



February 24, 2014

Ms Linda Tucker
City of Isle of Palms
PO Drawer 508
Isle of Palms SC 29451

RE: Breach Inlet Quarterly Survey — January 2014 (Amendment 2 – Task 8) [CSE 2386]

Dear Ms. Tucker:

Per Amendment #2 to the agreement between the City of Isle of Palms and Coastal Science & Engineering (CSE), CSE completed an assessment of the shoreline around Breach Inlet on 23 January 2014. The assessment was conducted in response to severe erosion occurring over the past two years along the southwestern end of the Isle of Palms (monitoring stations 0+00–80+00 encompassing monitoring Reach 1 and Reach 2) (Fig 1). The purpose of the assessment is to provide quarterly updates on the magnitude of erosion and potential threats to private property so that the City may inform property owners and plan remedial action if necessary.



FIGURE 1. Monitoring baseline in Reach 1 (upper) and Reach 2 (lower). The highlighted areas show the reach limits.



The January 2014 survey included land-based and hydrographic survey work extending from landward of the frontal dune to (~)1,500 feet (ft) from the shore. The data allow for an analysis of dune recession or recovery, beach volume, and changes in the shoals and channels of Breach Inlet. Beach volumes were calculated to –6 ft NAVD, which is approximately low-tide wading depth, for comparison with the first quarterly survey (October 2013). Volume change was also computed to –10 ft to compare with the last comprehensive monitoring event in July 2013.

Beach profiles are provided in Attachment 1 and volume changes are shown in Table 1. The Breach Inlet area (Reaches 1 and 2) gained ~24,000 cubic yards (cy) of sand between July and October 2013. This led to moderate recovery of the dry beach following the erosion occurring between 2011 and July 2013 (details are provided in the letter report submitted in November 2013). Between October 2013 and January 2014, the area as a whole was stable, gaining only 116 cy (measured to –6 ft NAVD). Reach 1 (west of 6th Avenue) gained ~9,500 cy, while Reach 2 lost a similar volume.

There was not a distinct erosional trend within either reach. The tip of the spit (stations 0+00 thru 12+00) showed minor erosion (1.4 to 3.1 cy/ft) and stations 0+00 and 4+00 showed ~10 ft of dune recession. Stations OCRM 3105 thru OCRM 3110 (2nd and 3rd Ave) all gained sand and were responsible for the net accretion observed over the reach. Figure 2 shows unit volumes for monitoring stations useful for visualizing how beach volume has changed over the past 4.5 years. Profiles show that sand from a low-tide ridge (higher part of the beach seaward of a runnel) present in October 2013 migrated higher up the beach by January 2014. Erosion/accretion was more variable north of station 30+00, ranging from 9.0 cy/ft erosion to 4.4 cy/ft accretion. Station 30+00, 40+00, and OCRM 3115 all showed minor erosion of the frontal dune toe, though no significant loss of dune width or elevation was evident. Comparative ground photos are provided at the end of this letter.

In Reach 1, the October–January time period showed a similar accretion **rate** as the July–October time period (~45,000 cy/yr). The volume change rate for Reach 2 changed from +47,500 cy/yr (accretion) between July and October to –43,800 cy/yr (erosion) between October and January. For comparison, Reach 1 lost an average of ~85,000 cy/yr between July 2011 and July 2013 and Reach 2 was essentially stable.

CSE updated a contour map showing the position of the +7 ft NAVD elevation contour (approximate base of the dune or escarpment line) in Reach 1 (Fig 3). The map shows little change between the October 2013 and January 2014 position, indicating little dune recession occurred during that time. The stability of the contour is a positive sign for the beach condition as portions of the area lost over 100 ft of dunes between 2011 and 2013.



TABLE 1. Volume calculations for recent surveys at Breach Inlet. Volumes were calculated to -6 ft NAVD within the boundaries shown in the profile plots (Attachment 1). Reach 1 encompasses stations 0+00 through OCRM 3115. Reach 2 encompasses the beach between stations OCRM 3115 and 80+00.

Station	Unit Volumes (cy/ft) to -6 ft NAVD										Station	Unit Volume Change Since Previous (cy/ft) to -6 ft NAVD										Unit Volume Change to -10 ft NAVD Jul 13 to Jan 14
	Sep-09	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Jun-11	Jul-12	Jul-13	Oct-13		Jan-14	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14					
3100	129.1	68.3	175.9	110.4	112.7	110.9	-60.8	107.5	-65.5	2.3	-1.8	-1.8	1.5									
0+00	54.7	138.6	135.8	59.1	83.1	80.0	83.9	-2.8	-76.7	24.0	-3.1	-3.1	-1.6									
4+00	179.2	185.3	167.1	129.7	131.7	130.3	6.1	-18.2	-37.3	2.0	-1.4	-1.4	4.7									
8+00	203.3	202.2	168.8	146.1	144.1	147.5	-1.0	-33.4	-22.8	-2.0	-1.6	-1.6	-7.4									
12+00	239.8	211.4	174.4	187.8	181.6	178.9	-28.3	-37.0	13.4	-6.2	-2.7	-2.7	-8.9									
3105	245.8	228.1	192.5	185.6	152.6	184.4	-17.8	-35.5	-7.0	-32.9	31.8	31.8	-0.6									
16+00	205.5	194.9	144.6	152.4	150.6	164.9	-10.6	-50.3	7.7	-1.7	14.2	14.2	17.0									
20+00	159.3	165.4	131.4	101.9	107.8	126.6	6.1	-34.0	-29.5	5.9	18.8	18.8	26.5									
3110	145.8	155.7	111.4	103.4	111.4	119.4	9.9	-27.4	-25.0	8.0	8.0	8.0	15.8									
30+00	104.7	121.2	105.5	88.0	88.3	88.2	16.6	-15.8	-17.5	0.3	-0.1	-0.1	0.9									
40+00	104.9	106.1	102.0	88.0	93.5	90.0	1.2	-4.1	-14.0	5.5	-3.6	-3.6	-2.8									
3115	124.7	124.7	129.1	115.9	117.5	112.0	0.0	4.4	-13.2	1.5	-5.5	-5.5	-7.2									
50+00	129.8	128.2	129.9	121.4	117.4	121.3	-1.6	1.7	-8.5	-4.0	4.0	4.0	-3.0									
60+00	112.1	113.4	116.7	112.0	119.8	115.7	1.3	3.3	-4.7	7.8	-4.1	-4.1	3.7									
70+00	124.6	121.4	123.3	127.7	135.9	126.9	-3.1	1.9	4.4	8.2	-9.0	-9.0	-5.8									
80+00	111.6	112.8	117.7	121.4	118.9	123.3	1.3	4.9	3.7	-2.5	4.4	4.4	-6.2									
Station	Total Volume to Next Station (cy) to -6 ft NAVD										Change Since Previous to -6 ft NAVD										Change to -10 ft NAVD Jul 13 to Jan 14	
Sep-09	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14							
0+00	46,793	64,787	60,569	37,764	42,958	42,061	25,384	-96,859	-80,706	11,974	9,464	16,135										
4+00	76,501	77,508	67,182	55,161	55,164	54,552	-2,480	10,275	-9,365	11,980	-9,349	-9,778										
8+00	86,605	82,728	68,647	66,771	65,142	64,270	22,904	-86,584	-90,071	23,954	116	6,357										
12+00	89,052	81,260	63,802	68,031	66,453	68,758	5.8	-22.1	-18.4	2.7	2.2	3.7										
16+00	72,962	72,054	55,200	50,852	51,684	58,303	-0.7	2.8	-2.6	3.3	-2.6	-2.7										
20+00	41,194	43,349	35,067	27,710	29,583	33,207	2.9	-10.8	-11.3	3.0	0.0	0.8										
3110	91,438	101,091	85,346	69,842	72,859	75,746	Annual Change Rate (cy/ft per yr) to -6 ft NAVD															
30+00	104,783	113,689	103,739	88,010	90,901	89,072	Jun 11 - Jul 12	-89,276	-80,706	47,506	44,289	32,007										
40+00	44,766	45,012	45,068	39,774	41,145	39,384	Jul 12 - Jul 13	9,471	-9,365	47,551	-43,747	-19,396										
3115	77,632	77,141	78,992	72,376	71,617	71,160	Total	-79,806	-90,071	95,037	542	12,611										
50+00	120,962	120,797	123,271	116,668	118,558	118,511	Reach 1															
60+00	118,322	117,411	119,986	117,827	127,826	121,291	Reach 2															
70+00	118,060	117,147	120,522	124,535	127,385	125,076	Total															
80+00	0	0	0	0	0	0																
Reach 1	656,095	681,479	584,620	503,914	515,888	525,353																
Reach 2	434,976	432,496	442,771	433,406	445,387	436,038																

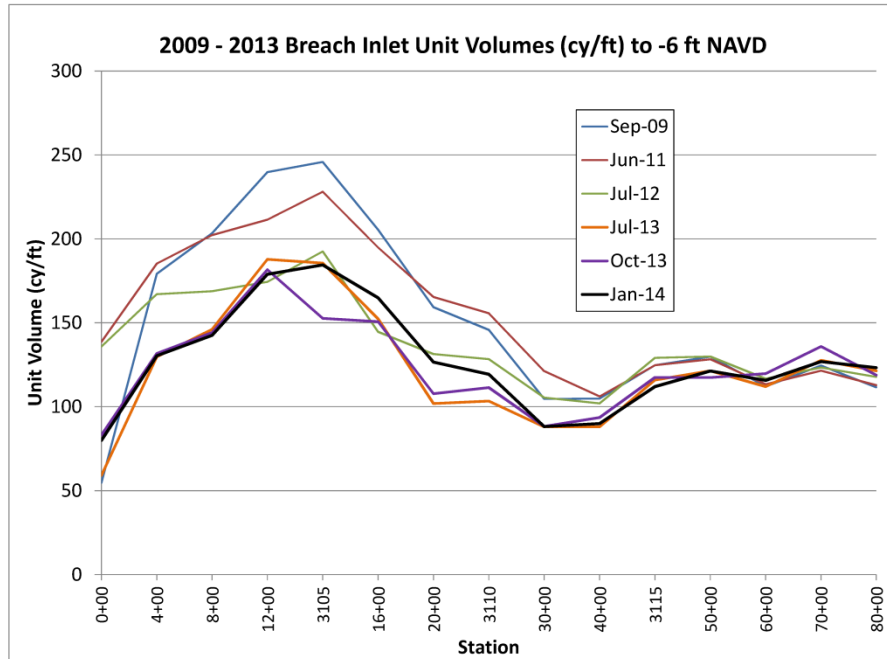


FIGURE 2. Beach unit volumes (in cy/ft to -6 ft NAVD) for monitoring stations in the Breach Inlet area.

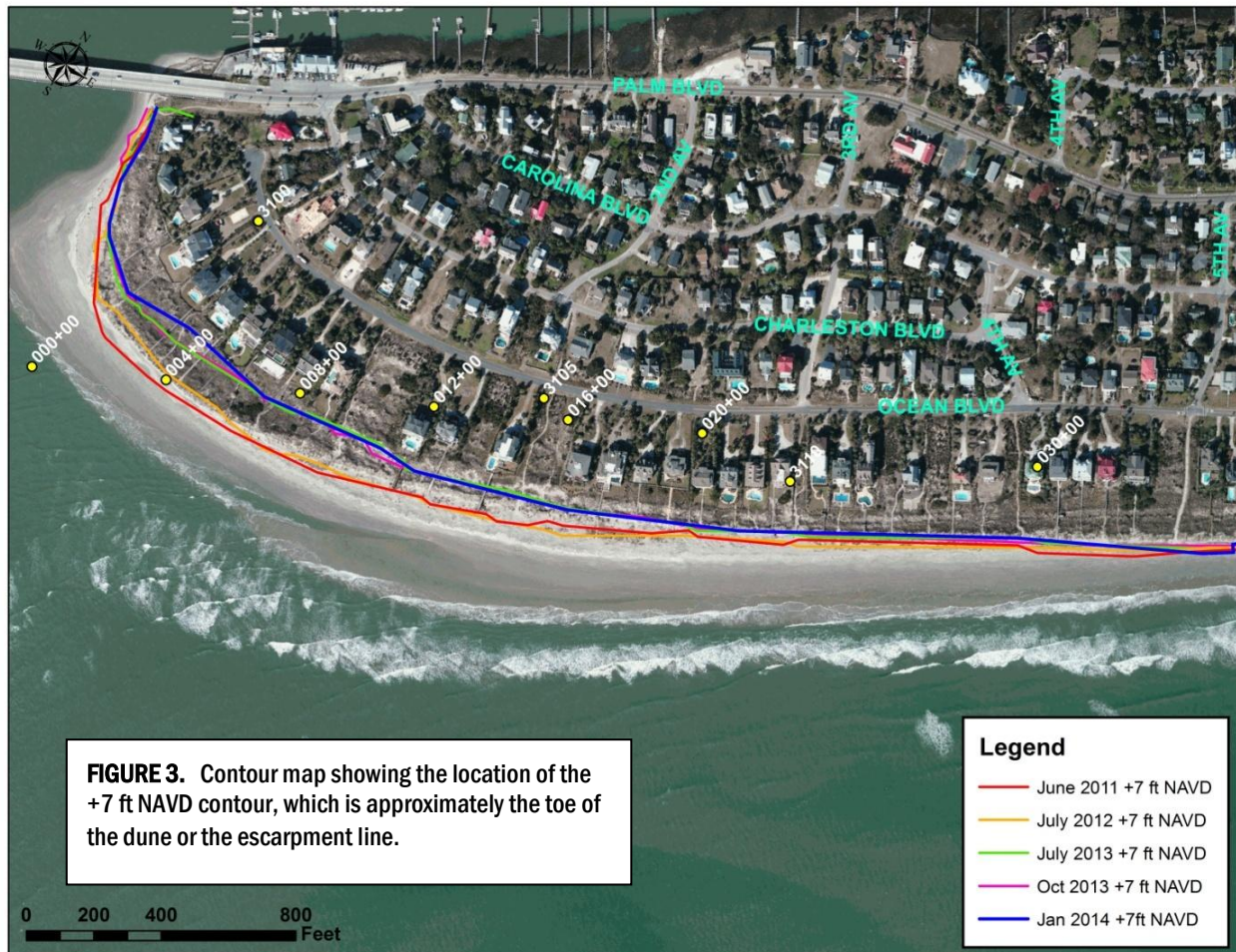


FIGURE 3. Contour map showing the location of the +7 ft NAVD contour, which is approximately the toe of the dune or the escarpment line.



The most recent assessment included a comprehensive survey of the Breach Inlet delta to evaluate potential changes in channel positions, channel depths, and shoal positions. Figure 4 shows digital terrain models (DTMs) of the inlet delta in July 2013 and January 2014. Note that the data coverage is variable between the two, so the limits of the colored area are not the same. Overall, the main channel of the inlet (green hues) has been fairly stable, although it continues to slowly migrate toward Sullivan’s Island. As the channel shifts west, the linear shoal on the eastern side of the channel also migrates west, drawing sand away from Isle of Palms.

Of particular importance to the Isle of Palms shoreline directly adjacent to Breach Inlet is the position and extent of the marginal flood channel. The channel is marked by “M” (Fig4) and was generally stable between October and January. The only location showing any notable change was at station 8+00, where the channel edge moved closer to the beach, although this was likely in response to a low-tide bar merging with the wet beach (sand moved higher up in the profile, allowing the channel boundary to migrate closer to the shore). Other than the minor changes in the marginal flood channel, no significant changes were observed in the DTMs that directly impacted the beach condition between October and January. The next quarterly monitoring event (scheduled for April 2014) is planned to survey only the beach to low-tide wading depth (excluding the channels and shoals of the inlet). The next comprehensive survey is scheduled for summer of 2014.

The January 2014 survey revealed that the Breach Inlet area was less accretional between October and January than from July to October 2013. The most critically eroded area, near the tip of Breach Inlet, showed minor volume loss (though the dune line was stable), while the area near 2nd Avenue and 3rd Avenue accreted. The area remains more stable than the 2011 to July 2013 period, where certain areas lost over 100 ft of dunes. This is a positive trend, especially since the stability is occurring over the typically erosive winter season. CSE continues to anticipate the area recovering naturally over time, although the area should continued to be monitored at least semi-annually until significant recovery can be documented.

Under the present agreement, CSE will complete a land-based assessment of the Breach Inlet area in April 2014. A similar letter report will follow updating the condition of the beach and providing volume-change analysis to –6 ft NAVD.

Sincerely,

Coastal Science & Engineering (CSE)

A handwritten signature in black ink, appearing to read 'Steven Traynum', written over a white background.

Steven Traynum
Coastal Scientist

Enclosures: Photos and Attachment 1 — October 2013 Profiles

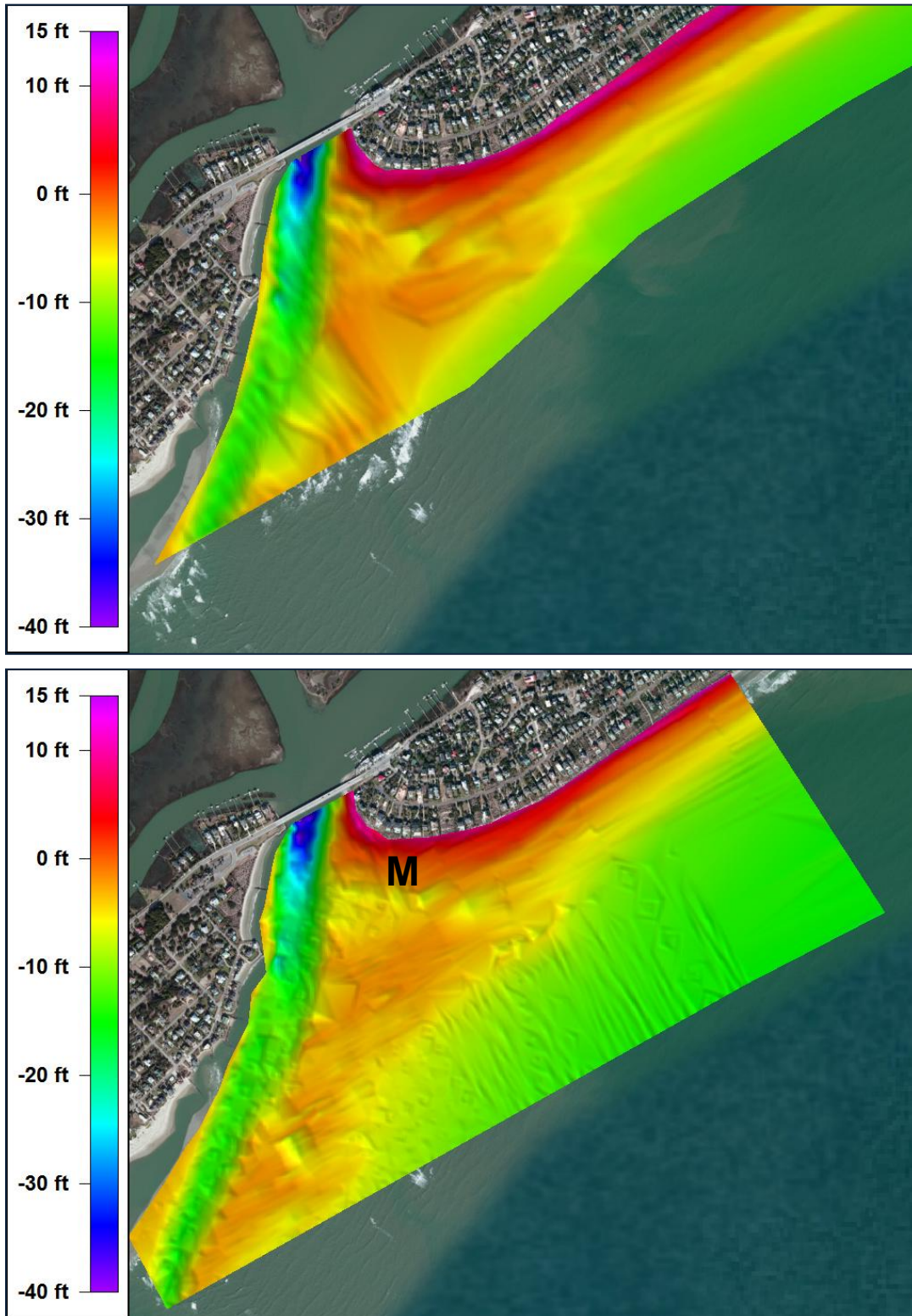


FIGURE 4. Digital terrain models (DTMs) of the Breach Inlet area in July 2013 (upper) and January 2014 (lower). The marginal flood channel is denoted by “M” and was mostly stable between October and January.



October 2013 (left) and January 2014 (right) images from station 8+00, looking toward the dune. The escarpment in this area moved a few feet landward between the image dates.



October 2013 (left) and January 2014 (right) images from station 16+00, looking west. This area gained sand between the image dates.



October 2013 (left) and January 2014 (right) images of station 16+00, looking east.



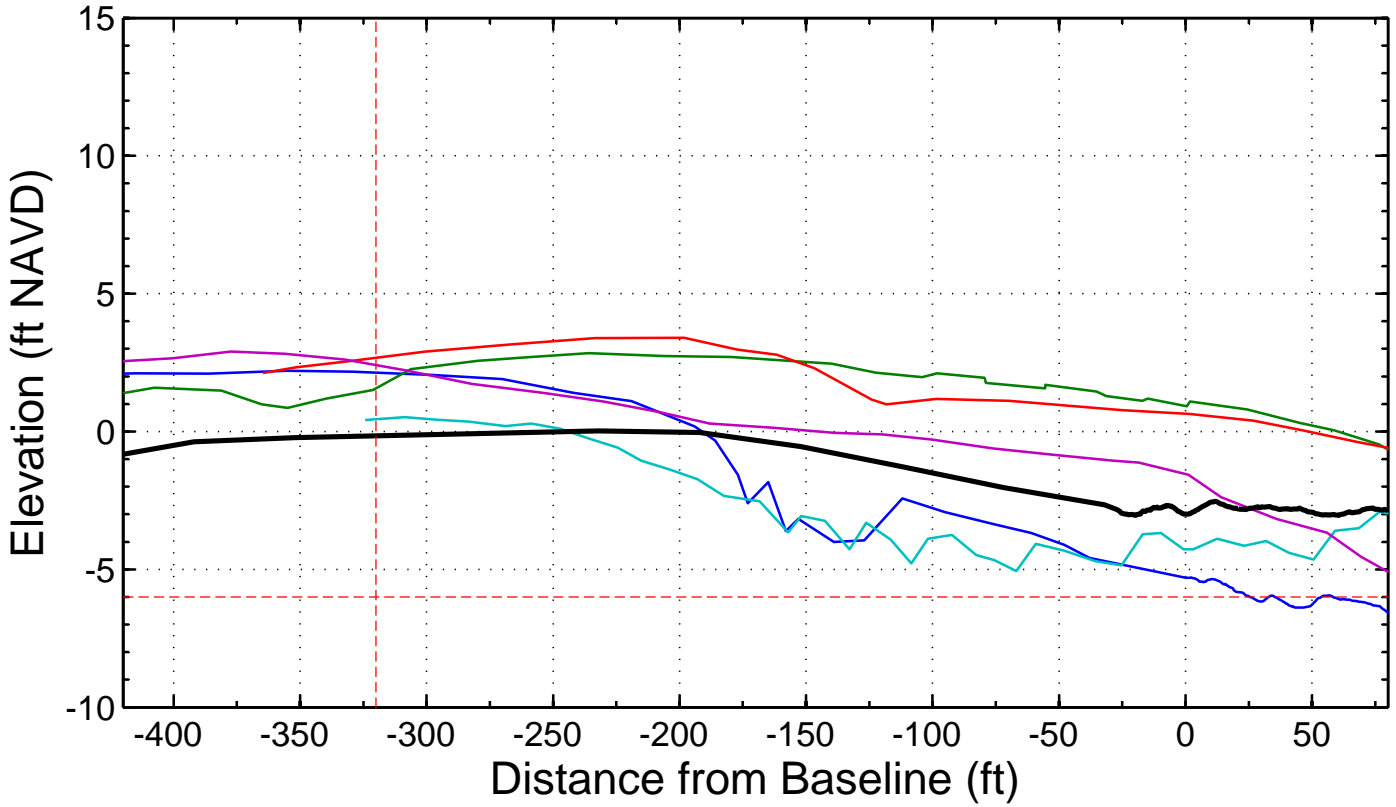
October 2013 (left) and January 2014 (right) images of station 50+00, looking west. This station gained 4.0 cy/ft between October and January, and the escarpment appears to be healing (note small buildup of sand at the base of the escarpment in the right image).



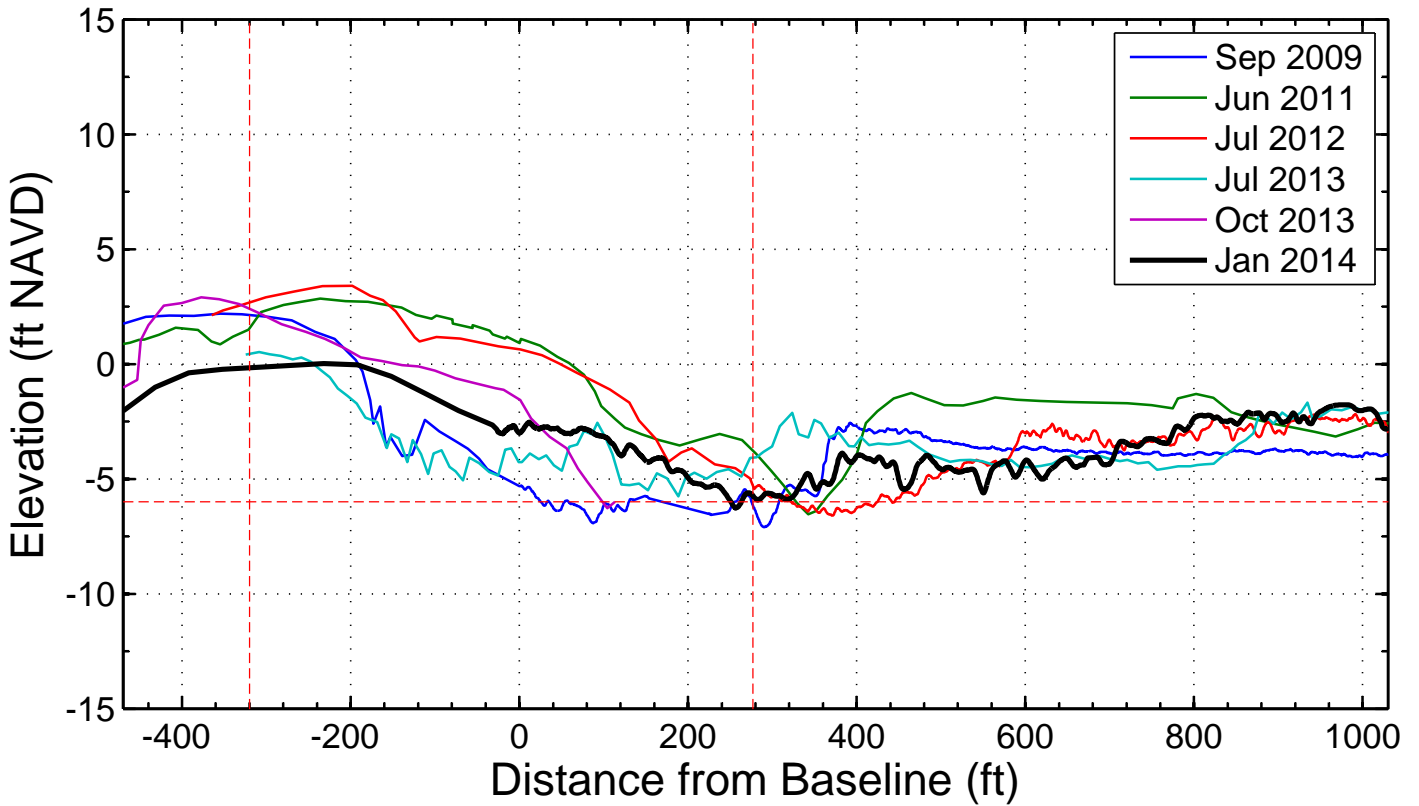
January 2014 image from station 4+00, looking landward. This area continues to rebuild following extensive erosion between 2011 and 2013. Note the older escarpment behind a more recent one, all fronted by a dry beach.

ATTACHMENT 1

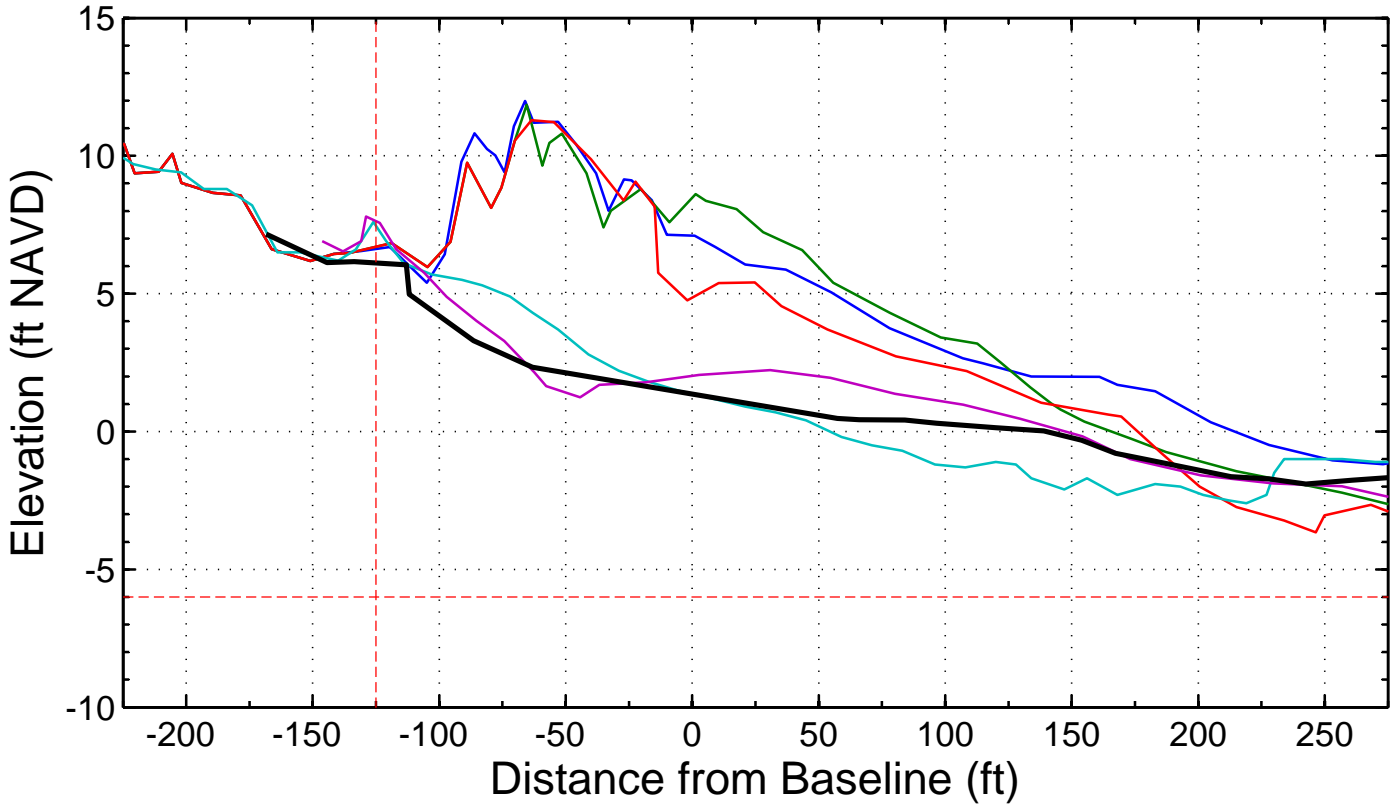
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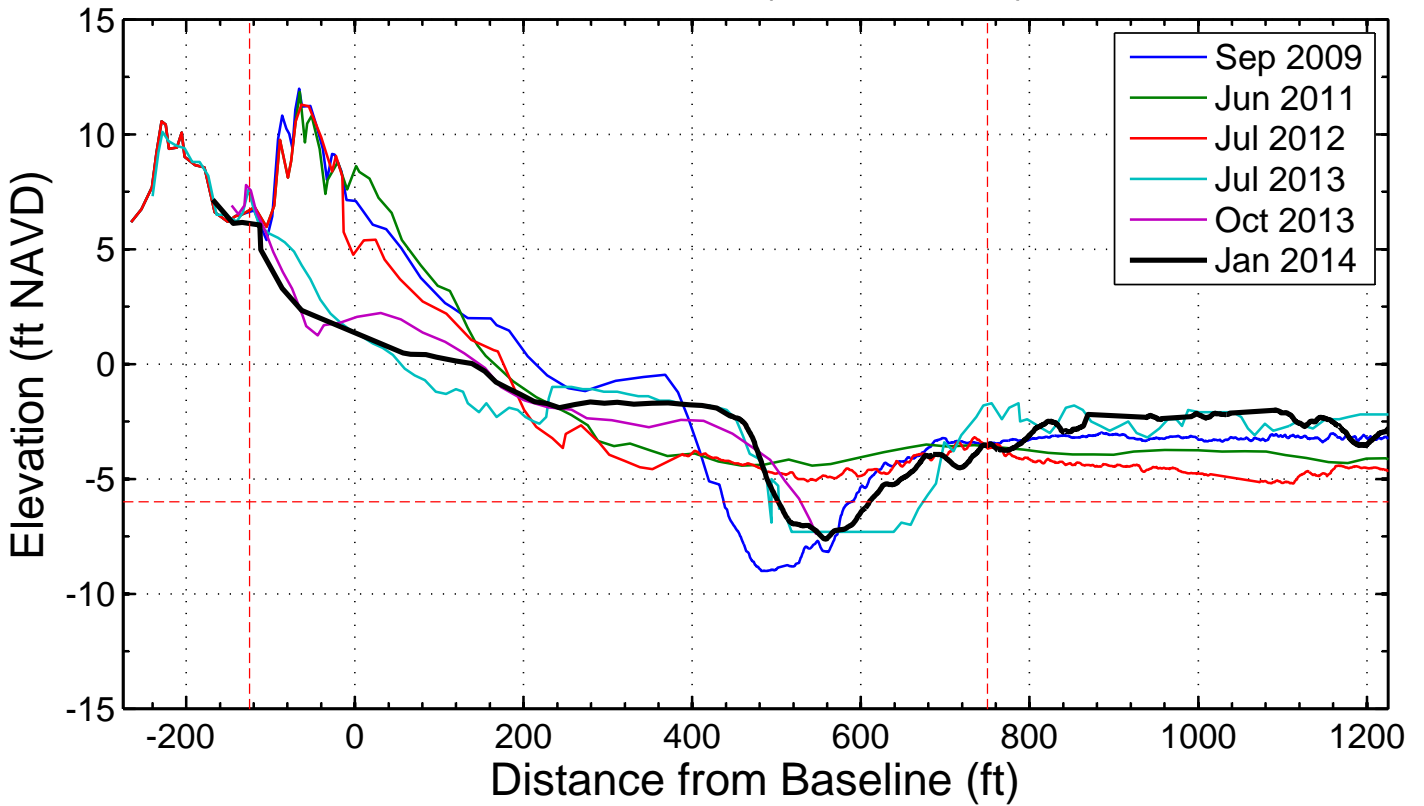
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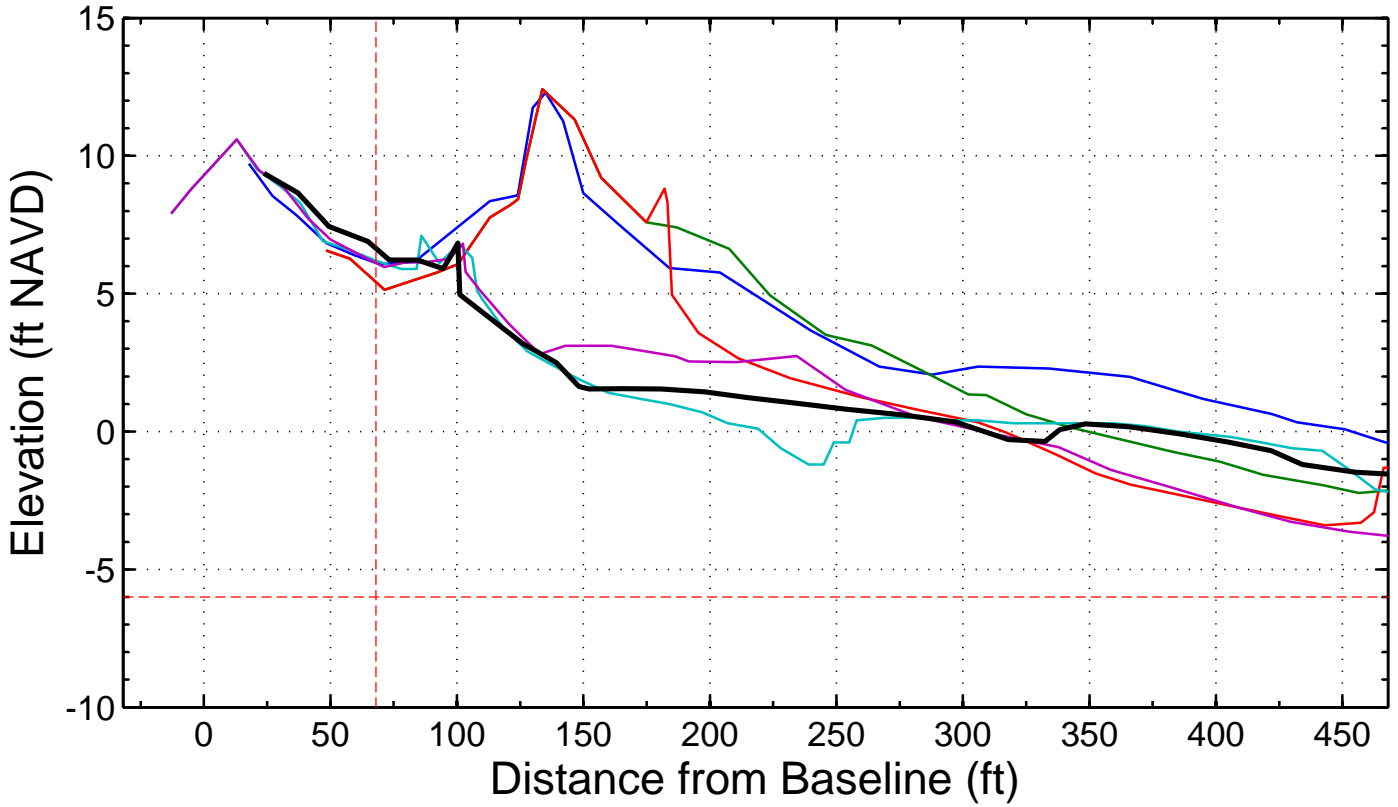
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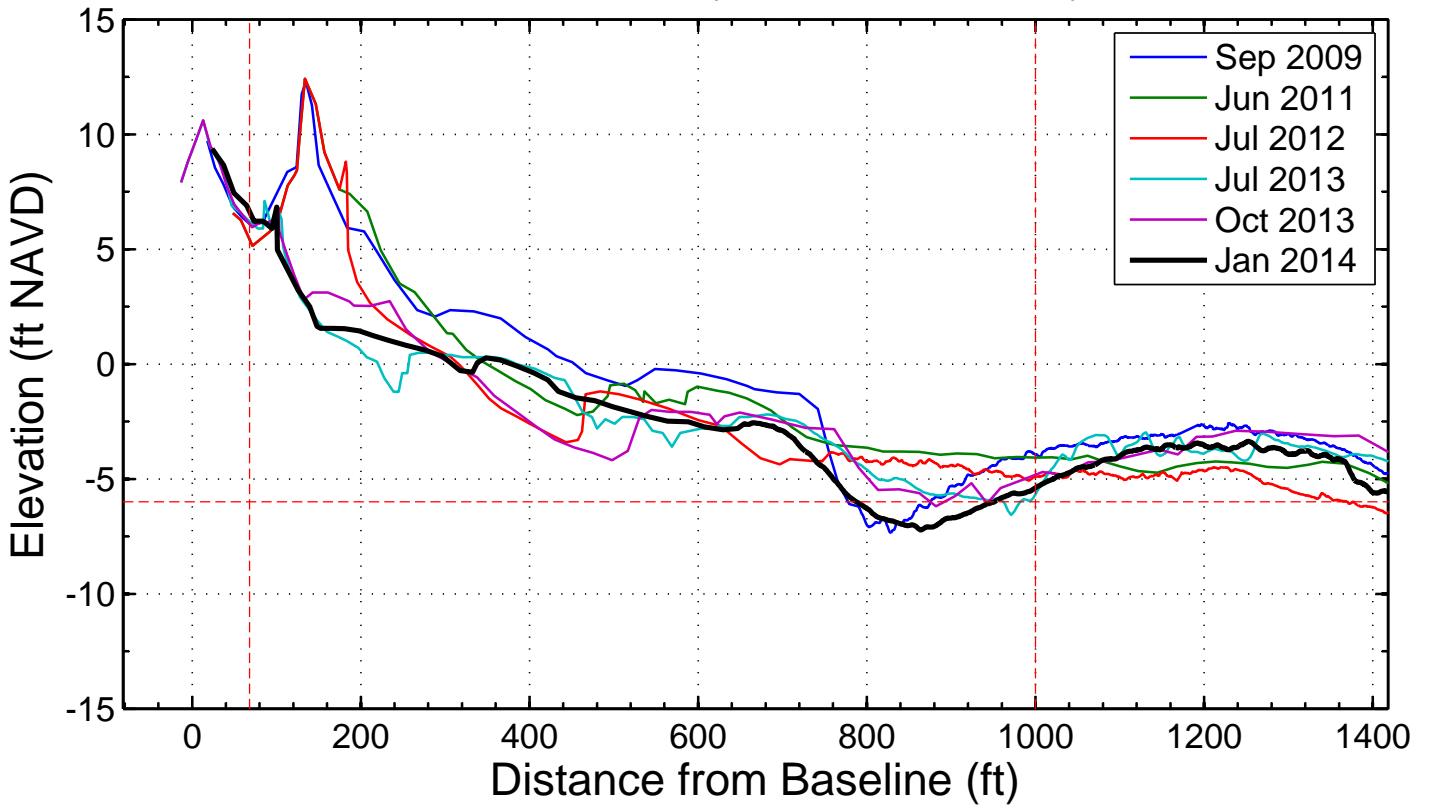
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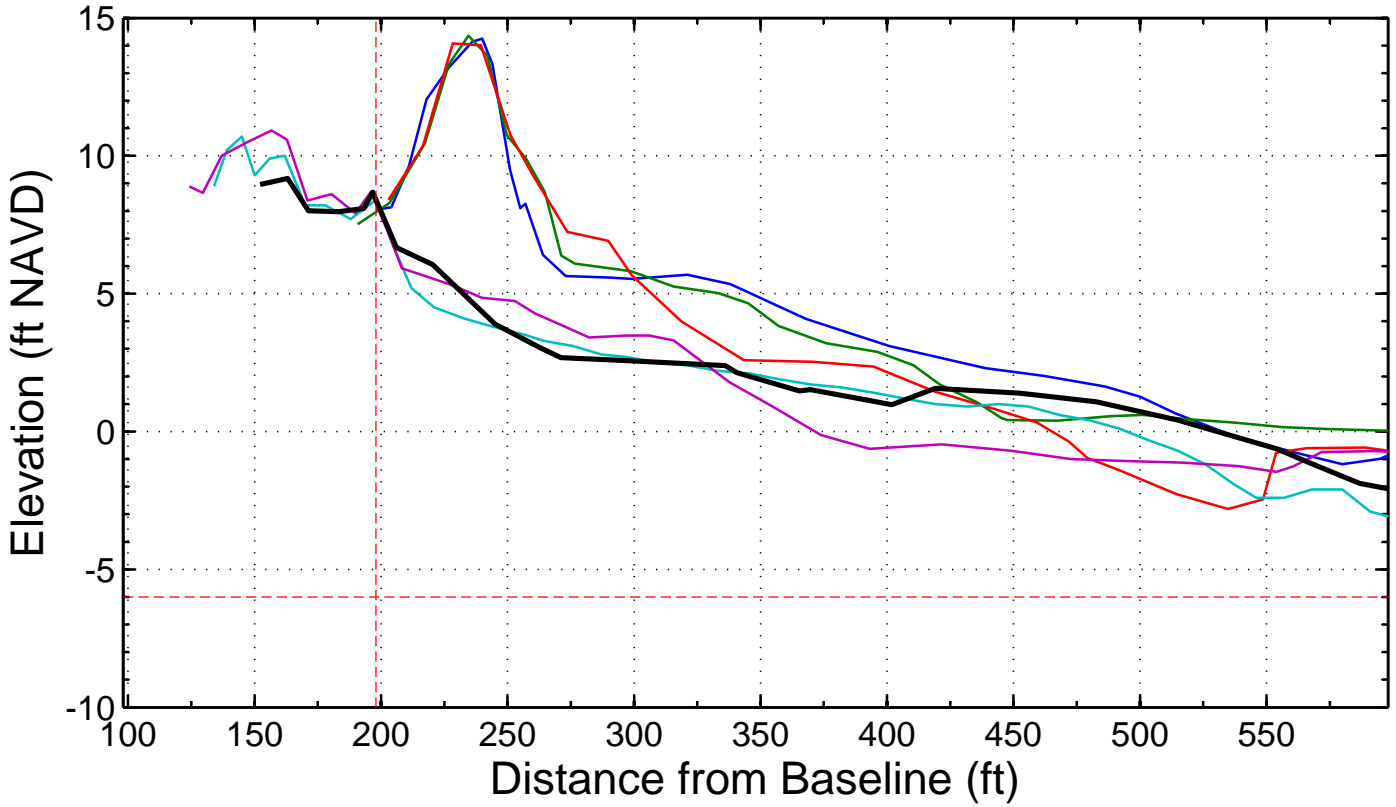
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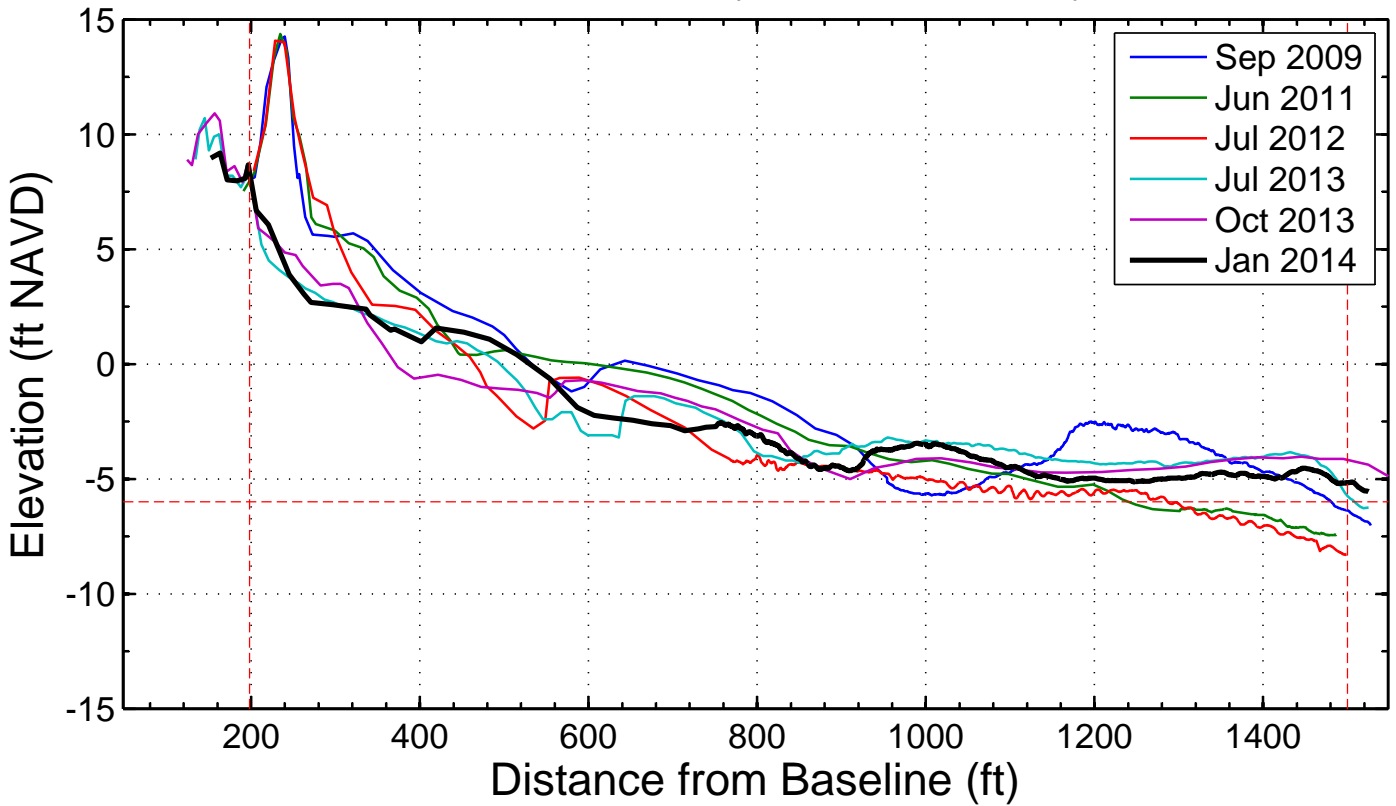
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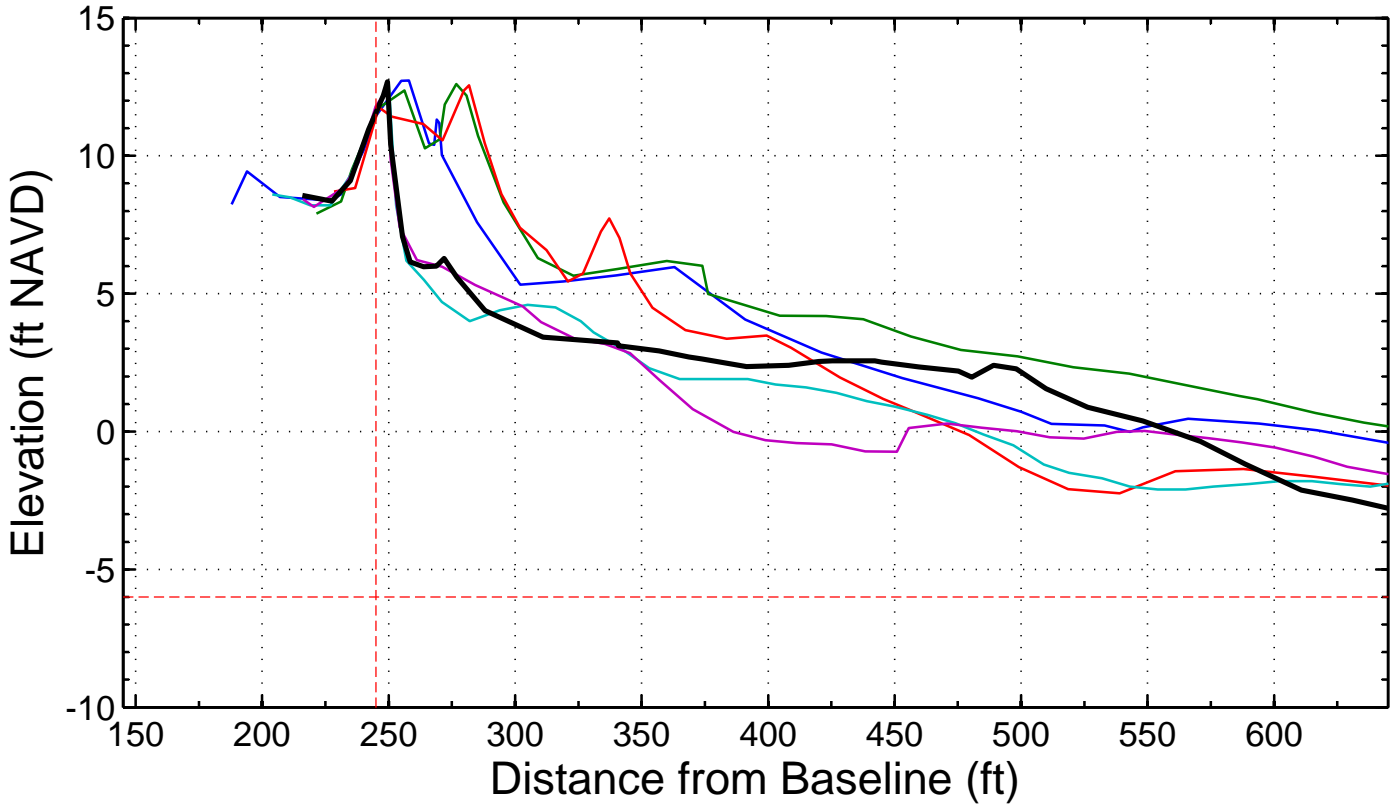
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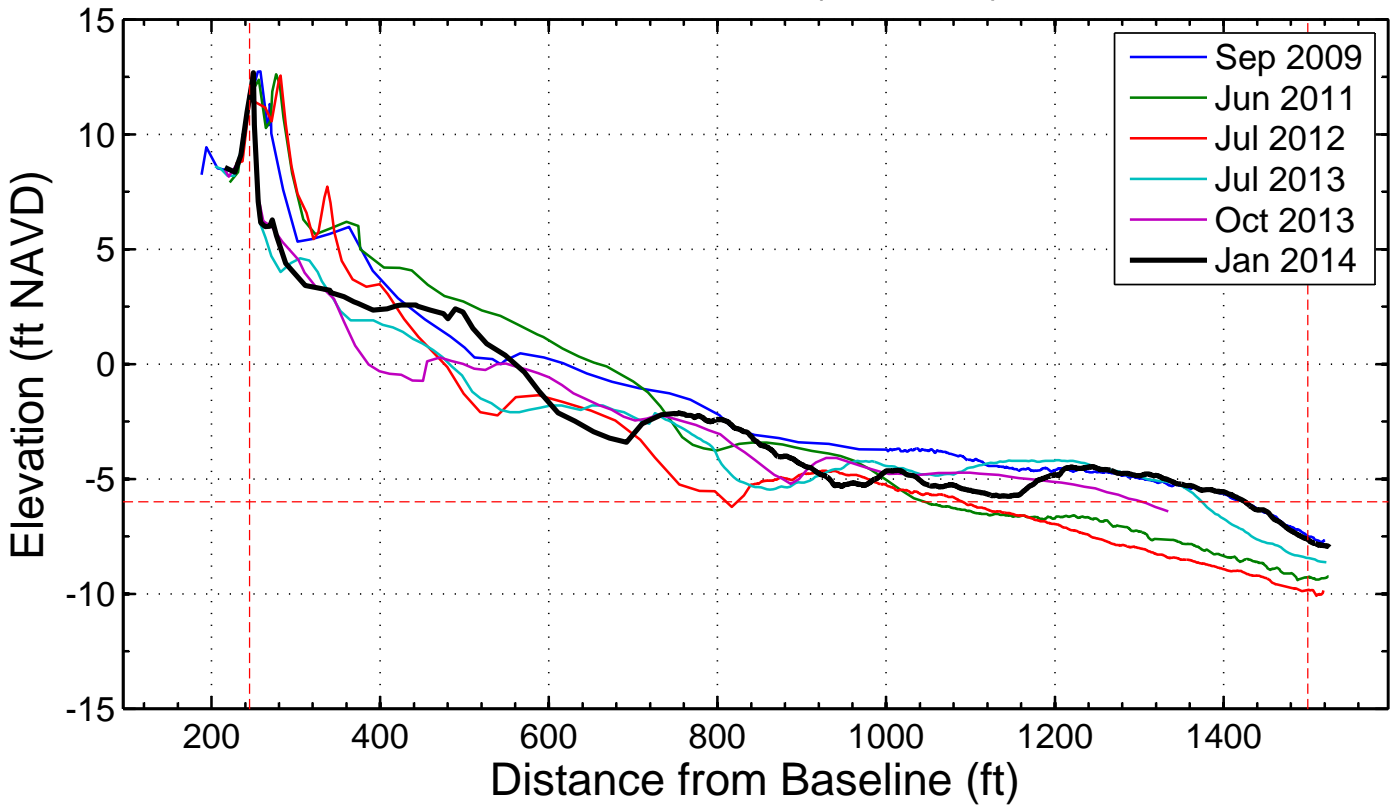
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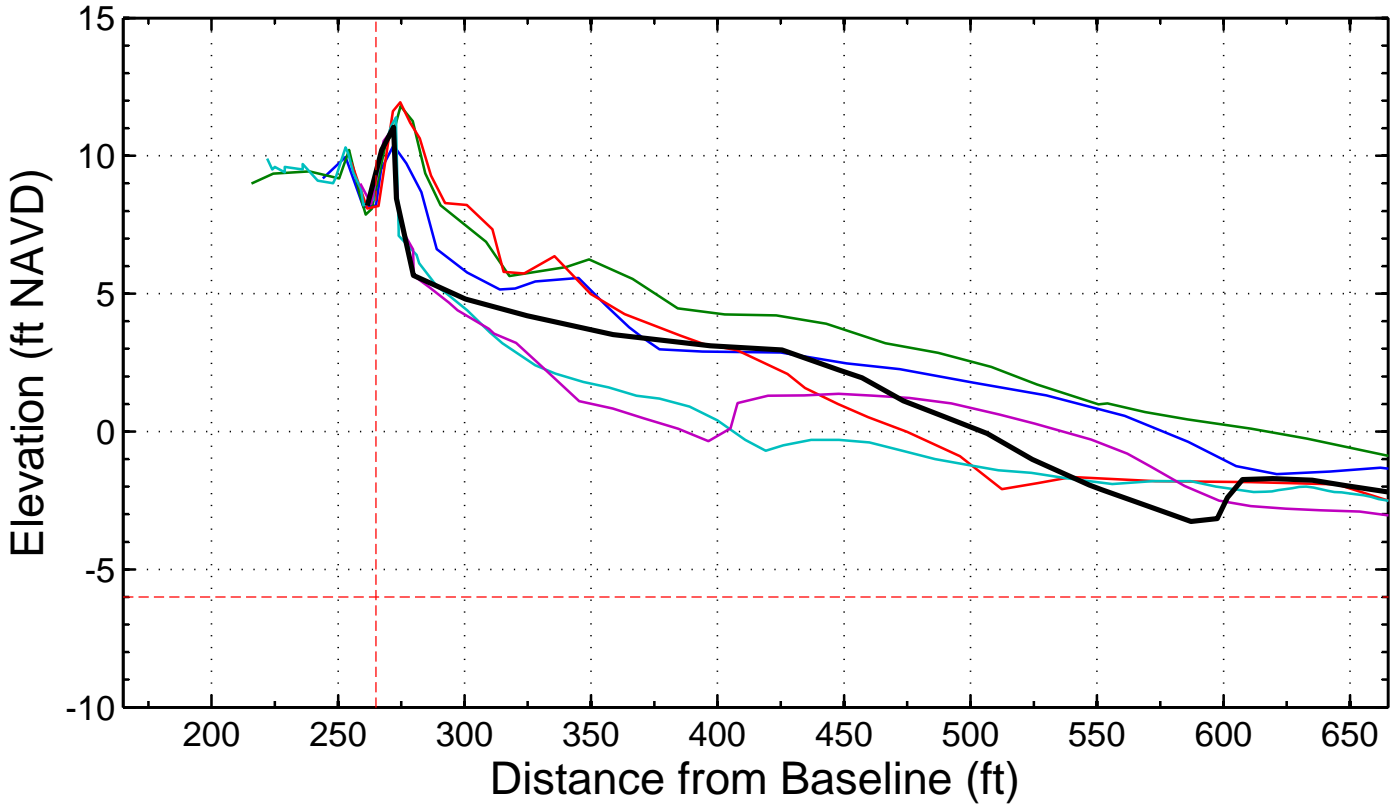
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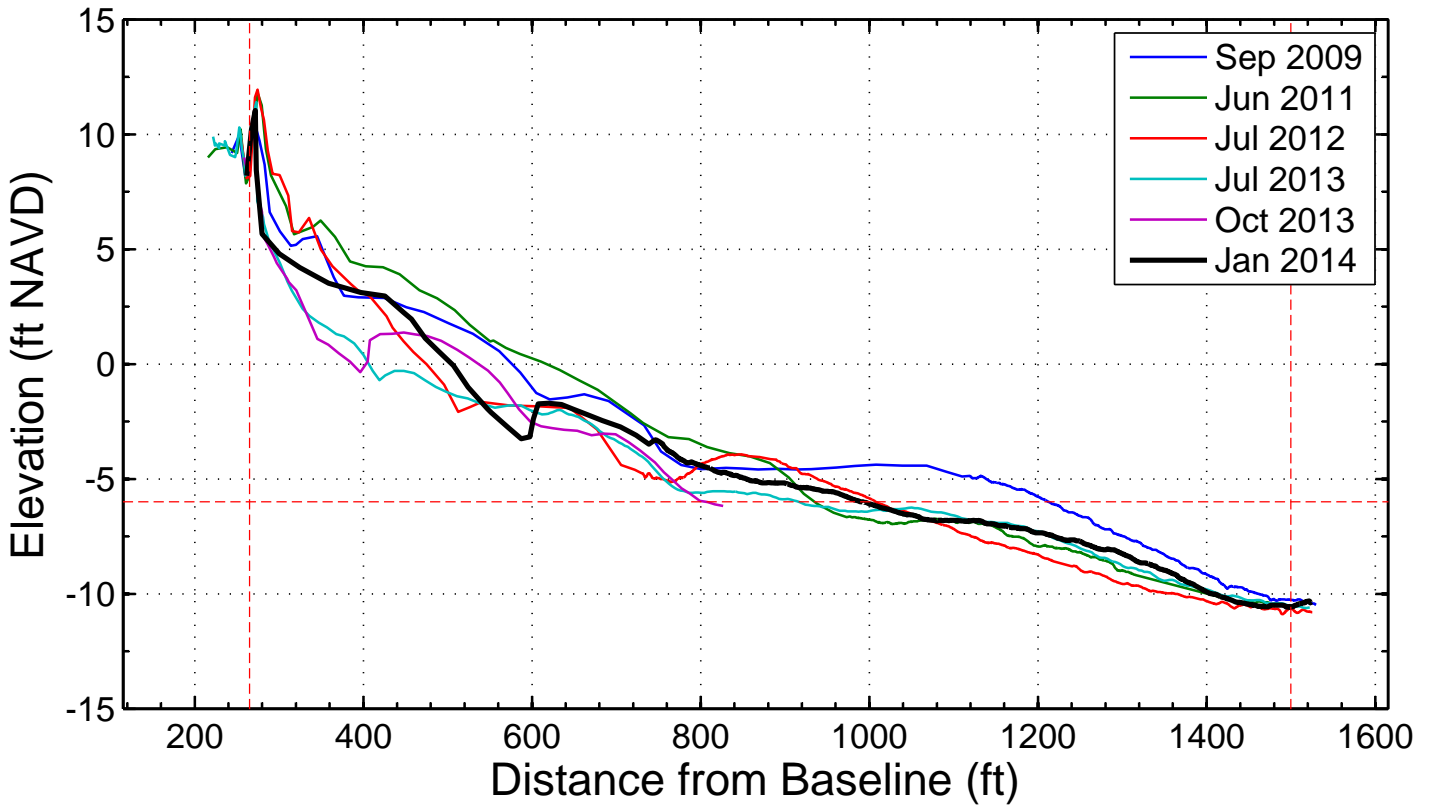
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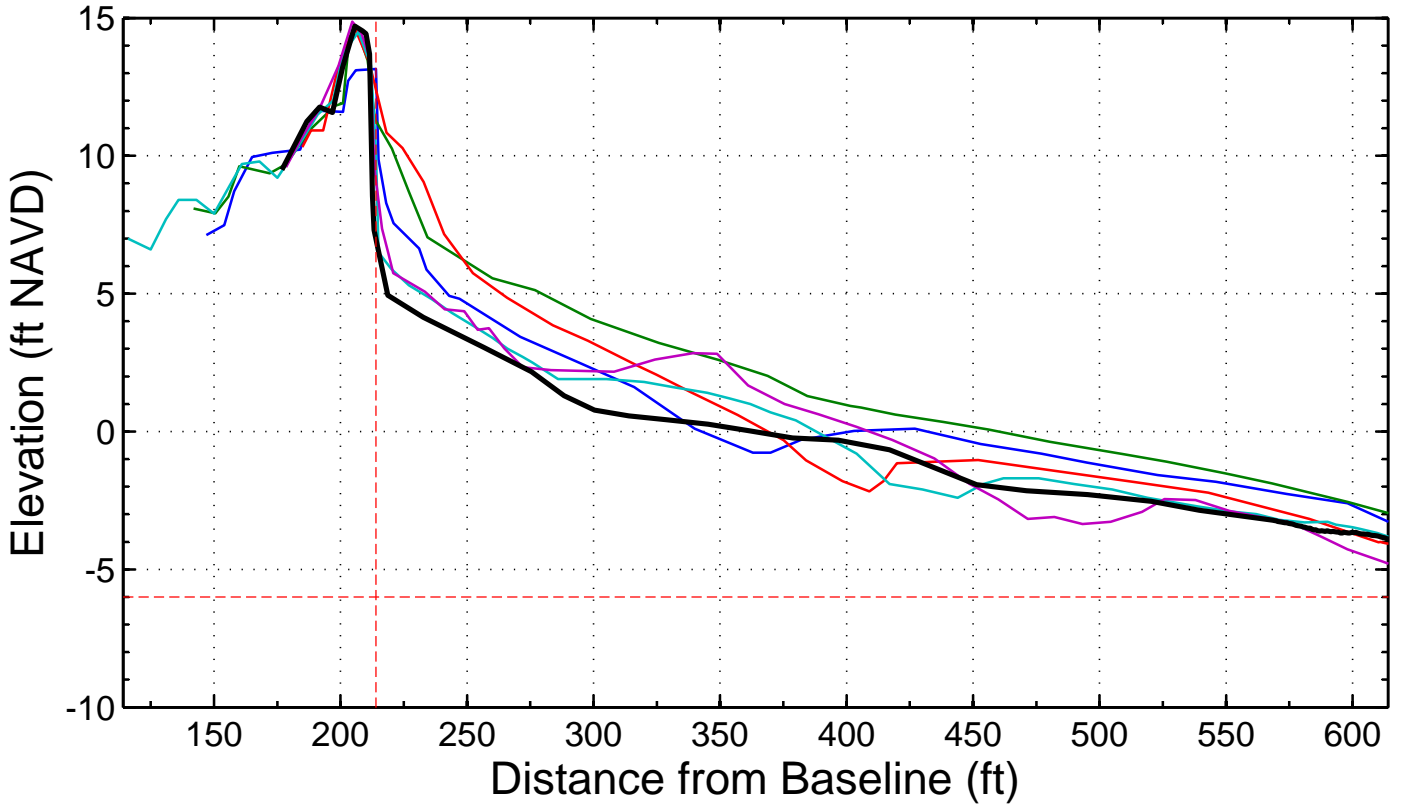
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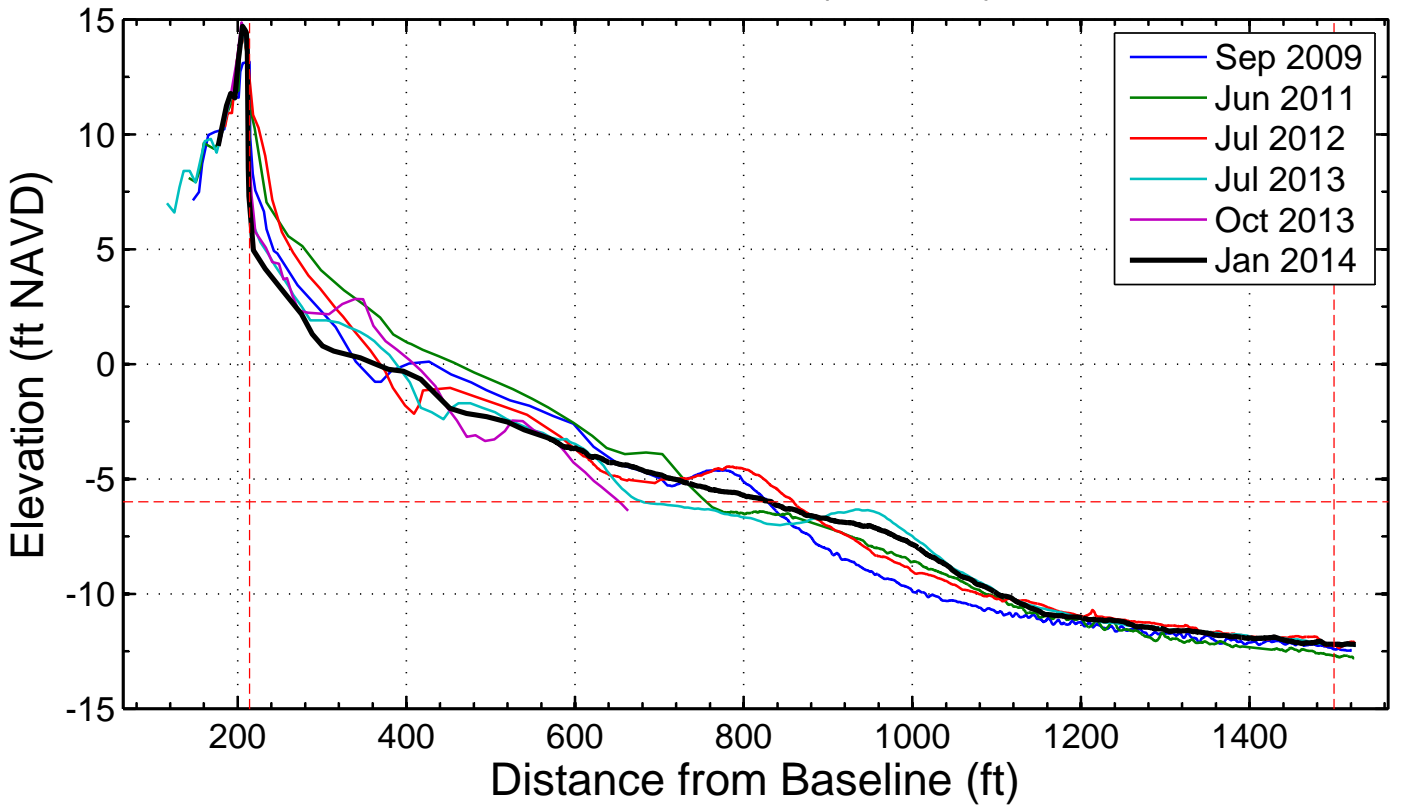
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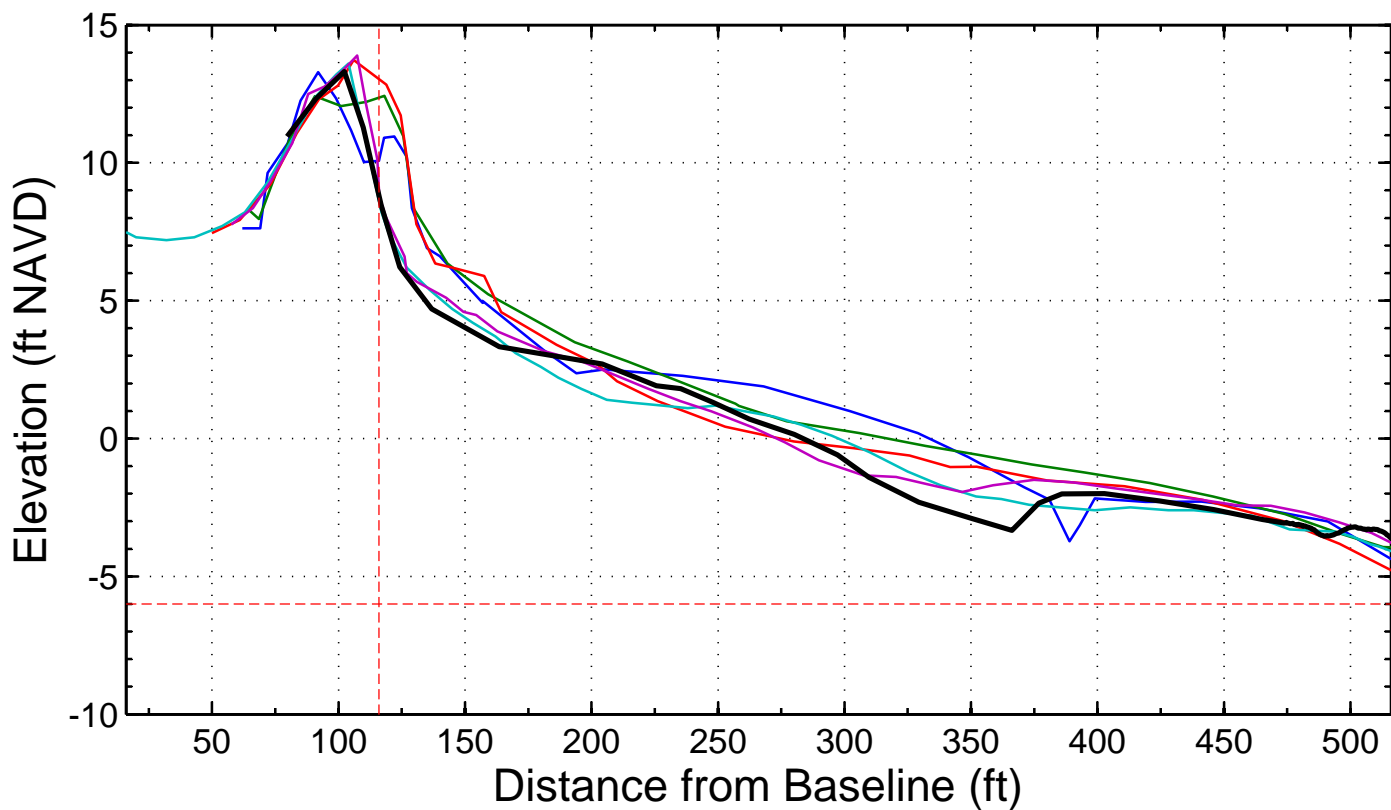
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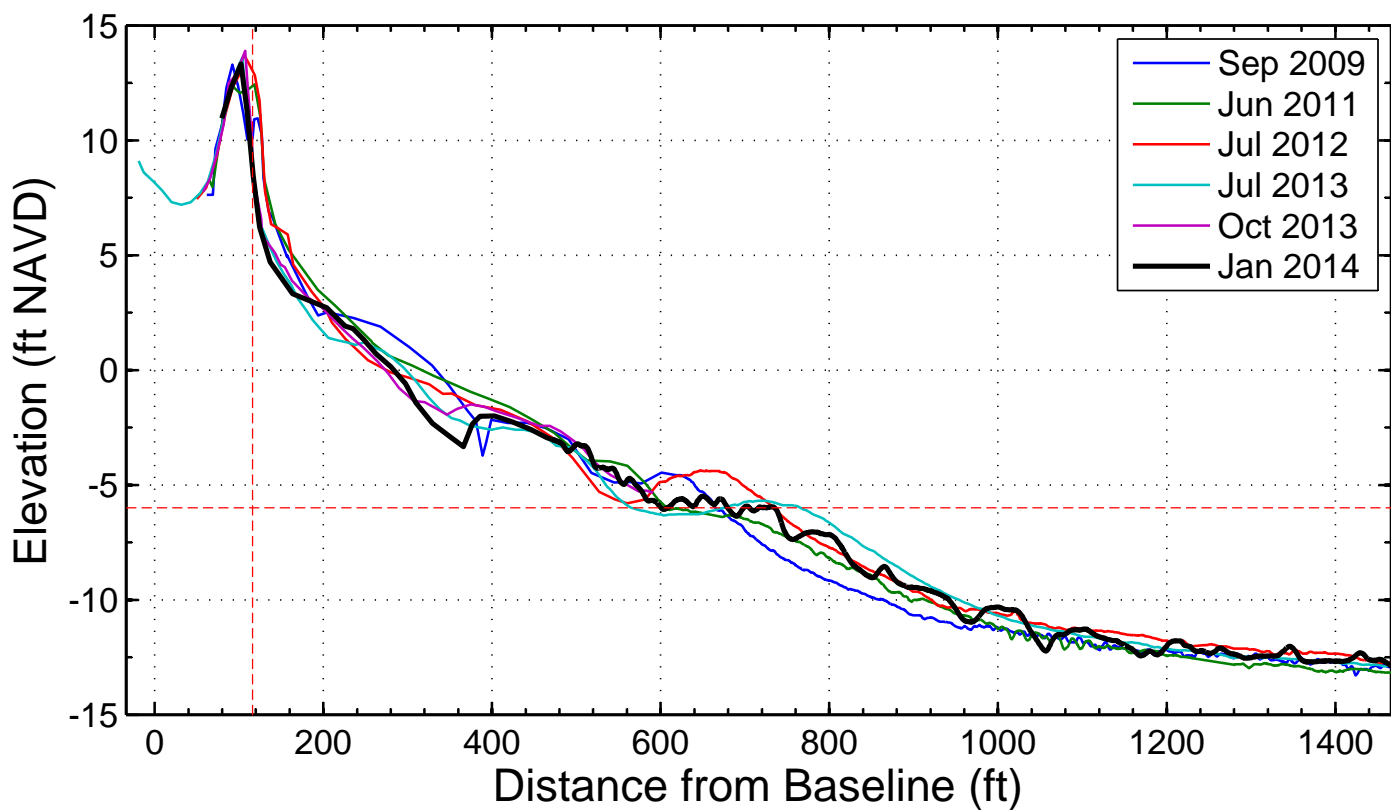
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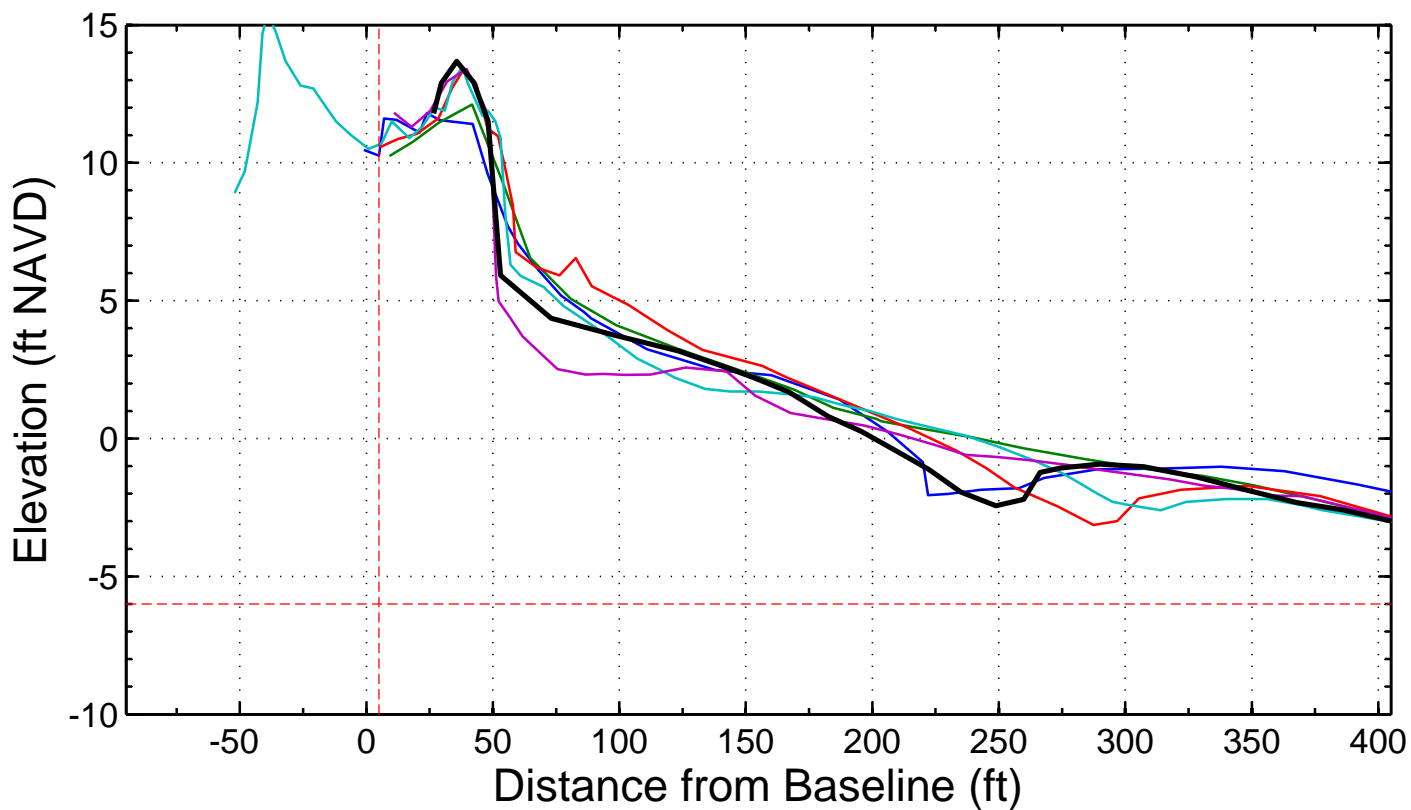
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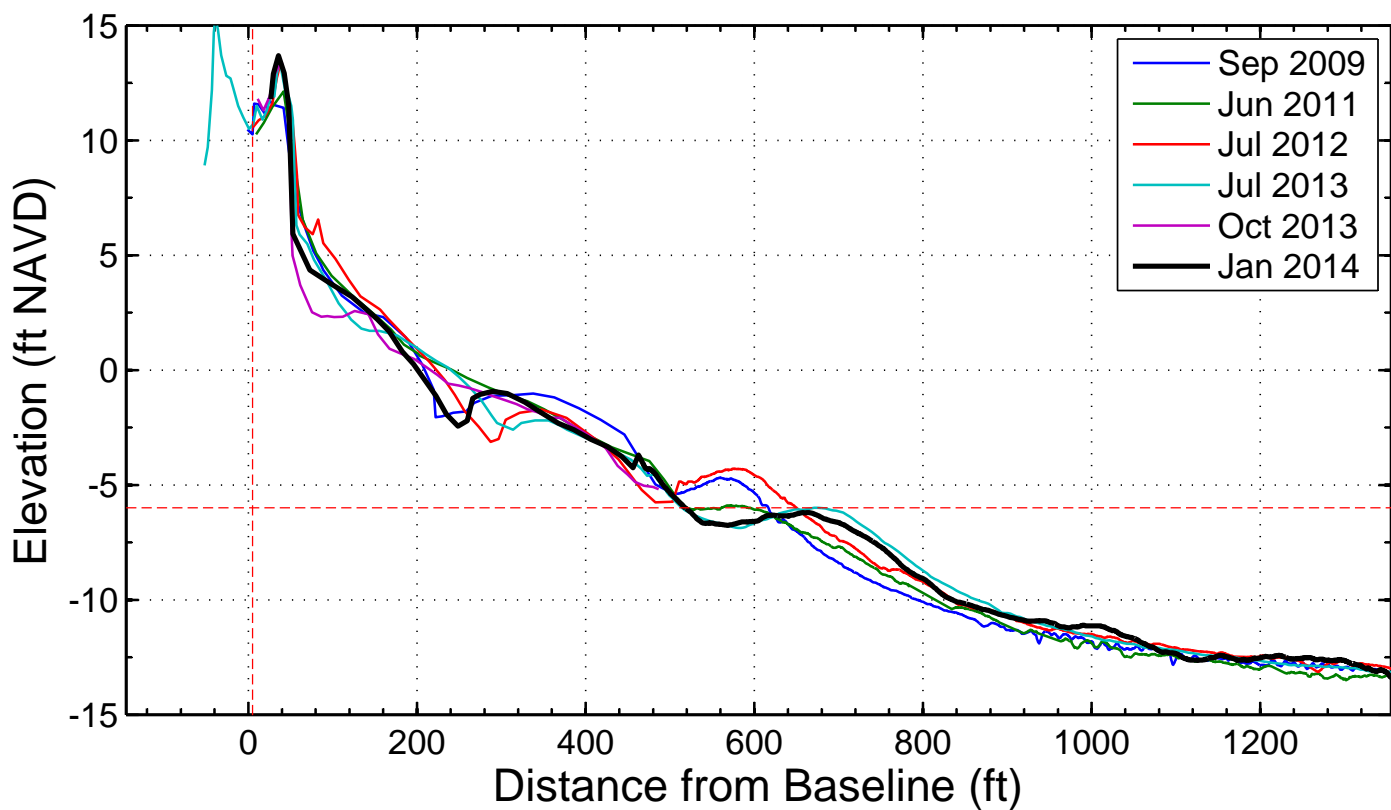
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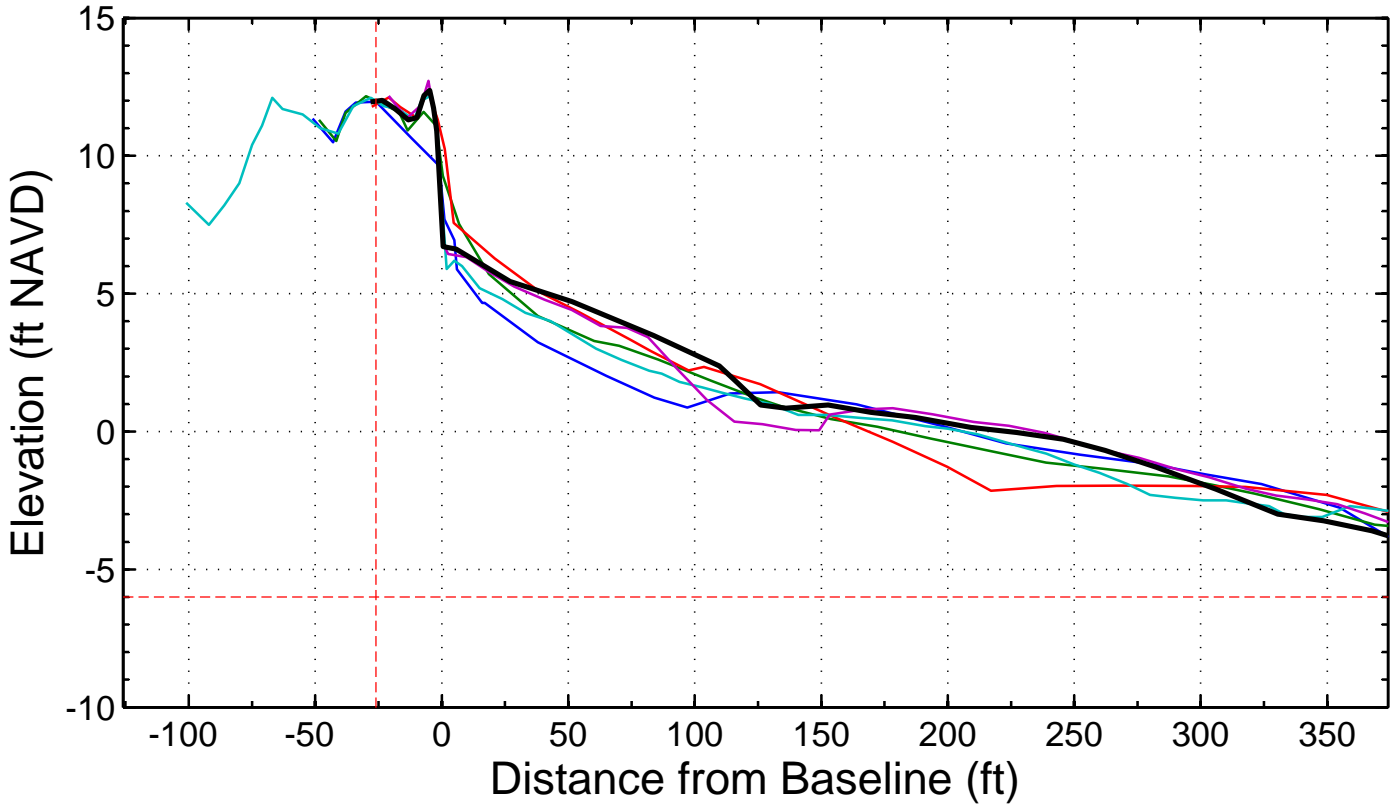
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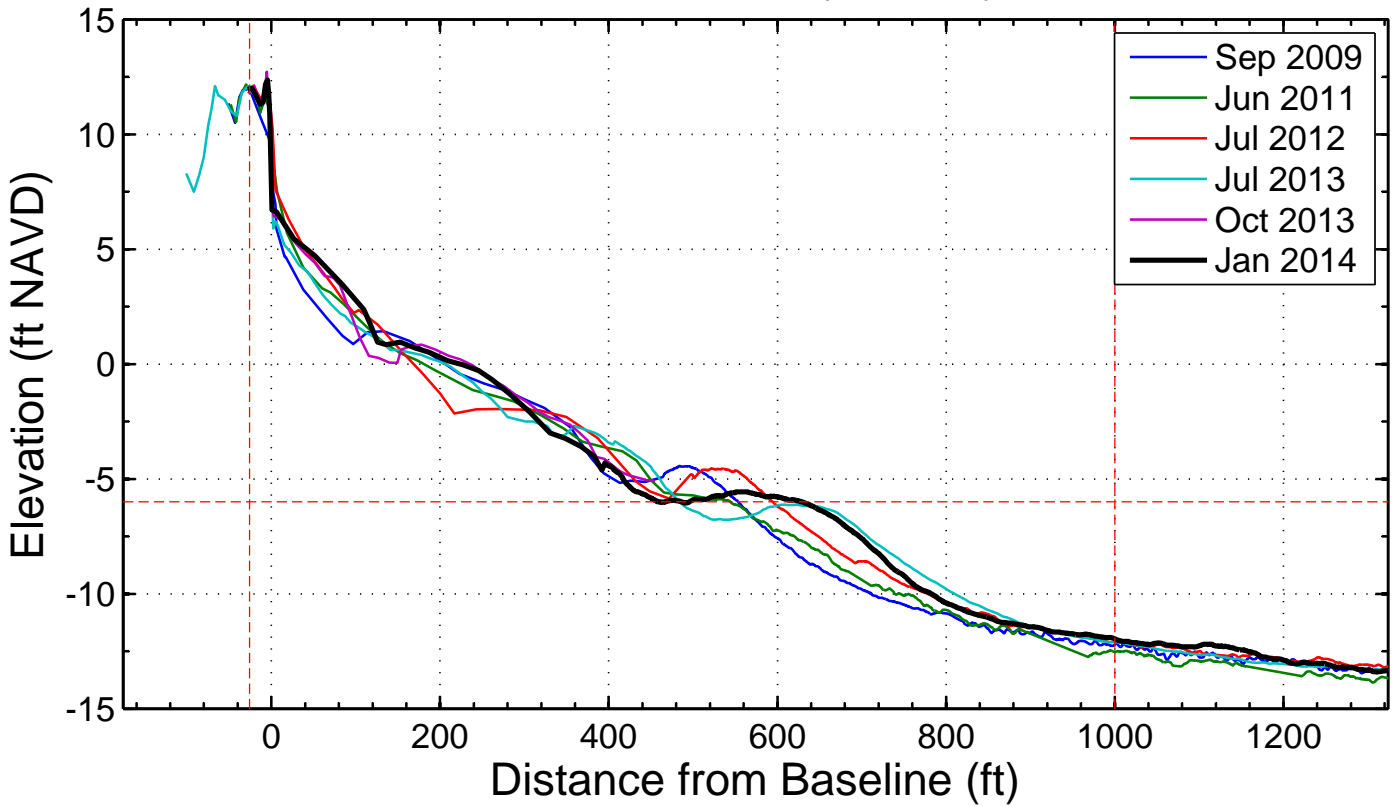
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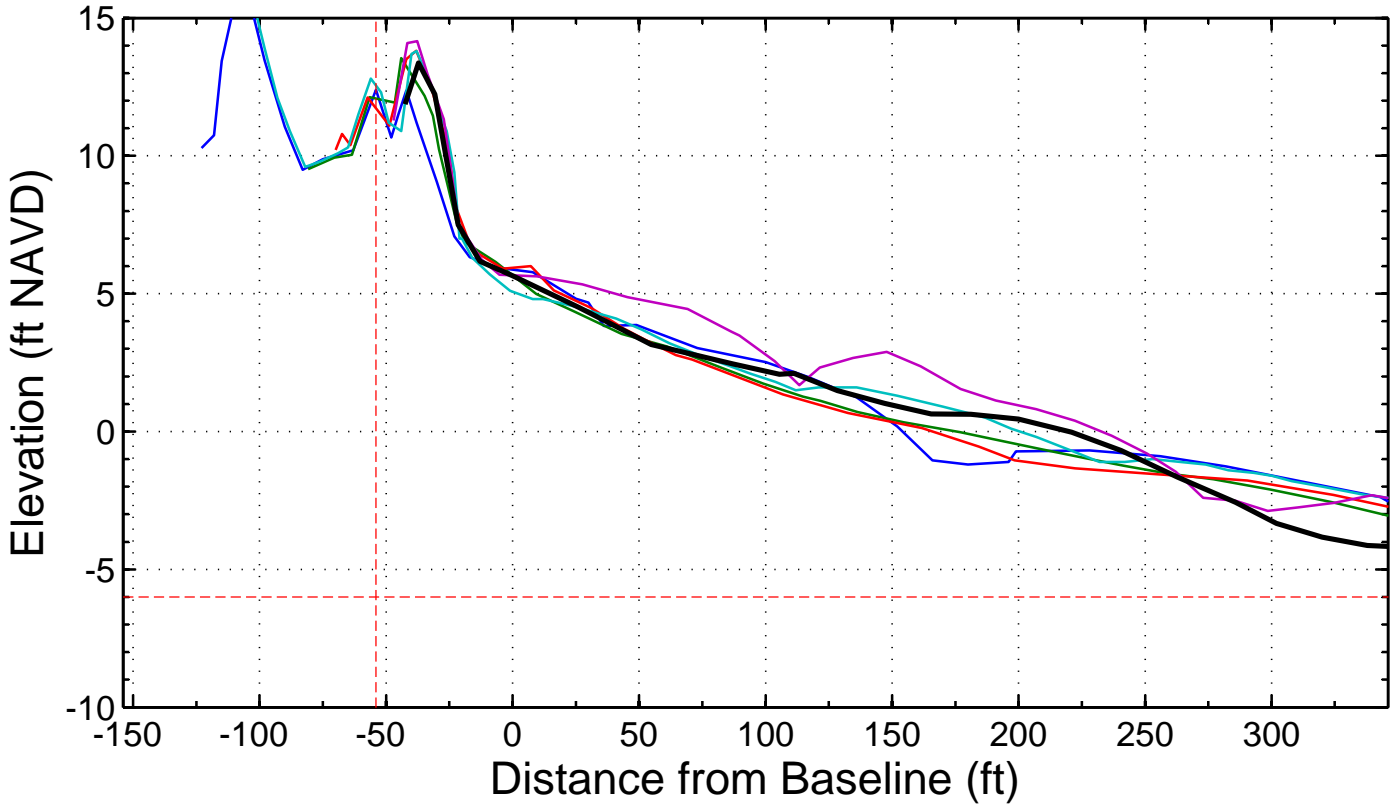
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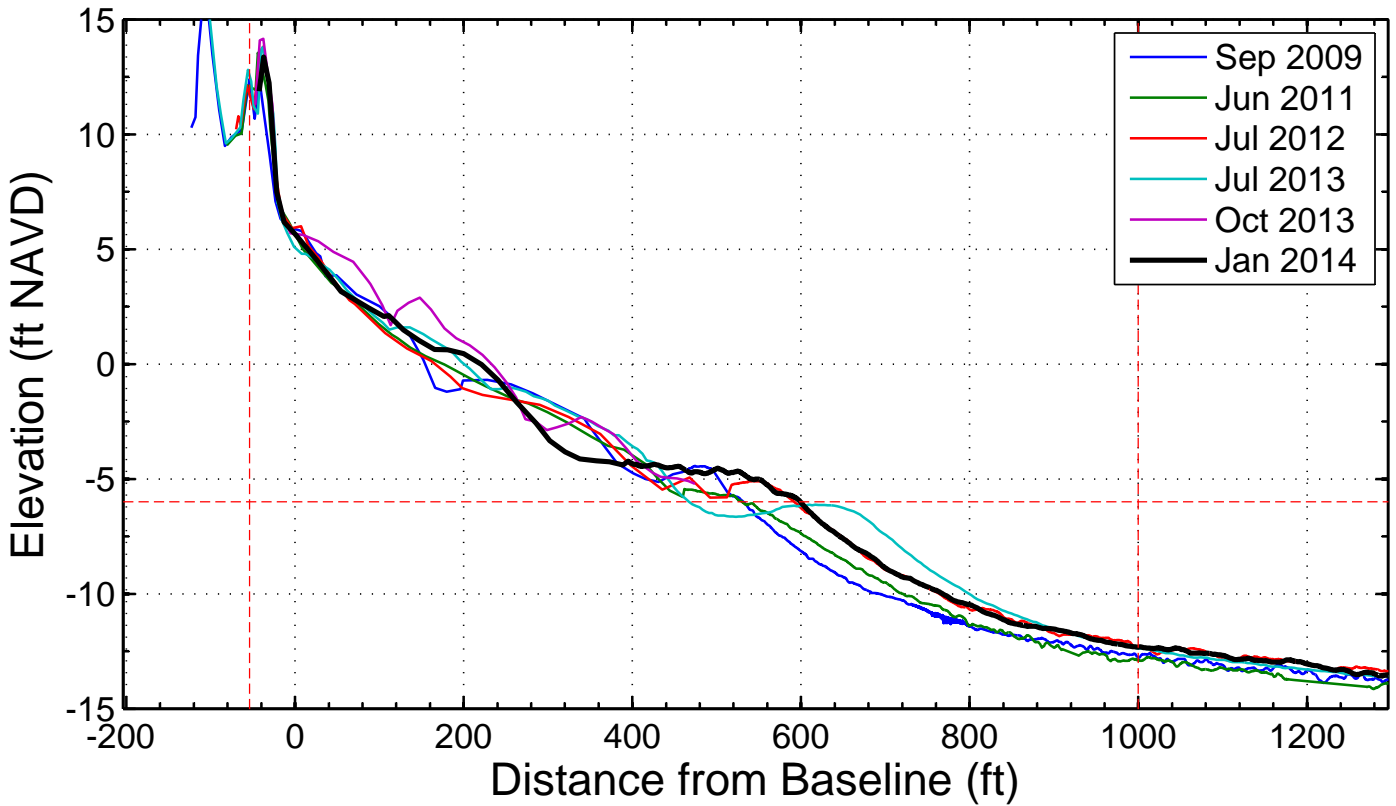
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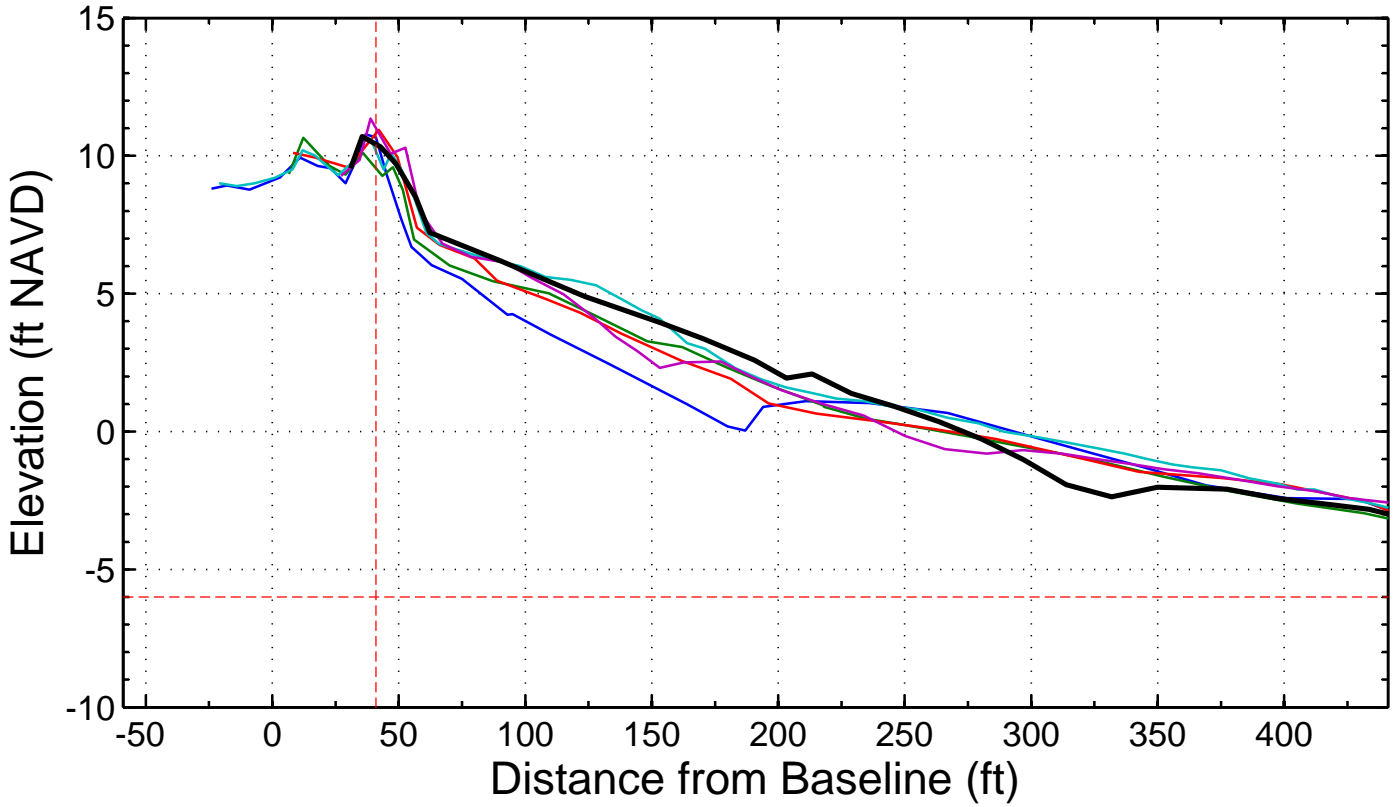
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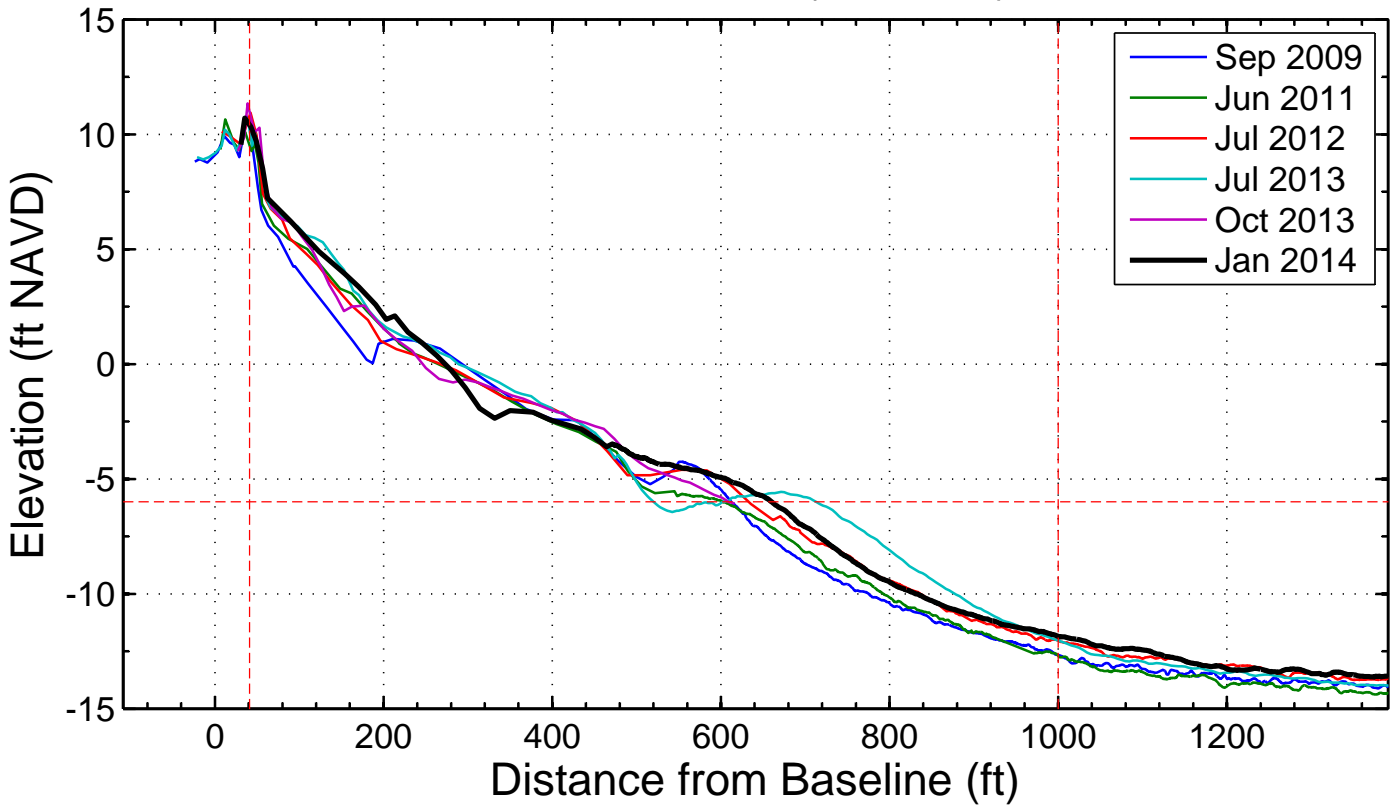
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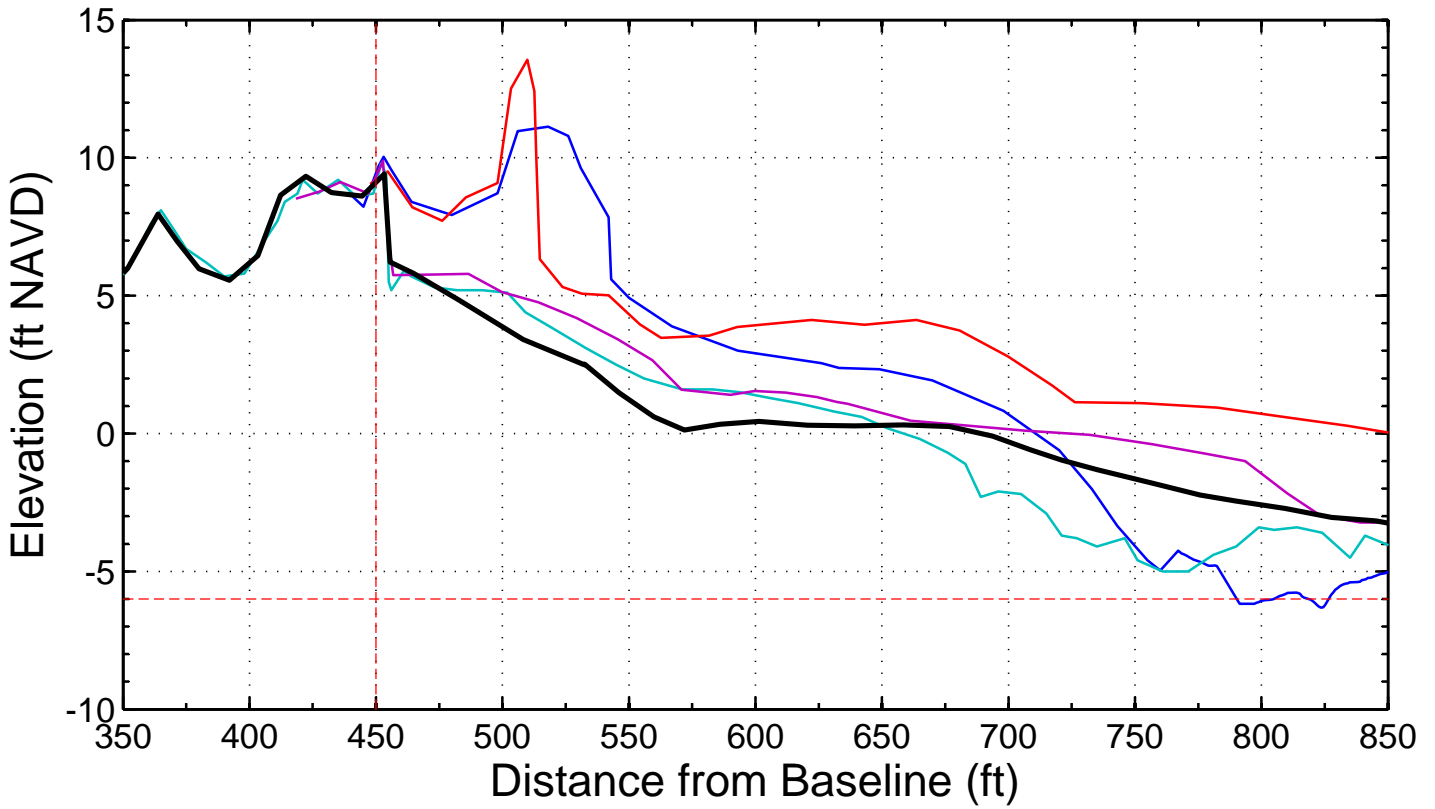
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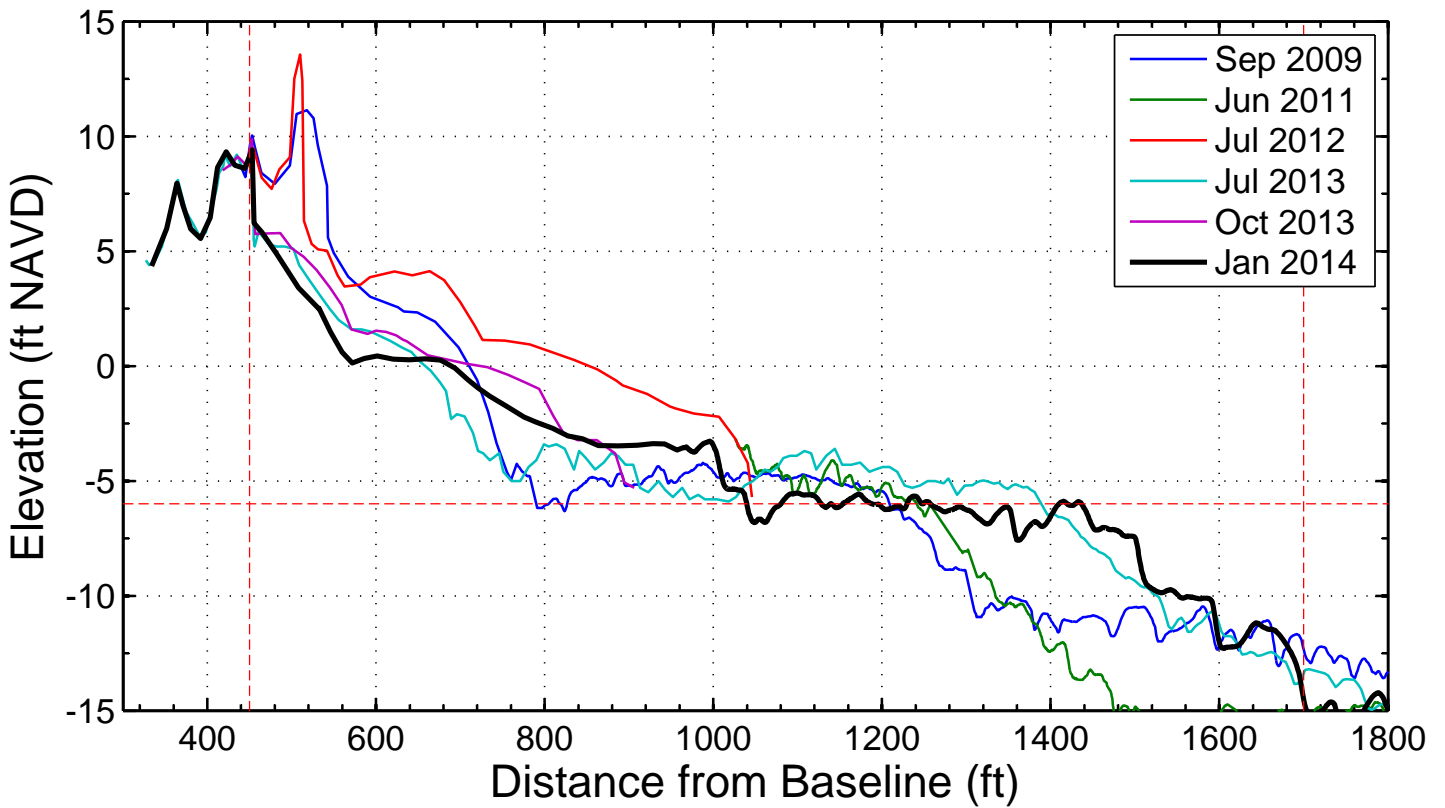
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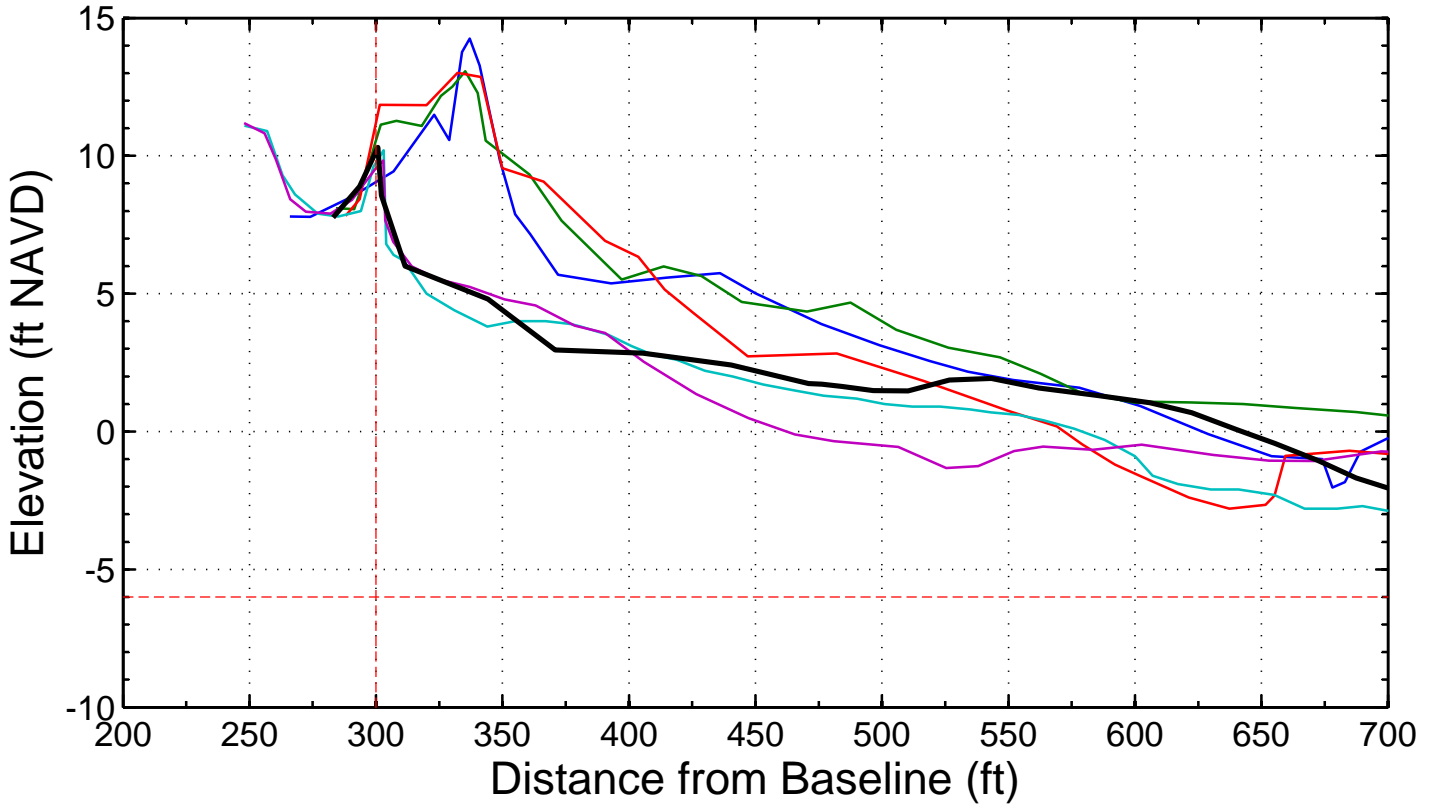
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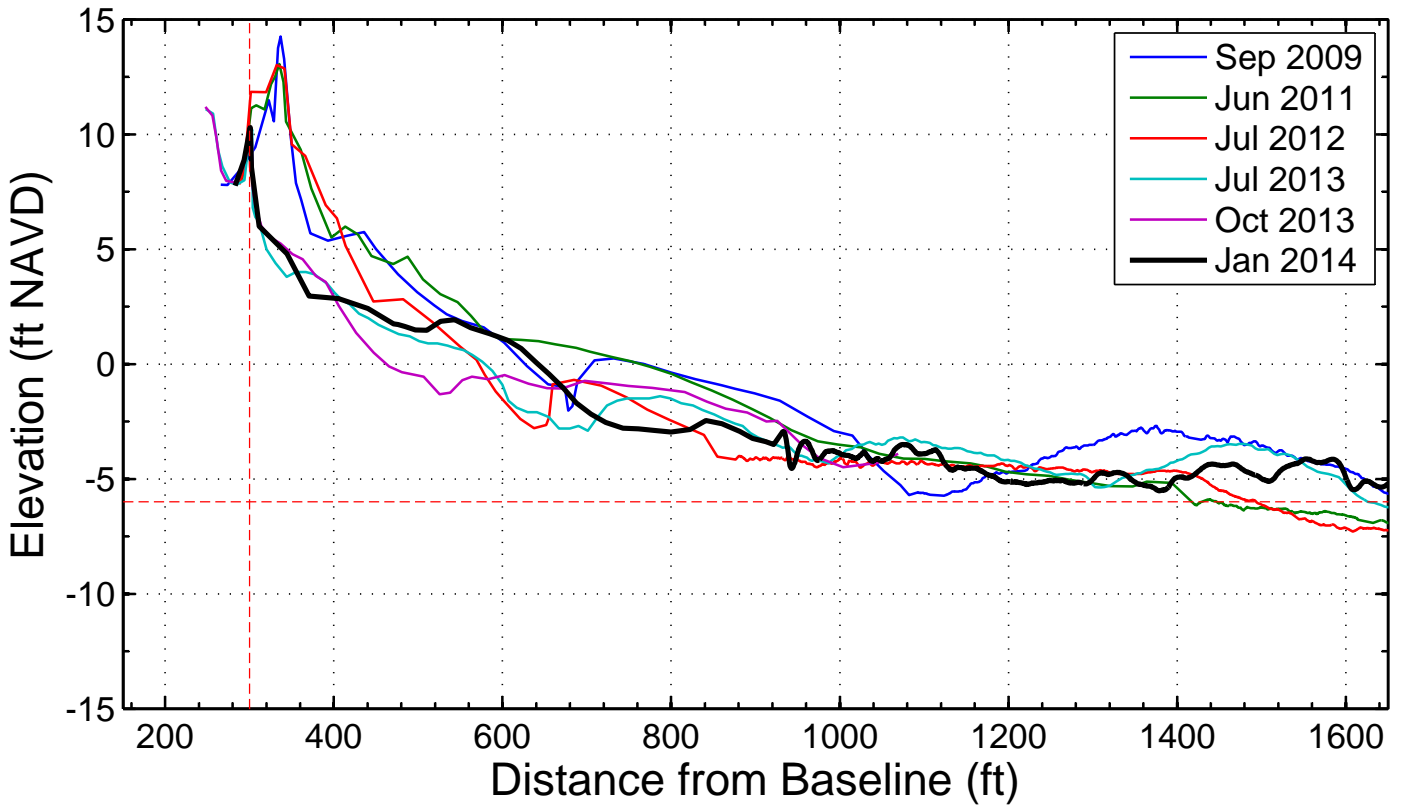
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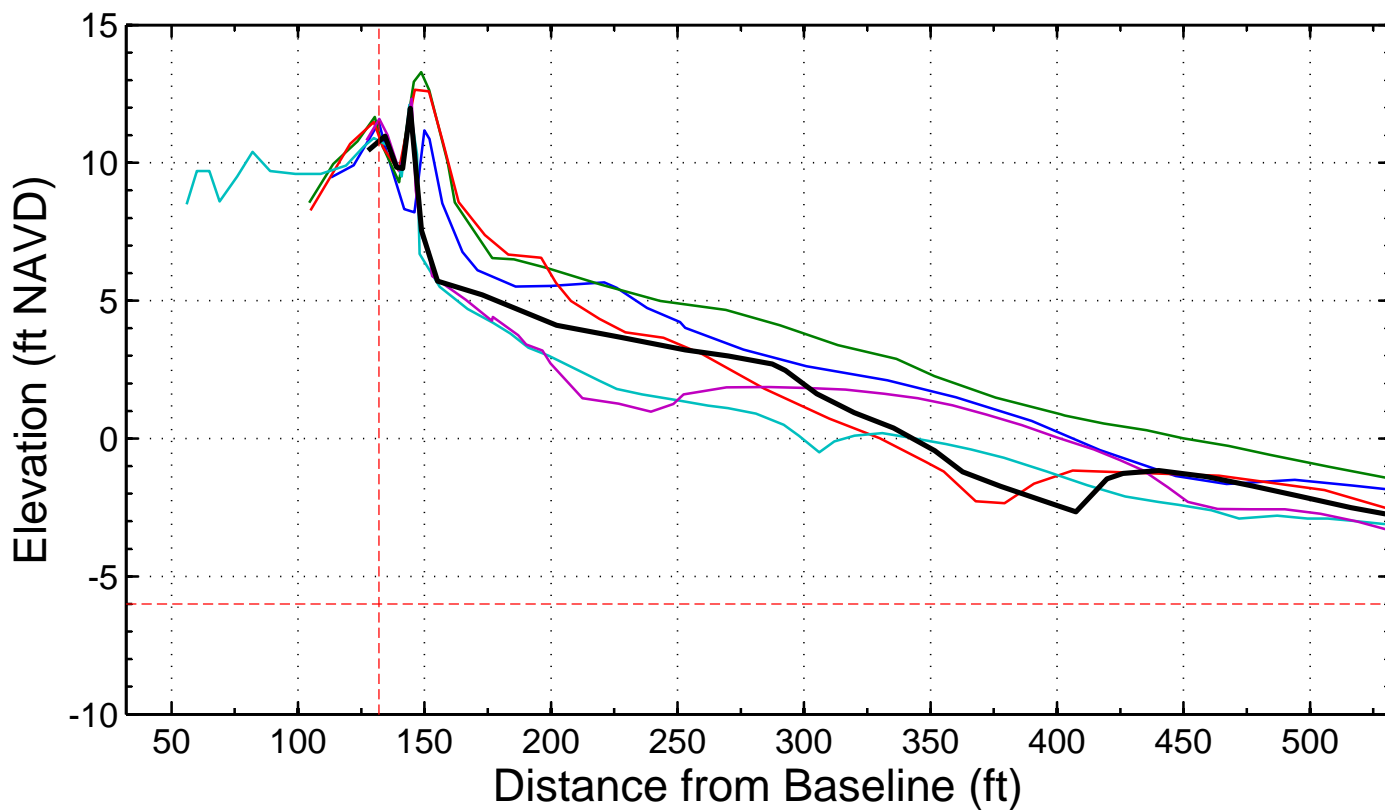
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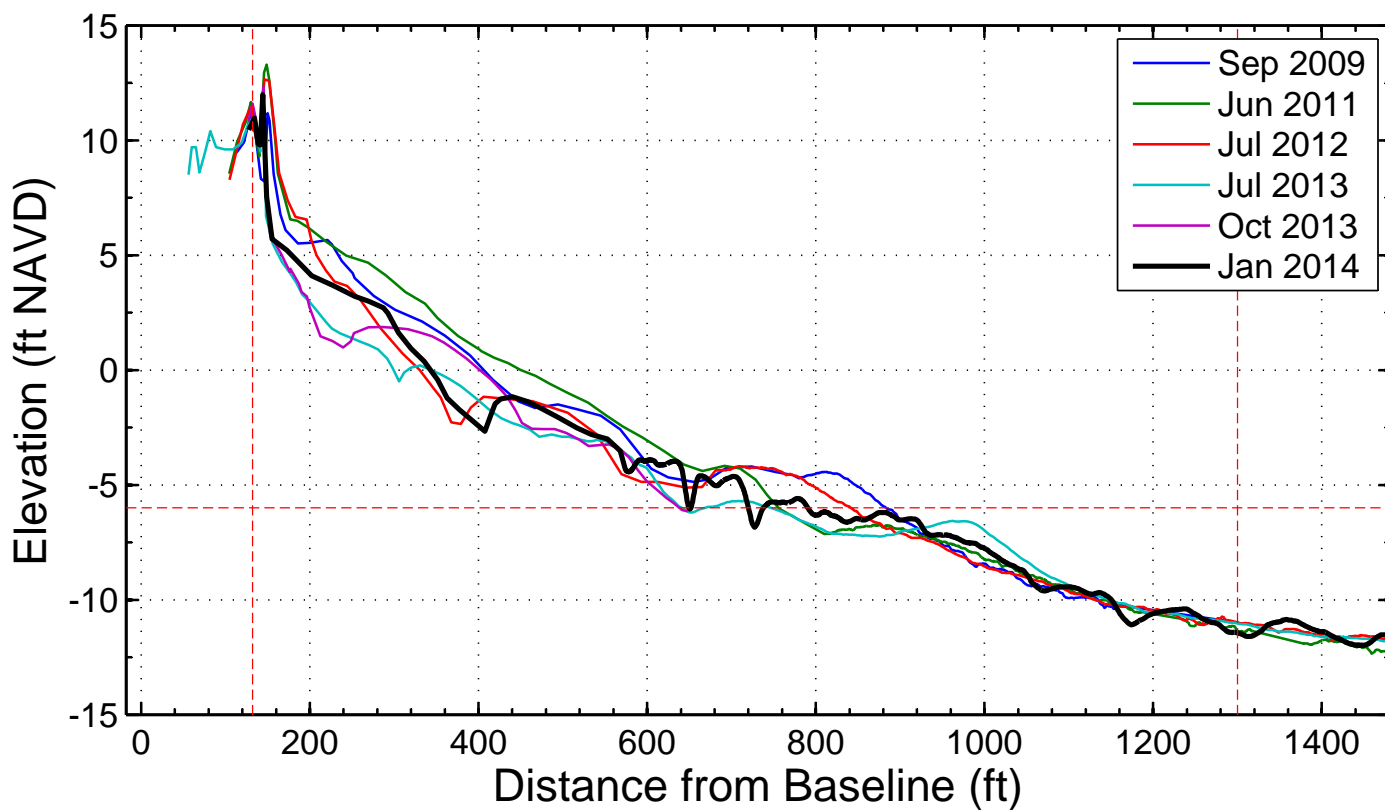
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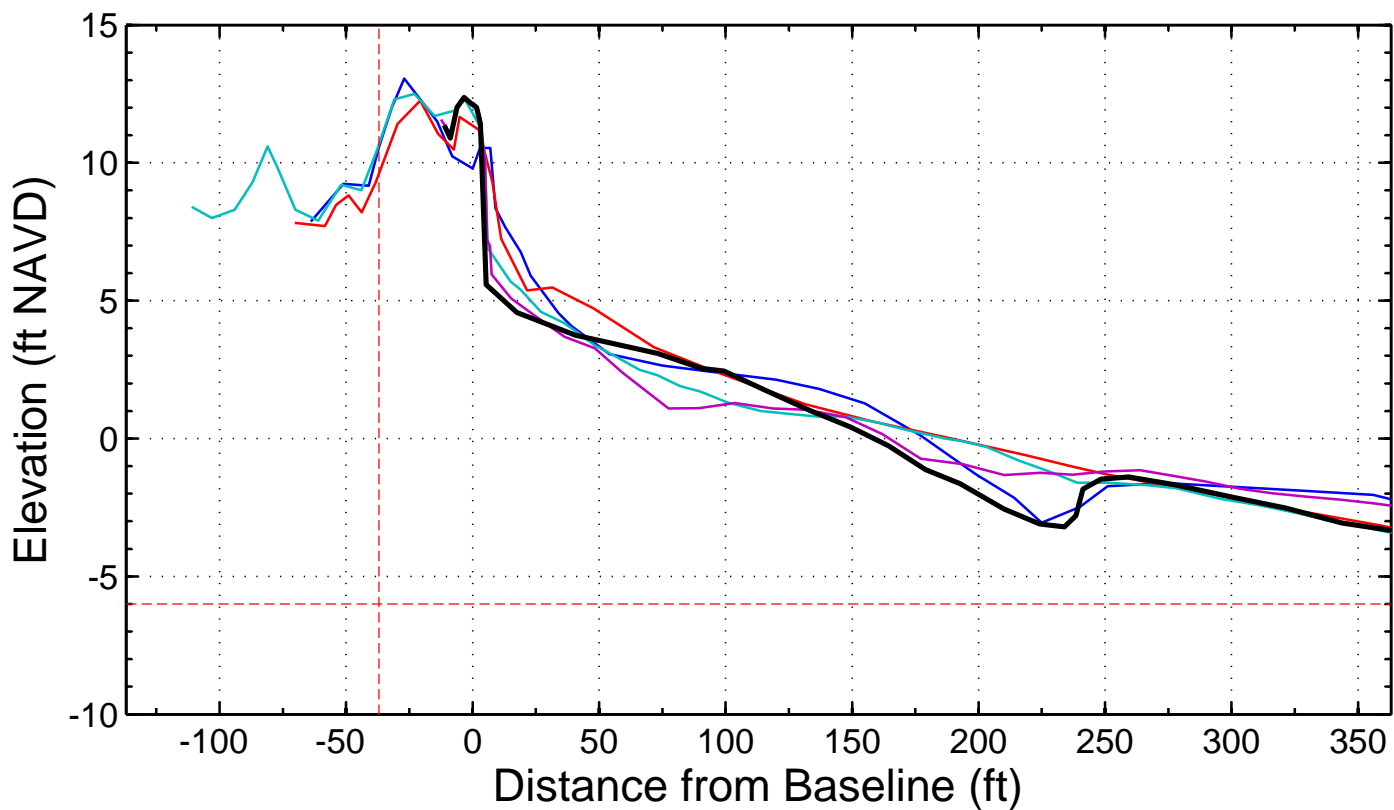
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Station: OCRM 3110a



Station: OCRM 3115a



Station: OCRM 3115a

