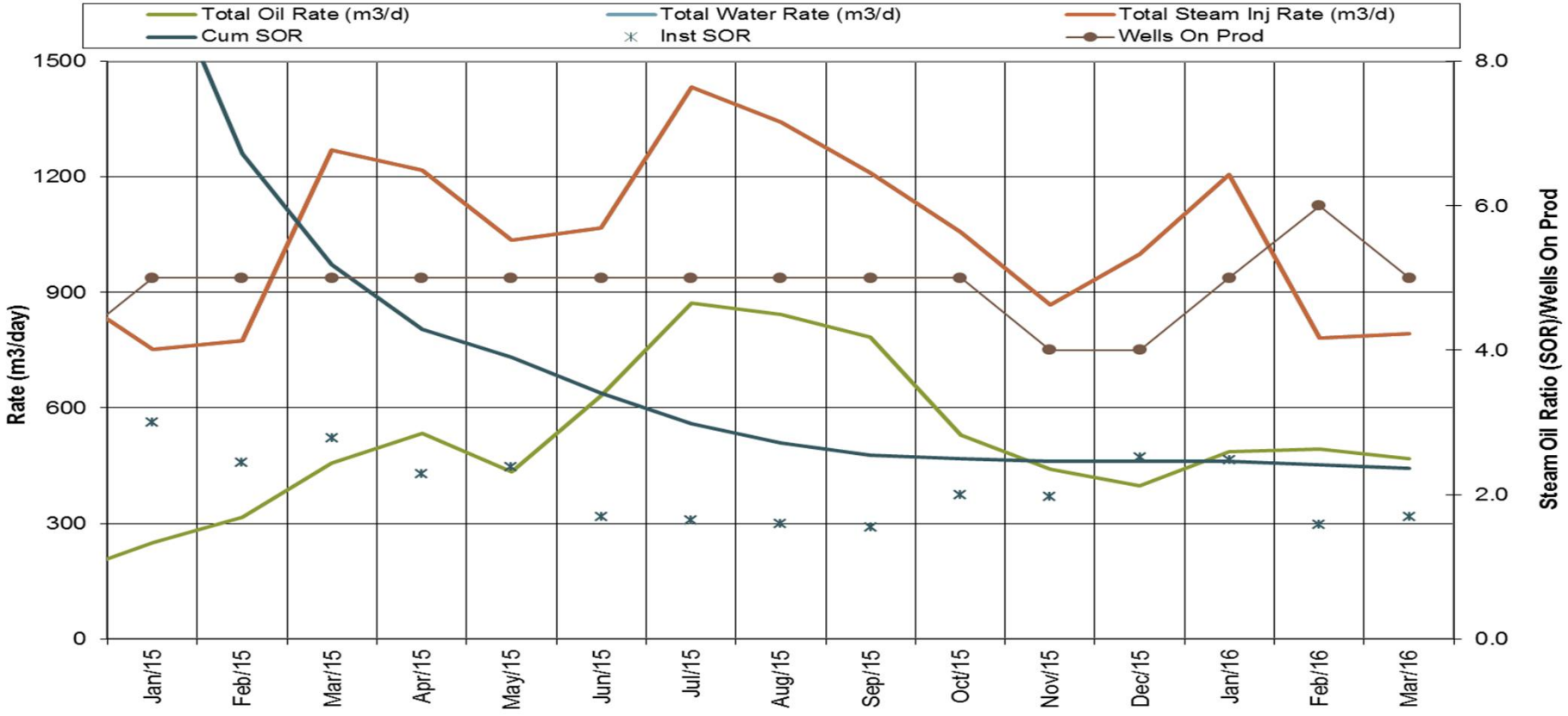
FOSTER CREEK
W06 Pad Performance



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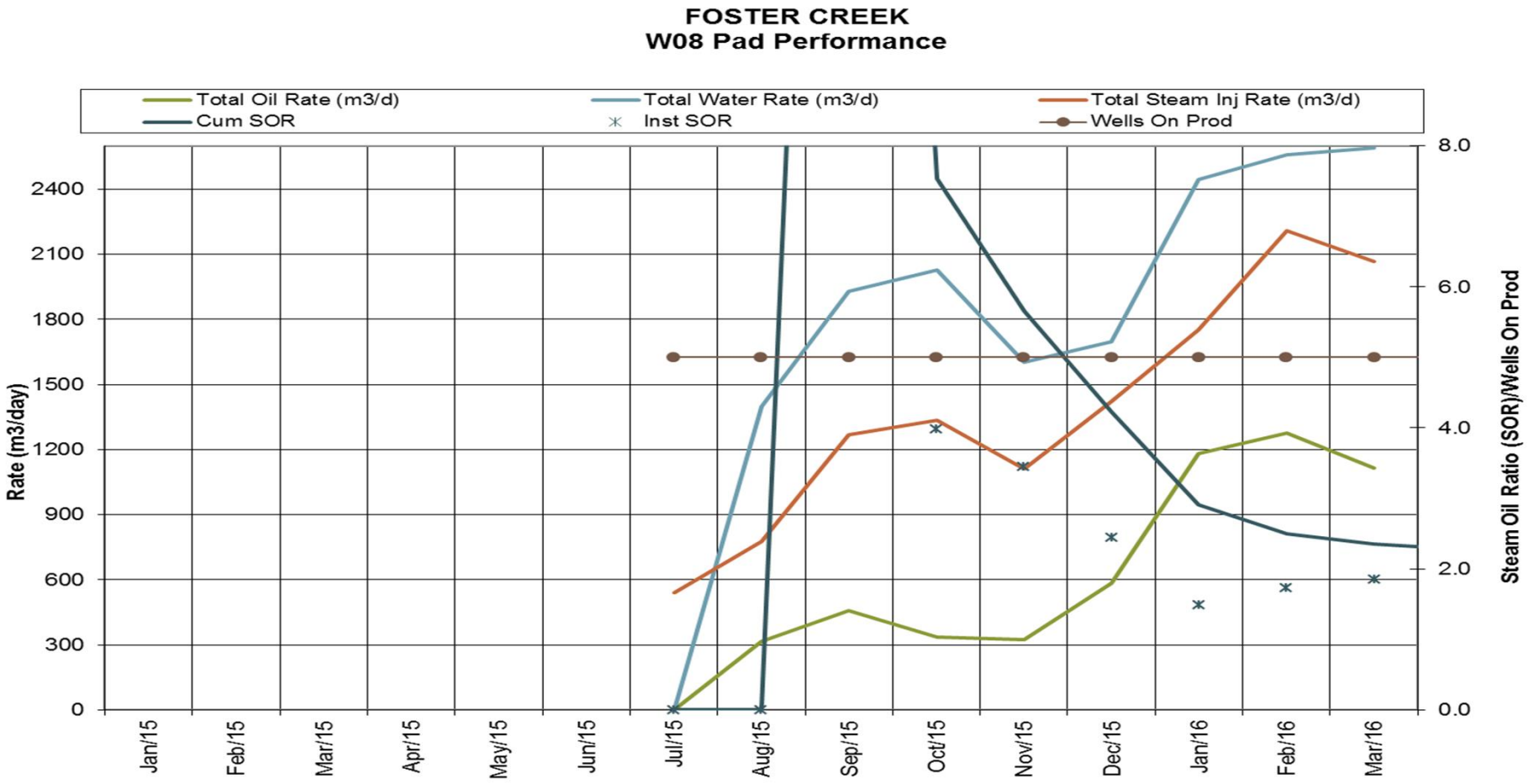

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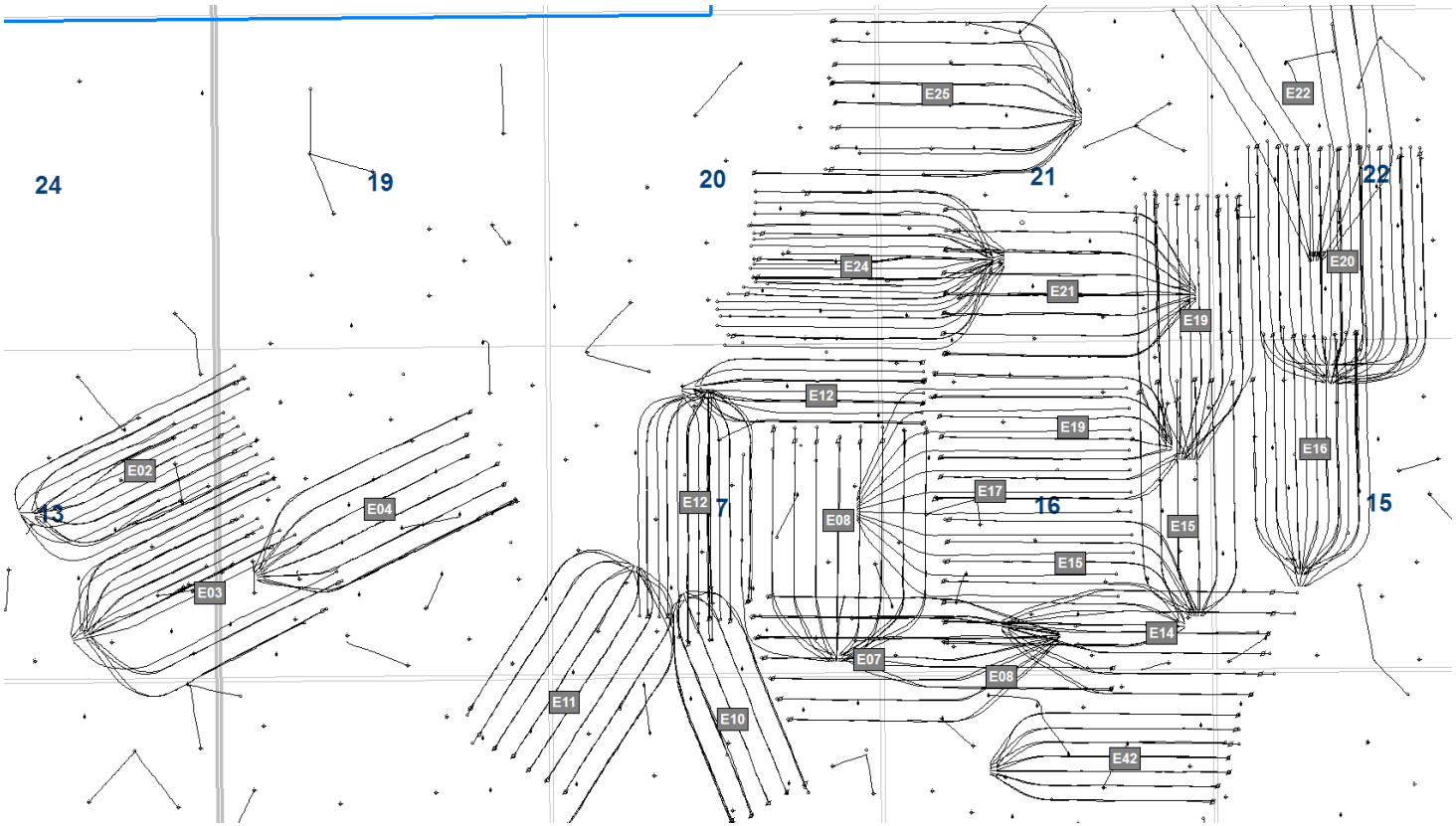
Foster Creek east area



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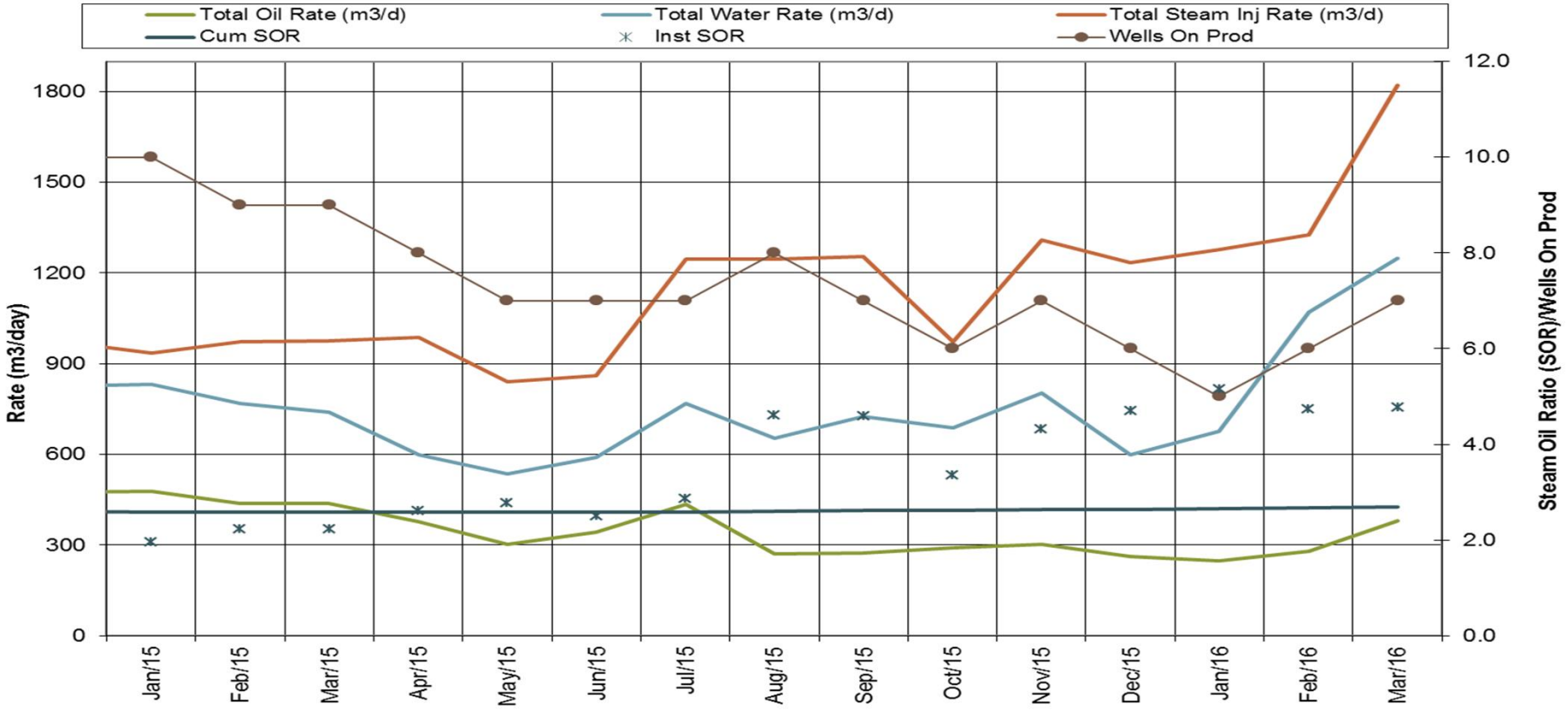
FOSTER CREEK
E02 Pad & E02 Wedge Wells Performance



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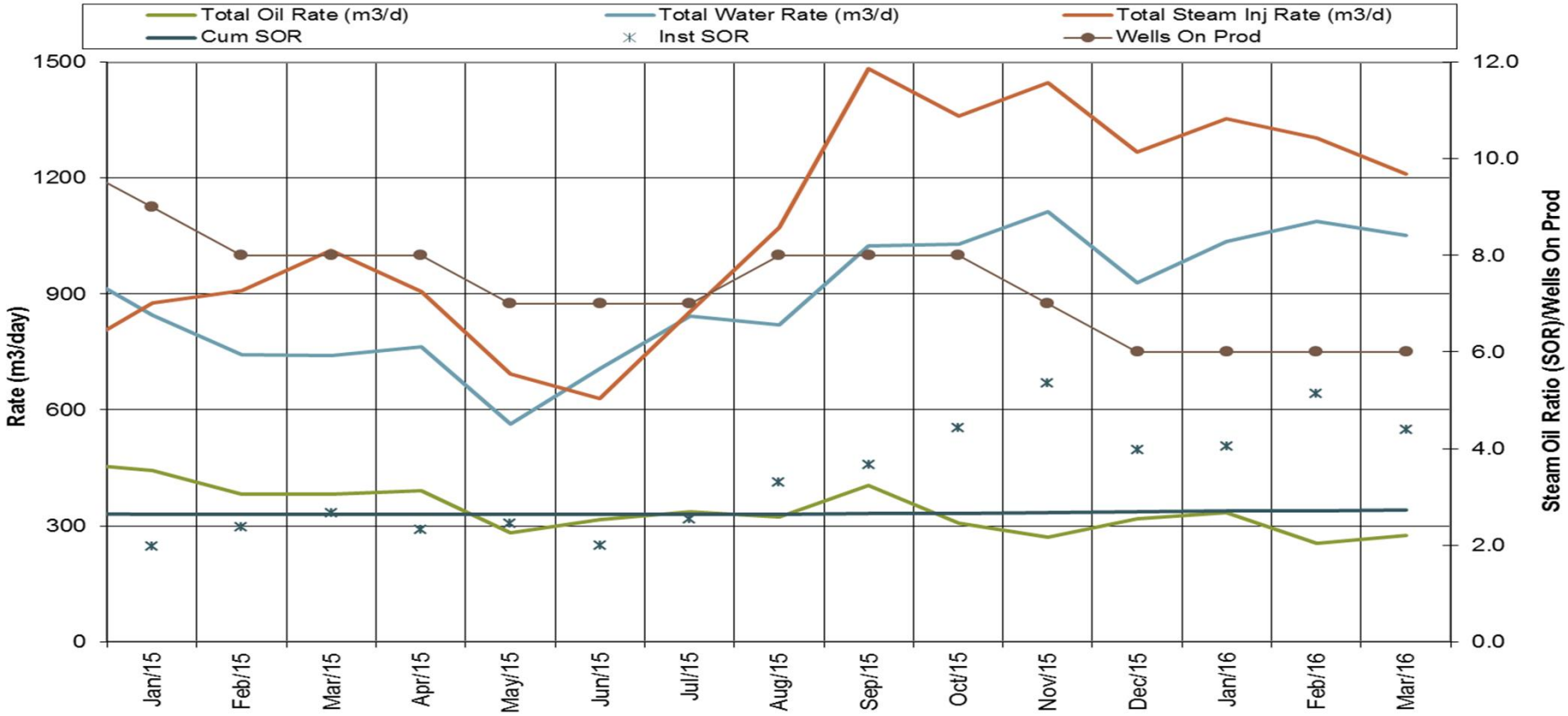
FOSTER CREEK
E03 Pad & E03 Wedge Wells Performance



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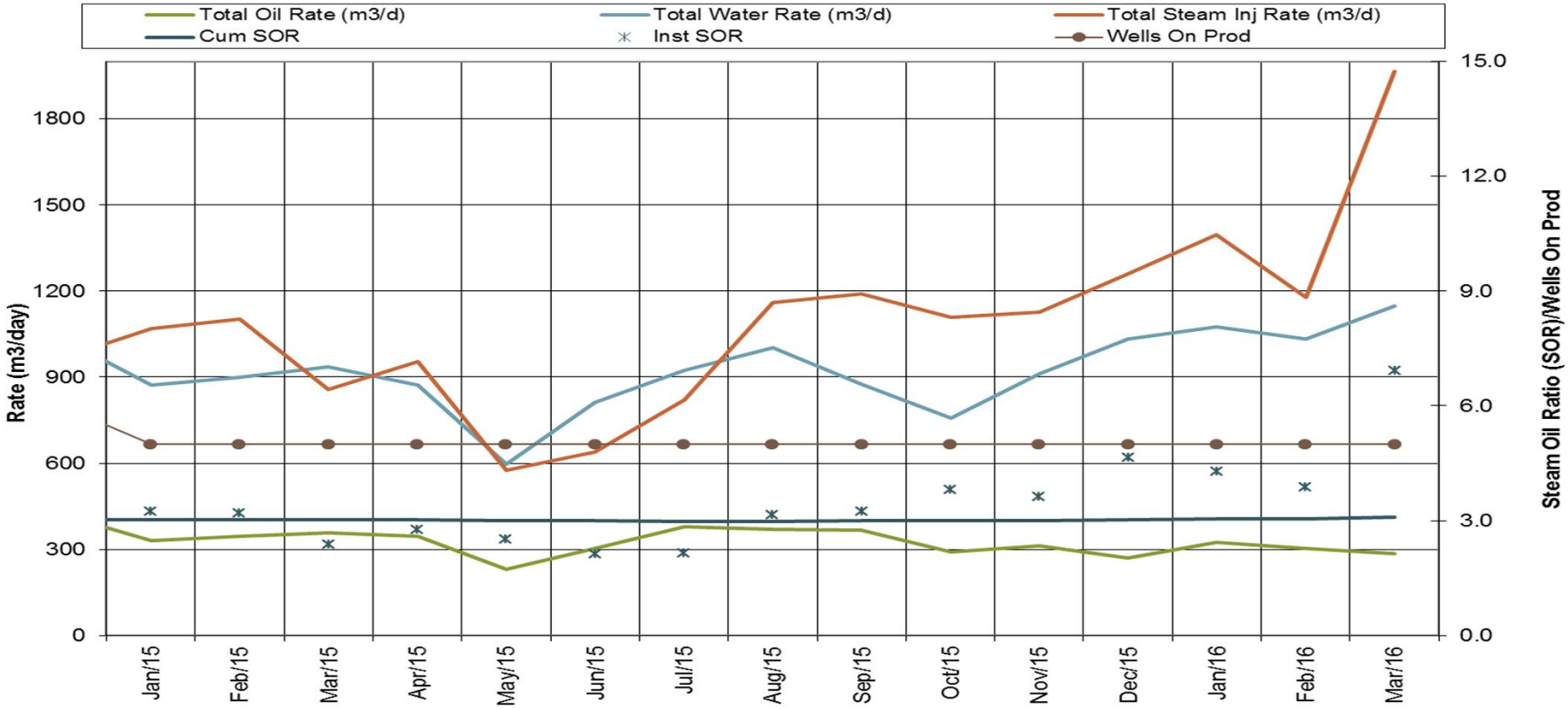
FOSTER CREEK
E04 Pad Performance



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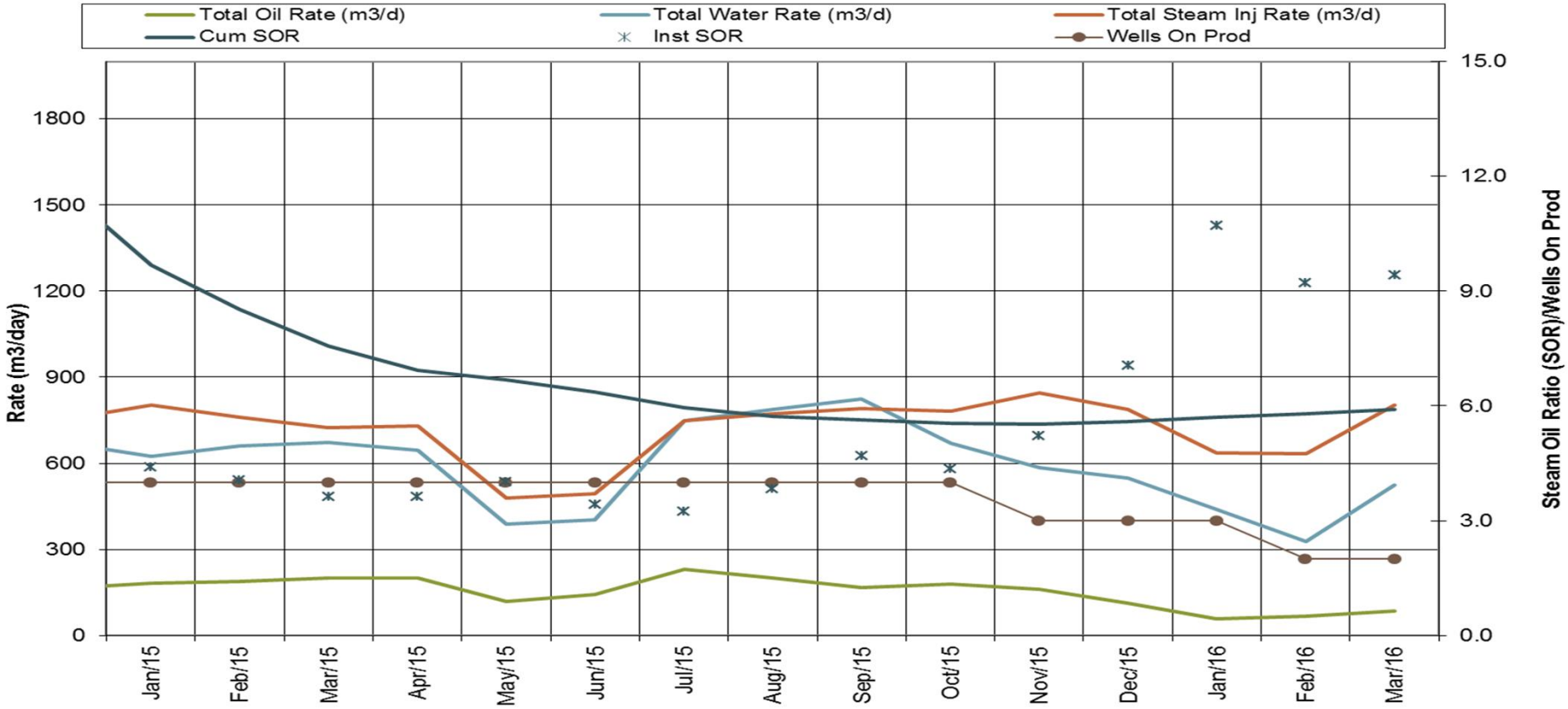
FOSTER CREEK
E07 Pad Performance



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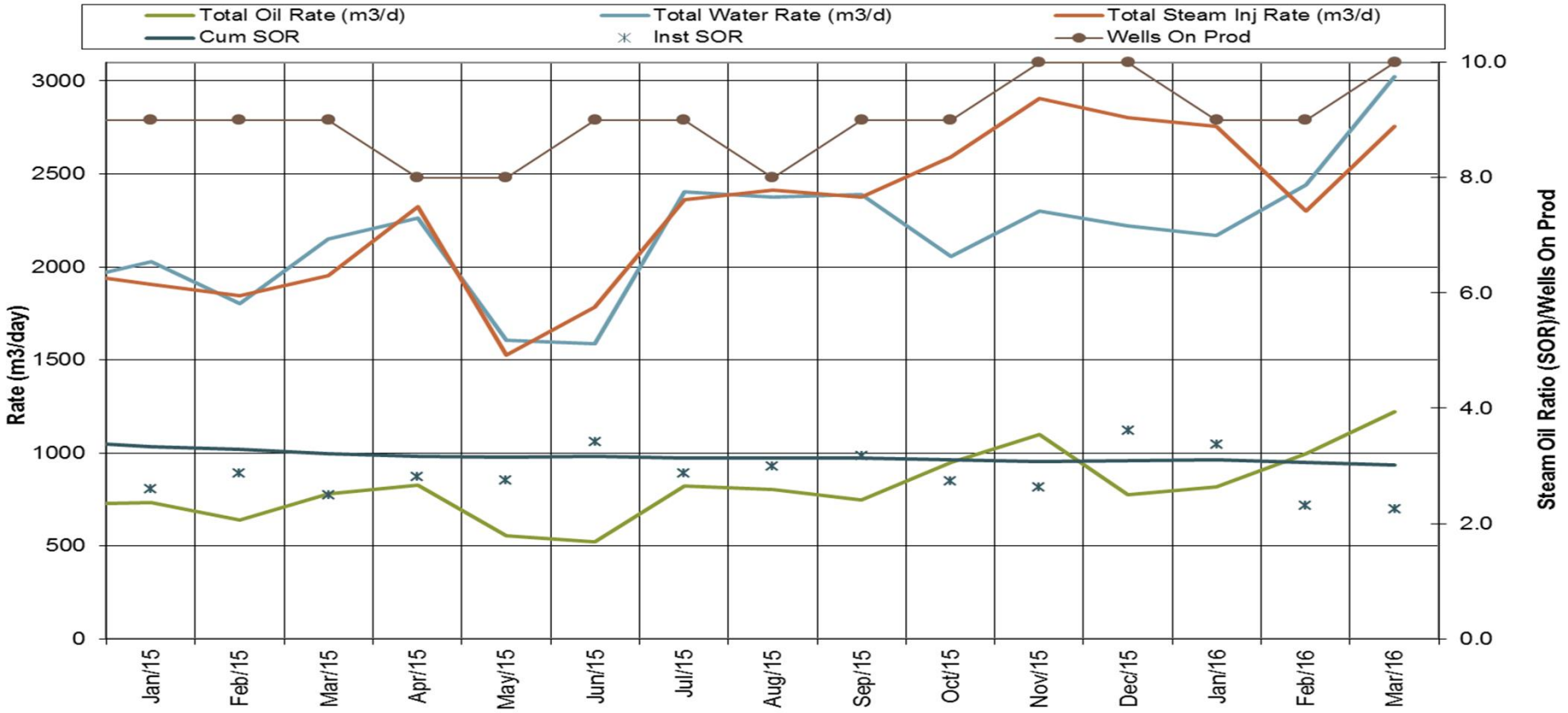
FOSTER CREEK
E08 Pad Performance



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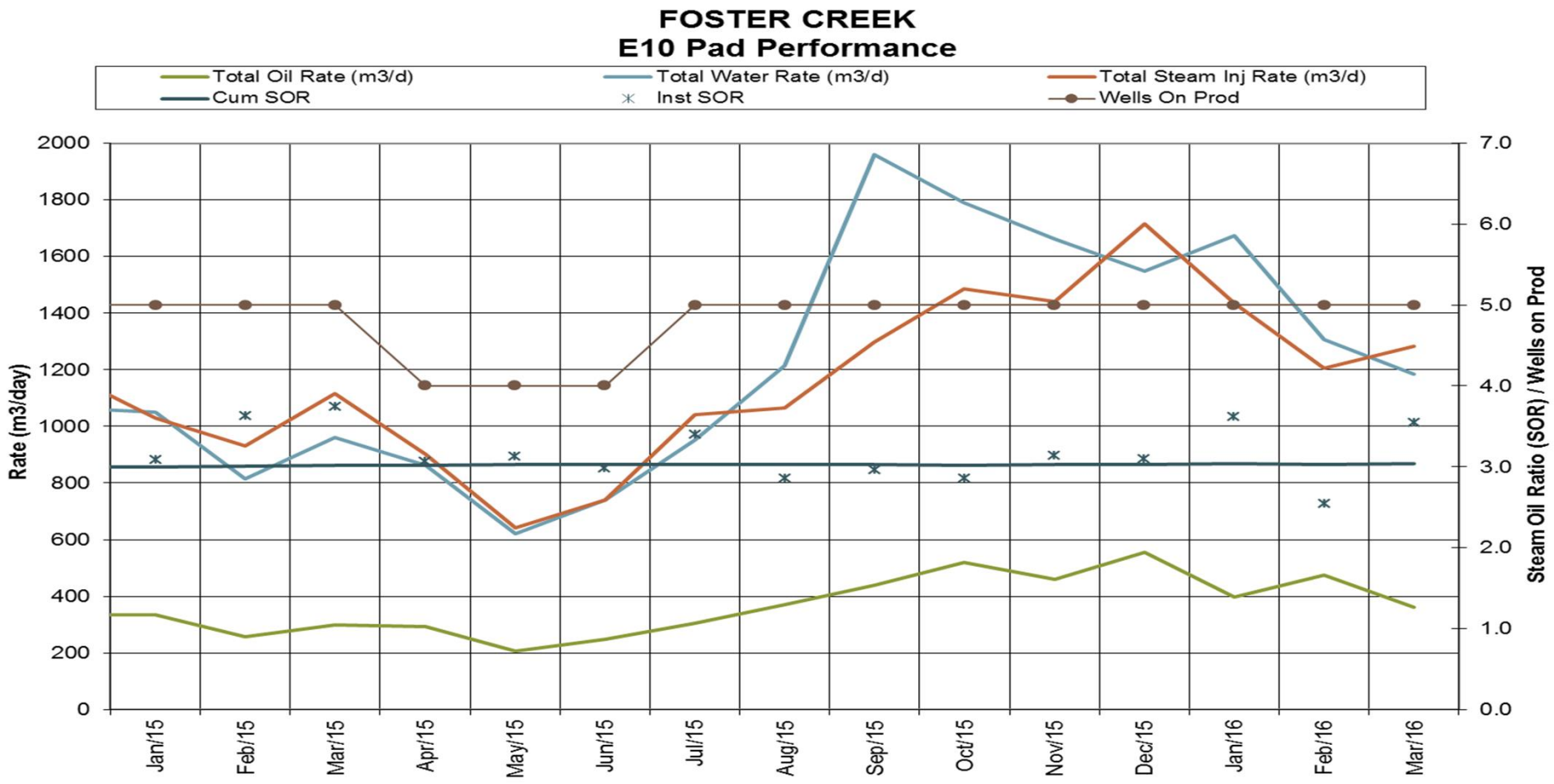

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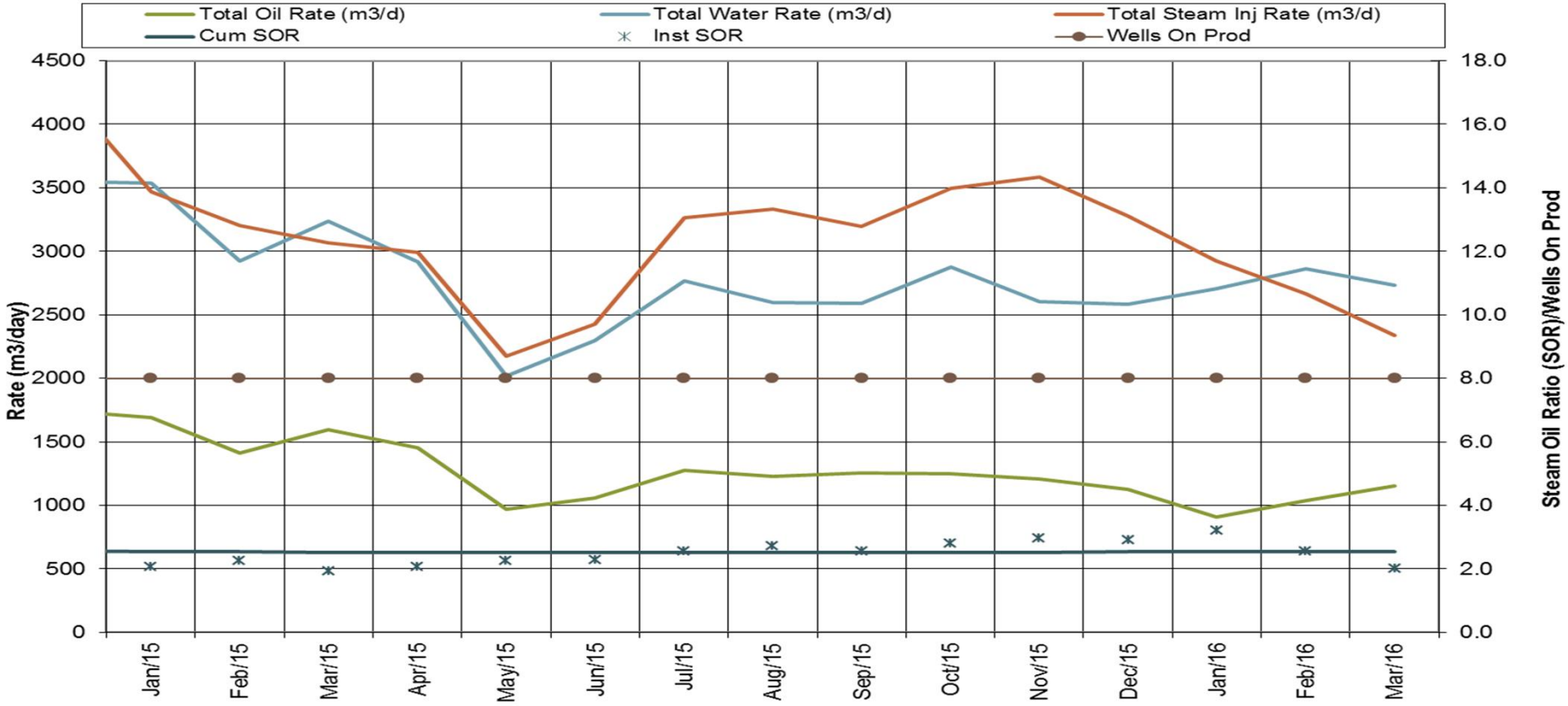
FOSTER CREEK
E11 Pad Performance



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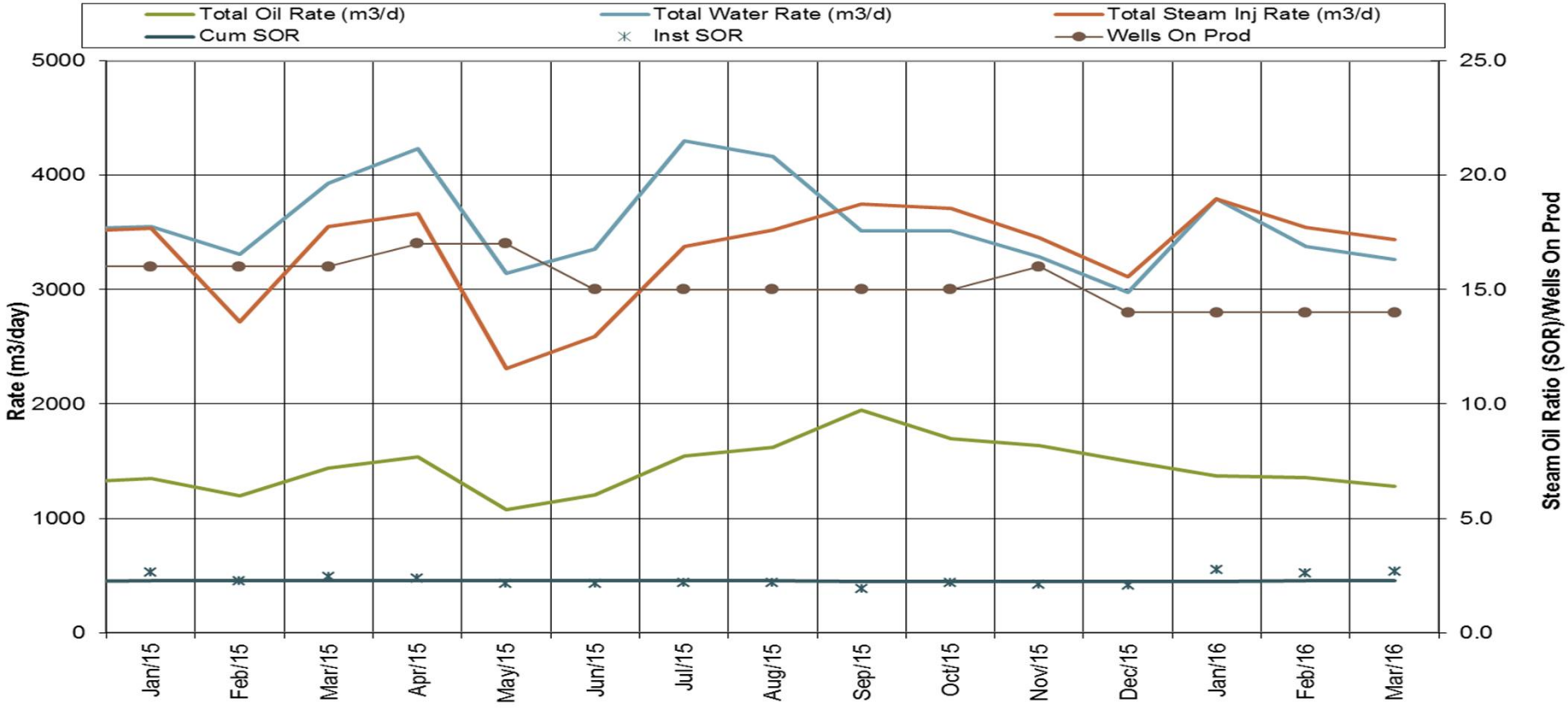
E12 Pad & E12 Wedge Wells Performance



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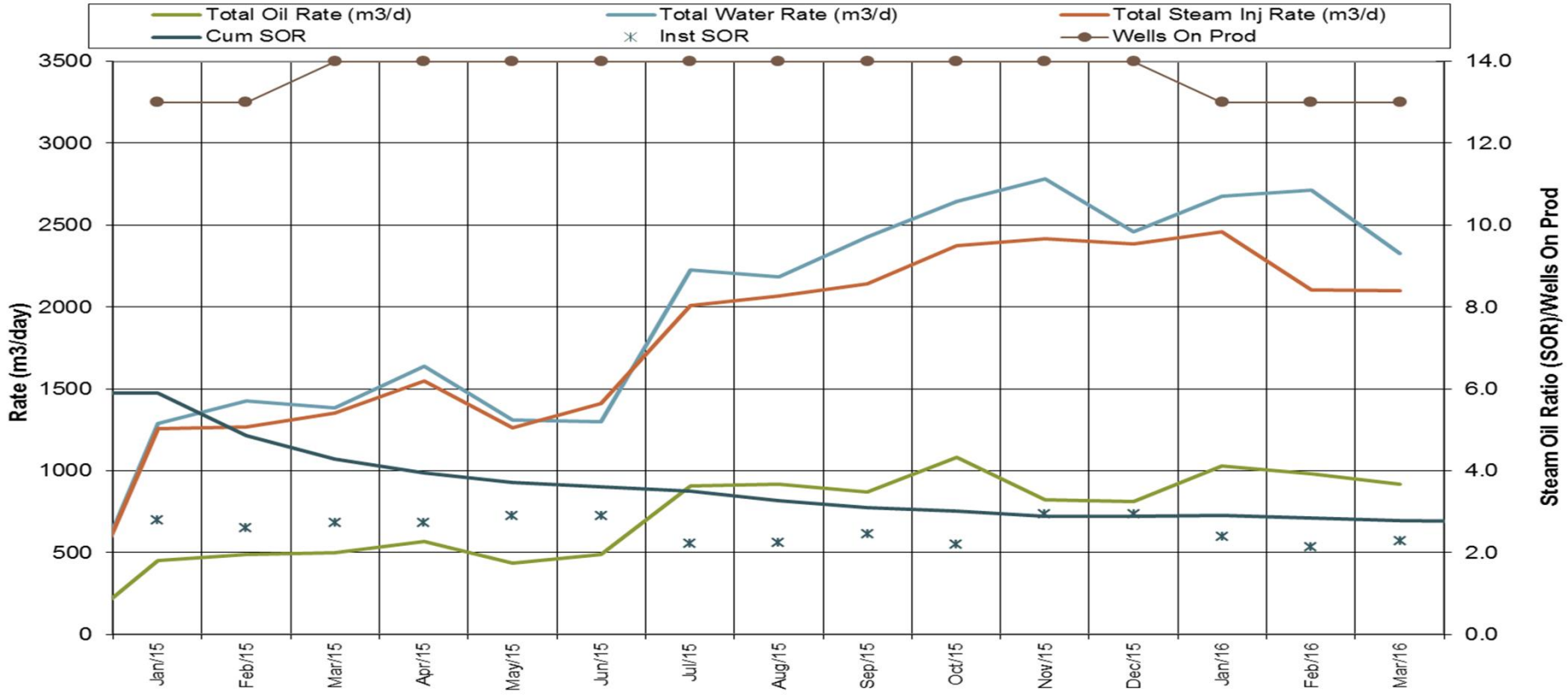
FOSTER CREEK
E14 Pad Performance



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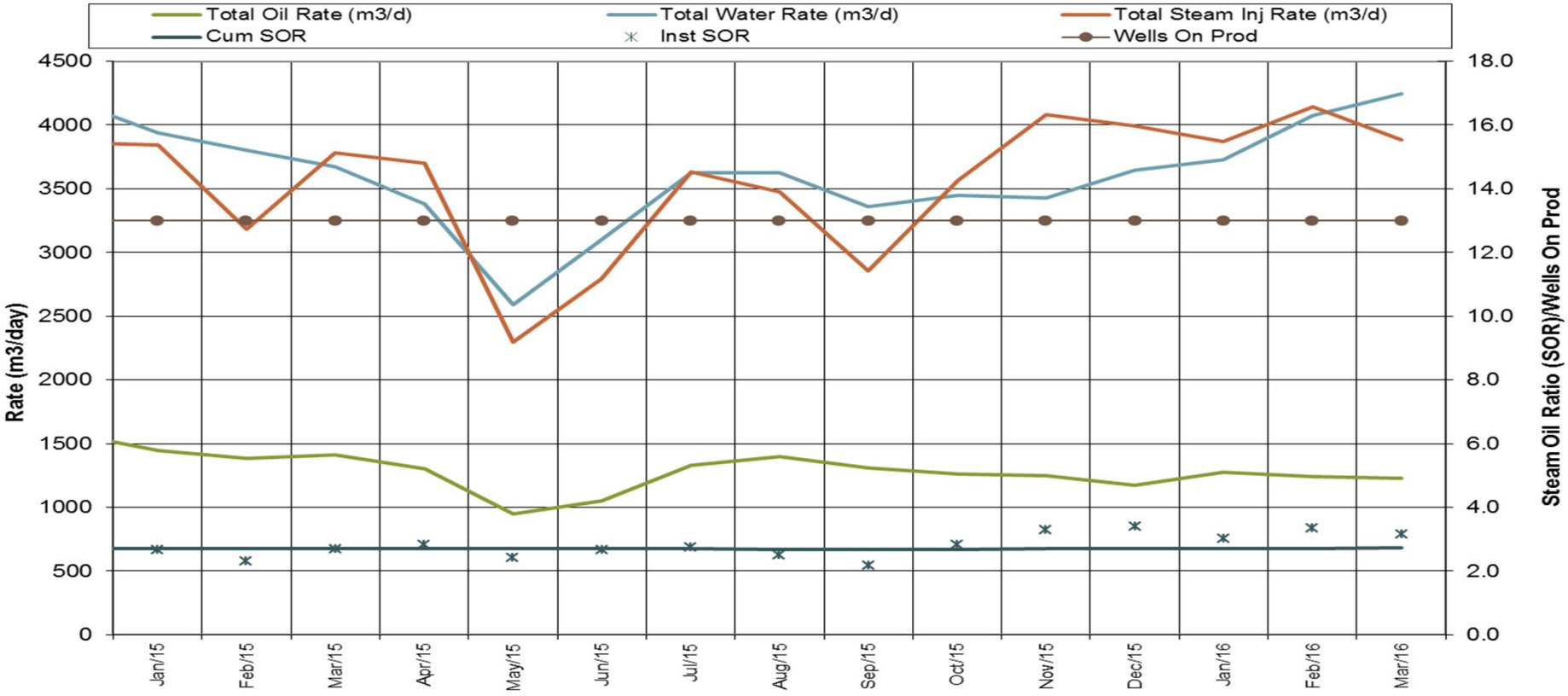
FOSTER CREEK
E15 Pad Performance



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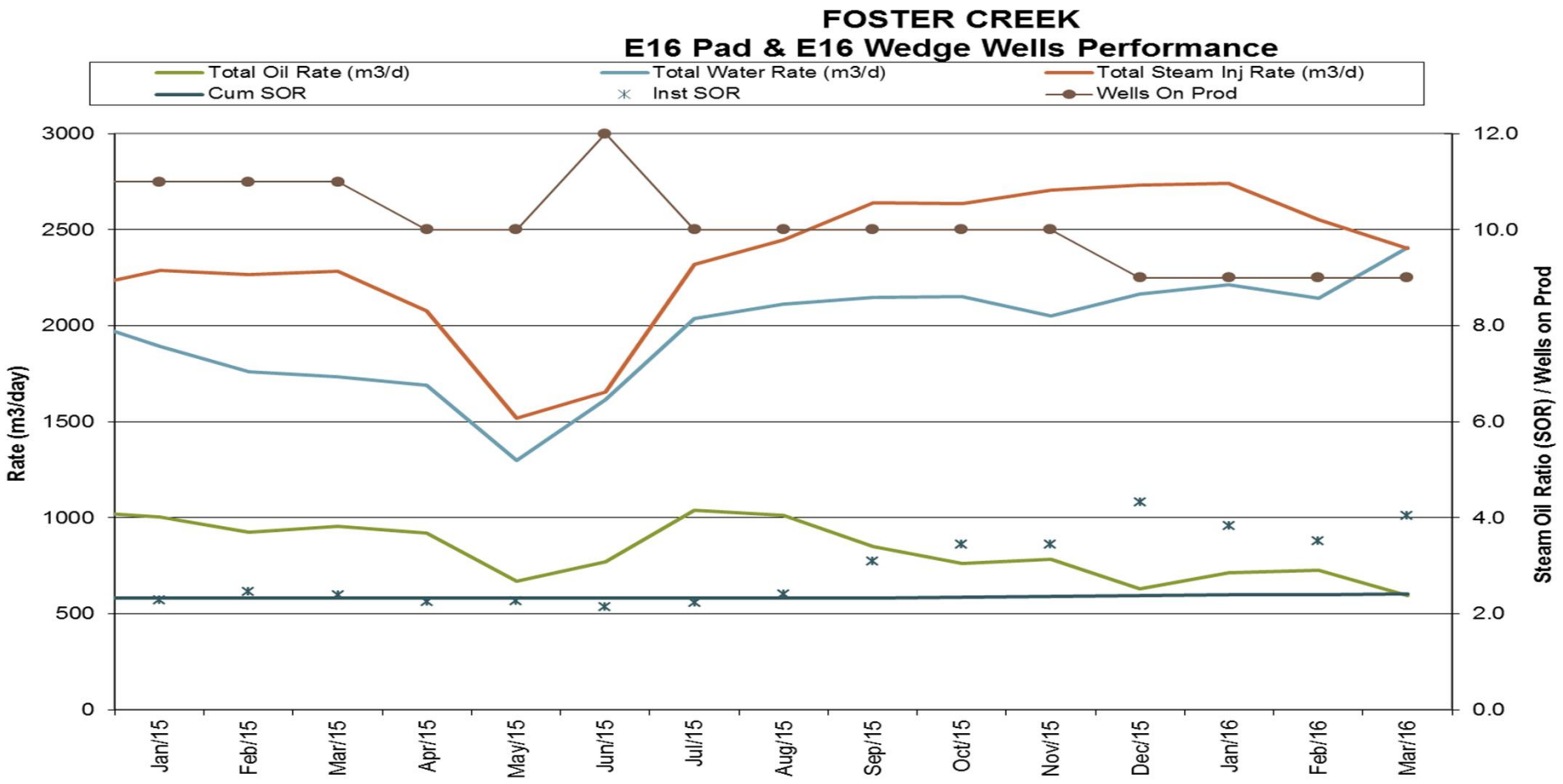

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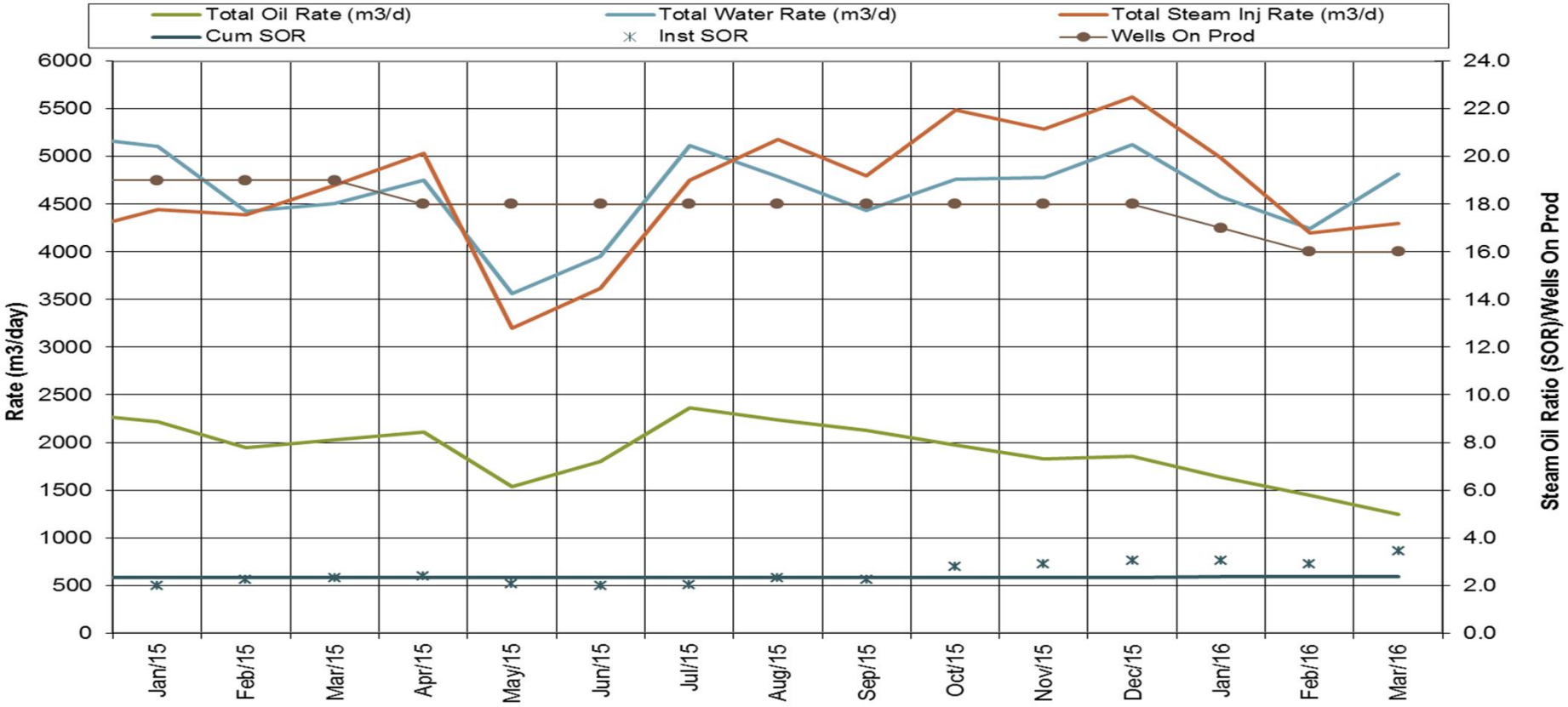
FOSTER CREEK
E19 Pad & E19 Wedge Wells Performance



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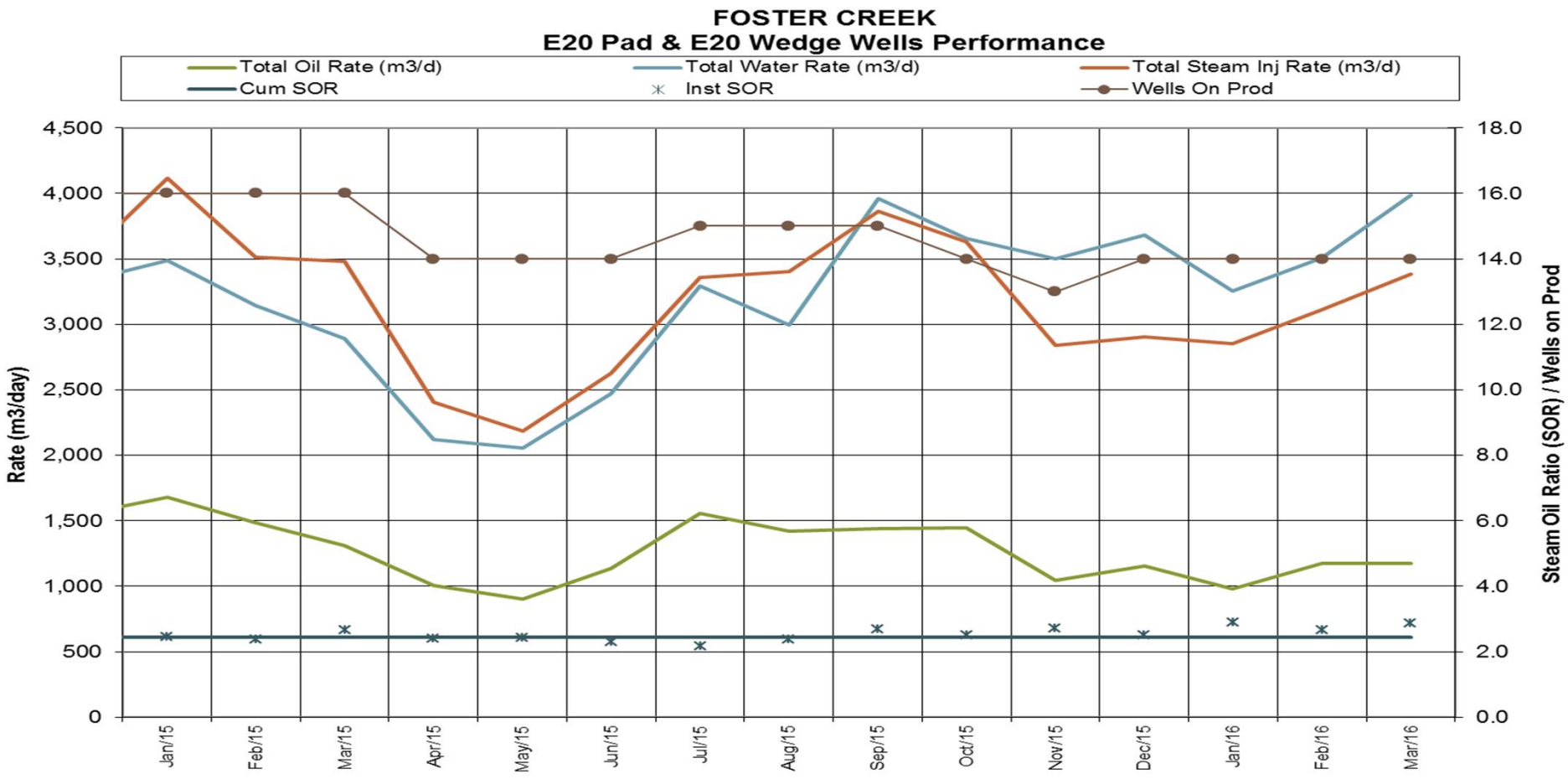

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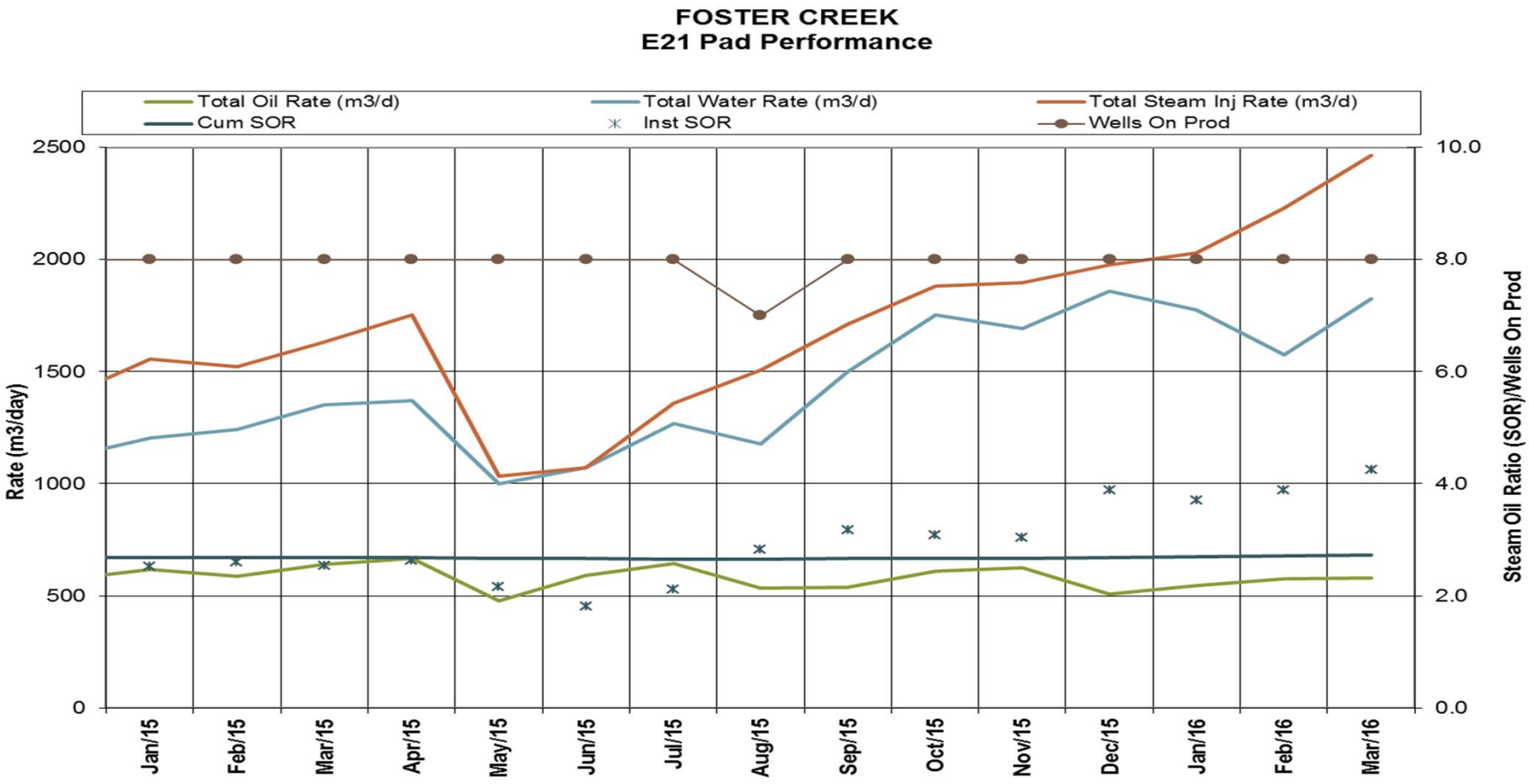

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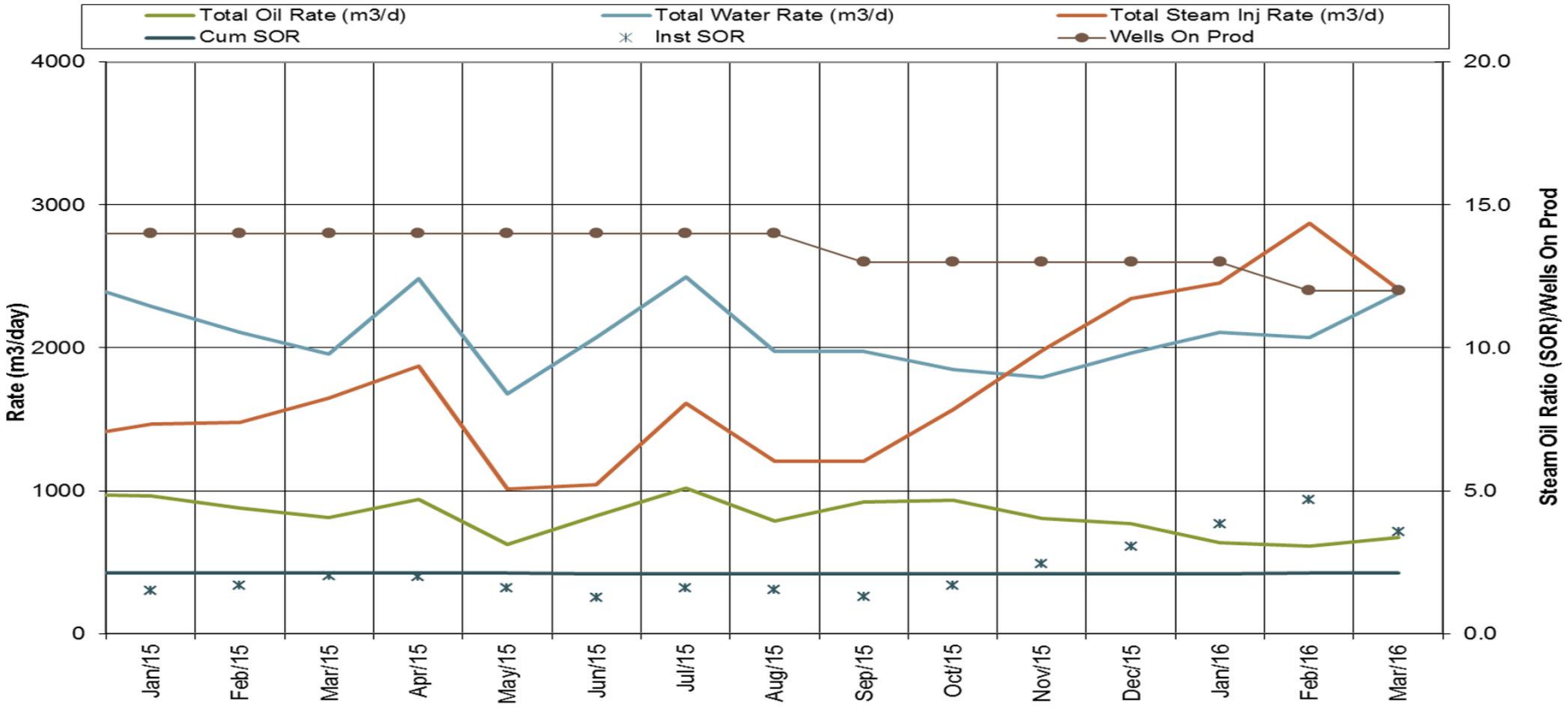
FOSTER CREEK
E24 PAD & E24 Wedge Wells™ Performance



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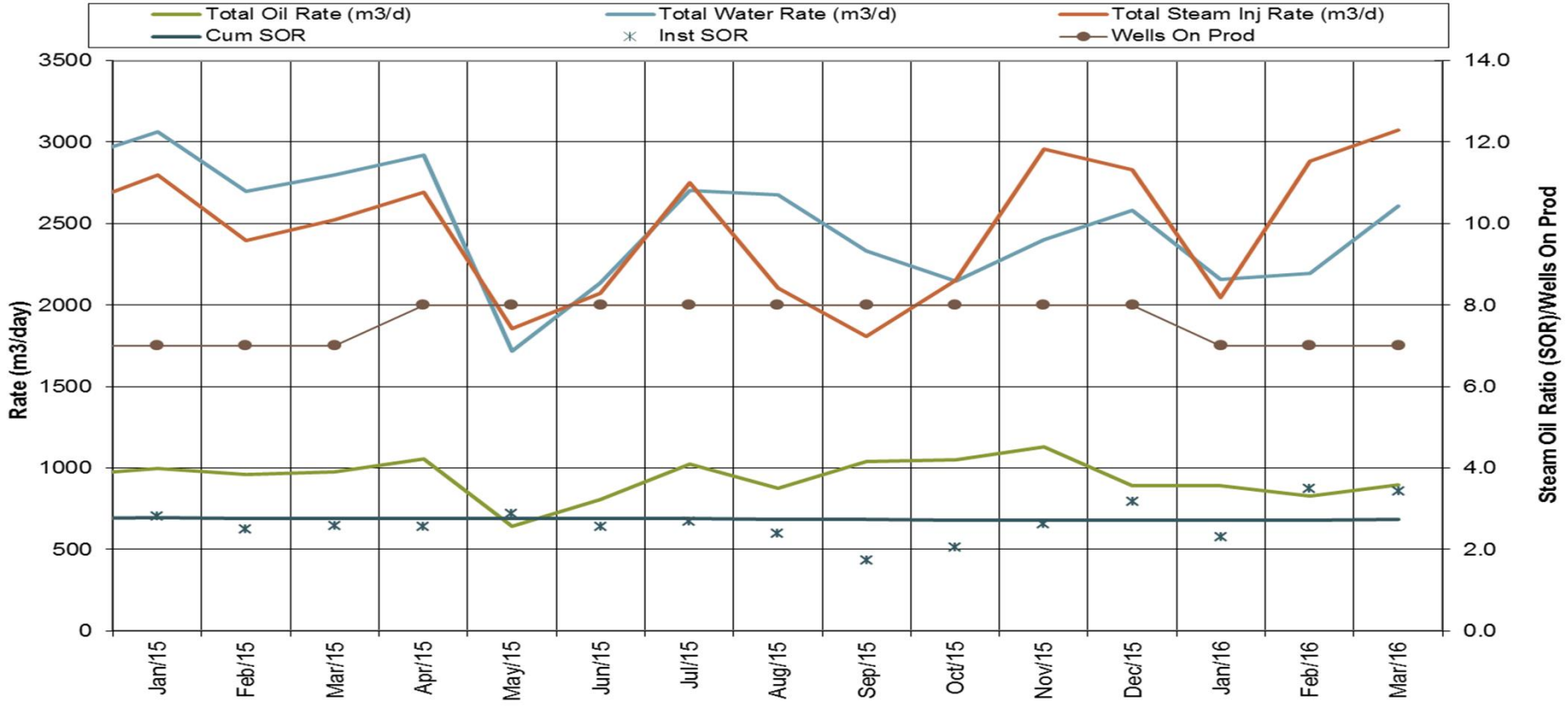
FOSTER CREEK
E25 Pad Performance



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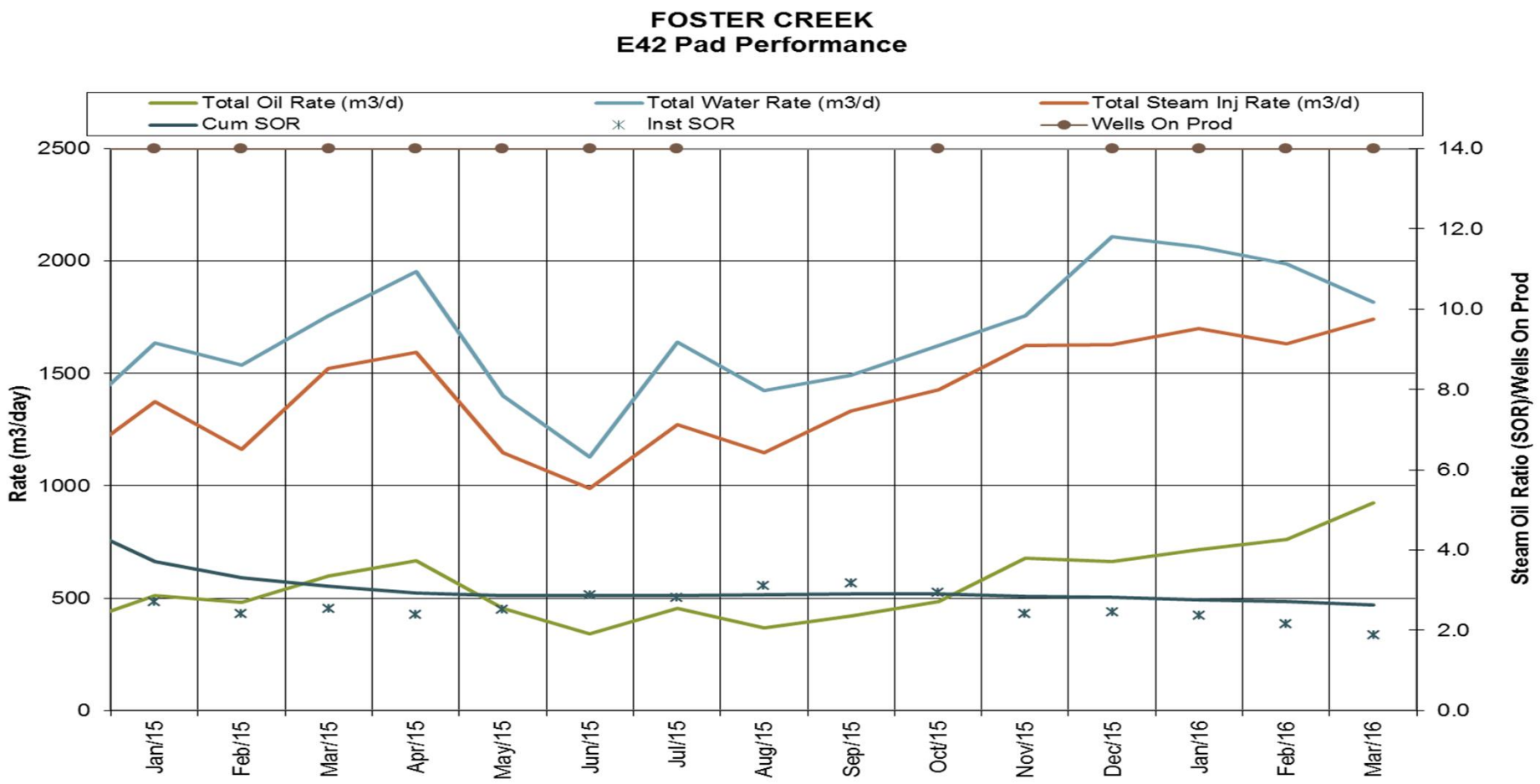

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Instrumentation in wells

Subsection 3.1.1 – 5 c, d)

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Piezometer data

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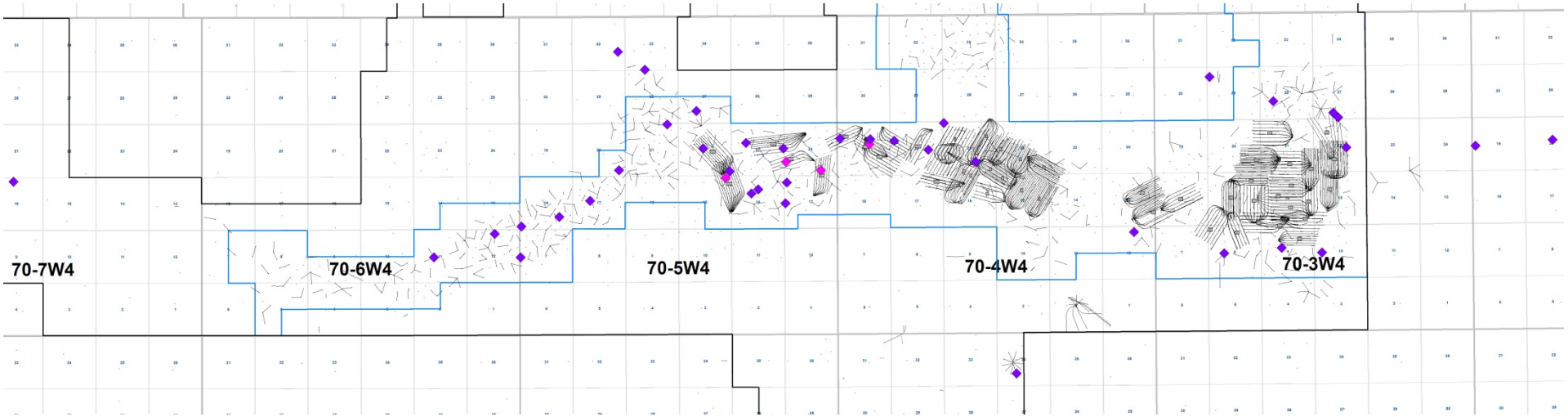
Foster Creek piezometer locations



Existing Piezometer

2016 Piezometer

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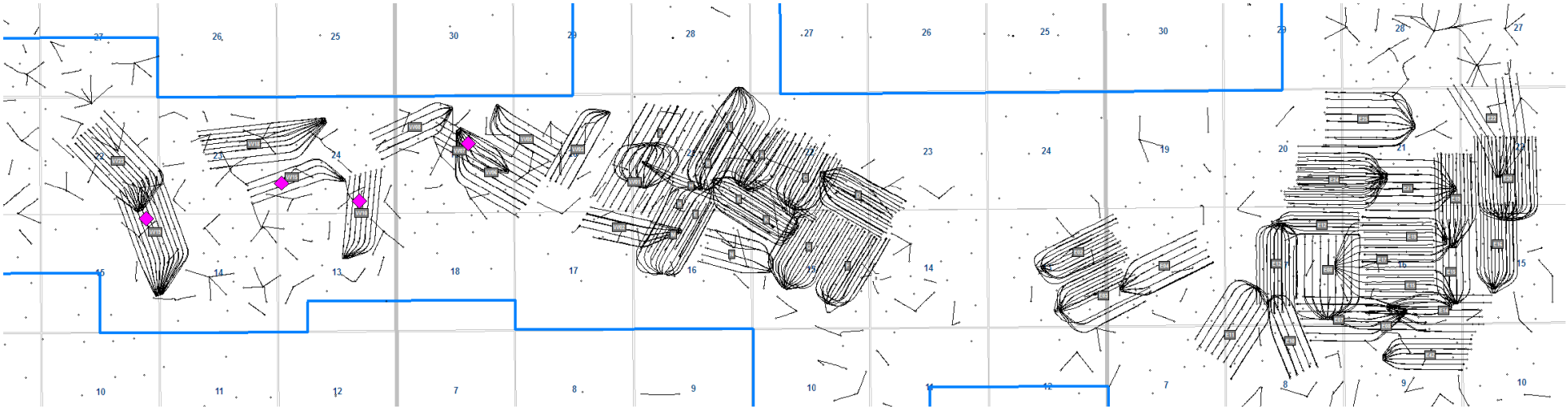
Foster Creek 2016 piezometer locations



2016 Piezometer

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Piezometer details

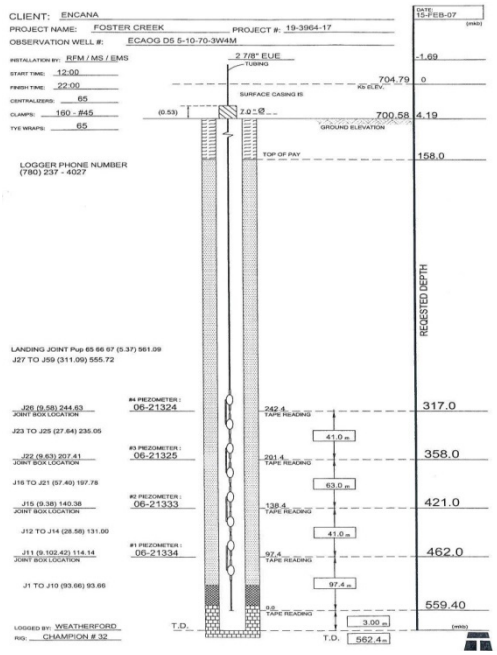
Three installation types:

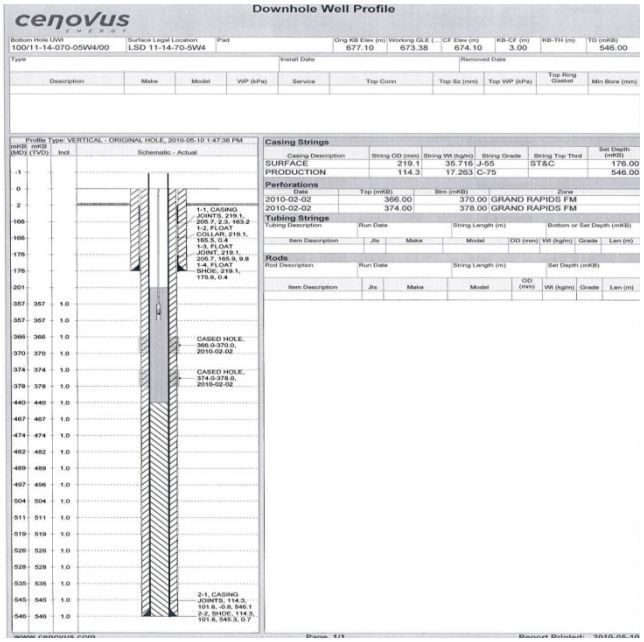
Cemented tubing - vibrating wire piezometers mounted on tubulars and cemented in place (14 wells)

Hanging wire – pressure / temperature gauges hung from the wellhead to about 10-15m above perforations (9 wells)

Cemented casing – High temperature optical pressure sensors strapped and cemented to the production casing (33 wells)

Four new McMurray piezometers installed





Piezometer Pressure Data

UWI	Formation	MD (mKB)	TVD (mSS)	2016 Reported Pressures (kPaa)		
				2016-01-31	2016-02-29	2016-03-31
100/07-22-070-03W4	McMurray	556.9	161.4	2393		
102/13-21-070-04W4	McMurray	484.7	184.87		2813	2855
1F1/05-19-070-02W4	Clearwater	544.6	195.22	2176	2167	2153
100/10-20-070-02W4	McMurray	592	132.2			
100/15-12-070-04W4	McMurray	517.9	161.61	3011	2977	2949
100/06-08-070-03W4	McMurray	529	161.15	3154	3114	3066
100/08-32-070-05W4	Lower Grand Rapids	358	300.87			
100/11-14-070-05W4	Lower Grand Rapids	357.2	319.9	1520	1520	1517
1F1/03-27-070-03W4	Clearwater	462	242.8	2538	2539	2539
1F1/03-27-070-03W4	Lower Grand Rapids	421	283.8	946	988	975
1F1/03-27-070-03W4	Upper Grand Rapids	358	346.8	1403	1407	1409
1F1/03-27-070-03W4	Viking	317	387.8	2296	2301	2308
1F1/05-10-070-03W4	Clearwater	458	261.39	2341	2341	2340
1F1/05-10-070-03W4	Lower Grand Rapids	425	294.39	1434	1436	1444
1F1/05-10-070-03W4	Upper Grand Rapids	360	359.39			
1F1/05-10-070-03W4	Viking	320	399.39	2216	2220	2224
103/13-29-070-03W4	Clearwater	403.6	269.75	1515		1518
103/13-29-070-03W4	Lower Grand Rapids	365	308.35	1085	1089	1092
100/06-11-070-06W4	McMurray	568	124.35			
100/06-11-070-06W4	McMurray	540	152.35			
100/06-11-070-06W4	McMurray	533	159.35			
100/06-11-070-06W4	Lower Grand Rapids	404	288.35			
100/02-21-070-04W4	Colorado Shale	241	428.93	3775		3767
100/14-16-070-07W4	McMurray	524	141.13		3008	3009
100/14-16-070-07W4	McMurray	505	160.13		2809	2810
100/14-16-070-07W4	McMurray	494	171.13		2722	2722
100/14-16-070-07W4	Lower Grand Rapids	402	263.13		2213	2212

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Piezometer Pressure Data Continued…

UWI	Formation	MD (mKB)	TVD (mSS)	2016 Reported Pressures (kPaa)		
				2016-01-31	2016-02-29	2016-03-31
103/07-20-070-04W4	McMurray	584.98	162.38	3072	3078	3121
103/07-20-070-04W4	McMurray	565.97	176.96	2824	2827	2851
103/07-20-070-04W4	McMurray	556.79	184.04	2771	2769	2782
103/07-20-070-04W4	Lower Grand Rapids	389.67	313.96	1583	1580	1579
102/09-23-070-05W4	McMurray	581.86	186.27	2953	3004	4790
102/09-23-070-05W4	McMurray	589.97	180.42	2958	2966	2957
102/09-23-070-05W4	McMurray	619.59	158.73	3110	3111	3104
102/11-23-070-05W4	McMurray	559.27	194.56	2686	2695	2703
102/11-23-070-05W4	McMurray	590.34	173.16	3044	3078	4051
102/11-23-070-05W4	McMurray	621.31	152.1	3385	3383	3379
102/12-19-070-04W4	McMurray	573	185.22	5271	5005	4887
102/12-19-070-04W4	McMurray	587	175.05	5361	5090	4977
102/12-19-070-04W4	McMurray	601	164.88	3169	3162	3157
102/05-13-070-05W4	McMurray	600.79	176.26	2920	2922	2919
102/05-13-070-05W4	McMurray	608.9	170.67	2975	2975	2973
102/05-13-070-05W4	McMurray	623.45	160.68	3130	3128	3121
104/12-20-070-04W4	McMurray	607.6	182.03	3033	3031	3036
104/12-20-070-04W4	McMurray	618.76	174.91	3101	3082	3159
104/12-20-070-04W4	McMurray	626.68	169.85	3124	3103	3180
100/13-13-070-05W4	McMurray	602.86	187.14	2873	2870	2873
100/13-13-070-05W4	McMurray	614.18	179.76	3054	3050	3047
100/13-13-070-05W4	McMurray	636.39	165.38	2915	2912	2914
102/10-14-070-05W4	McMurray	613.59	175.98	2986	2985	2983
102/10-14-070-05W4	McMurray	622.73	170.66	2968	2969	2942
102/10-14-070-05W4	McMurray	659.5	149.29	3223	3221	3219
102/01-20-070-05W4	McMurray	523.88	151.39	3150	3150	3145
102/01-20-070-05W4	McMurray	514.66	160.61	3061	3060	3056
102/01-20-070-05W4	McMurray	489.88	185.39	2779	2782	2779

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Piezometer Pressure Data Continued…

UWI	Formation	MD (mKB)	TVD (mSS)	2016 Reported Pressures (kPaa)		
				2016-01-31	2016-02-29	2016-03-31
100/03-27-070-05W4	McMurray	526.8	147.07	3188	3190	3182
100/03-27-070-05W4	McMurray	512	161.87	2980	2984	2975
100/03-27-070-05W4	McMurray	495.6	178.27	2866	2870	2864
1AB/11-17-070-05W4	McMurray	543	137.94	3141	3141	3139
1AB/11-17-070-05W4	McMurray	501	179.94	2638	2643	2645
1AB/11-17-070-05W4	McMurray	487	193.94	2480	2481	2486
1AB/01-18-070-05W4	McMurray	526	143.95	3018	3019	3011
1AB/01-18-070-05W4	McMurray	505	164.95	2749	2749	2747
1AB/01-18-070-05W4	McMurray	490	179.95	2603	2603	2595
1AA/16-21-070-05W4	McMurray	607	151.35	3007	3011	3002
1AA/16-21-070-05W4	McMurray	591	162.98	2862	2868	2861
1AA/16-21-070-05W4	McMurray	581	170.22	2813	2798	2801
1AB/01-22-070-05W4	McMurray	633	153.42	3023	3025	3021
1AB/01-22-070-05W4	McMurray	605	171.8	8445	8370	7478
1AB/01-22-070-05W4	McMurray	575	191.93	2611	2612	2607
1AB/01-22-070-05W4	T31	518	231.34	2450	2444	2439
1AB/01-22-070-05W4	Lower Grand Rapids	474	261.67	1073	1193	1197
1AC/11-22-070-05W4	McMurray	517.5	151.8	3012	3018	3008
1AC/11-22-070-05W4	McMurray	498	171.3	2822	2818	2816
1AC/11-22-070-05W4	McMurray	488	181.3	2731	2729	2728
1AC/11-22-070-05W4	T31	455	214.3	2525	2520	2524
1AC/11-22-070-05W4	Lower Grand Rapids	415	254.3	1637	1646	1632
1AB/03-33-070-05W4	McMurray	519	152.81	2983	2983	2983
1AB/03-33-070-05W4	McMurray	512	159.81	2917	2422	2917
1AB/03-33-070-05W4	McMurray	500	171.81	2742	2742	2734
102/03-27-070-03W4	Clearwater A	457	249.36	2245	2245	2237

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Piezometer Pressure Data Continued…

UWI	Formation	MD (mKB)	TVD (mSS)	2016 Reported Pressures (kPaa)		
				2016-01-31	2016-02-29	2016-03-31
102/15-12-070-06W4	McMurray	559.5	121.88	3241	3243	3244
102/15-12-070-06W4	McMurray	506.5	174.88	1848	1851	1850
102/15-12-070-06W4	2WS	223	458.38	2499	2496	2495
102/04-18-070-05W4	McMurray	538.5	136.92	3097	3108	3108
102/04-18-070-05W4	McMurray	490	185.42	2568	2553	2565
102/04-18-070-05W4	Clearwater	420	255.42	1675	1674	1672
102/04-18-070-05W4	Lower Grand Rapids	376.5	298.92	2359	2367	2361
102/04-18-070-05W4	2WS	214.5	460.92	2369	2369	2369
100/05-28-070-03W4	McMurray	501	183.78	2617	2631	2640
100/05-28-070-03W4	Clearwater	421.5	263.28	1847	1838	1855
100/05-28-070-03W4	Lower Grand Rapids	381	303.78	676	689	705
102/05-07-070-05W4	McMurray	527	148.94	2998	2993	2988
102/05-07-070-05W4	McMurray	494	181.94	2564	2555	2560
102/05-07-070-05W4	2WS	215	460.94	1809	1802	1801
100/11-09-070-03W4	McMurray	538.5	162.99	3616	3610	3592
100/11-09-070-03W4	Lower Grand Rapids	405	296.49	1174	1182	1189
100/03-34-069-04W4	Lower Grand Rapids	635.85	68.47	6146	6387	4541

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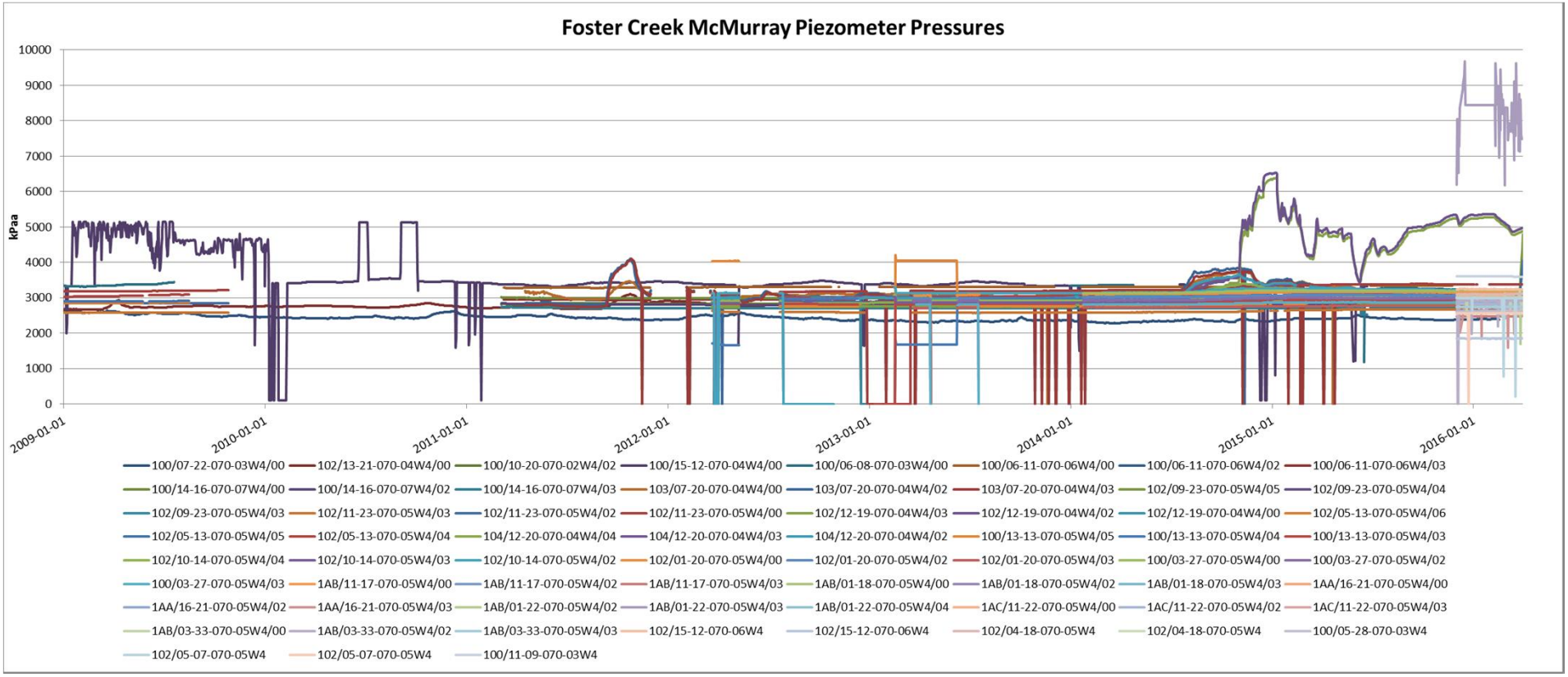

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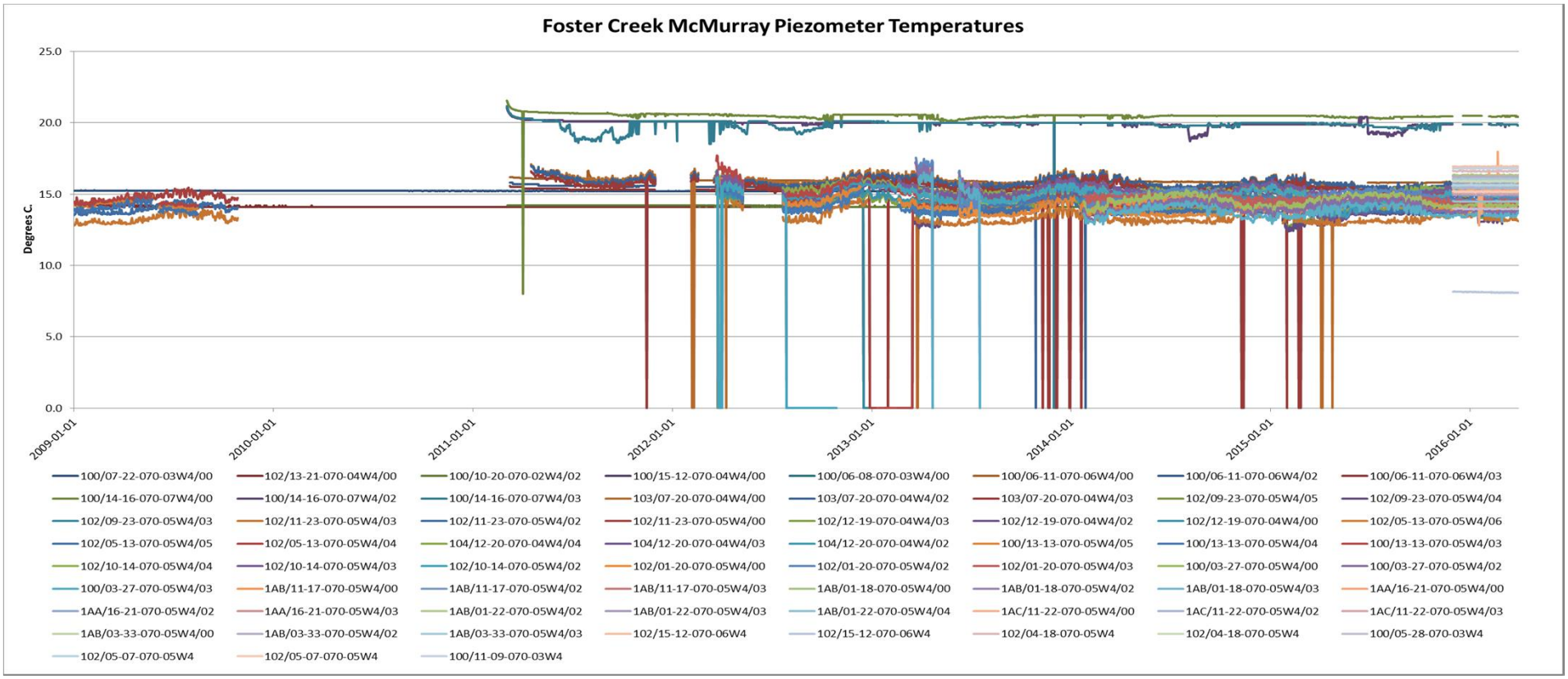

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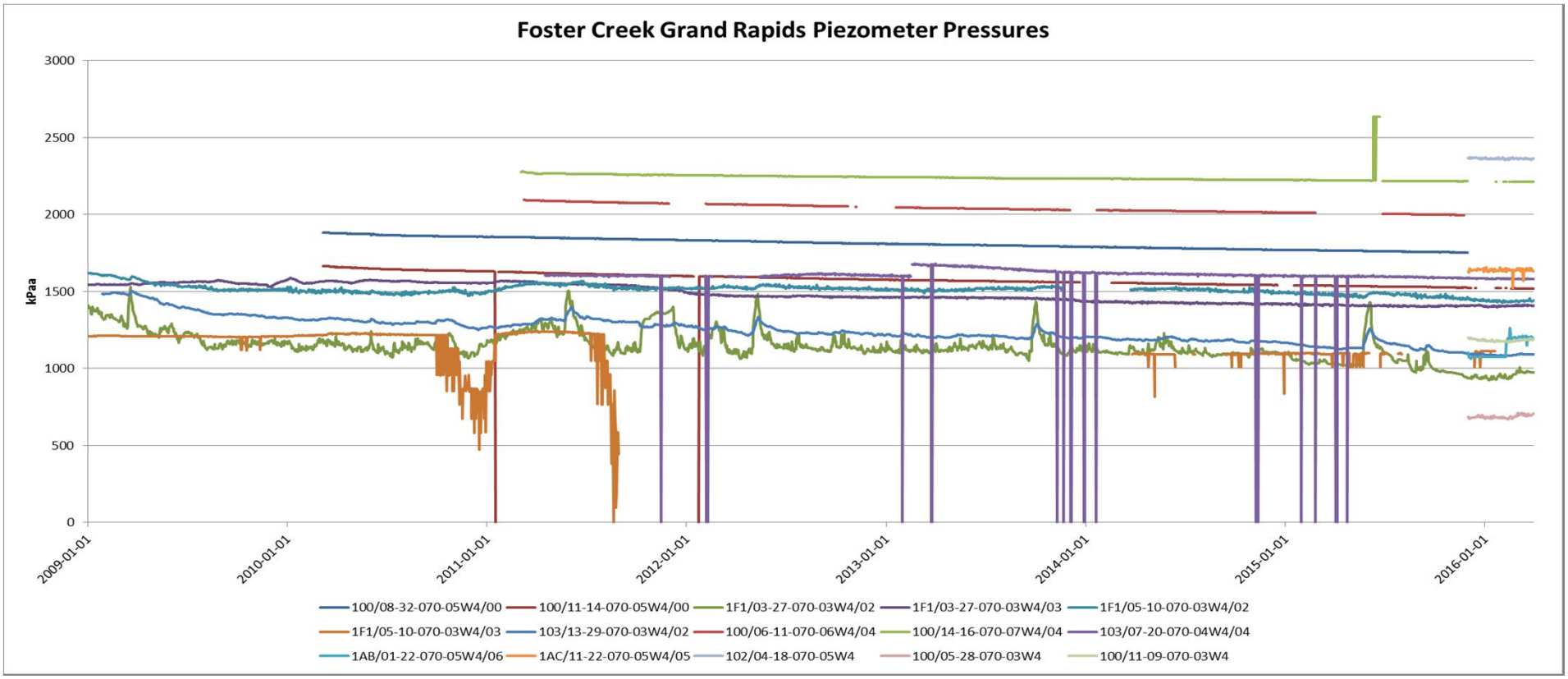

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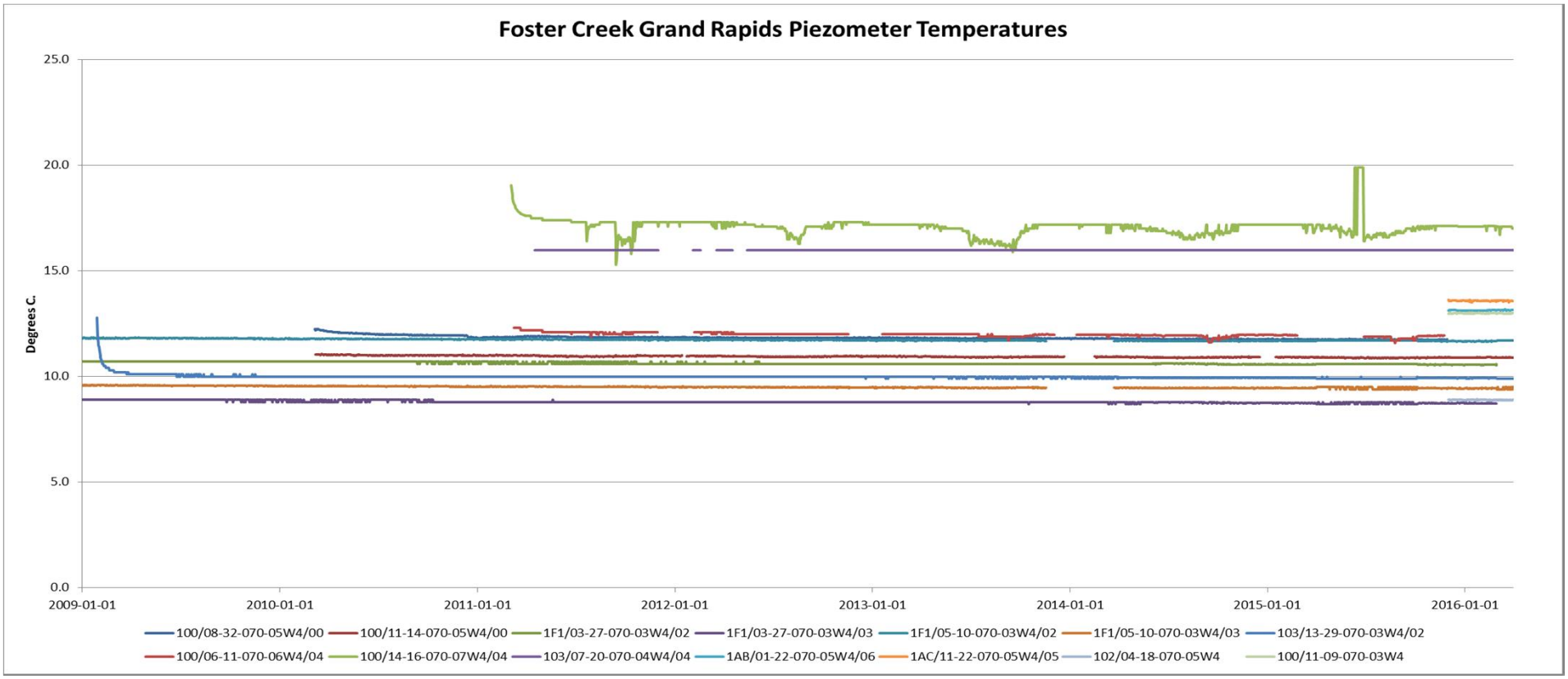

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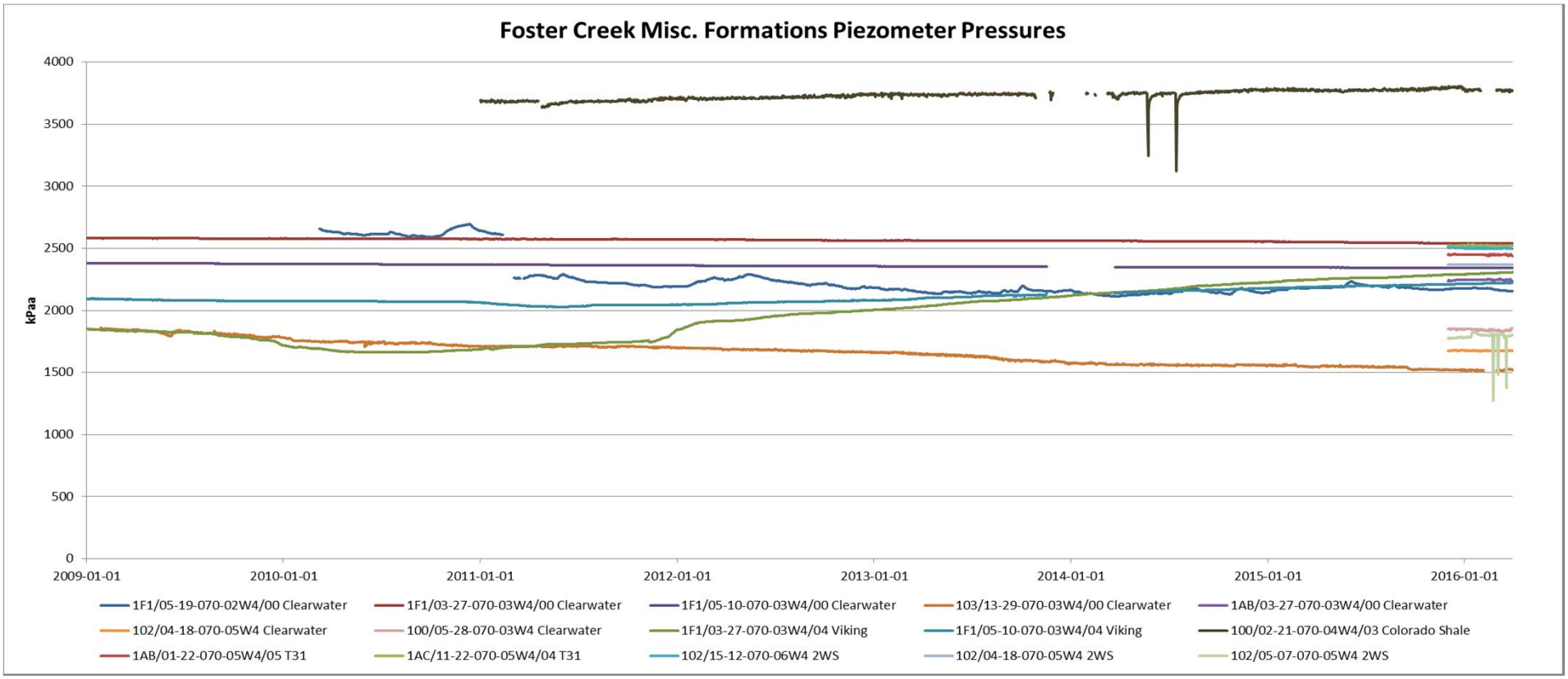

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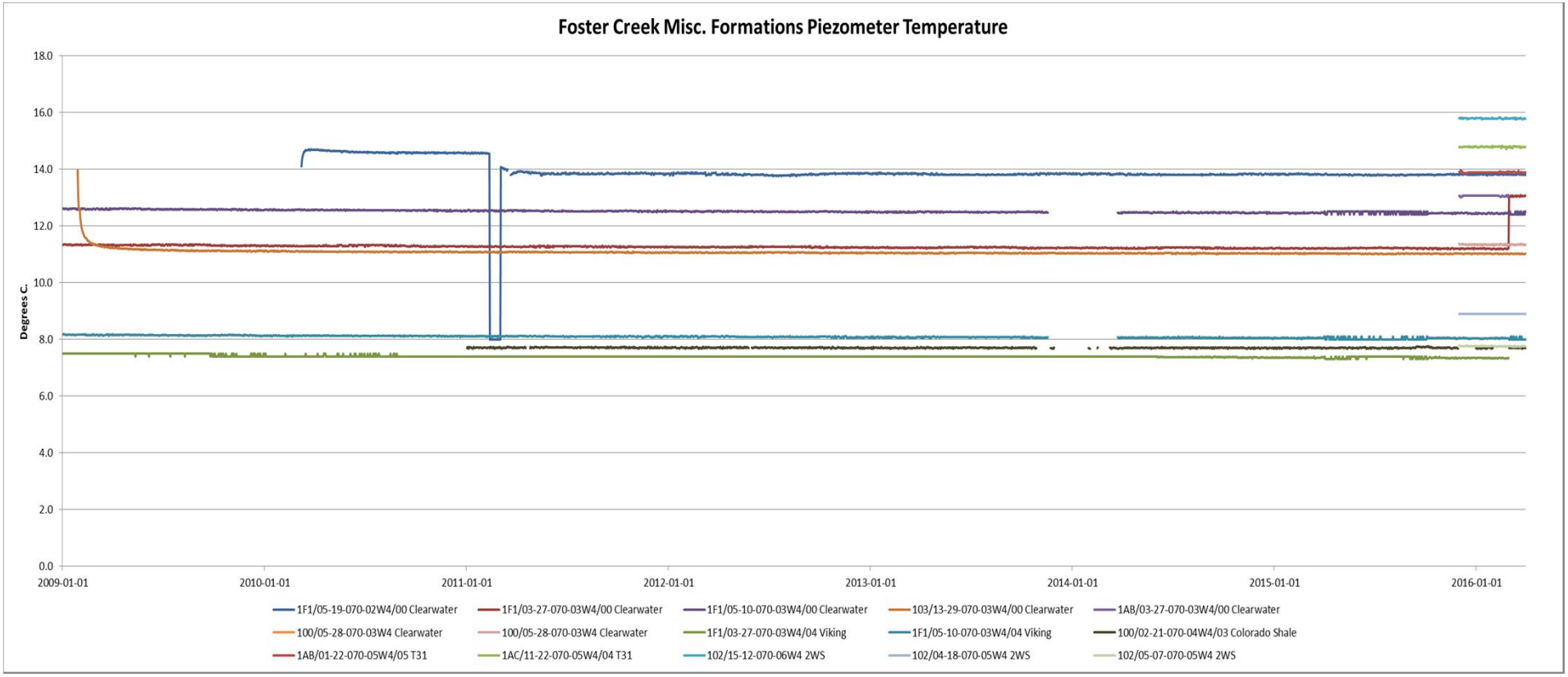

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Temperature data

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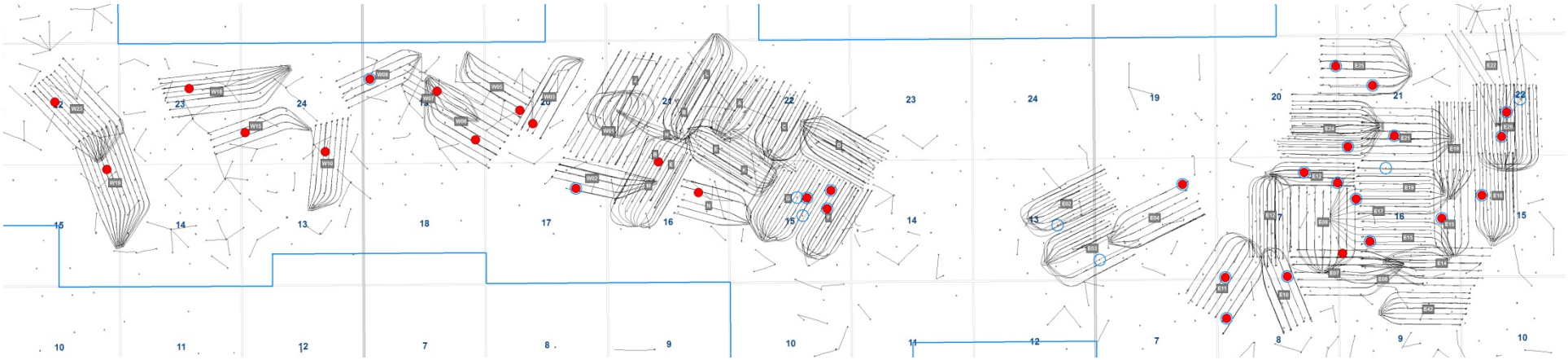
Foster Creek temperature and RST data -2016



- Wells selected for RST logging (33)
- Wells selected for Temperature logging (27)

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Observation well temperature data

UWI	Well Name	Pad
102071307004W400	CVE FCCL D7 FISHER 7-13-70-4	E02
102041807003W400	CVE FCCL C4 FISHER 4-18-70-3	E03
100151807003W400	CVE FCCL A15 FISHER 15-18-70-3	E04
100121607003W400	CVE FCCL D12 FISHER 12-16-70-3	E08
100021707003W400	CVE FCCL B2 FISHER 2-17-70-3	E10
100041707003W400	CVE FCCL B4 FISHER 4-17-70-3	E11
100120807003W400	CVE FCCL C12 FISHER 12-8-70-3	E11
100161707003W400	CVE FCCL A16 FISHER 16-17-70-3	E12
102151707003W400	CVE FCCL 2A15 FISHER 15-17-70-3	E12
102061607003W400	CVE FCCL B6 FISHER 6-16-70-3	E15
102081607003W400	CVE FCCL C8 FISHER 8-16-70-3	E15
100121507003W400	CVE FCCL D12 FISHER 12-15-70-3	E16
102141607003W400	CVE FCCL D14 FISHER 14-16-70-3	E19
100032207003W400	CVE FCCL FISHER 3-22-70-3	E20
102062207003W400	CVE FCCL 102 FISHER 6-22-70-3	E20
103062207003W400	CVE FCCL A6 FISHER 6-22-70-3	E20
102032107003W400	CVE FCCL D3 FISHER 3-21-70-3	E21
103042107003W400	CVE FCCL B4 FISHER 4-21-70-3	E24
100162007003W400	CVE FCCL A16 FISHER 16-20-70-3	E25
103112107003W400	CVE FCCL B11 FISHER 11-21-70-3	E25
100161507004W400	CVE FCCL B16 FISHER 16-15-70-4	F
102091507004W400	CVE FCCL B9 FISHER 9-15-70-4	F
100101507004W400	CVE FCCL C10 FISHER 10-15-70-4	G
103101507004W400	CVE FCCL D10 FISHER 10-15-70-4	G
104101507004W400	CVE FCCL B10 FISHER 10-15-70-4	G
102151707004W400	CVE FCCL A15 FISHER 15-17-70-4	W02
102121907004W400	CVE FCCL 2B13-19C FISHER 12-19-70-4	W08

27 observation wells were logged with temperature fiber between March 2015 and March 2016

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CVE FCCL FISHER 3-22-70-3
100/03-22-070-03W4
DTS Survey
Log Date: January 08, 2016

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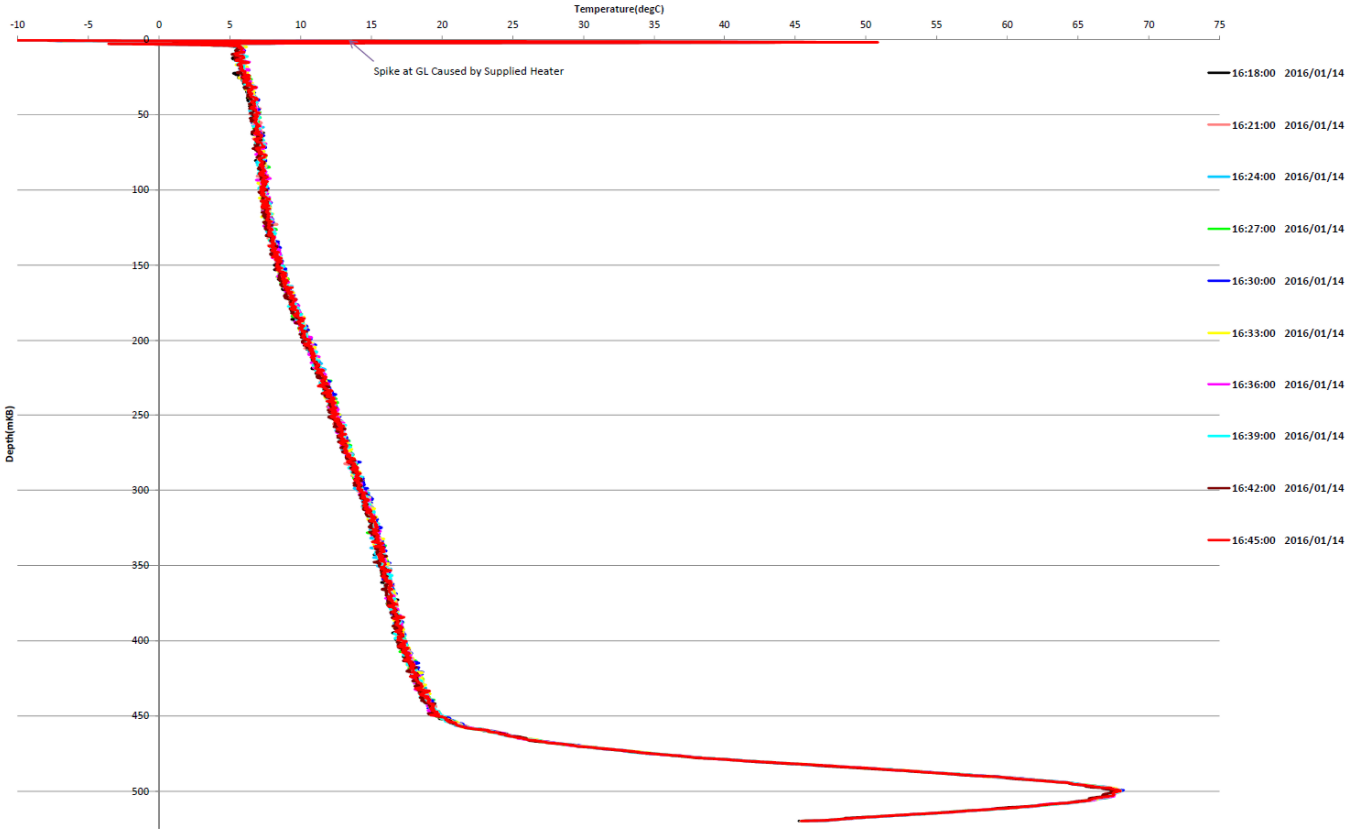
Cenovus Energy
CVE FCCL D14 FISHER 14-16-70-3
102/14-16-070-03W4
DTS Survey
Log Date: January 14, 2016



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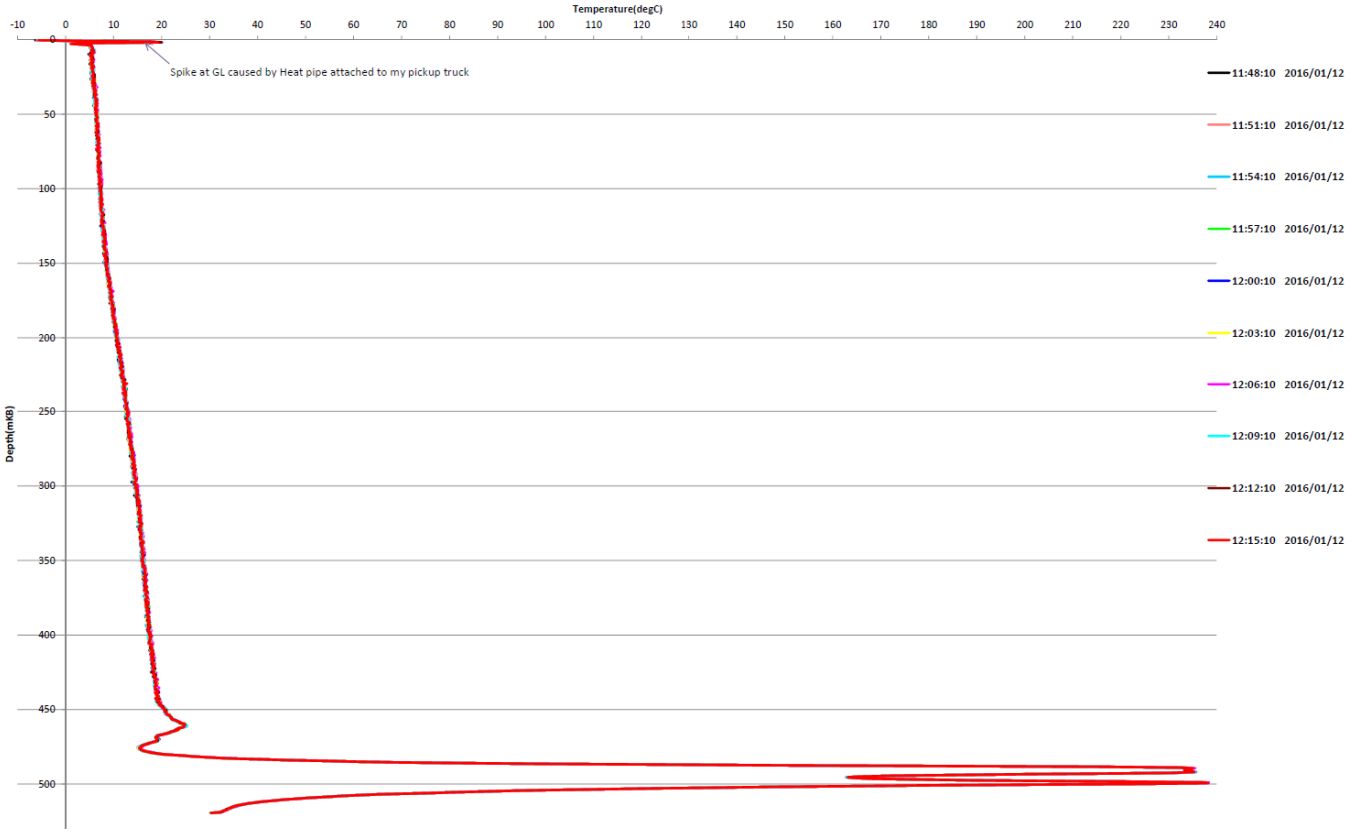
Cenovus Energy
CVE FCCL D12 FISHER 12-16-70-3
100/12-16-070-03W4
DTS Survey
Log Date: January 12, 2016



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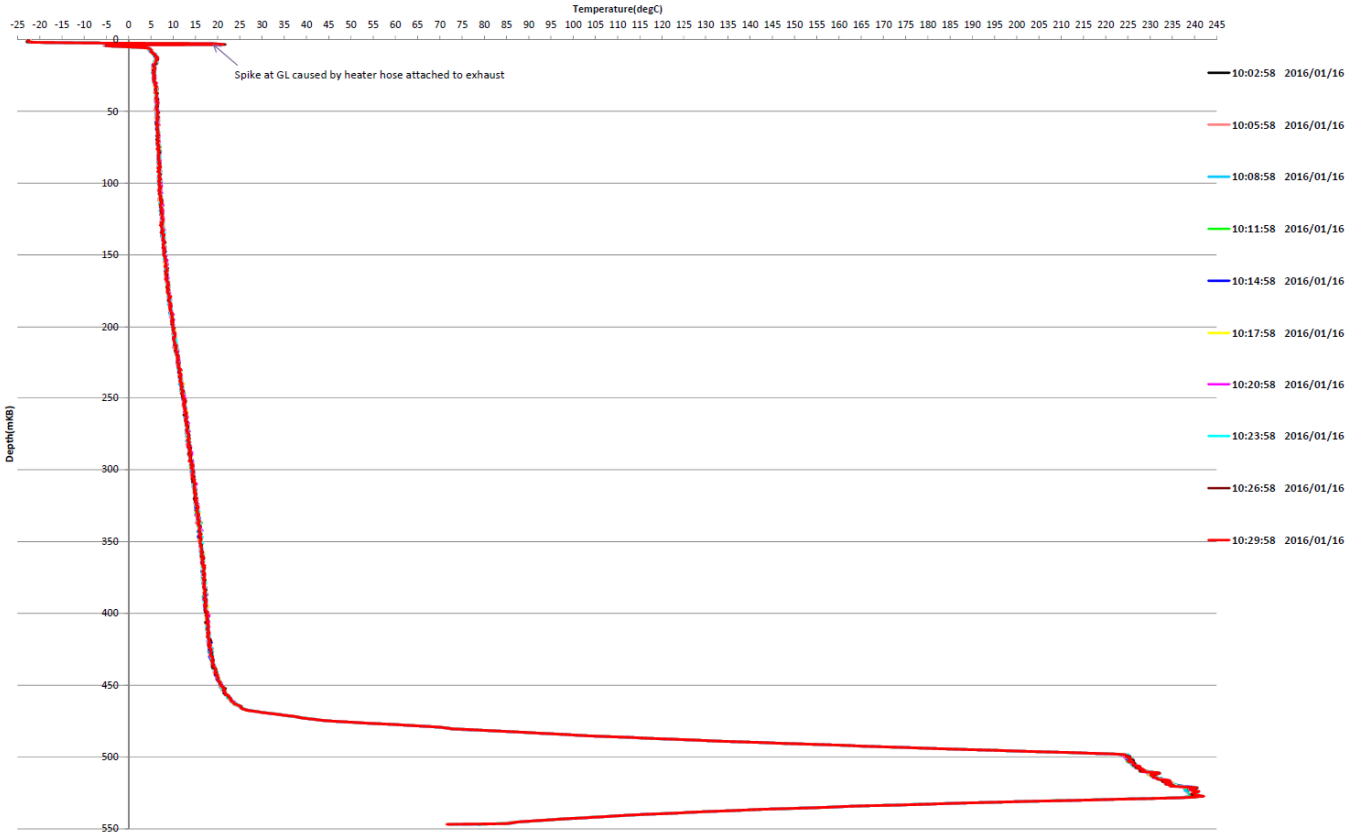
Cenovus Energy
CVE FCCL D12 FISHER 12-15-70-3
100/12-15-070-03W4
DTS Survey
Log Date: January 16, 2016



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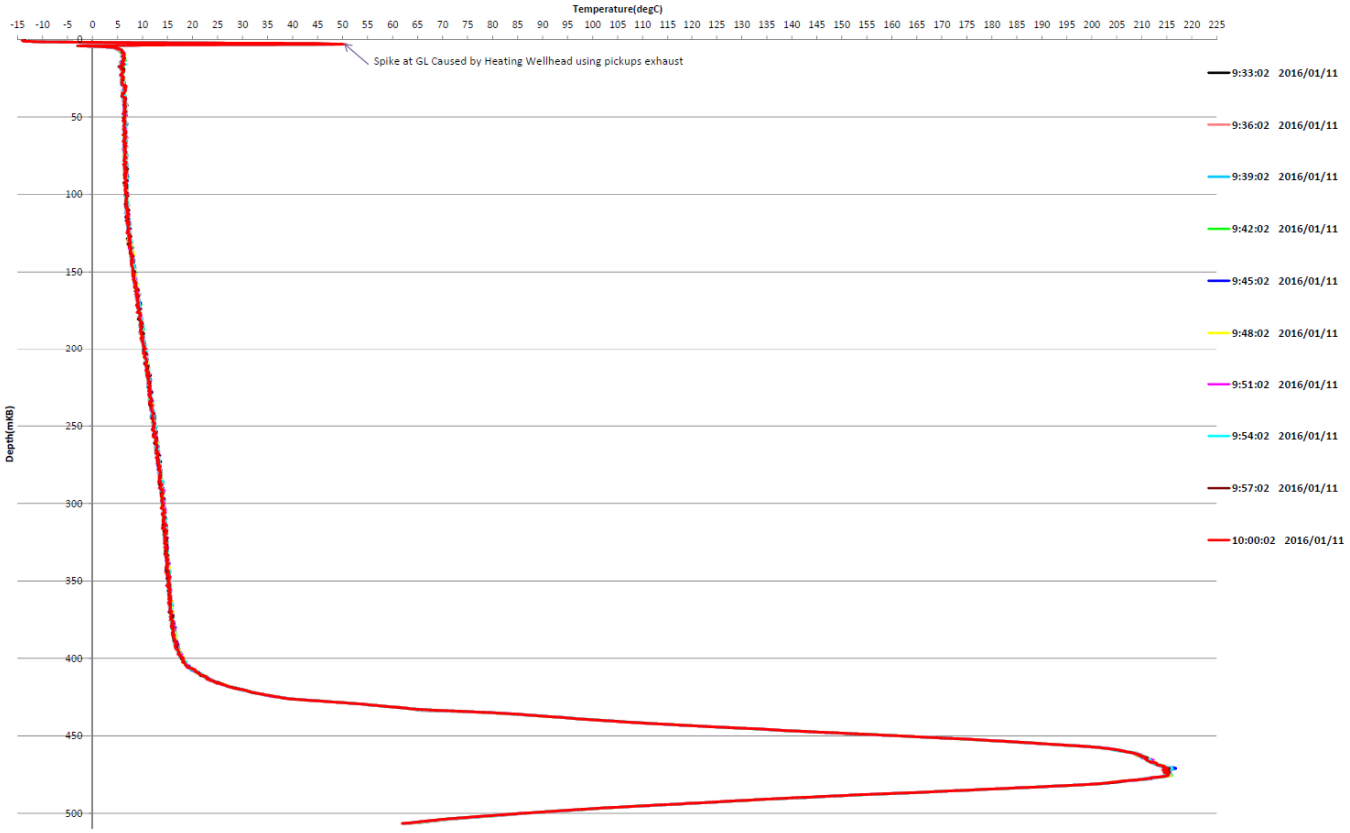
Cenovus Energy
CVE FCCL D10 FISHER 10-15-70-4
103/10-15-070-04W4
DTS Survey
Log Date: January 11, 2016



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Cenovus Energy
CVE FCCL D7 FISHER 7-13-70-4
102/07-13-070-04W4
DTS Survey
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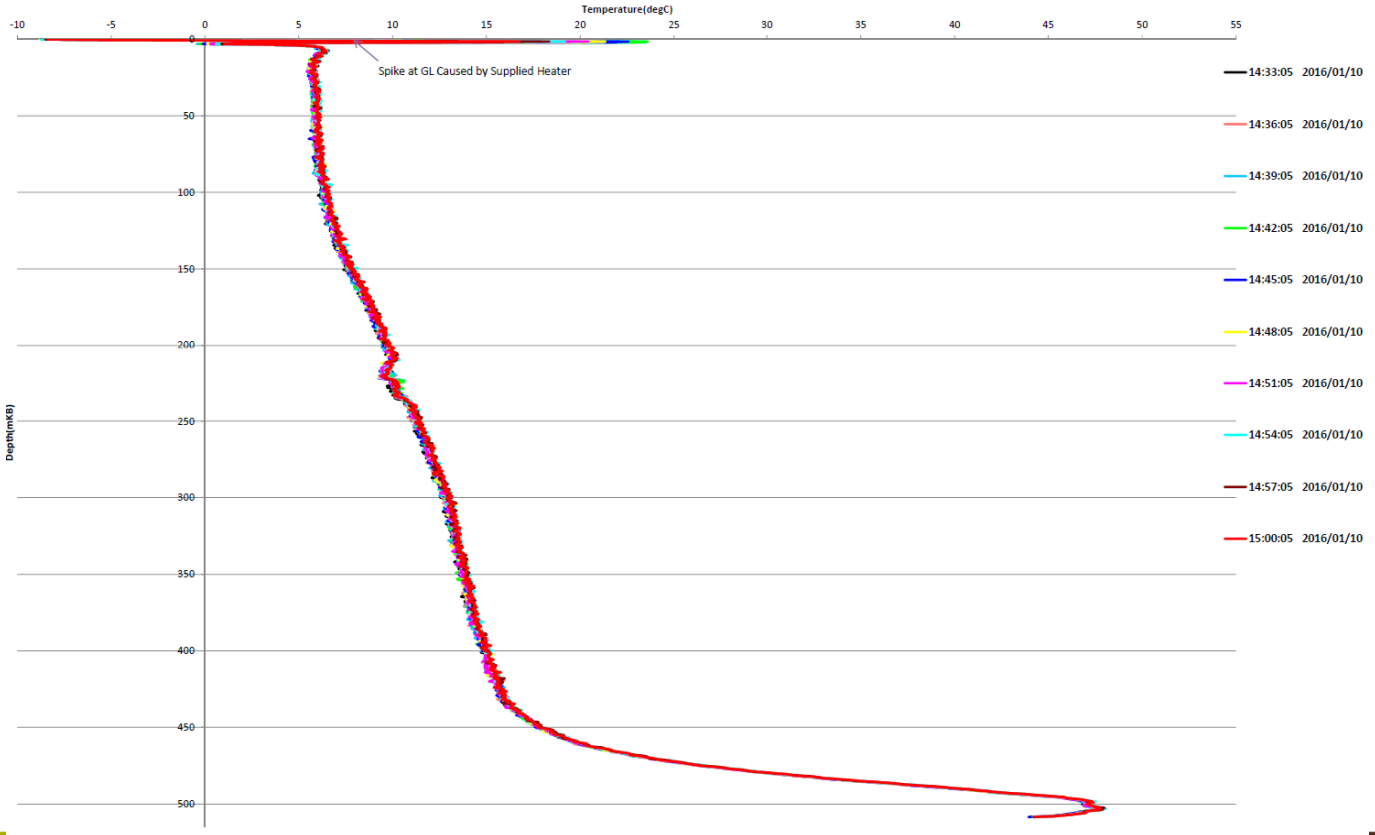

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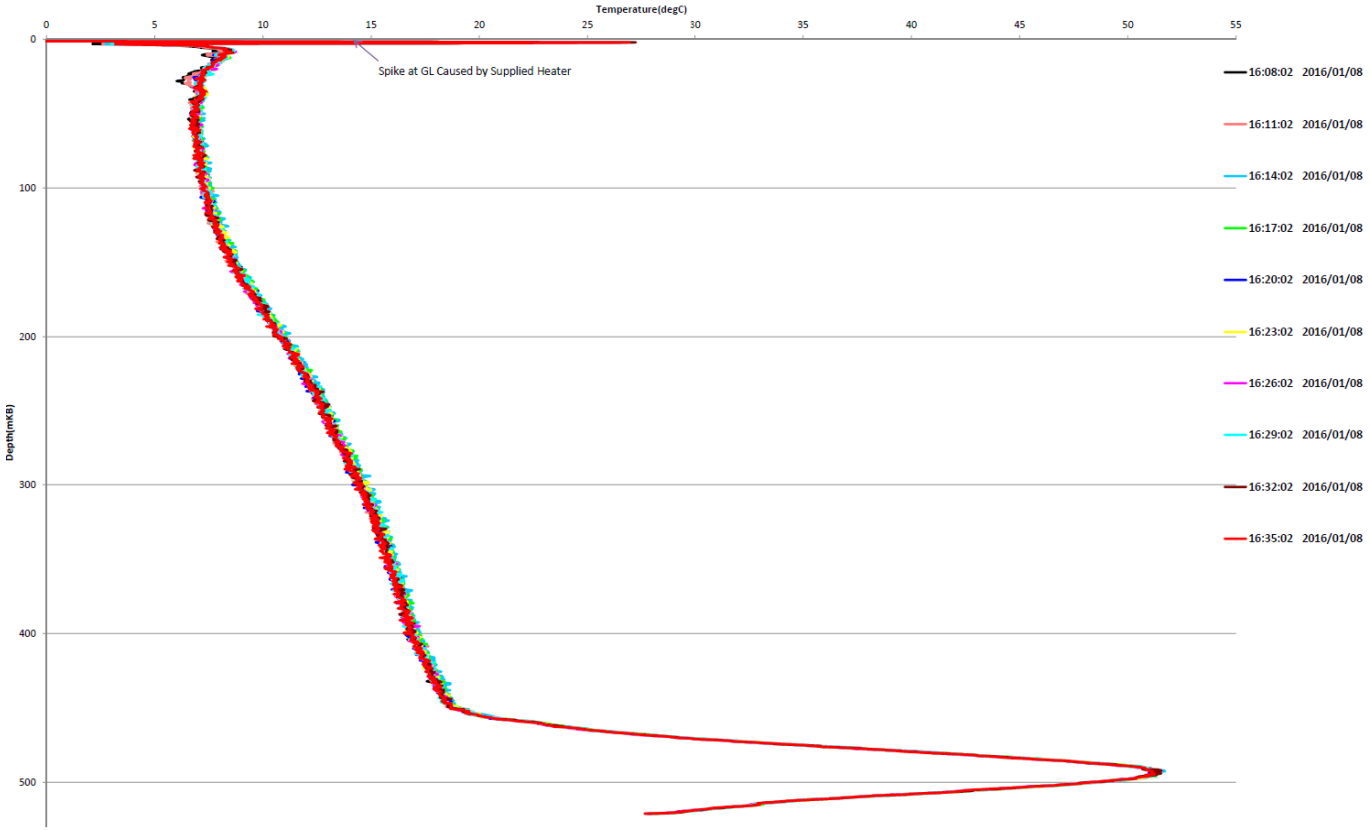
Cenovus Energy
CVE FCCL D3 FISHER 3-21-70-3
102/03-21-070-03W4
DTS Survey
Log Date: January 08, 2016



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Cenovus Energy
CVE FCCL C12 FISHER 12-8-70-3
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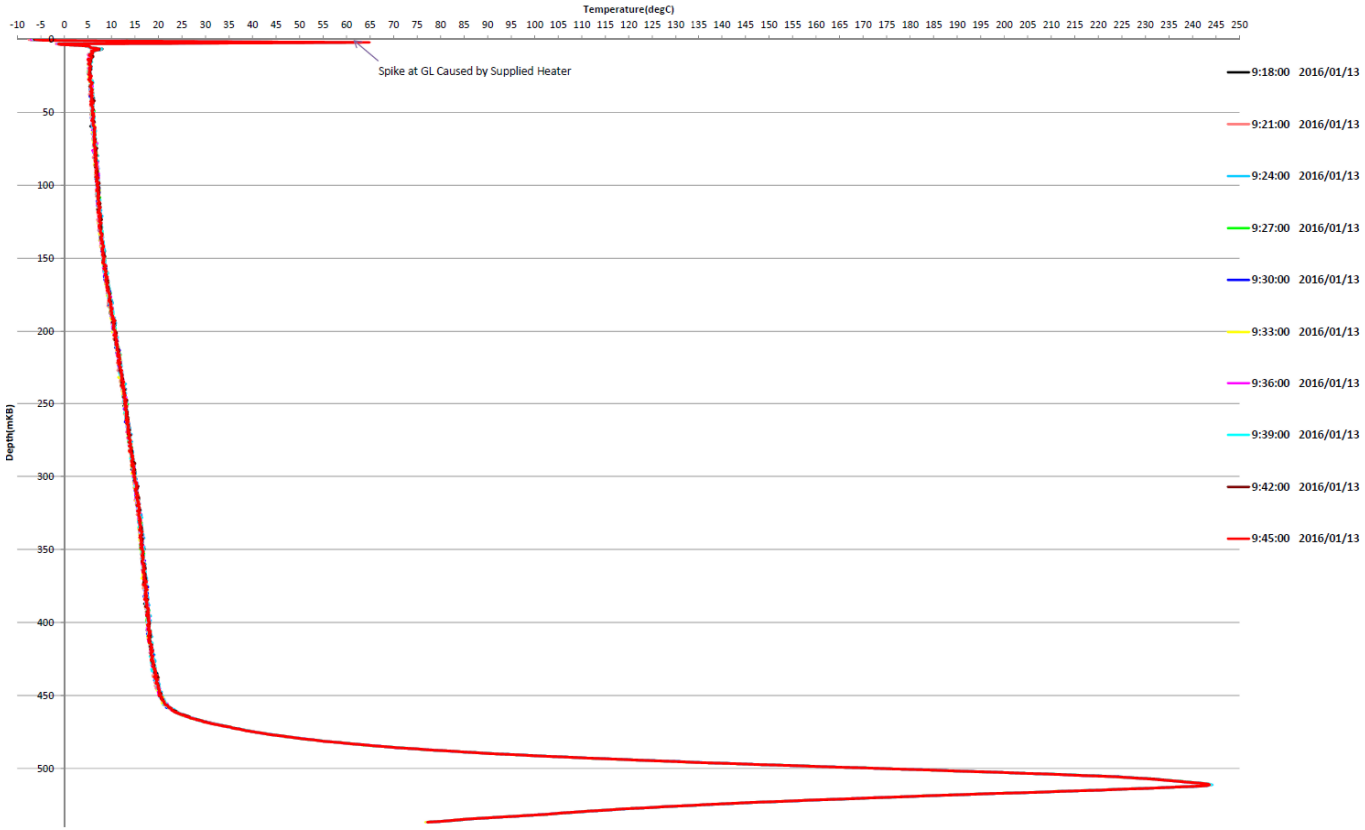
DTS Survey
Log Date: January 13, 2016



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Cenovus Energy
CVE FCCL C10 FISHER 10-15-70-4
100/10-15-070-04W4
DTS Survey
Log Date: January 11, 2016

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CVE FCCL C8 FISHER 8-16-70-3
102/08-16-070-03W4
DTS Survey
Log Date: January 13, 2016

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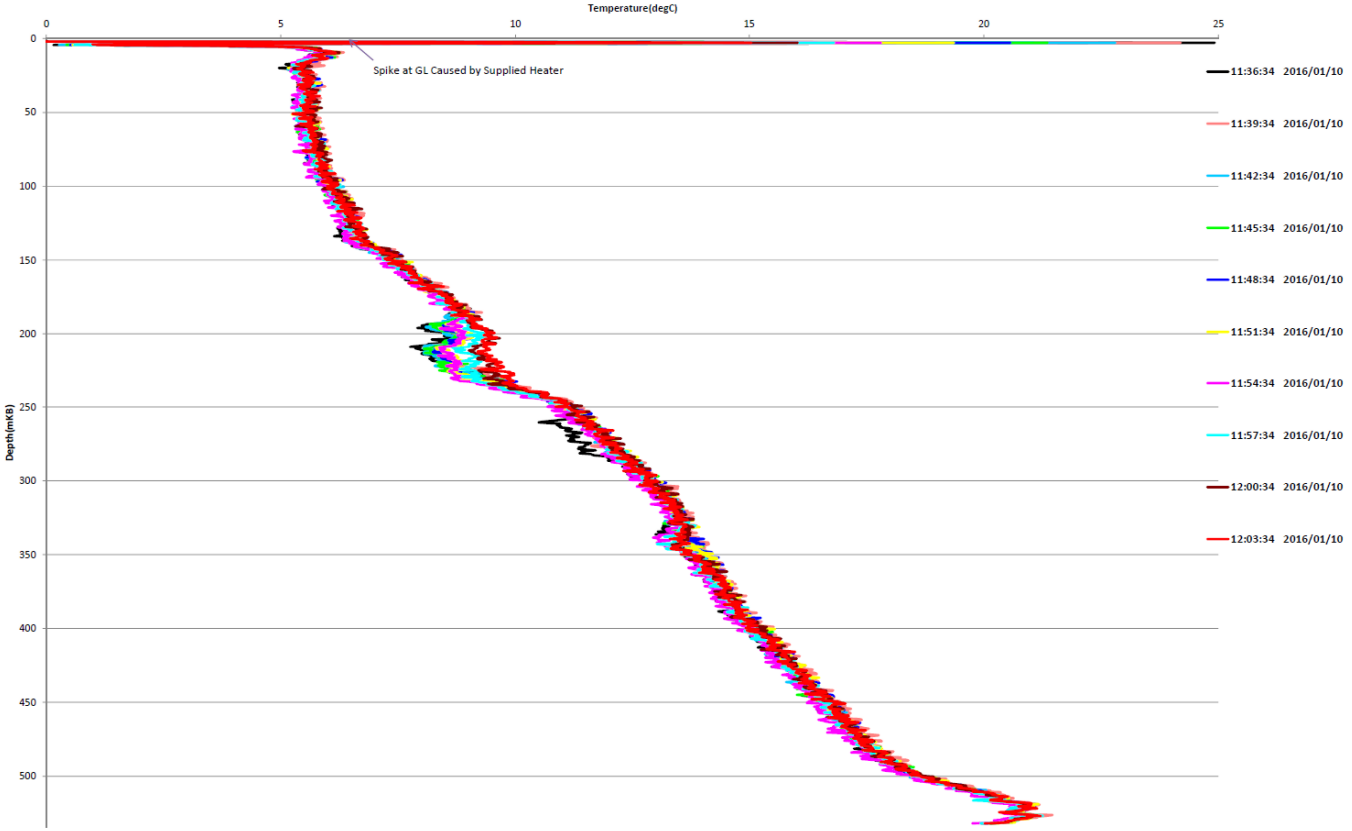
Cenovus Energy
CVE FCCL C4 FISHER 4-18-70-3
102/04-18-070-03W4
DTS Survey
Log Date: January 10, 2016



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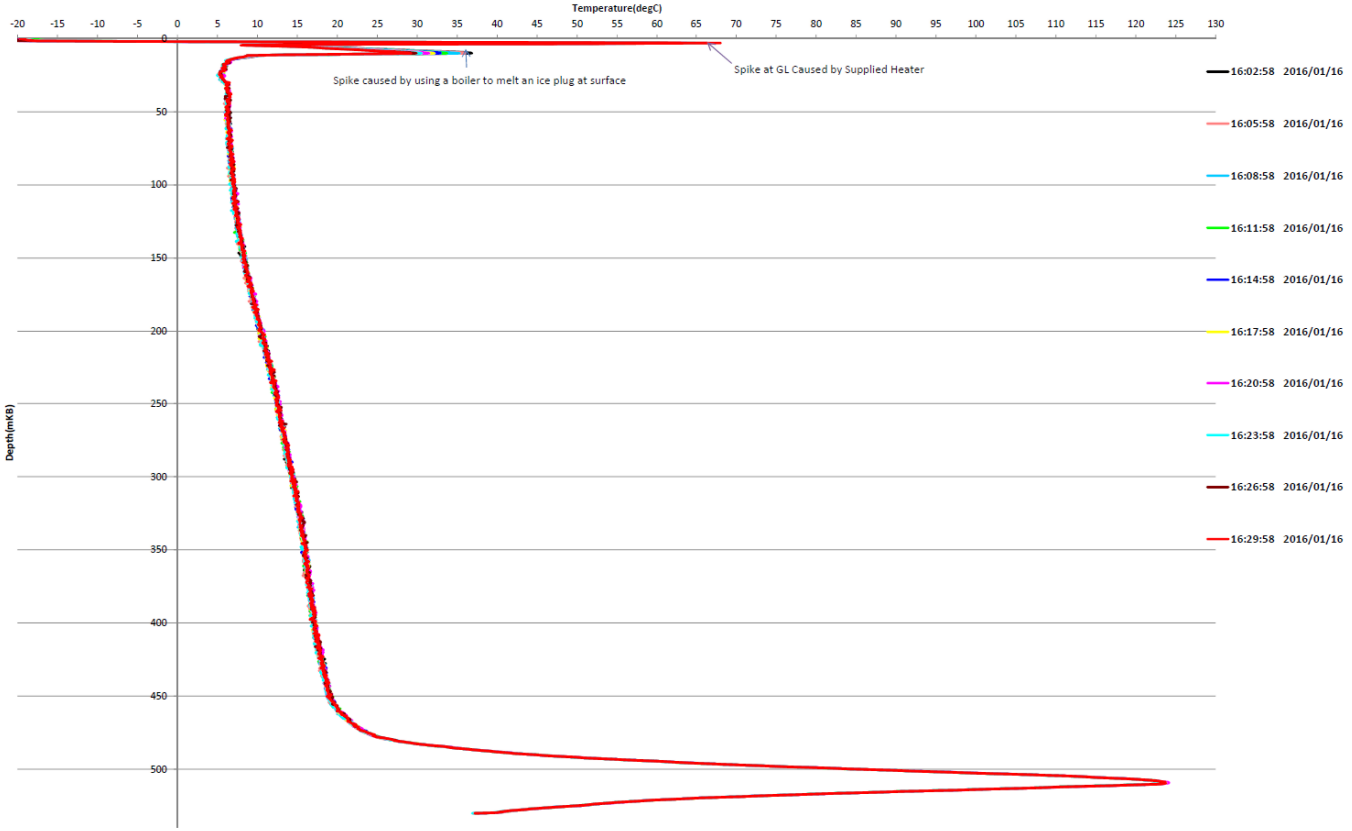
Cenovus Energy
CVE FCCL B11 FISHER 11-21-70-3
103/11-21-070-03W4
DTS Survey
Log Date: January 16, 2016



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Cenovus Energy
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DTS Survey
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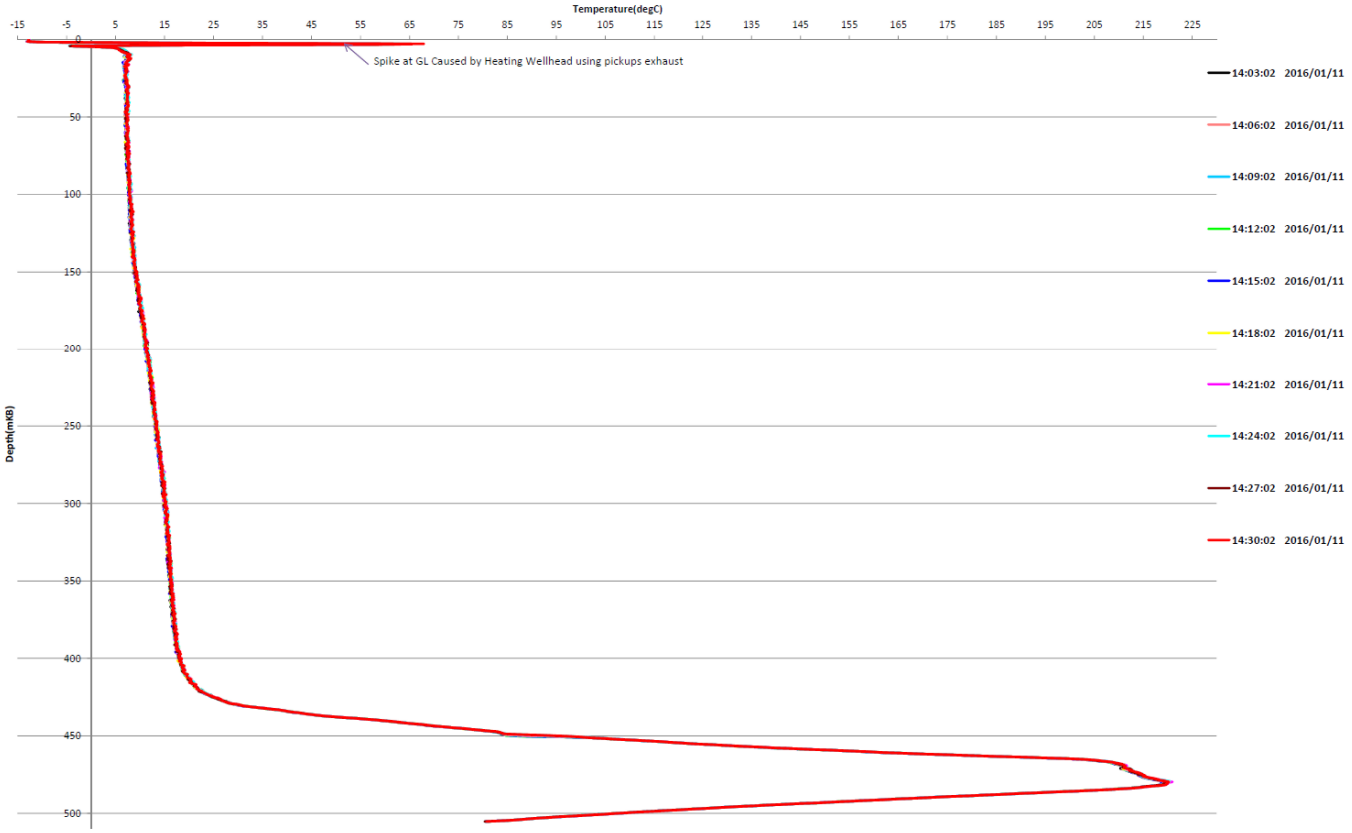

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CVE FCCL B9 FISHER 9-15-70-4
102/09-15-070-04W4
DTS Survey
Log Date: January 17, 2016

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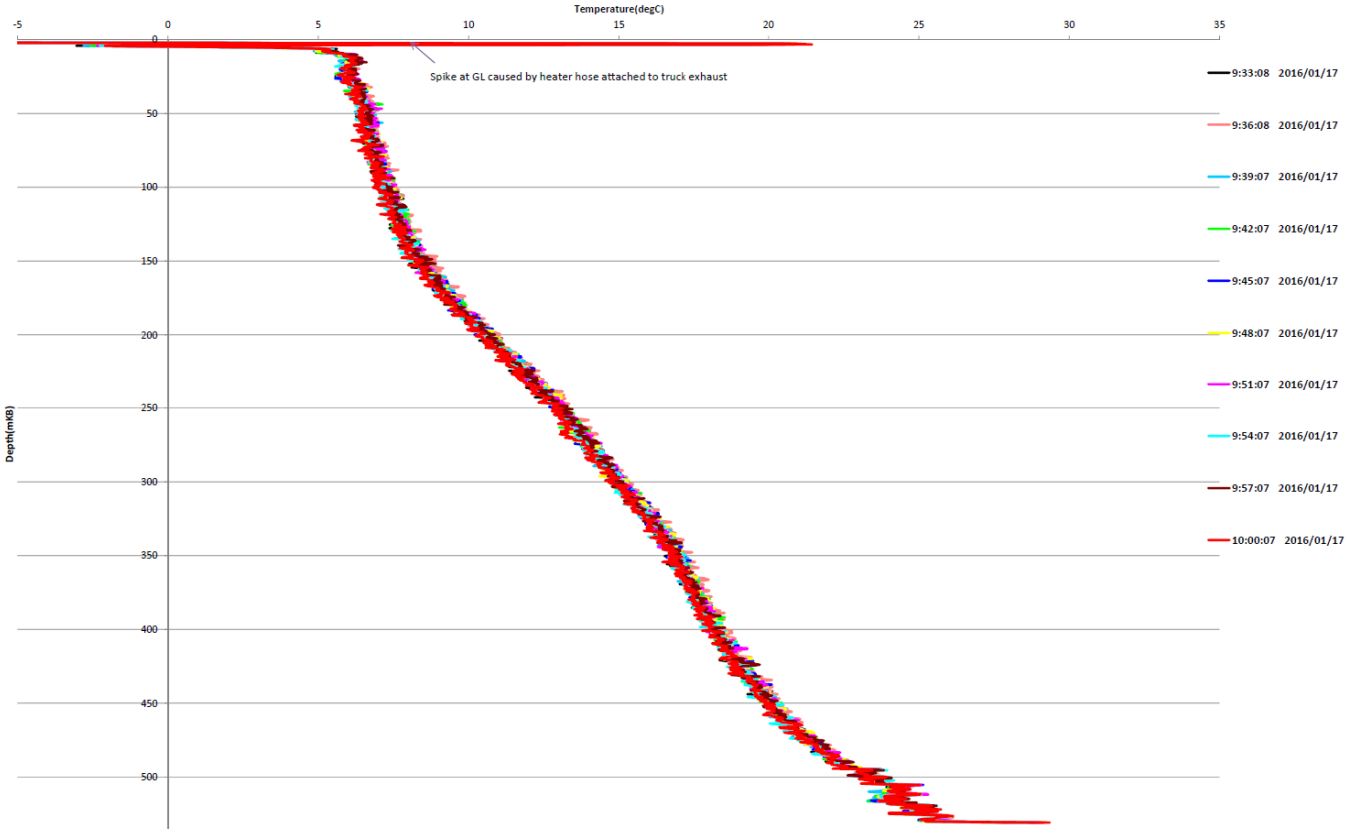
Cenovus Energy
CVE FCCL B6 FISHER 06-16-70-3
102/06-16-070-03W4
DTS Survey
Log Date: January 17, 2016



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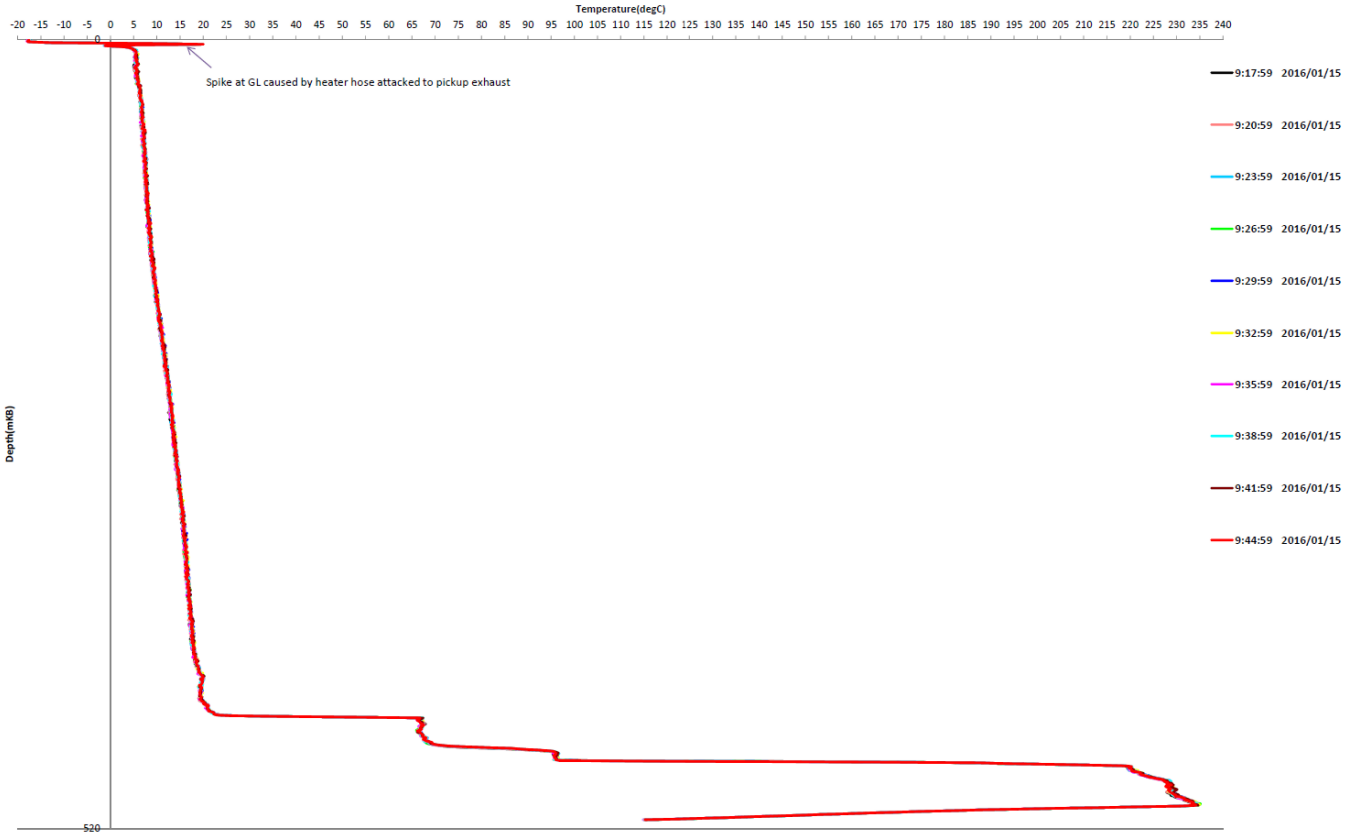
Cenovus Energy
CVE FCCL B4 FISHER 4-21-70-3
103/04-21-070-03W4
DTS Survey
Log Date: January 15, 2016



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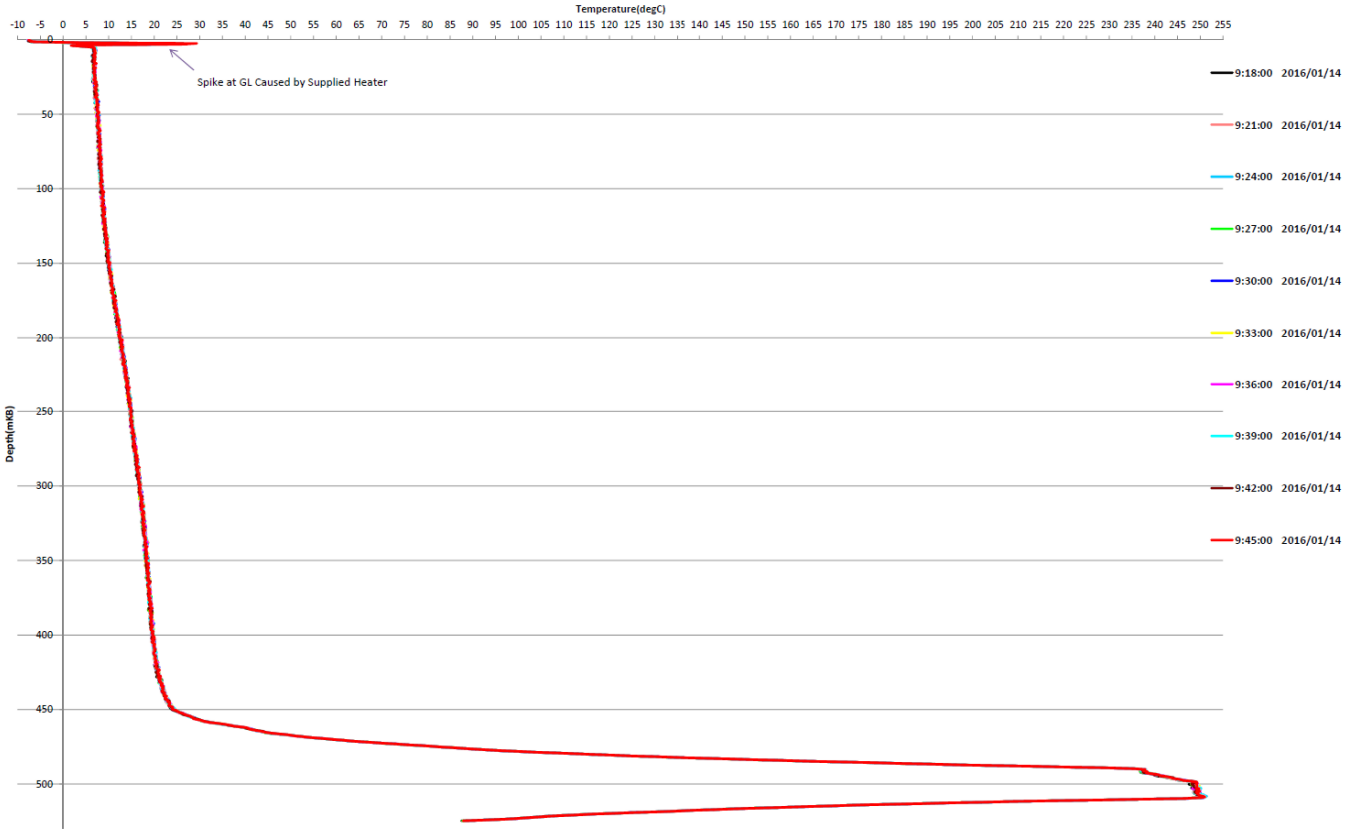
Cenovus Energy
CVE FCCL B4 FISHER 4-17-70-3
100/04-17-070-03W4
DTS Survey
Log Date: January 14, 2016



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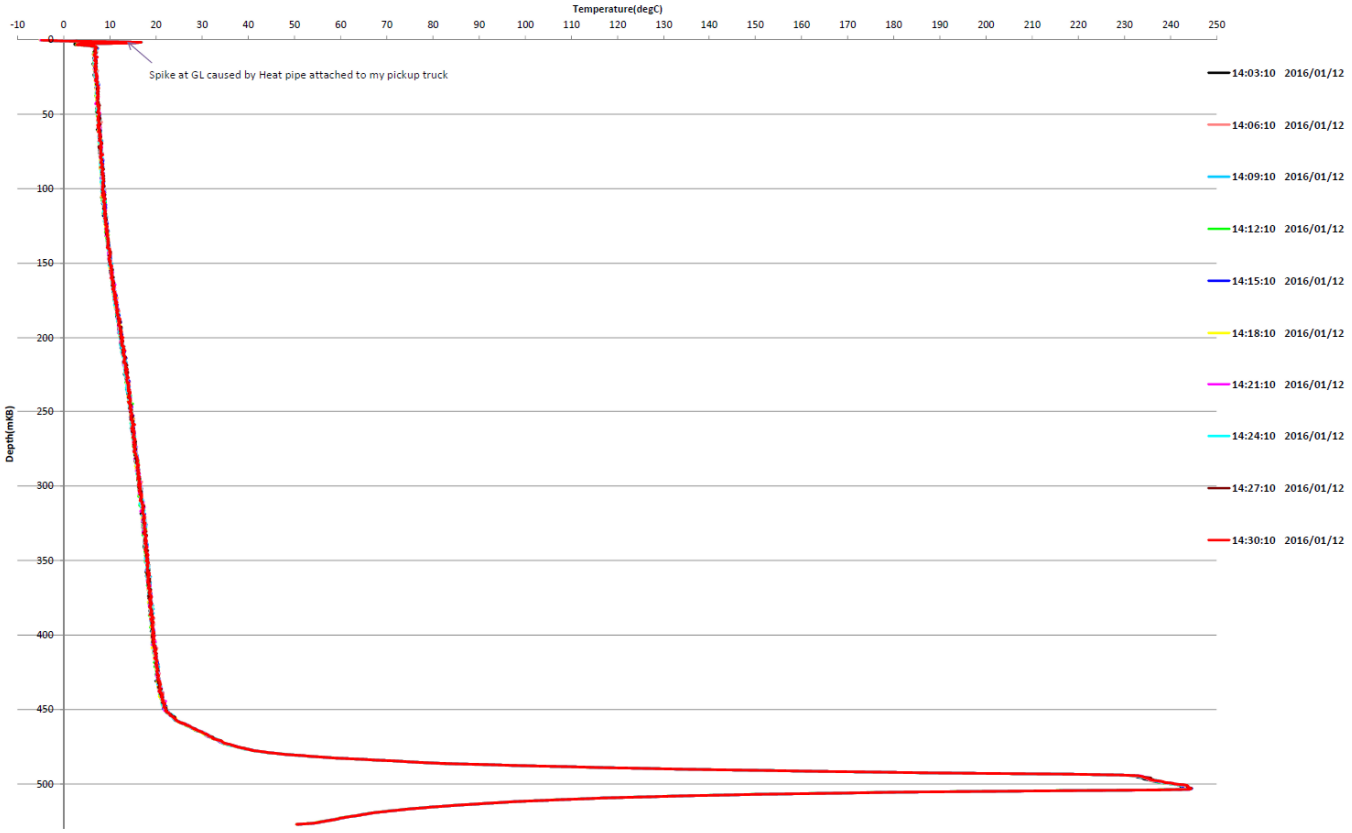
Cenovus Energy
CVE FCCL B2 FISHER 2-17-70-3
100/02-17-070-03W4
DTS Survey
Log Date: January 12, 2016



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Cenovus Energy
CVE FCCL A16 FISHER 16-20-70-3
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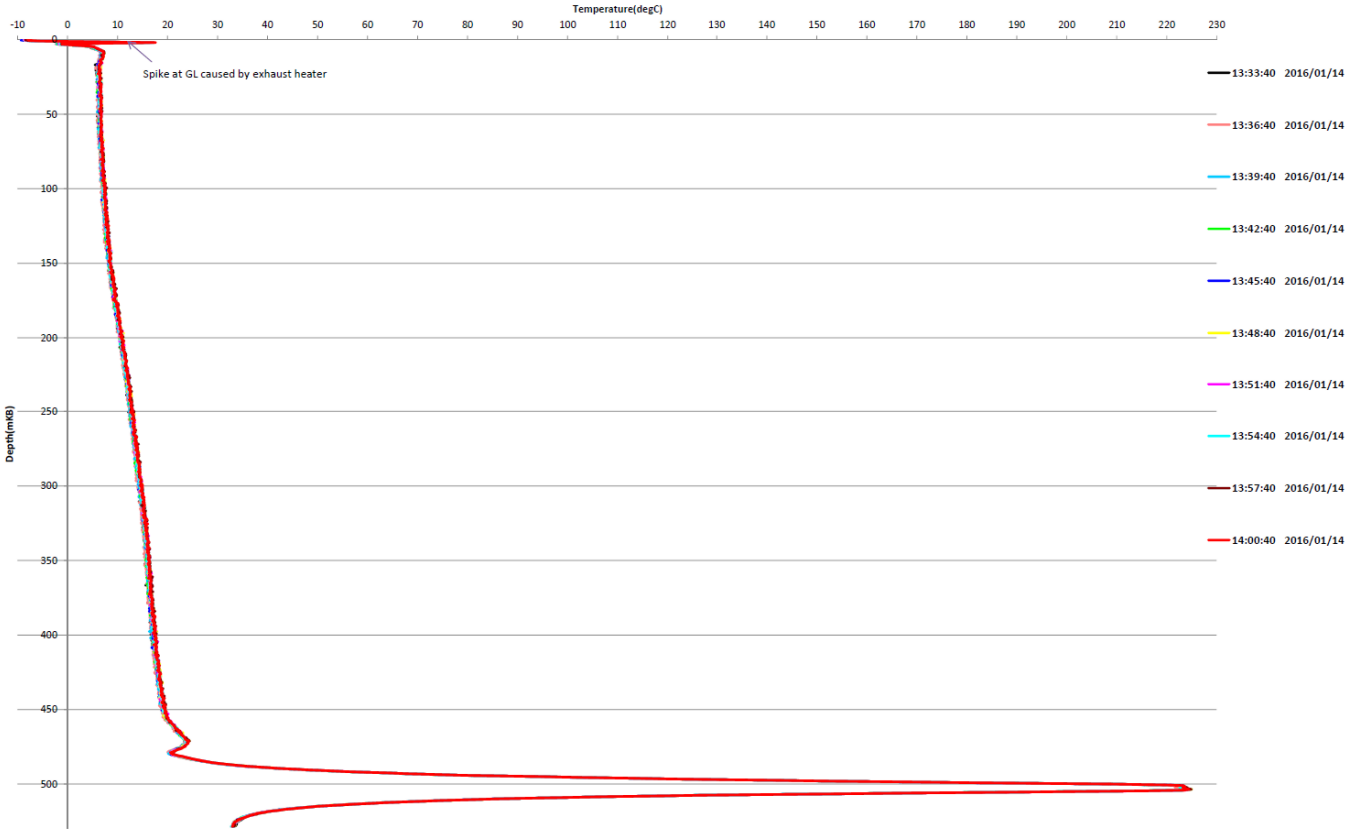
DTS Survey
Log Date: January 14, 2016



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Cenovus Energy
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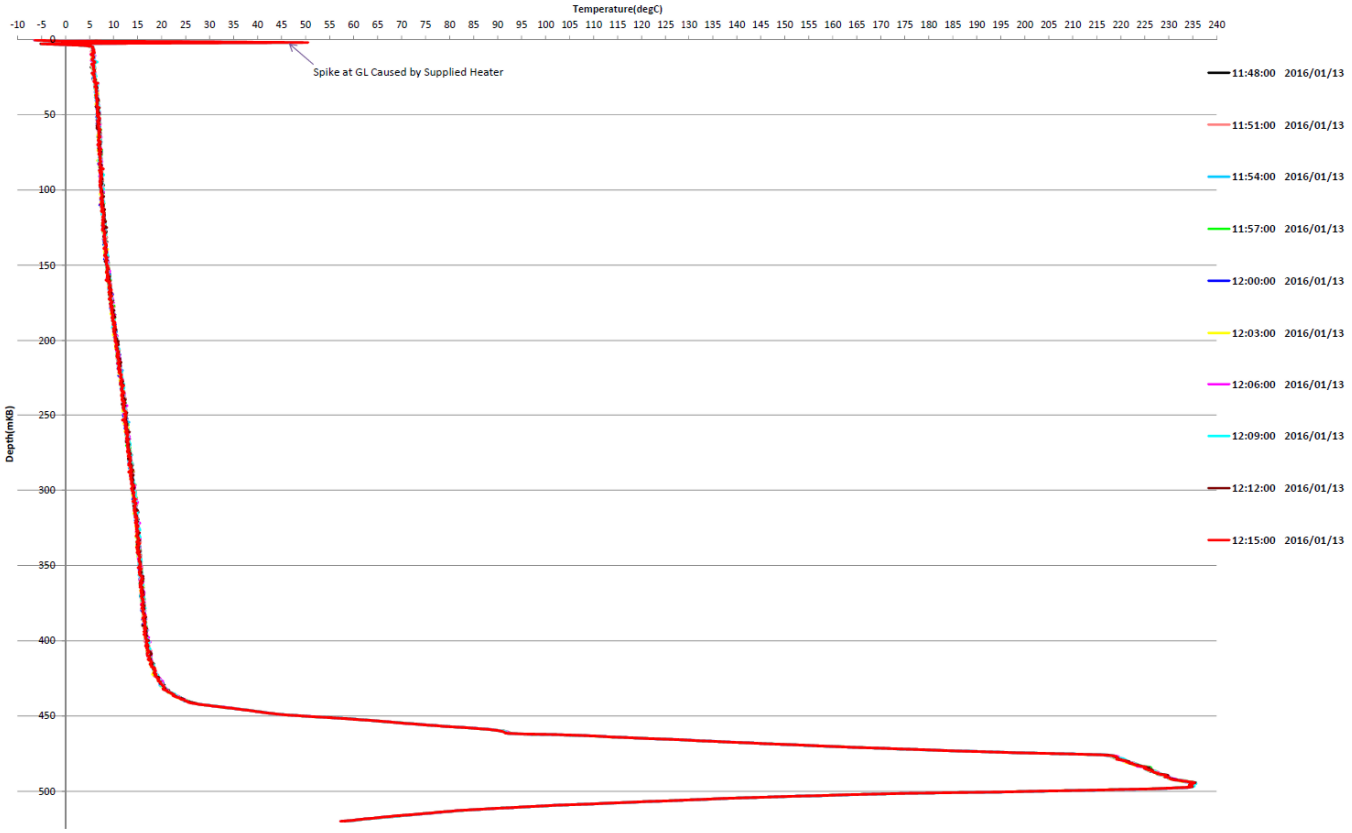
Log Date: January 13, 2016



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CVE FCCL 2B13-19C FISHER 12-19-70-4
102/12-19-070-04W4/00
DTS Survey
Log Date: February 19, 2016

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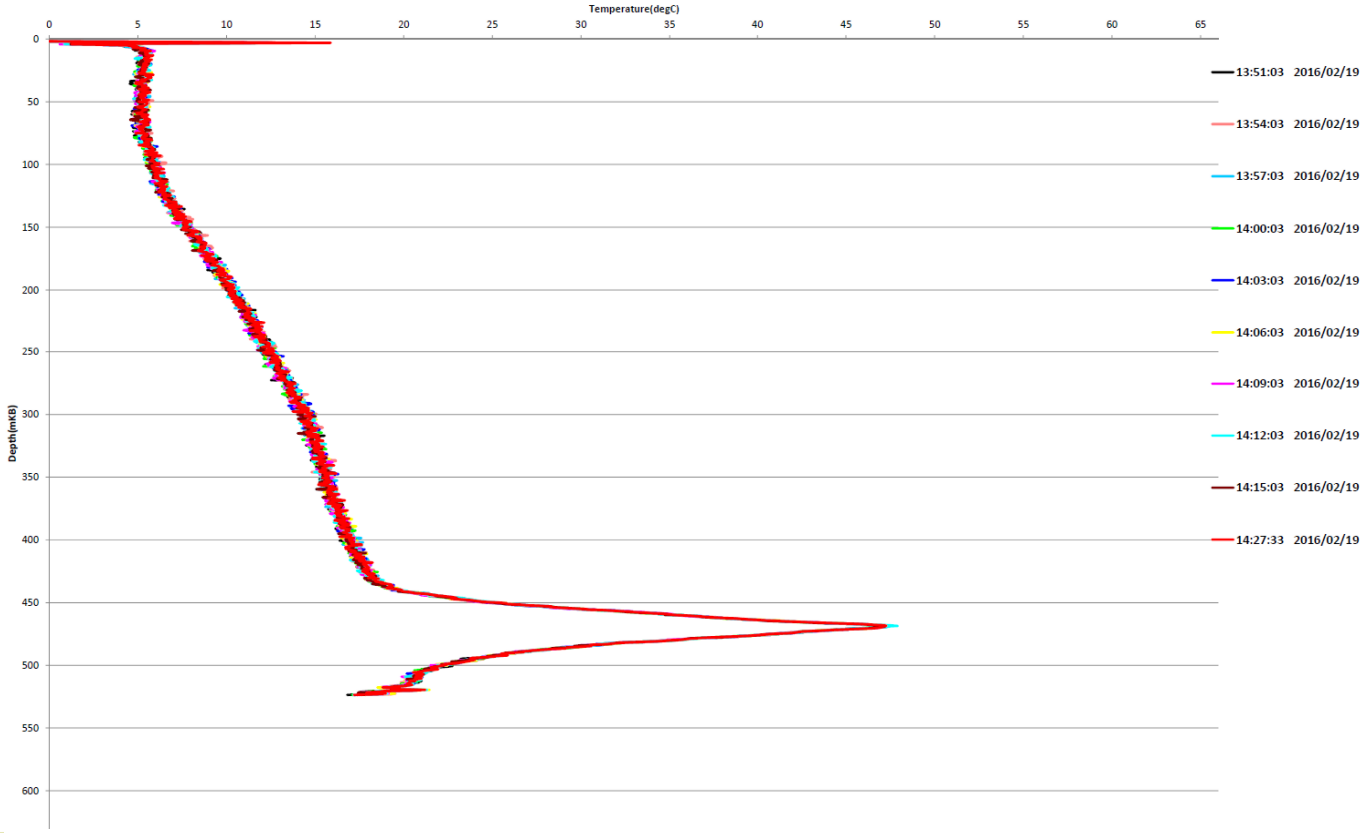
Cenovus Energy
CVE FCCL A15 FISHER 15-17-70-4
102/15-17-070-04W4/00
DTS Survey
Log Date: February 19, 2016



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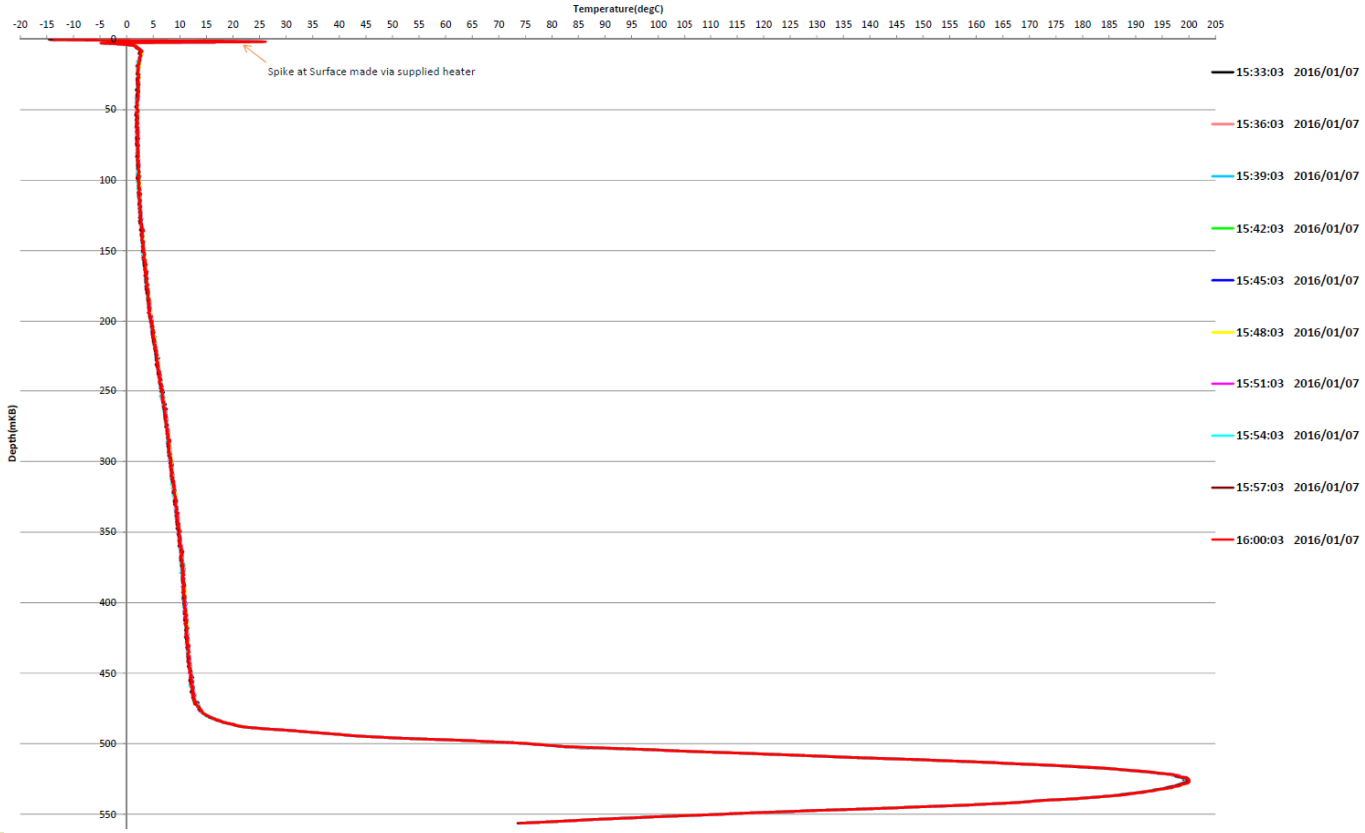
FMC Technologies

Cenovus Energy
CVE FCCL 102 FISHER 6-22-70-3
102/06-22-070-03W4
DTS Survey
Log Date: January 07, 2016



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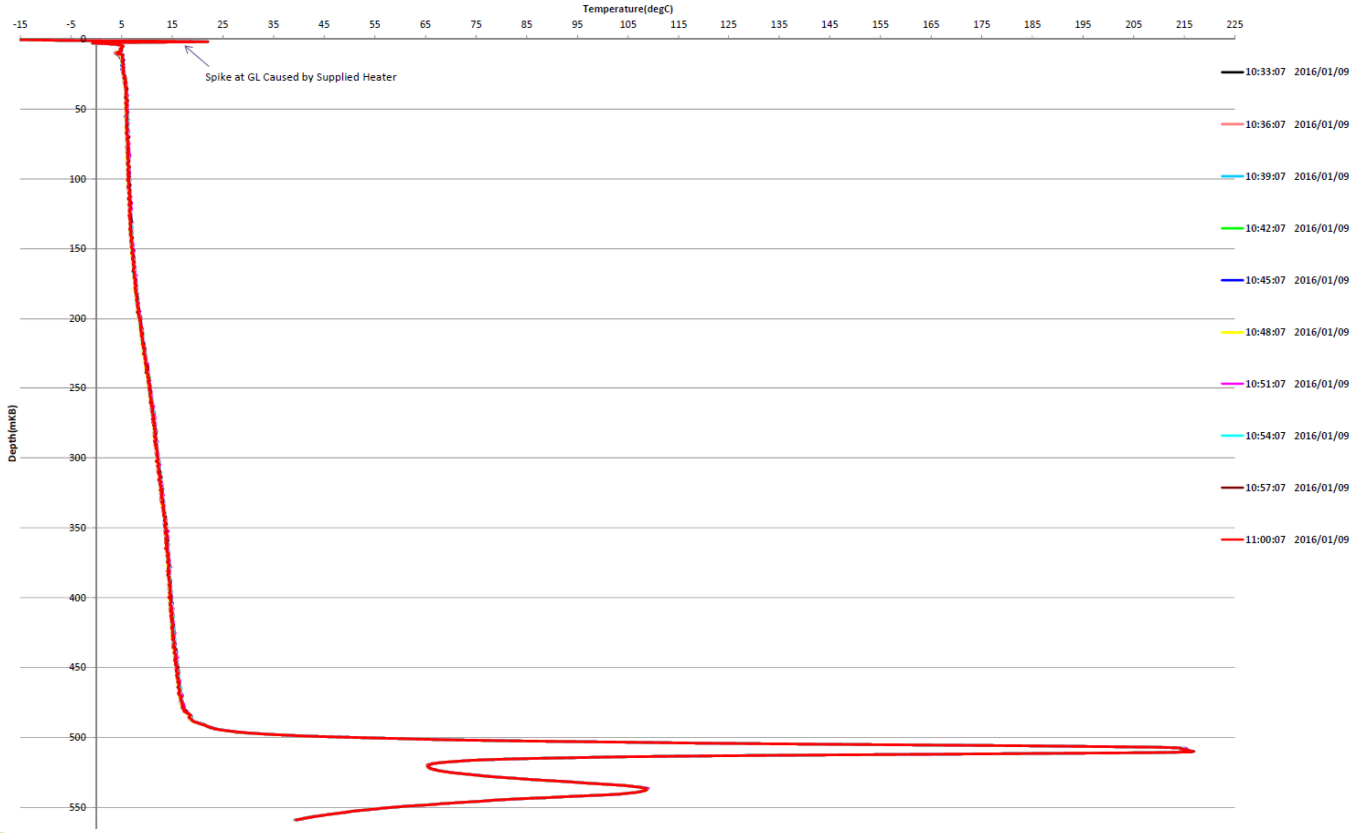
Cenovus Energy
CVE FCCL A6 FISHER 6-22-70-3
103/06-22-070-03W4
DTS Survey
Log Date: January 09, 2016



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Cenovus Energy
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102/15-17-070-03W4
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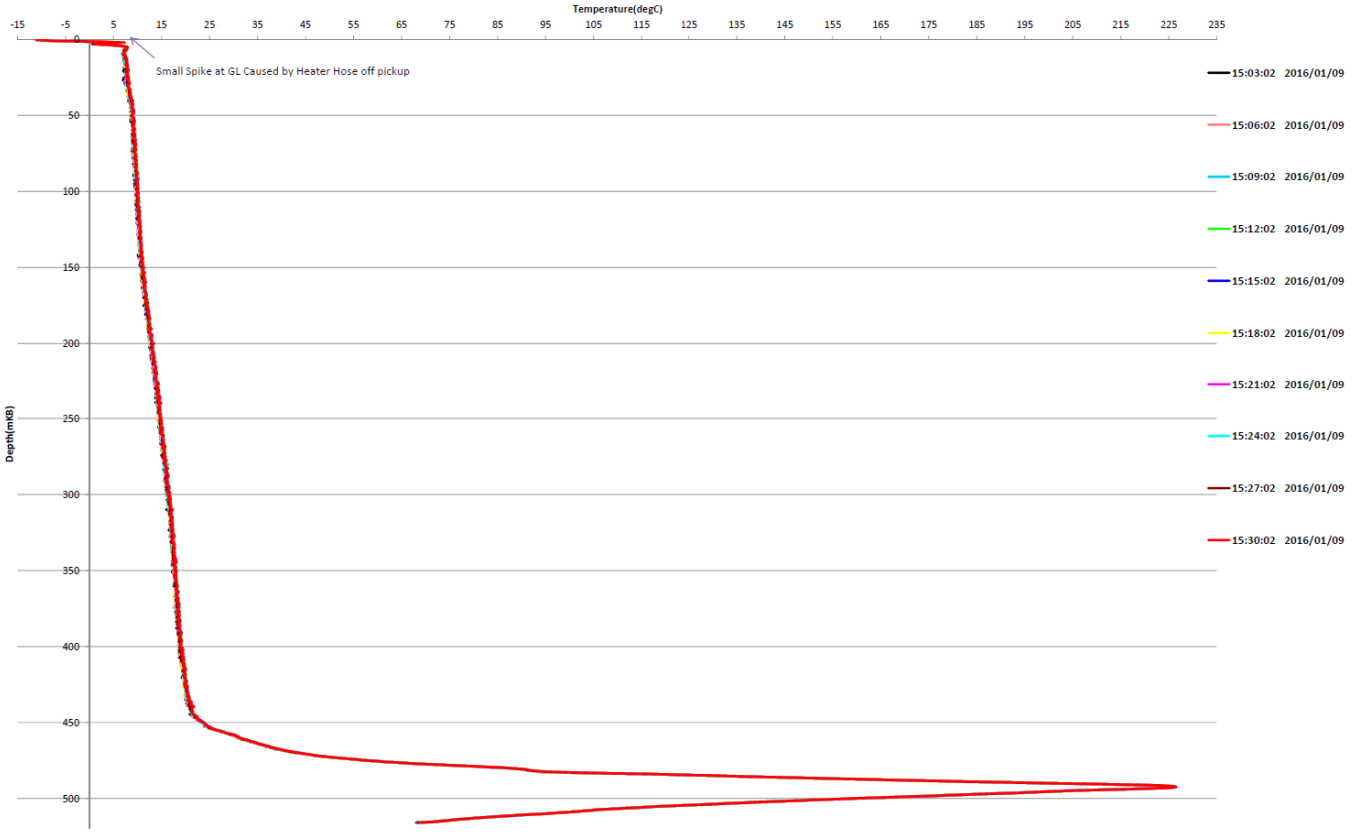
Log Date: January 09, 2016



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Cenovus Energy
CVE FCCL A15 FISHER 15-18-70-3
100/15-18-070-03W4
DTS Survey
Log Date: January 12, 2016

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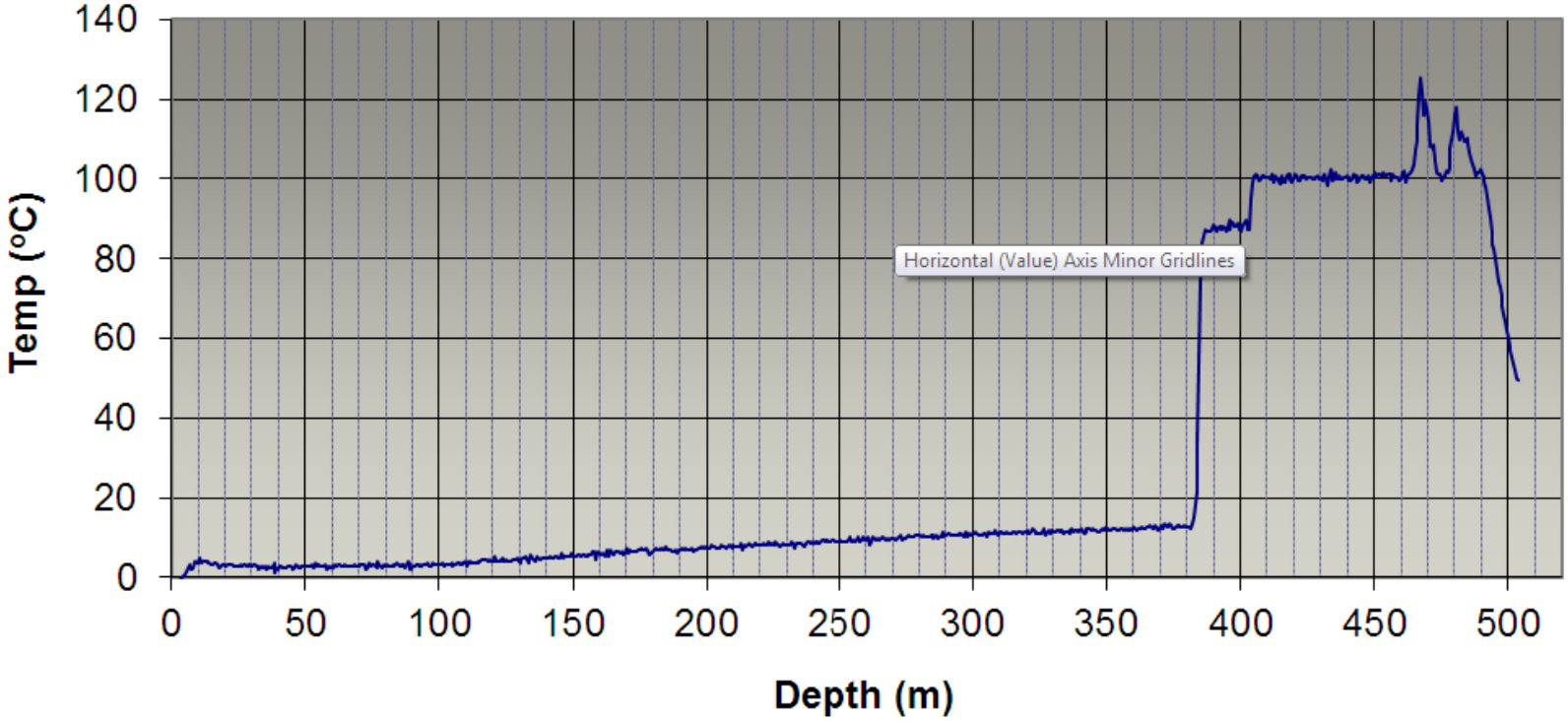
HALLIBURTON

Cenovus FCCL 100/16-15-070-04W4/00

B16, 03.03.2016



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Thermocouple data

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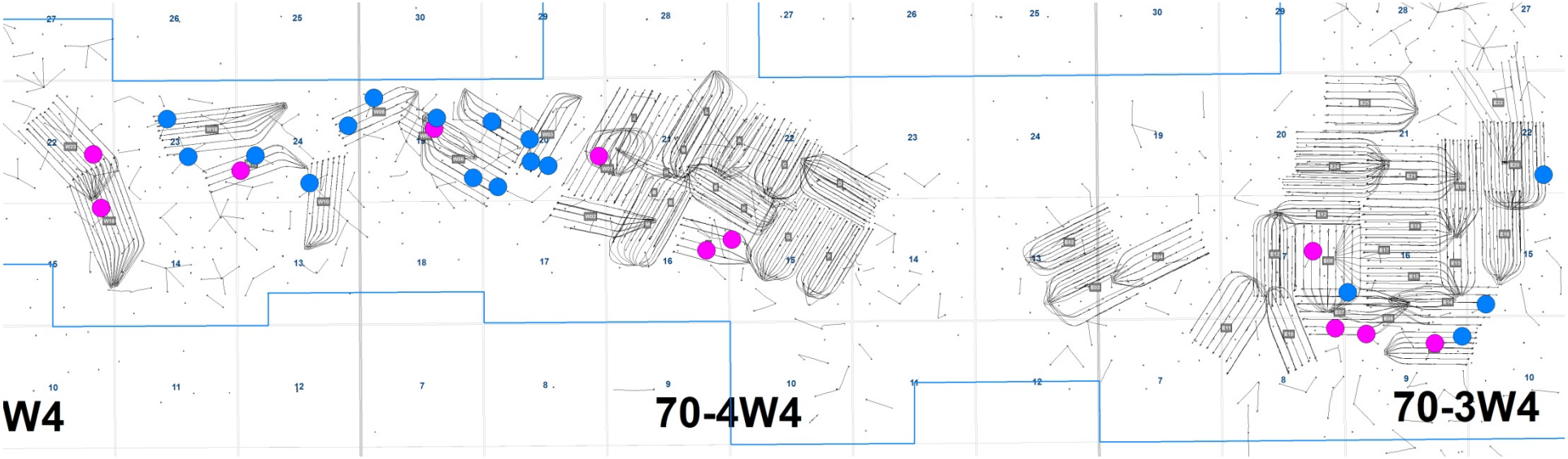
Foster Creek thermocouple locations



Existing Thermocouple

2016 Thermocouple

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Observation well thermocouple data

PAD	UWI	WELL NAME
E07	100041607003W400	CVE FCCL C4 FISHER 4-16-70-3
E07	100130907003W400	CVE FCCL A13 FISHER 13-9-70-3
E07	100160807003W400	CVE FCCL C16 FISHER 16-8-70-3
E08	106091707003W400	CVE FCCL D7-17 A10 FISHER 9-17-70-3
E14	103041507003W400	CVE FCCL 2B4 FISHER 4-15-70-3
E20	102022207003W400	CVE FCCL D2 FISHER 2-22-70-3
E42	100160907003W400	CVE FCCL A16 FISHER 16-9-70-3
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W07	103101907004W400	CVE FCCL 2B10 FISHER 10-19-70-4
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W18	100072307005W400	CVE FCCL C7 FISHER 7-23-70-5
W18	100112307005W400	CVE FCCL D11 FISHER 11-23-70-5
W19	102161507005W400	CVE FCCL D16 FISHER 16-15-70-5
W23	100082207005W400	CVE FCCL C8 FISHER 8-22-70-5

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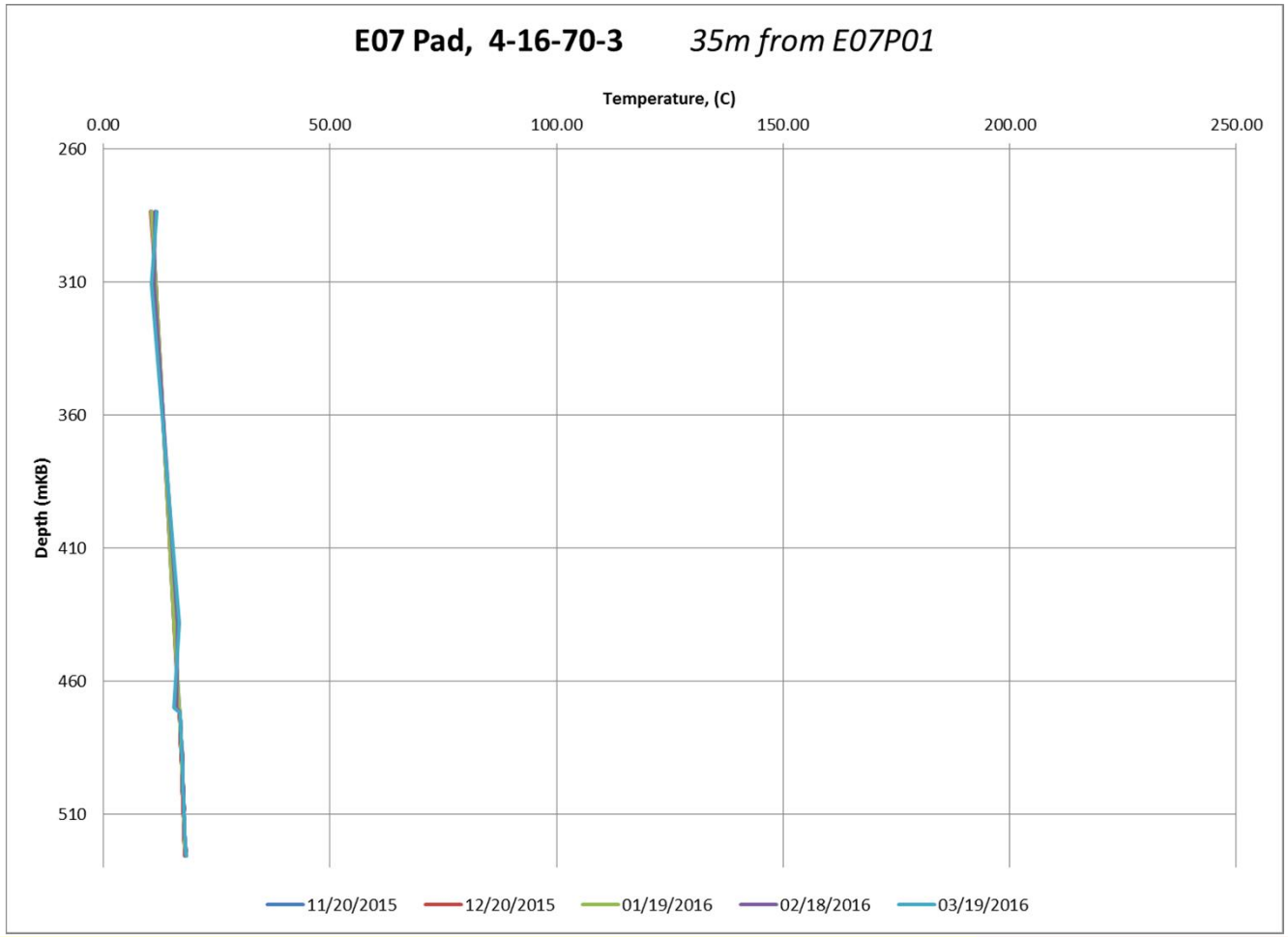

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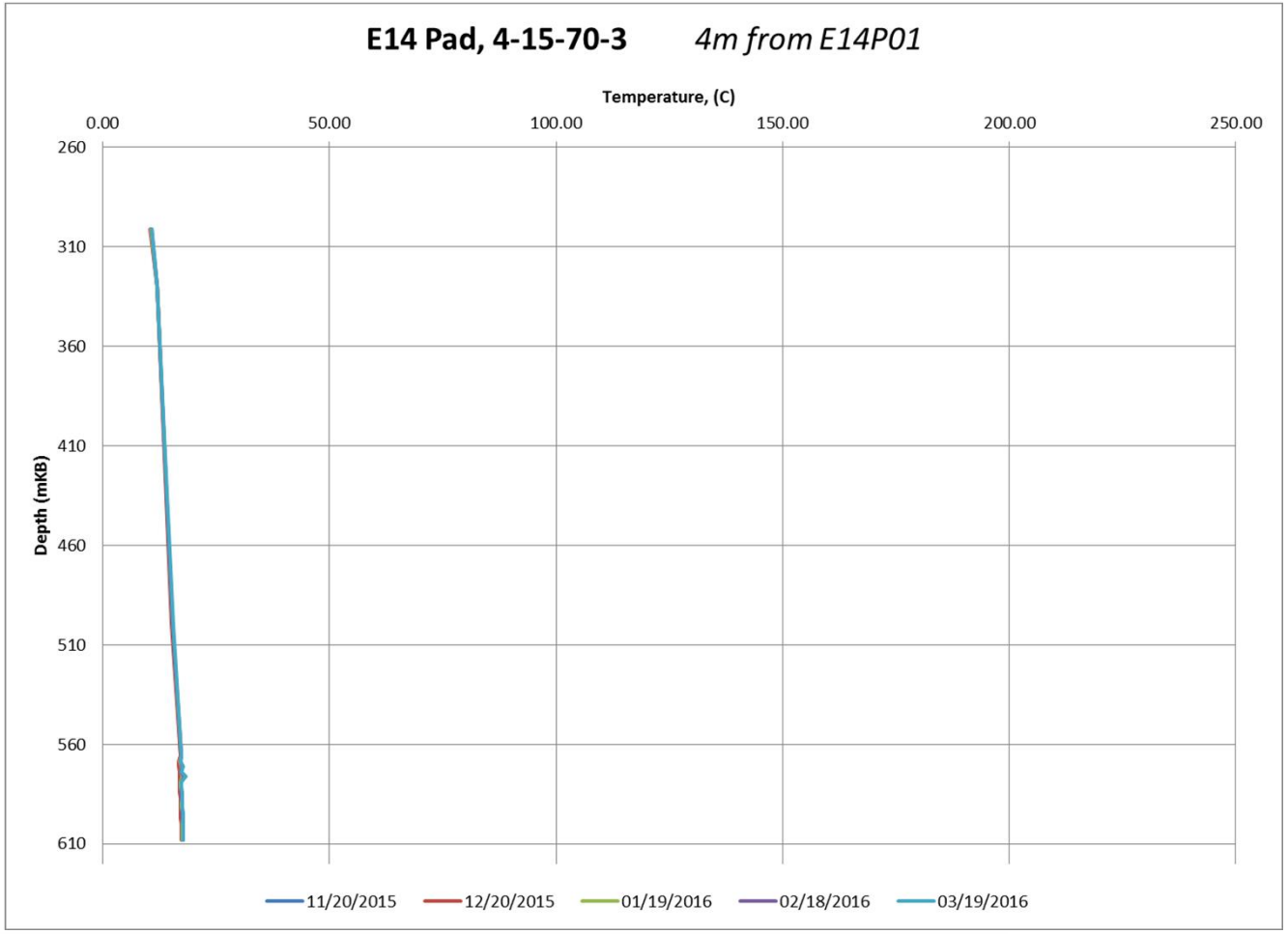

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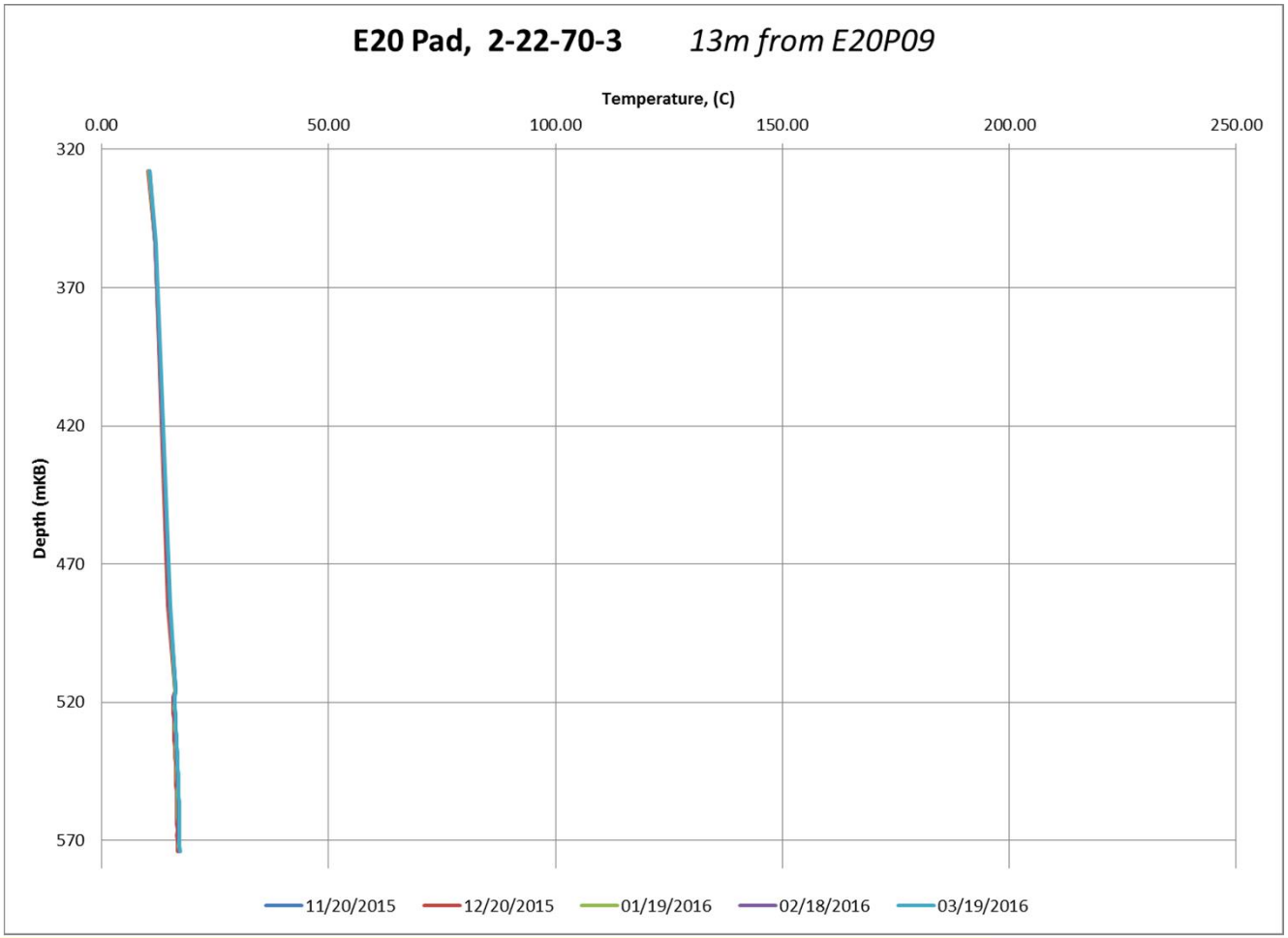

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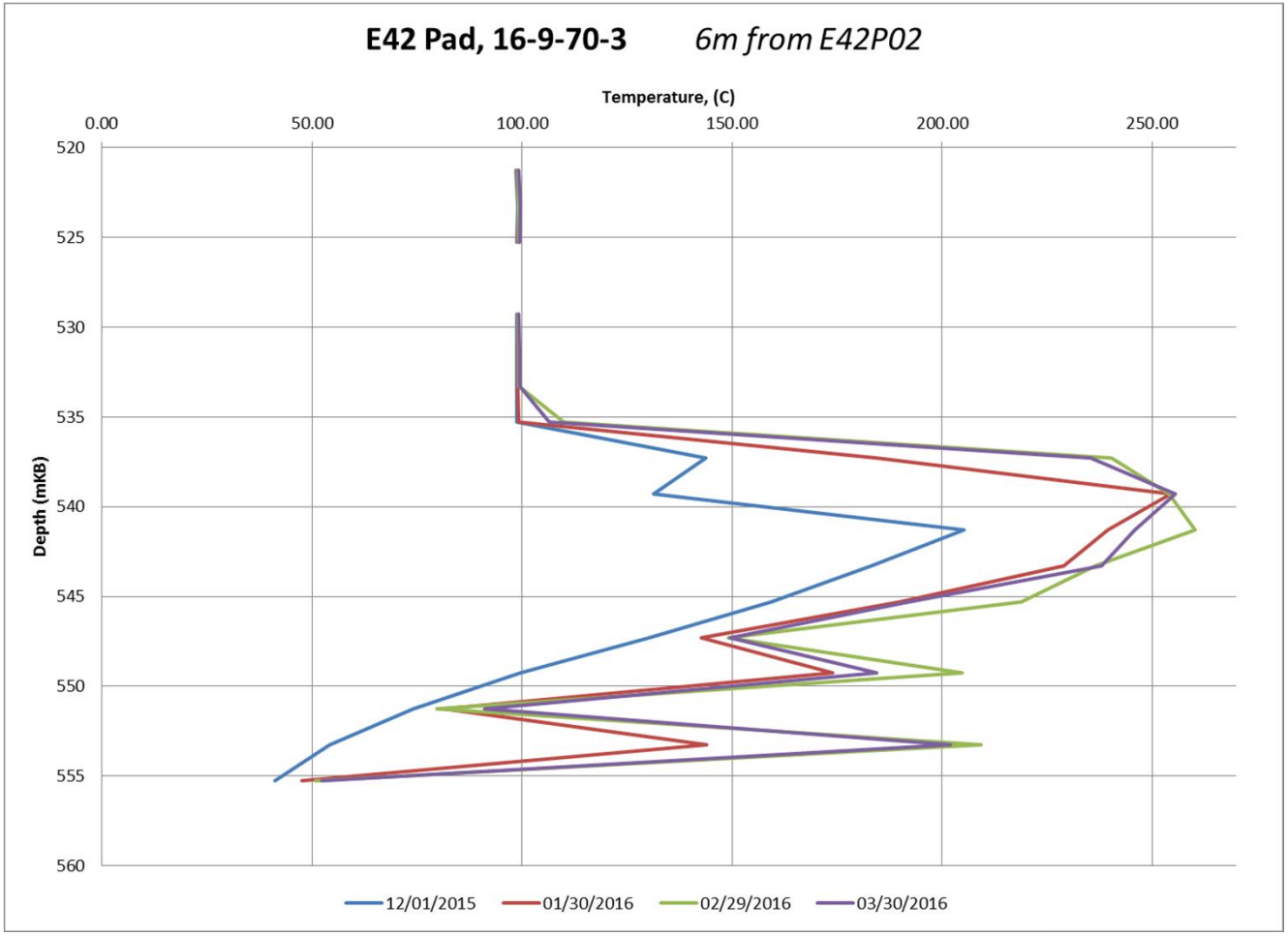

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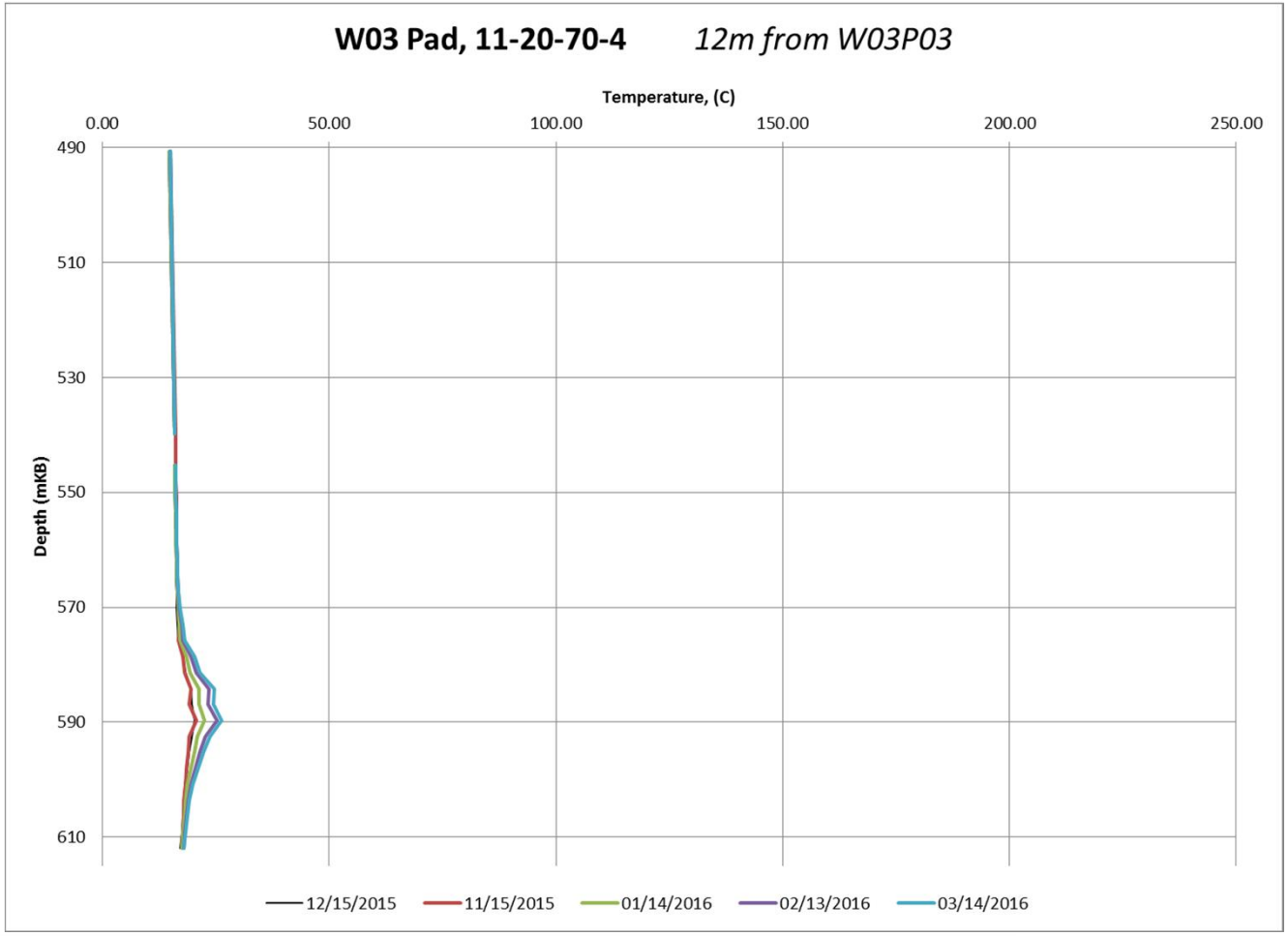

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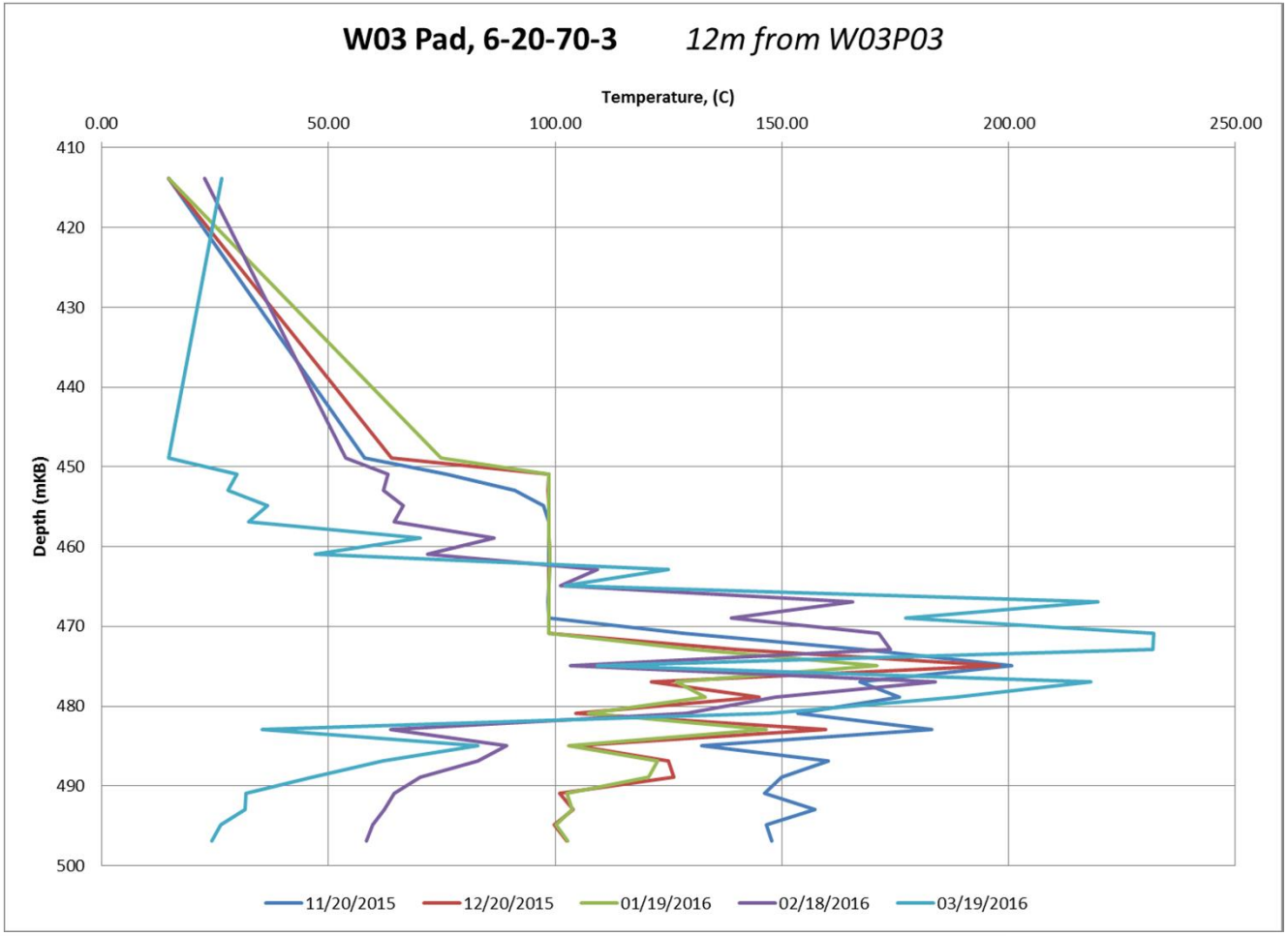

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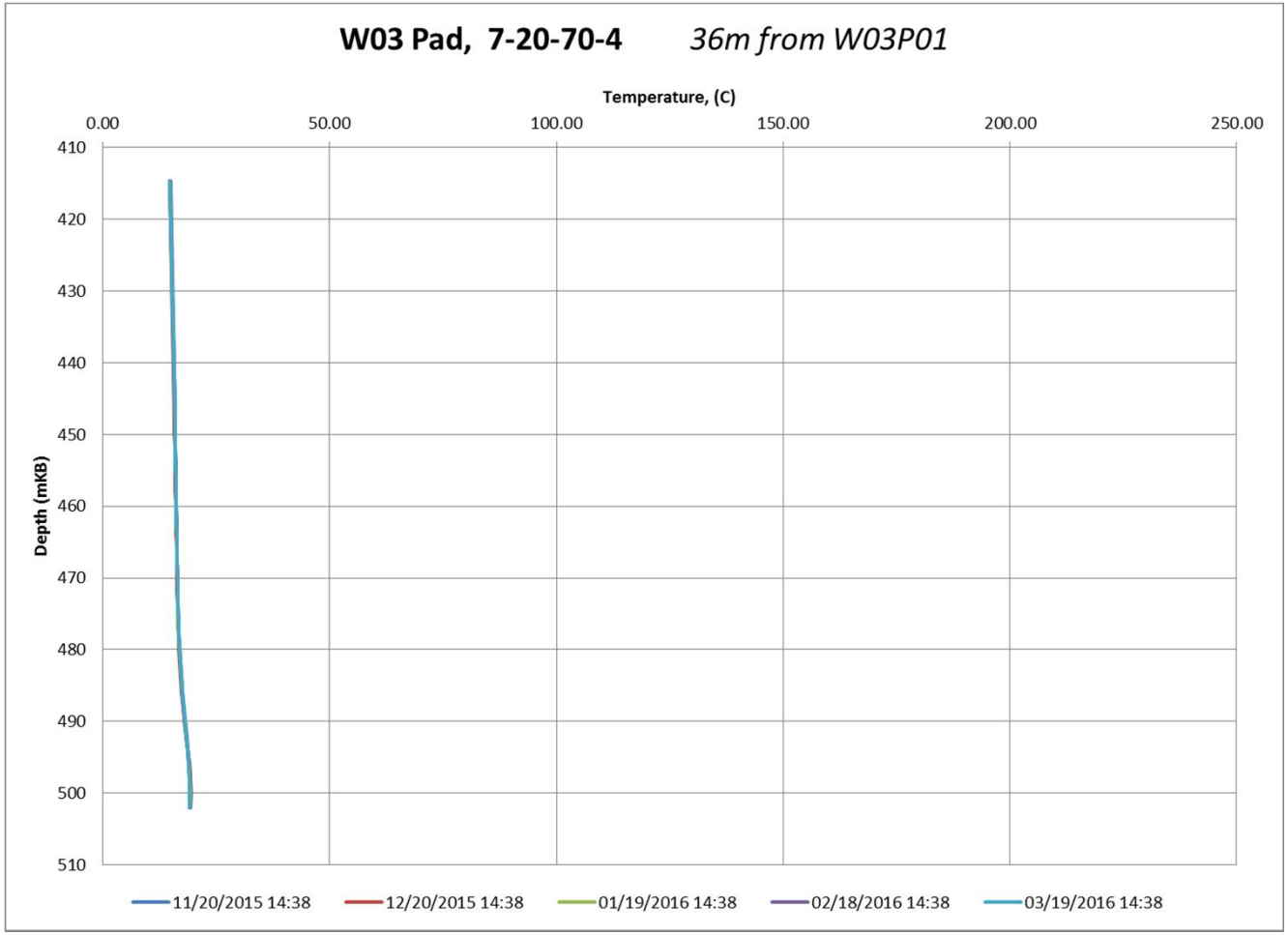

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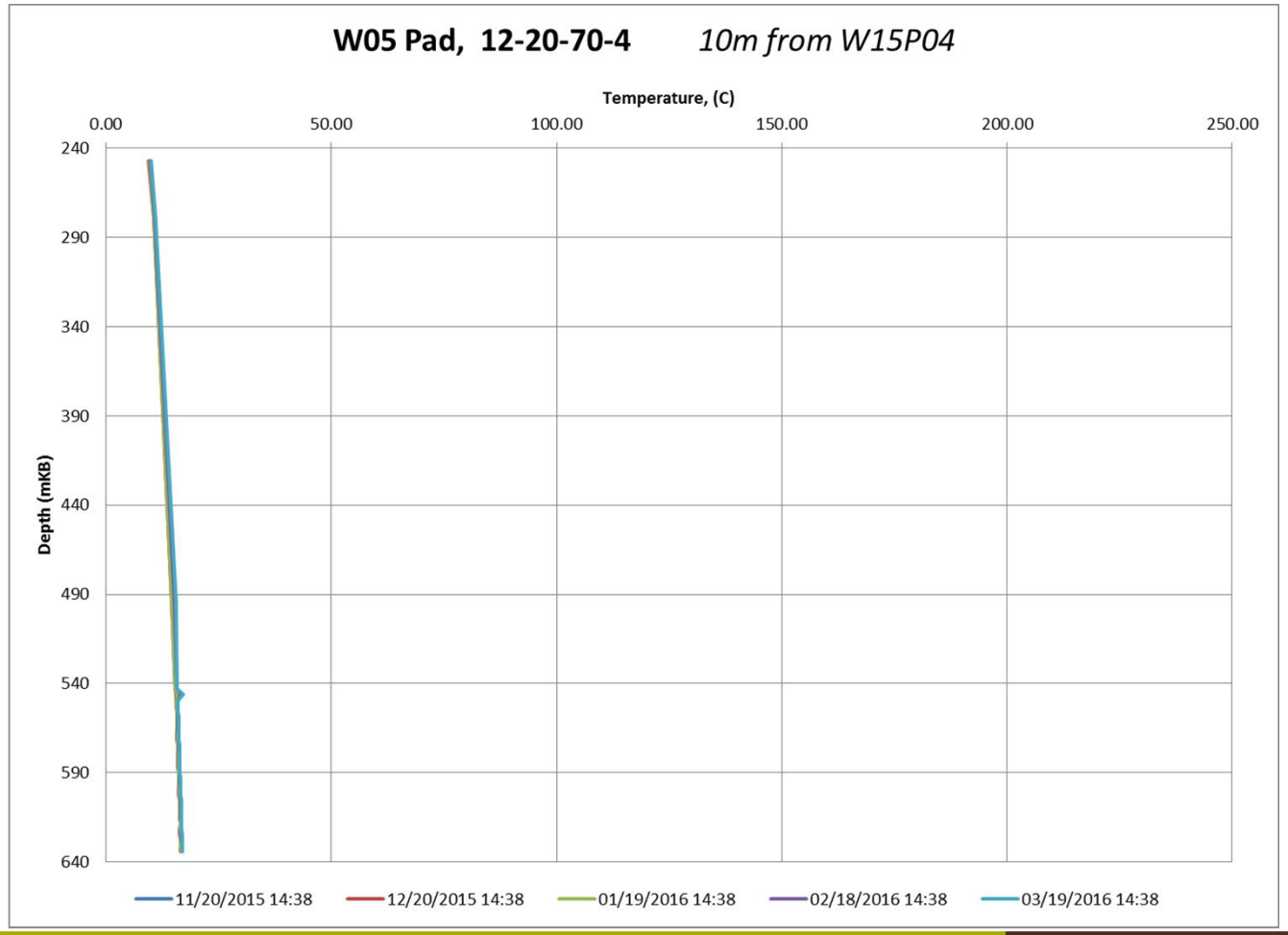

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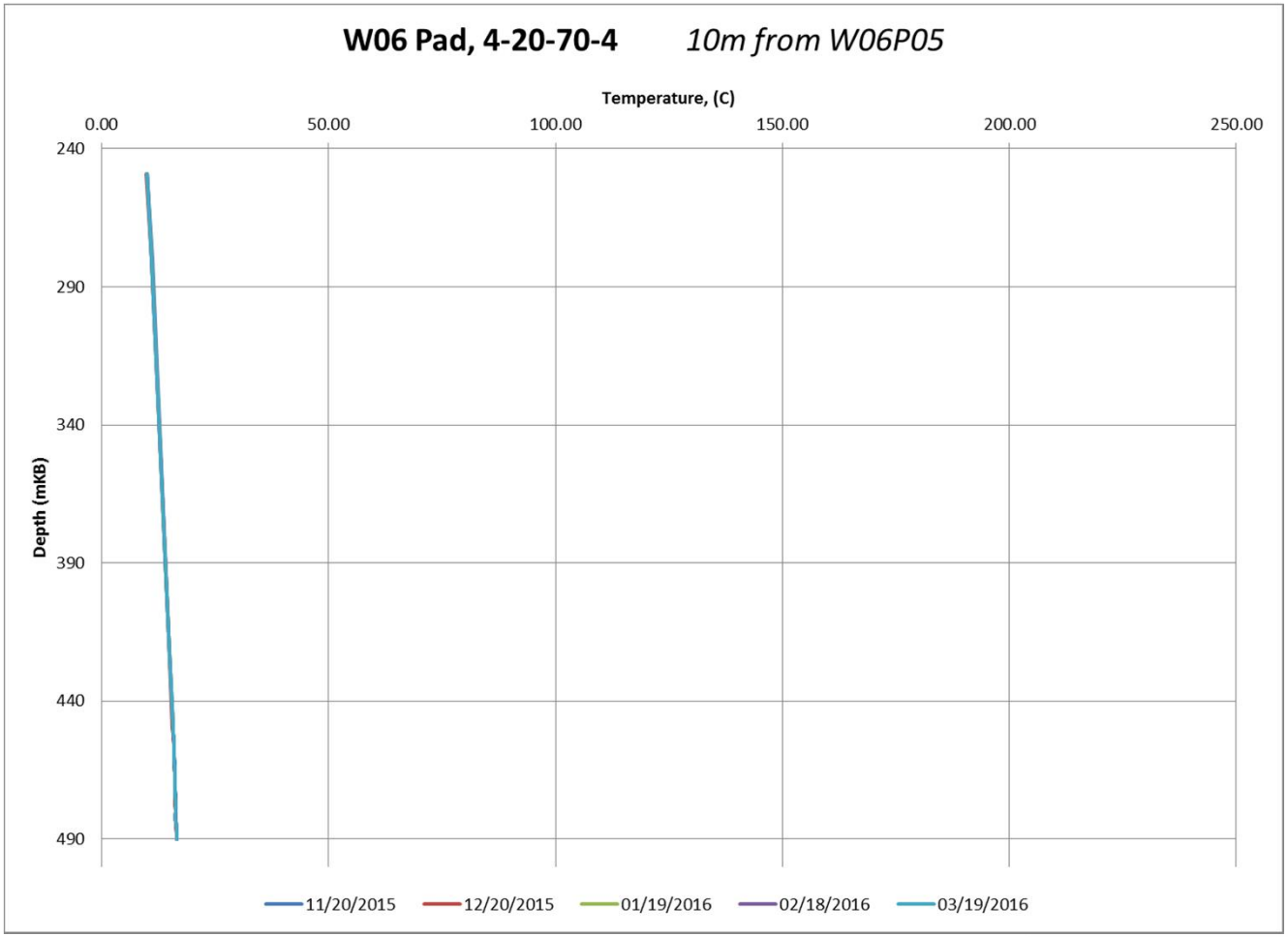

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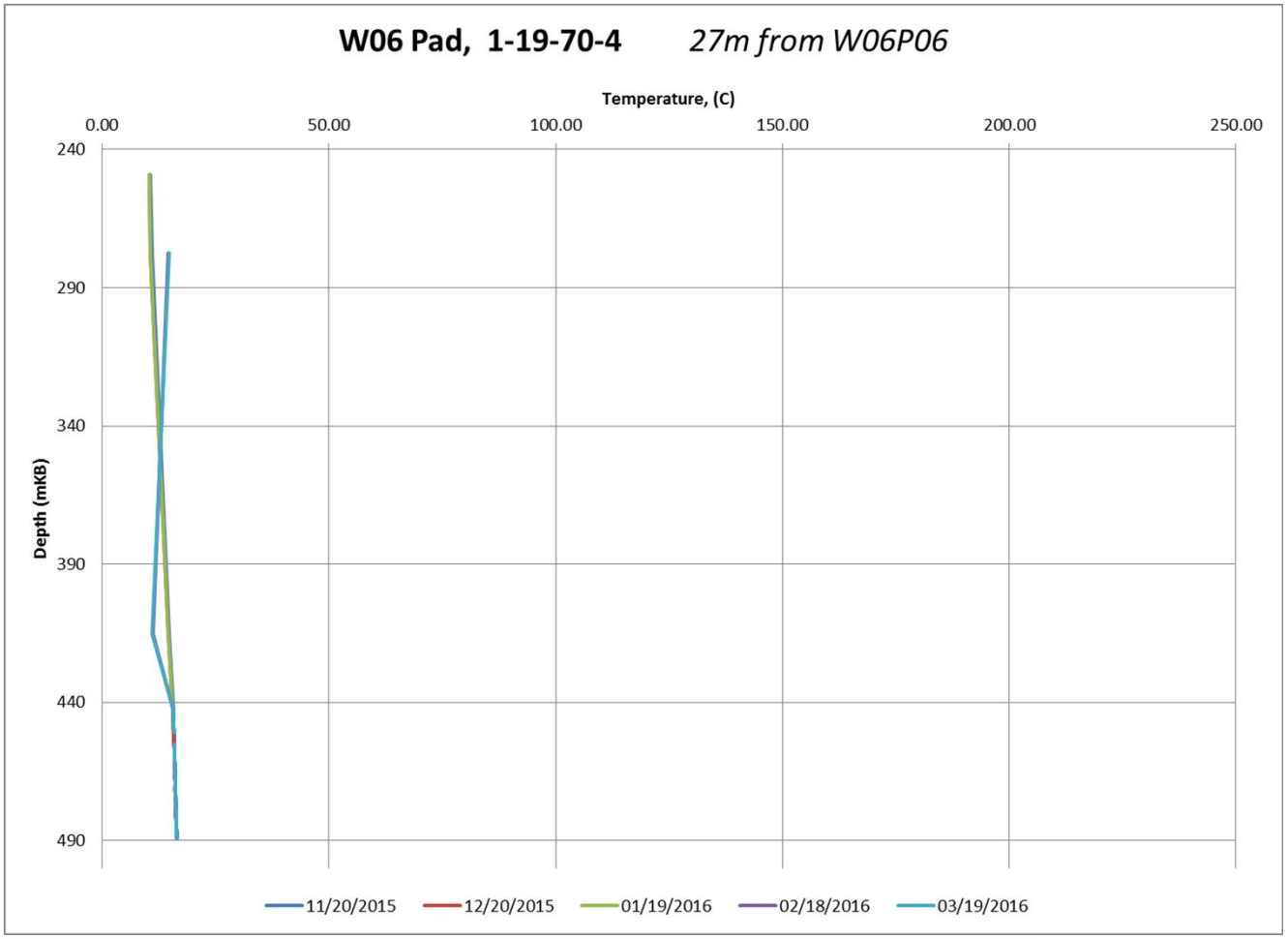

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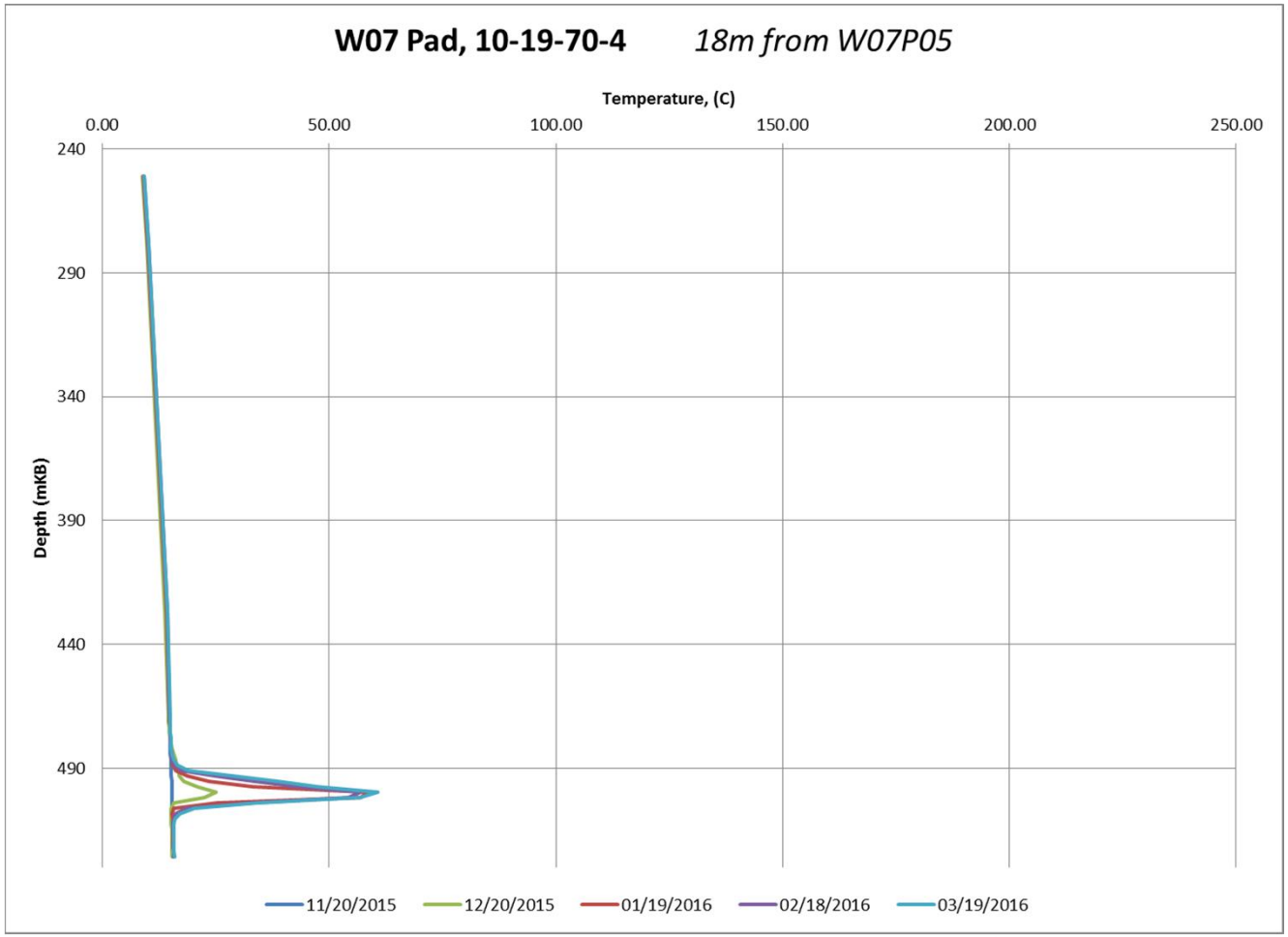

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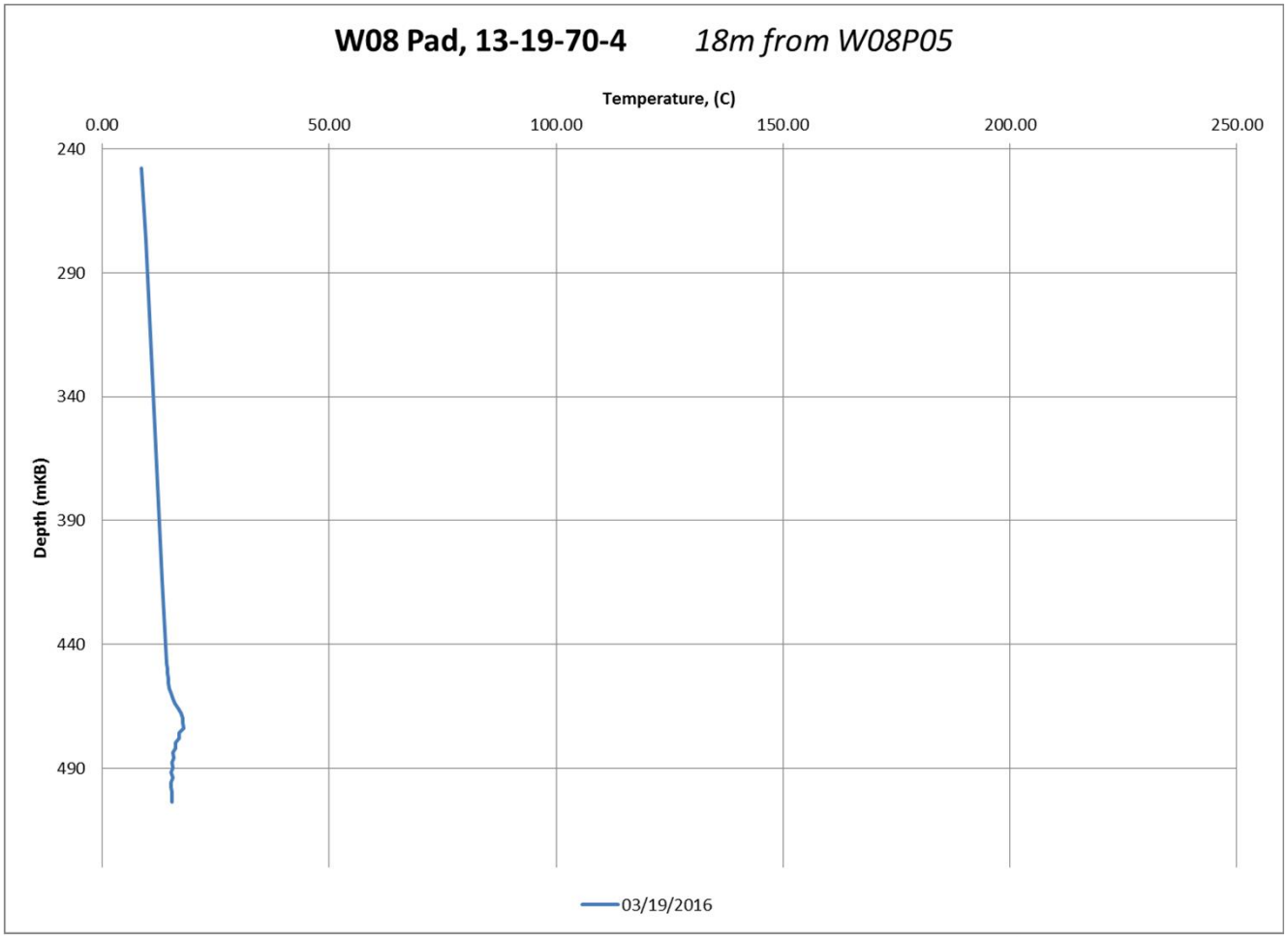

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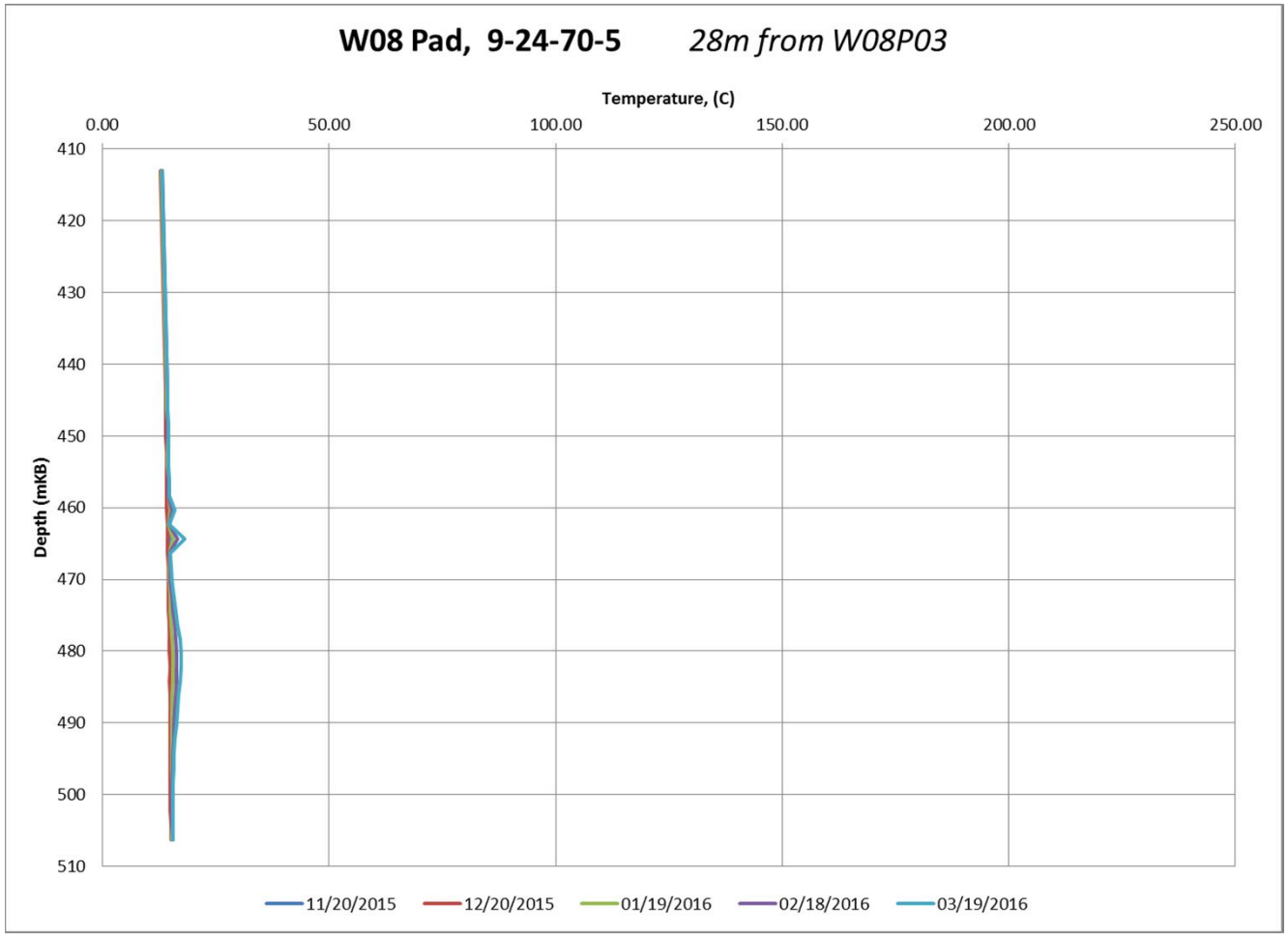

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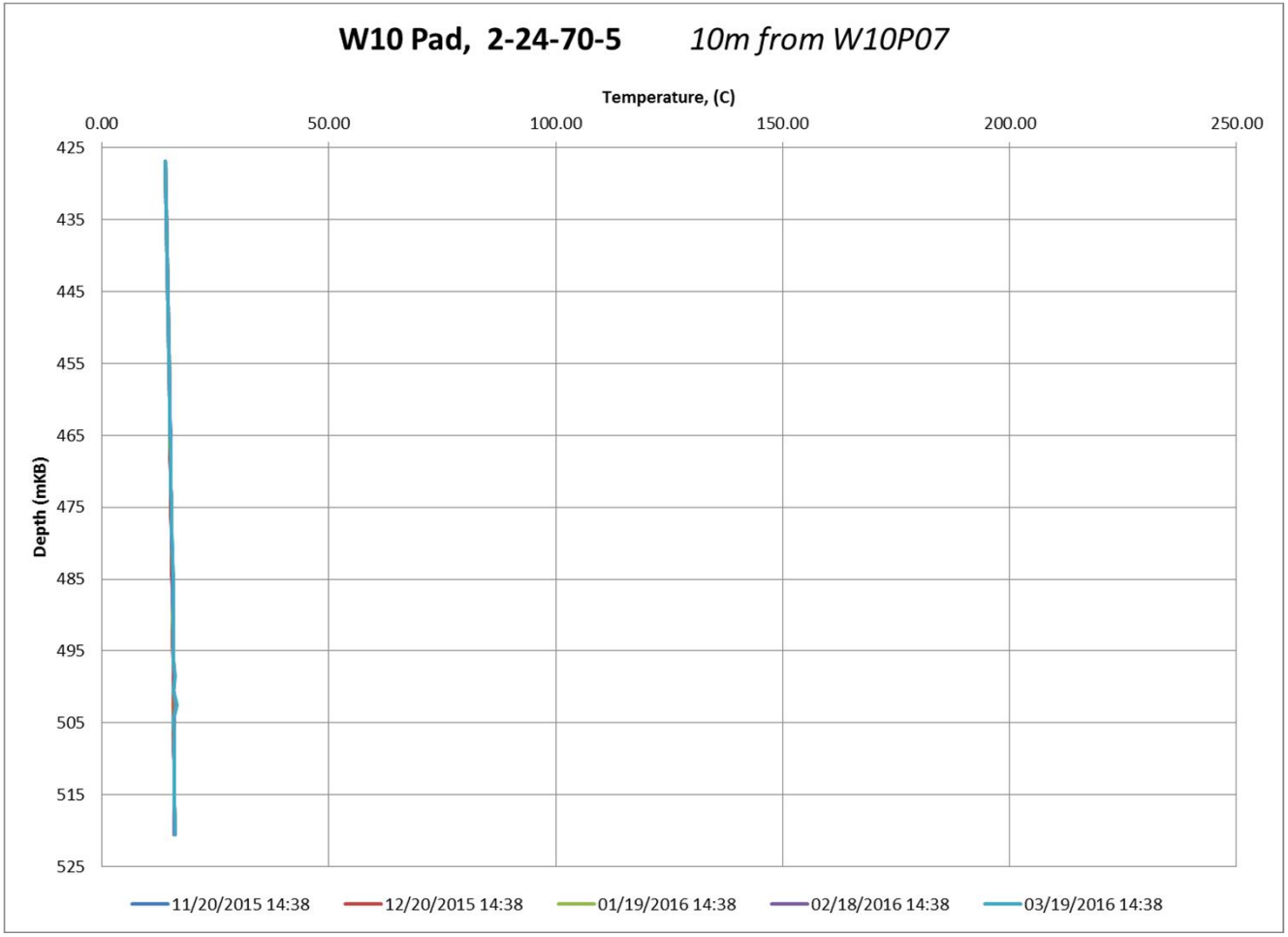

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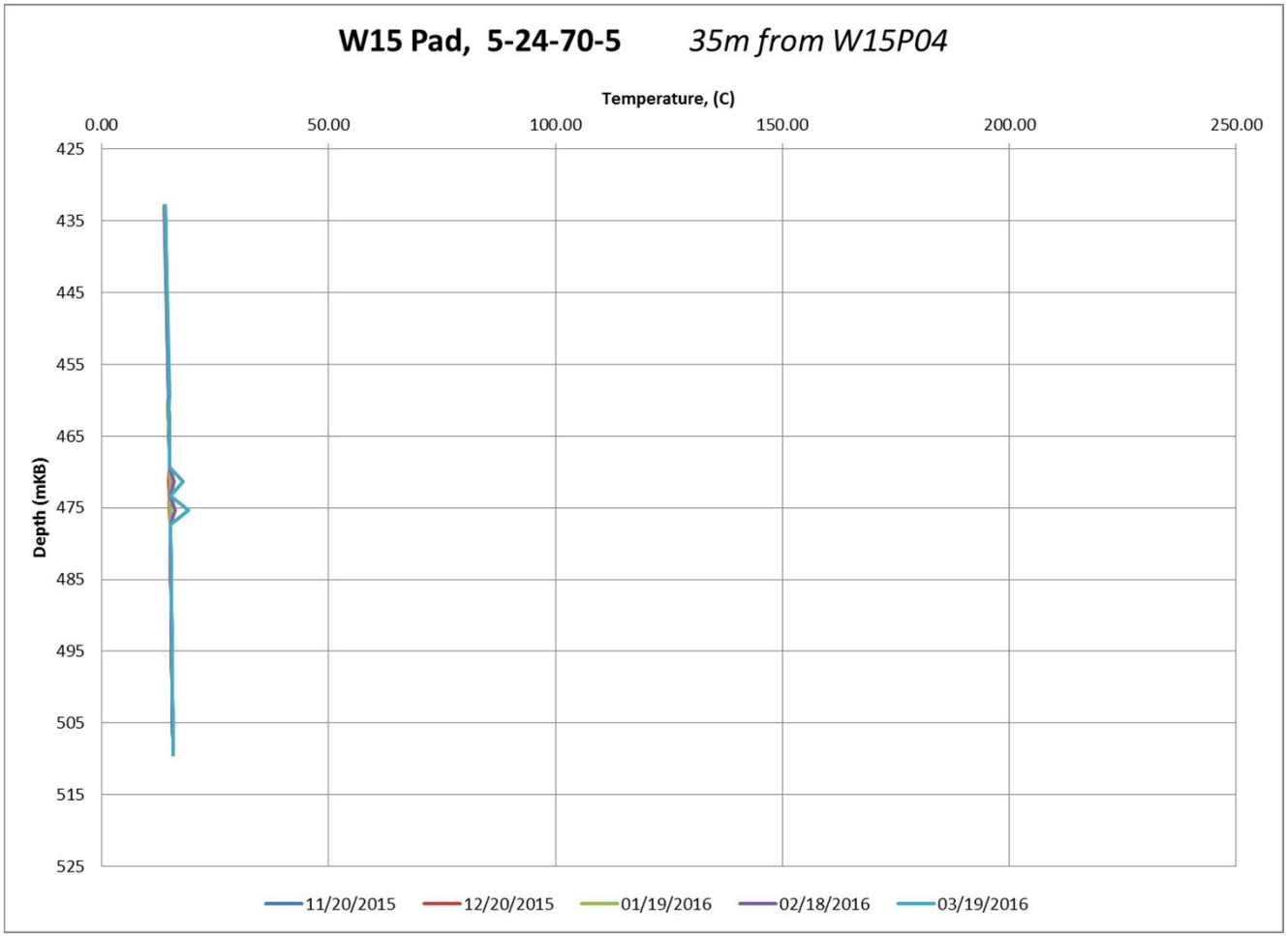

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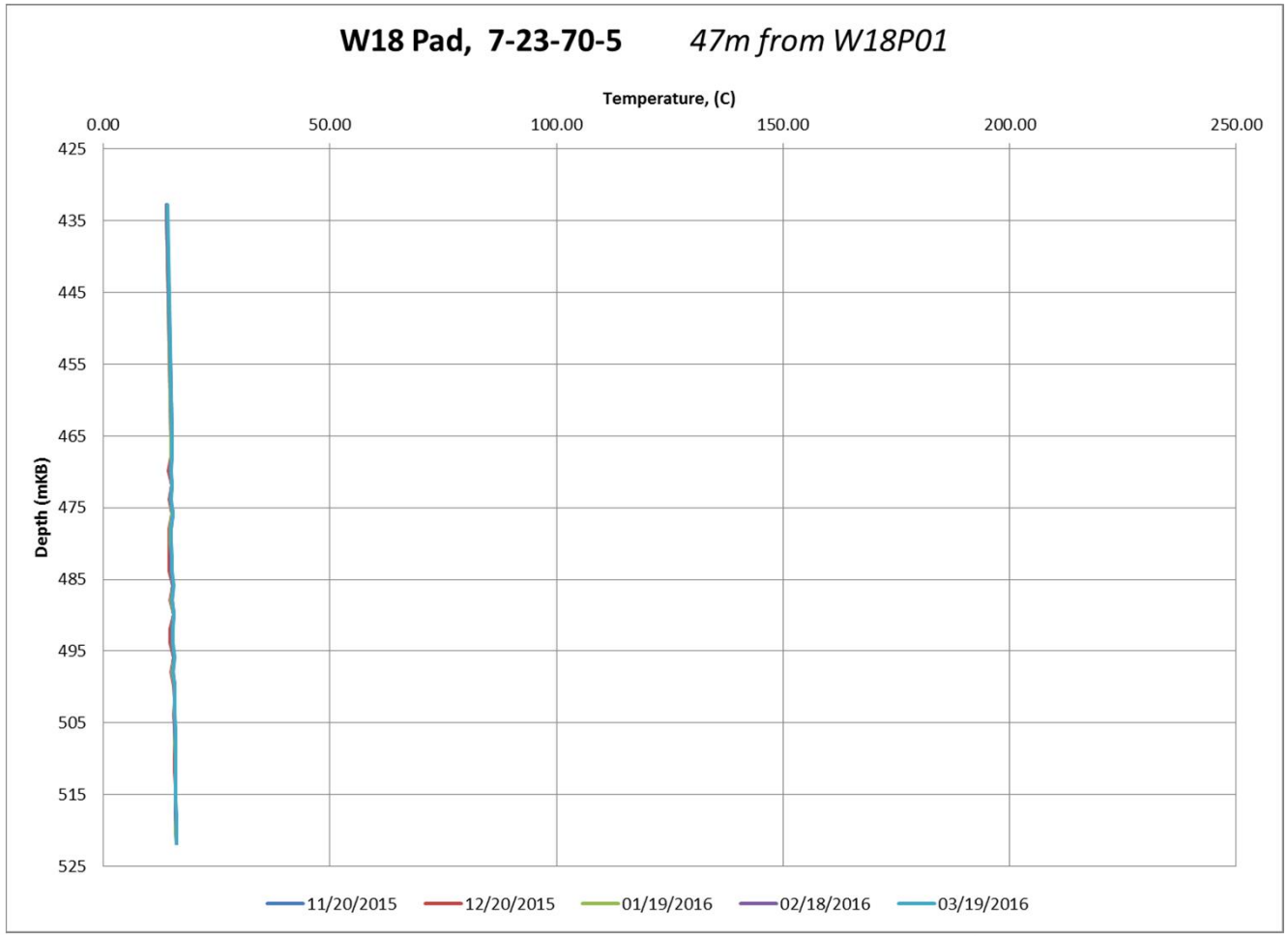

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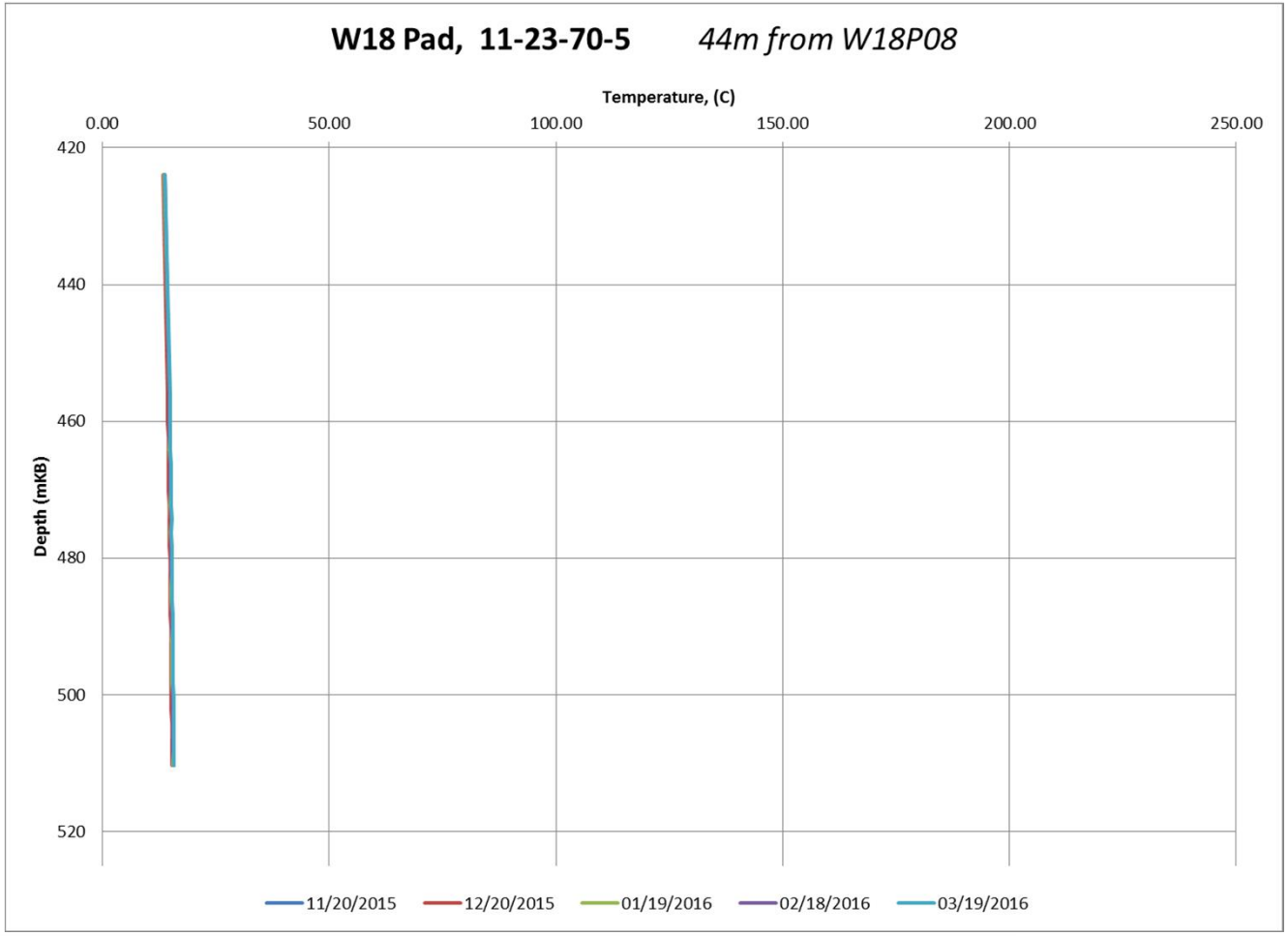

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