Appendix 4. Construction of Augering Polygons for Grand Isle

Executive Summary for Grand Isle

- This series of maps and beach profiles contain information concerning beach elevation changes, sites of possible buried oil, overburden thicknesses above a possible oiled sediment horizon, and locations of oiled sediment recorded since Hurricane Isaac. The maps are based on beach profile data collected since the summer of 2010 to post-Hurricane Isaac.

  Map #1 shows the beach profile locations.

  Map #2 defines general areas along the beach where buried residual oiled sediment may still exist and where buried oil is unlikely based on beach profile analysis. The legend has a category for oil residue sediment (mats and surface residue balls) identified following Hurricane Isaac. Mats have been found in work zones 6,10, 11, 12, 13, and 14 following Hurricane Isaac.

  Maps #3-7 are contour maps showing the depth of overburden covering areas of possible buried oil. There are three different color-coded units: yellow $\geq$100 cm, purple $\geq$ 50 and < 100 cm, and green > 0 and < 50 cm. The lack of color indicates areas where there is little likelihood for buried oil. The cross-hatched areas are foredune ridges where buried oil is highly unlikely.

  Maps #8-15 are detailed profile overburden cross sections for profiles that may have buried oil. Like the contour maps, they are color-coded showing areas having similar overburden depths.

  Beach profile overlays (1-12) show cross sections of the beach for three to four time periods covering when oil was coming ashore during the summer of 2010 (red profile), post-Tropical Storm Lee (green profile), and post-Hurricane Isaac (black profile). In some instances, a fourth profile is included (orange profile) that shows a profile after a stake reset. The profiles are surveyed from a permanent stake in the dunes or rear of the beach and transit along the same line across beach, thereby allowing comparisons to be made about how the elevation of beach changes through time.

- The contour maps show depth of overburden to the horizon where buried oil might exist, based on the profile data. These maps were constructed using profiles that were surveyed at Grand Isle when oil was coming ashore (red profile: 13 July to 19 August 2010) and two other profiles at the same site after two major erosional events (Tropical Storm Lee and Hurricane Isaac). The overburden is the vertical difference between the red profile and the post-Isaac black profile at sites along the profile where the beach was never exhumed to the red profile. The overburden at each profile where buried oil may exists, is shown in maps #8-15. These cross sections were used to construct the contour maps.

- It should be emphasized that the contour maps interpolate over a distance of 1 km, which introduces considerable uncertainty into the interpretation. Additionally, it should be noted that geomorphic features including dune systems and washovers, which may not be evident in the profiles, are incorporated into the contour maps.

- There are 12 beach profile stations along this barrier and at various times some of the stations had to be re-established due to storms, vandalism, and other circumstances. Care was taken to put the profiles in the exact same position, but errors, both vertically and horizontally were introduced. For our analysis and interpretations we have only used data that have been QA/QC'd and found to be acceptable.

- Of the 12 profiles on Grand Isle, it was determined that 8 profiles may contain buried oil that came ashore during the summer of 2010. Several mats were found in the lower intertidal zone and shallow subtidal zone (exposed during minus tides) following Hurricane Isaac.

- The stations that exhibit the greatest extent of overburden coincide with areas of dune construction located at the landwardmost portion of the profile.

- In addition to the areas documented on the contour maps, there may be buried oil, there are supratidal areas along the barrier that may also contain <u>secondary</u> buried oil.

- There are high concentrations of angular SRB's along the recurved spit at the State Park that may indicate a possible mat in the nearshore.

Grand Isle | Jefferson Parish, Division 1

Beach Profile Locations

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Profile Station

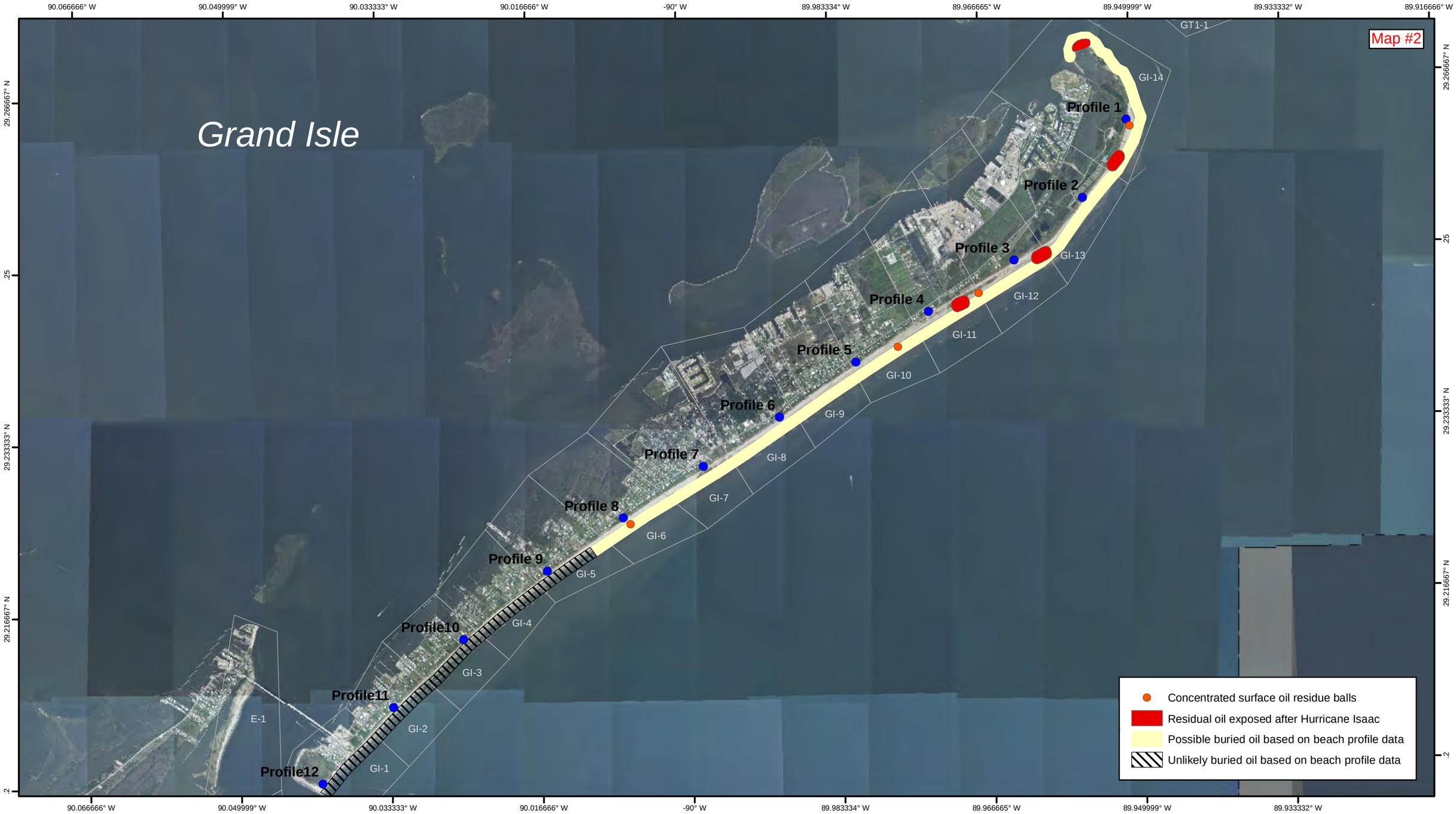
Operational Zone

0 400 800 1,600 Meters

0 1,500 3,000 6,000 Feet

N

Created on: December 9, 2012



Grand Isle | Jefferson Parish, Division 1

Possible and Unlikely Oiling Locations

Imagery: BP MC252 Incident, Fall 2012 - Digitial Mapping Camera image acquisition, Aero-Metric, Inc.

Profile Station

Operational Zone

0 600 1,200 2,400 Meters

0 1,950 3,900 7,800 Feet

N

Created on: 9 December 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 1

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 29 November 2012

Map #4

Grand Isle

Ops Zone14

Ops Zone13

Ops Zone12

LAJF01-016

Profile 2

Grand Isle | Jefferson Parish, Division 1 | Profile 2

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

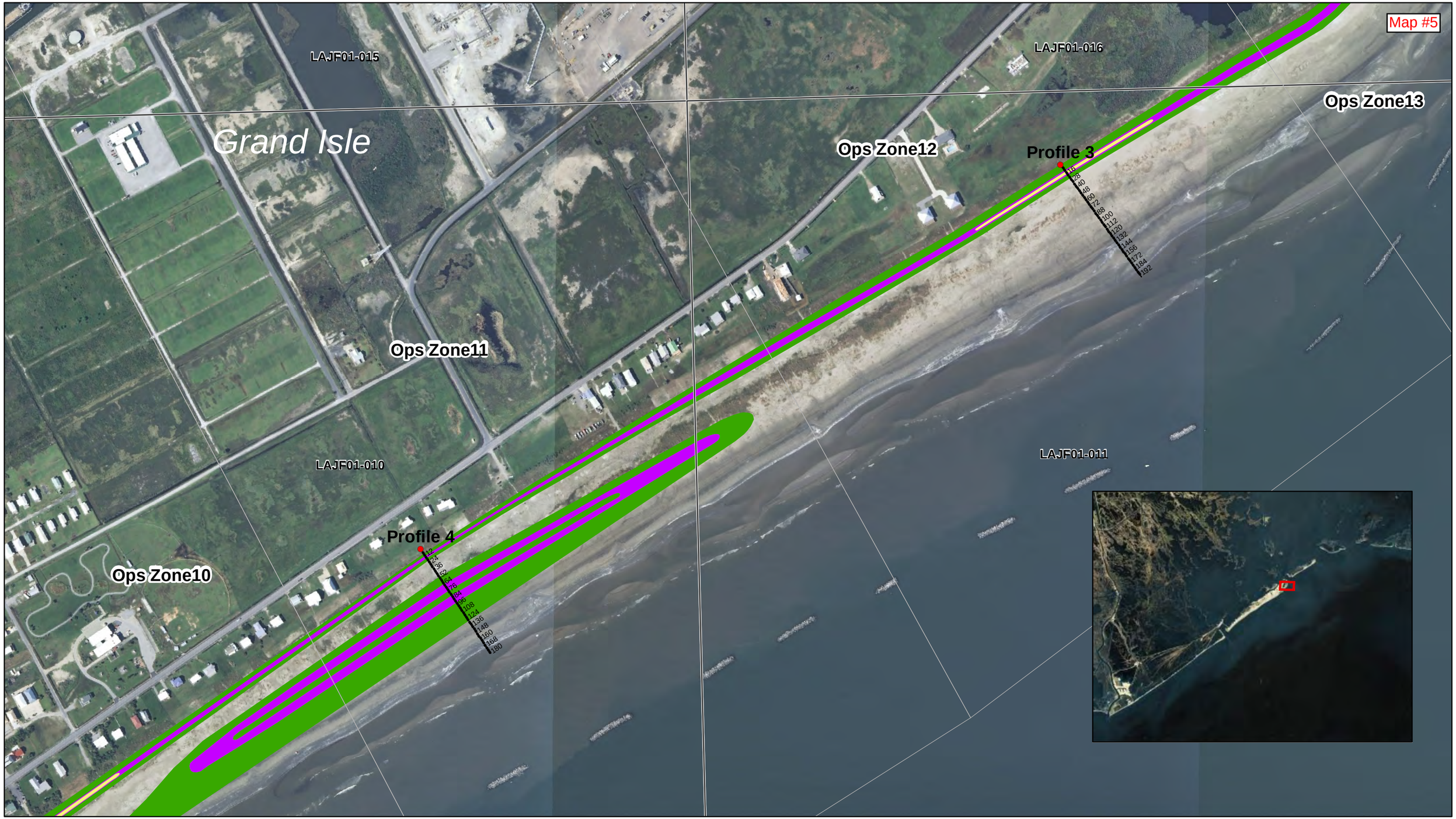
- ≥100 cm
- 50-99 cm
- 0-49 cm
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 29 November 2012



Grand Isle | Jefferson Parish, Division 1 | Profiles 3-4

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Contours

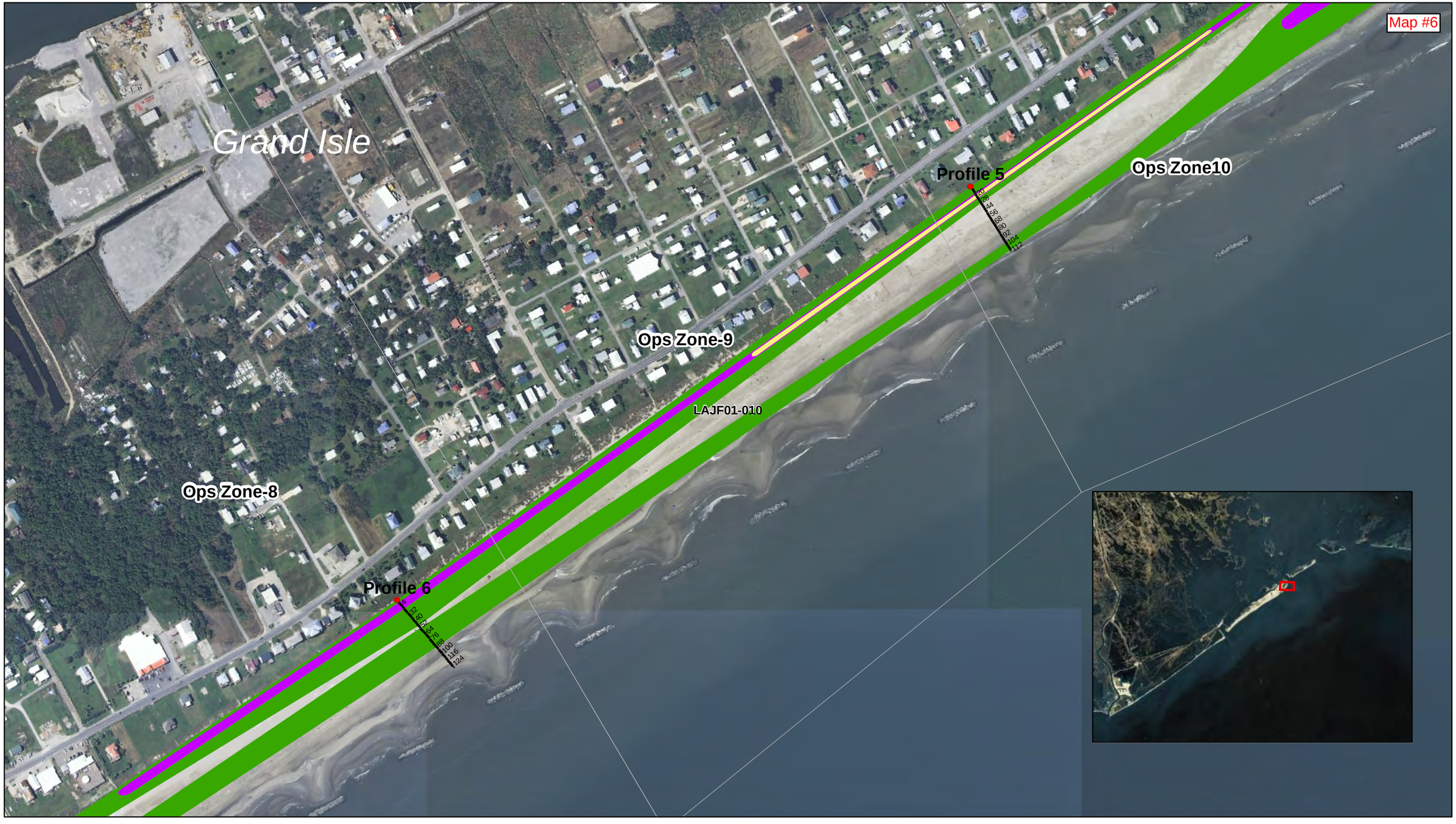
- 100 cm
- >50 cm
- <50 cm
- NOO
- Profile Station
- Profile Scale

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 30 November 2012



Grand Isle | Jefferson Parish, Division 1 | Profiles 5-6

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Contours

- 100 cm
- >50 cm
- <50 cm
- NOO
- Profile Station
- Profile Scale

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 30 November 2012

Grand Isle | Jefferson Parish, Division 1 | Profiles 7-8

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Contours

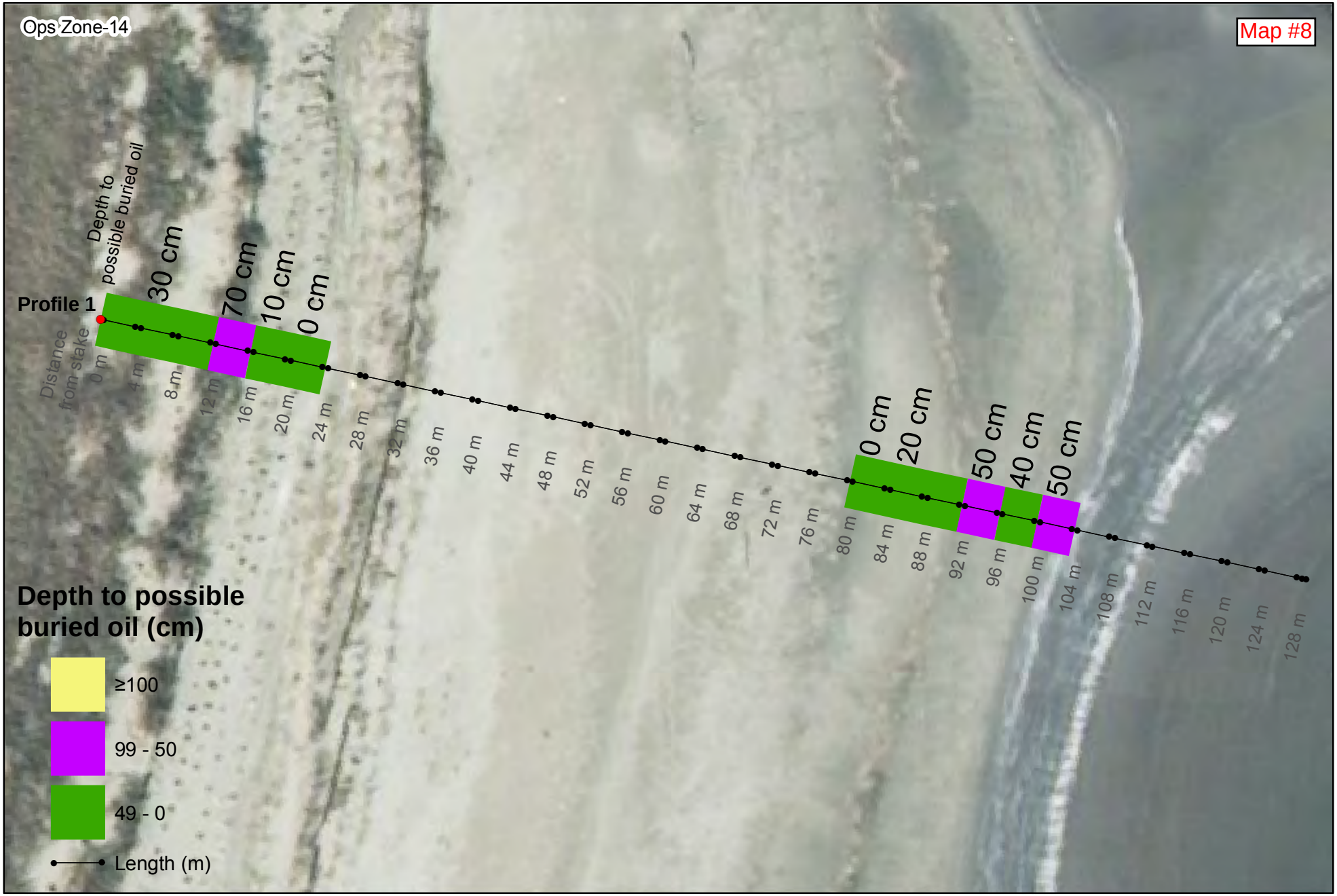
- 100 cm
- >50 cm
- <50 cm
- NOO
- Profile Station
- Profile Scale

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 30 November 2012



Grand Isle | Jefferson Parish, Division 1 | Profile 1

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 4 8 16 Meters

0 15 30 60 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 2

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 5 10 20 Meters

0 20 40 80 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 3

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 5 10 20 Meters

0 20 40 80 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 4

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 5 10 20 Meters

0 25 50 100 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 5

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 5 10 20 Meters

0 20 40 80 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 6

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 5 10 20 Meters

0 20 40 80 Feet

N

Created on: December 9, 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 7

Overburden Depth

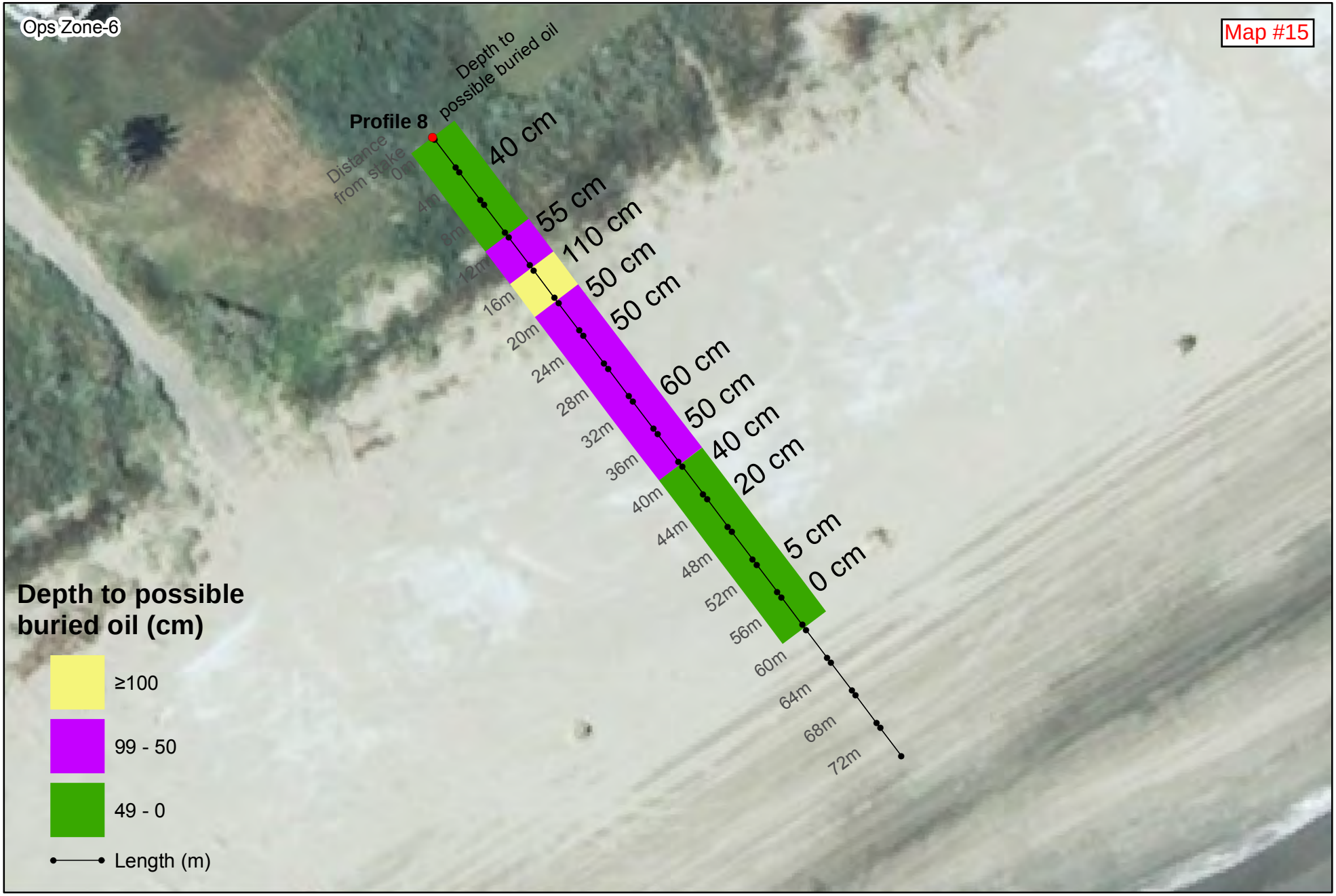
Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

0 10 20 40 Meters

0 30 60 120 Feet

N

Created on: December 9, 2012



Grand Isle | Jefferson Parish, Division 1 | Profile 8

Overburden Depth

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metic, Inc.

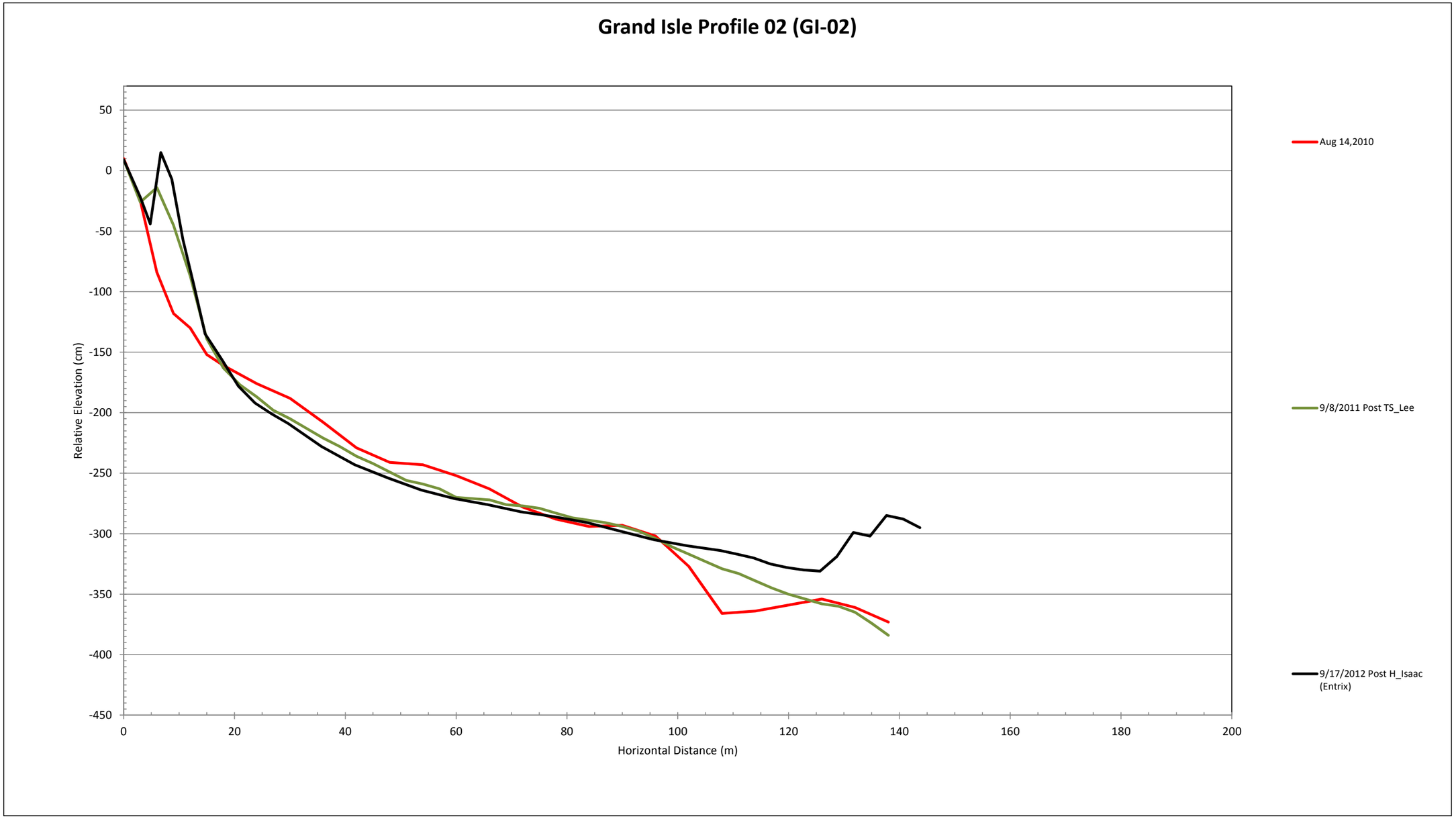
0 4 8 16 Meters

0 15 30 60 Feet

N

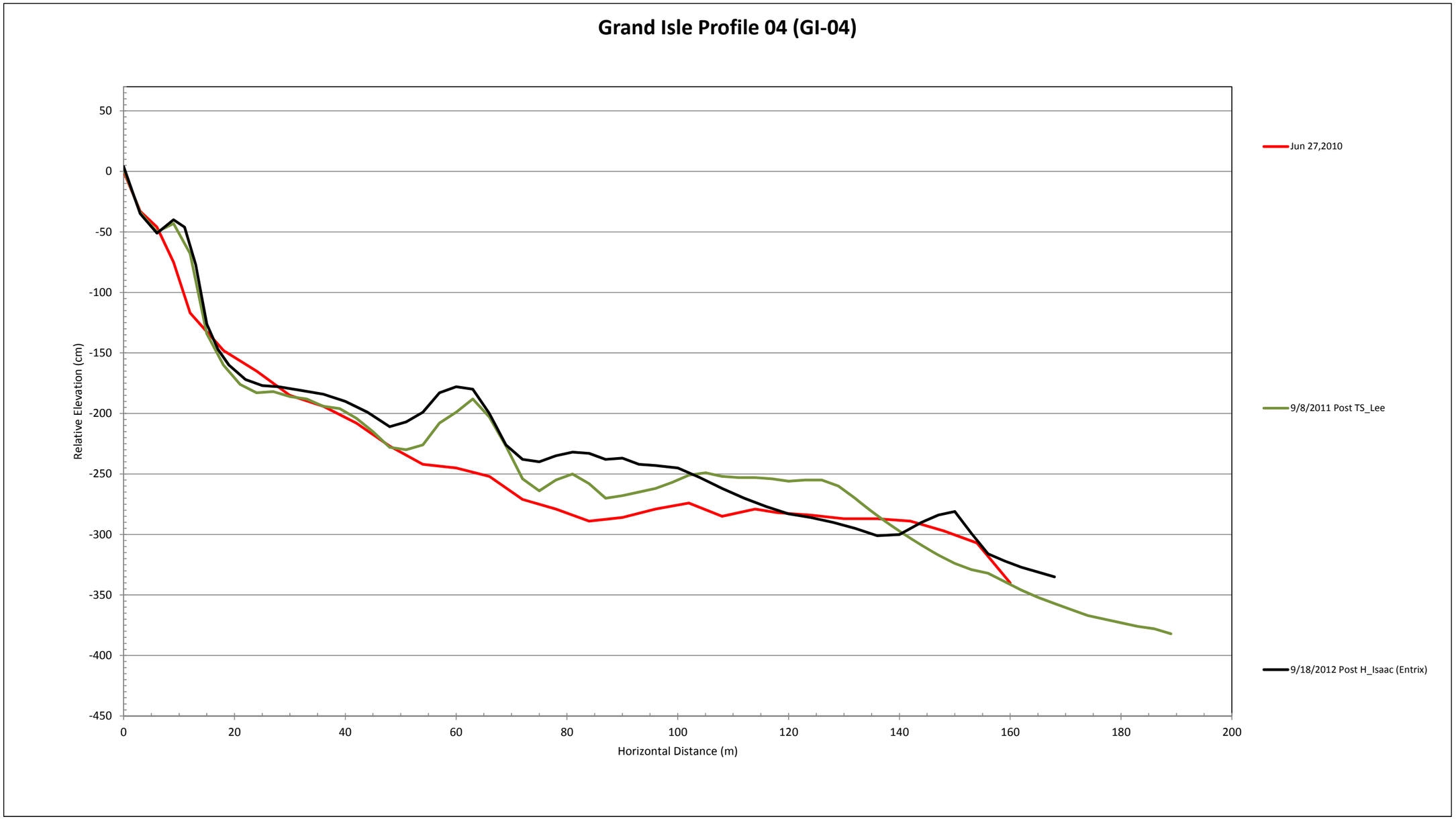
Created on: December 9, 2012

Grand Isle Profile Station #1: Buried oil may still exist in dunal area and seaward most portion of the beach. Tropical Storm Lee and Hurricane Isaac caused significant erosion and retreat of the beach, but it still did not extend to the level of the summer 2010 outer beach in the intertidal zone.

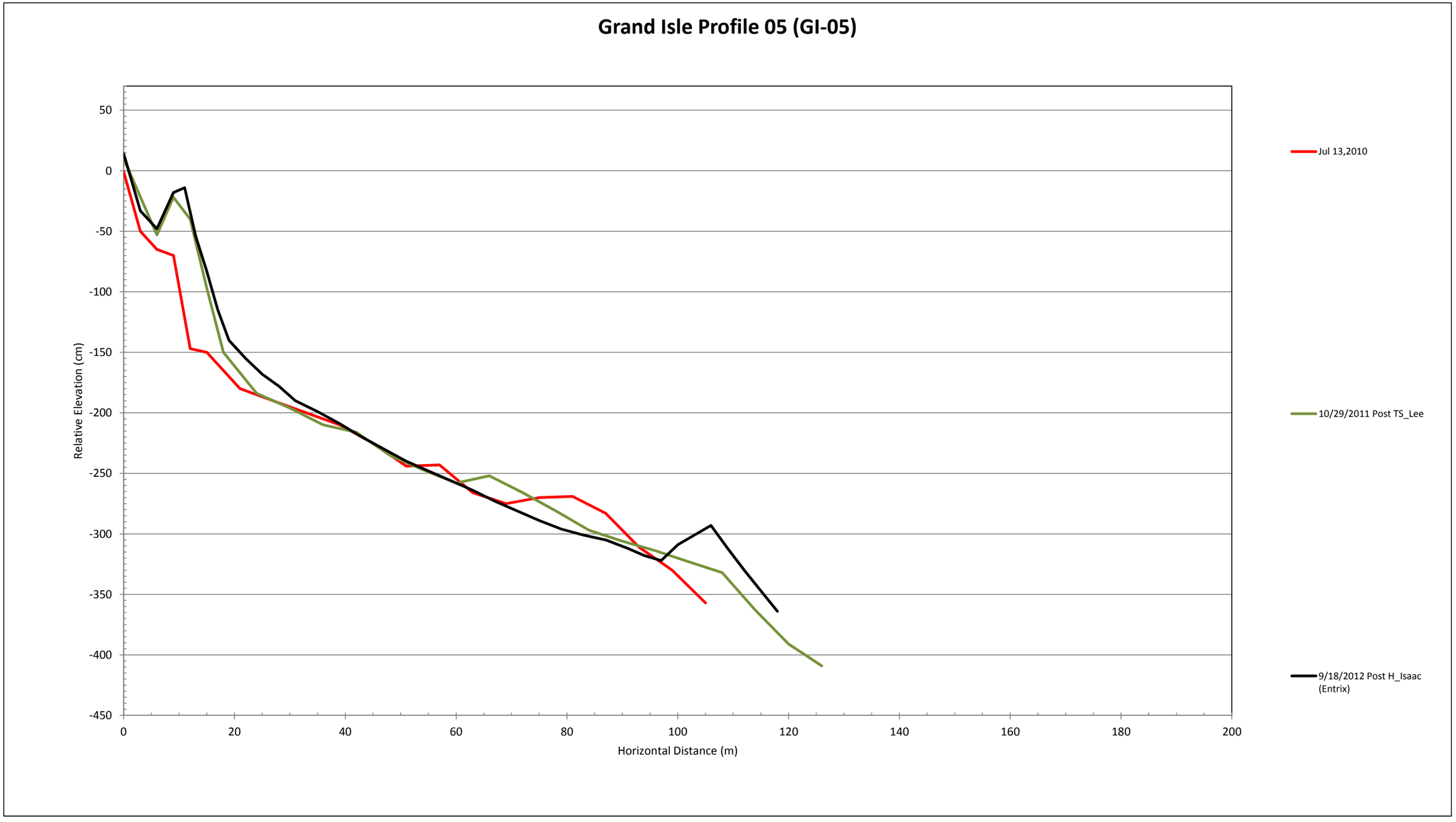


Grand Isle Profile Station #2: This profile has not changed appreciably thourgh time excepting some wind deflation of the upper supratidal beach. Buried oil may still exist in the seaward portion of the beach and in the dunal region. Hurricane Isaac caused little change to the back beach.

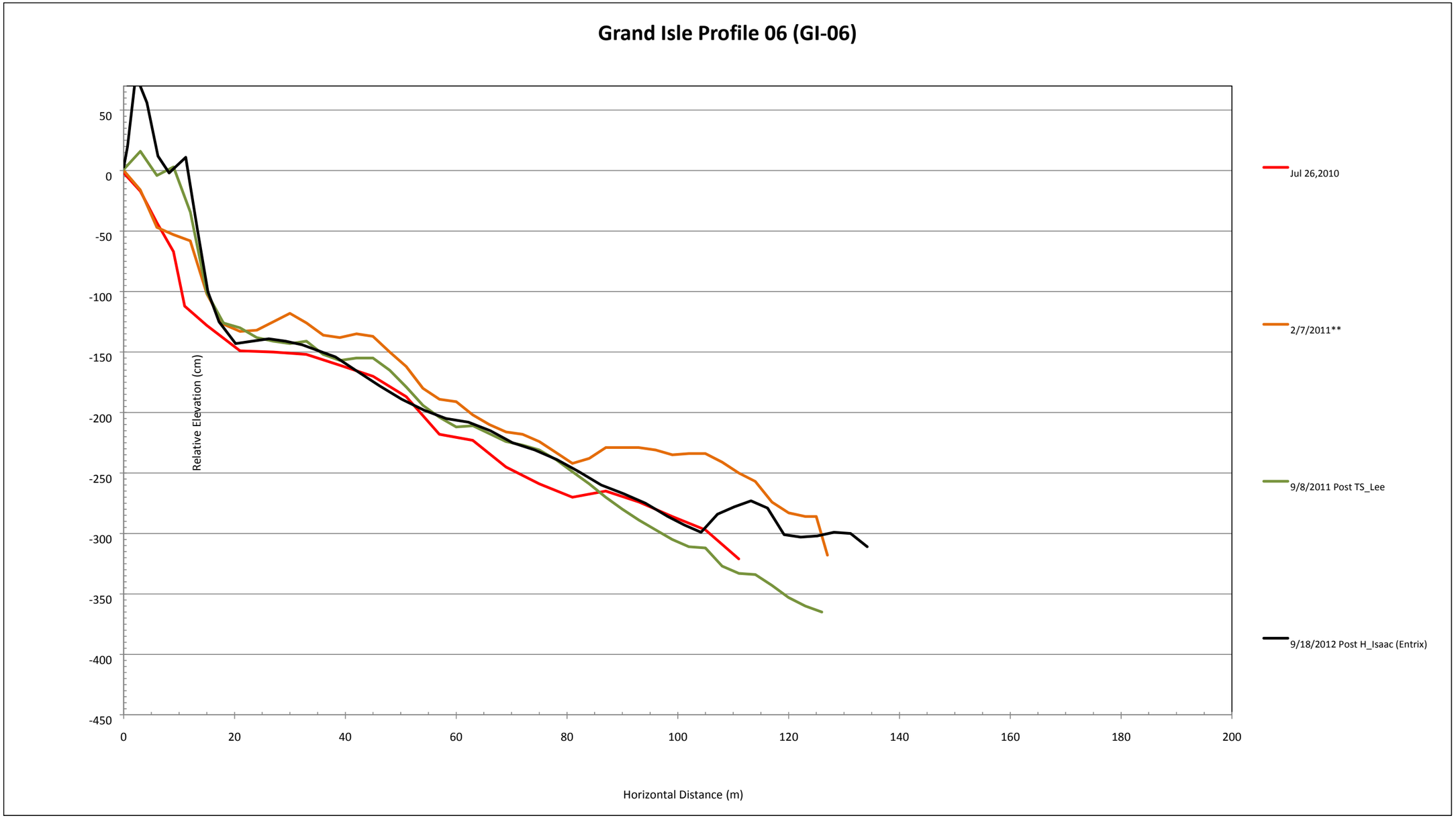
Grand Isle Profile Station #3: Tropical Storm Lee and Hurricane Isaac eroded the lower beach will below the 2010 oiling horizon. Tropical storm Lee had little effect on the upper supratidal beach, whereas Hurricane Isaac deposited sand in the mid-supratidal zone. Buried oil may exist in the dunal area, because 2010 oiling horizon had not been exhumed. However, because it is a dunal area located 160m from the shore, buried oil is unlikely.



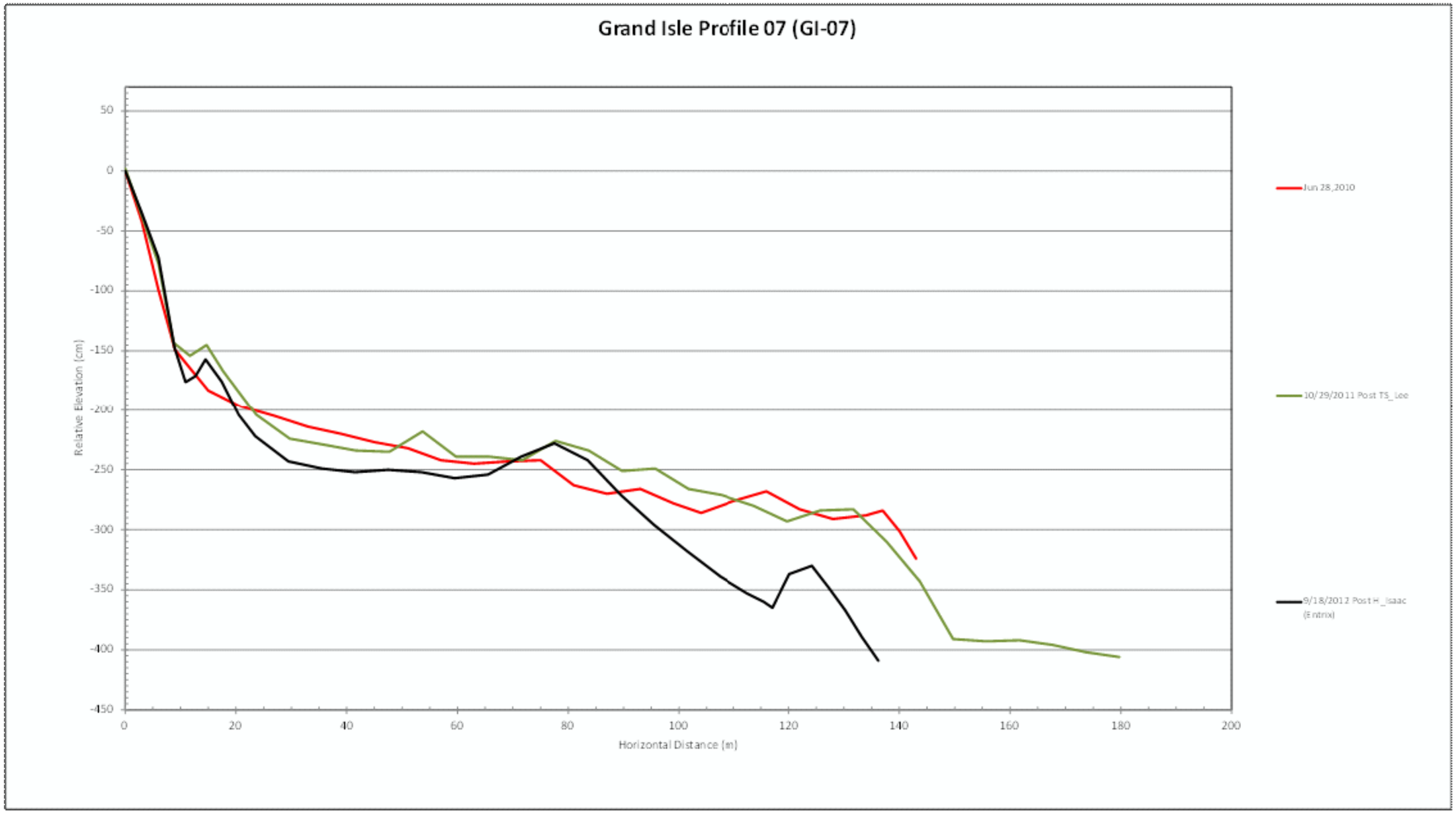
Grand Isle Profile Station #4: Long-term deposition in the mid-beach area indicates that buried oil may still exist along 80m swath of the beach. Buried oil in the dunal zone is remote. The 2010 oiling horizon (red line) does not extend far enough seaward to definitively determine if buried oil exists in the lower intertidal and subtidal zones.



Grand Isle Profile Station #5: Buried oil may still exist in the upper and lower portions of beach, but overall previous storms including Hurricane Isaac have reworked the sediment along most of this profile down to summer 2010 oiling elevations.

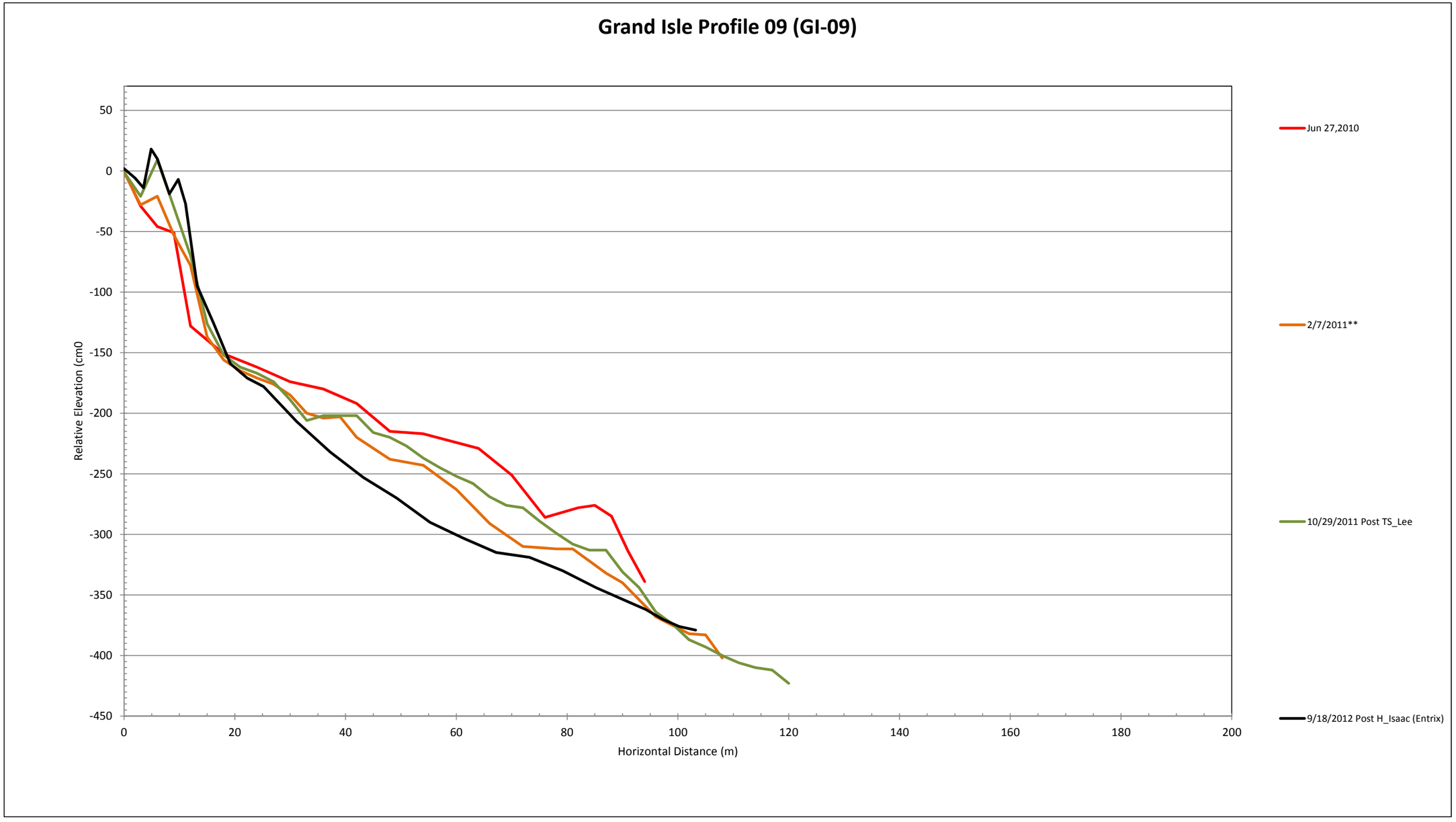


Grand Isle Profile Station #6: Buried oil may still exist along much of the upper and middle sections of the beach. Hurricane Isaac eroded below the summer 2010 oiling elevations in the lower portion of the beach. ** Survey stake reset.

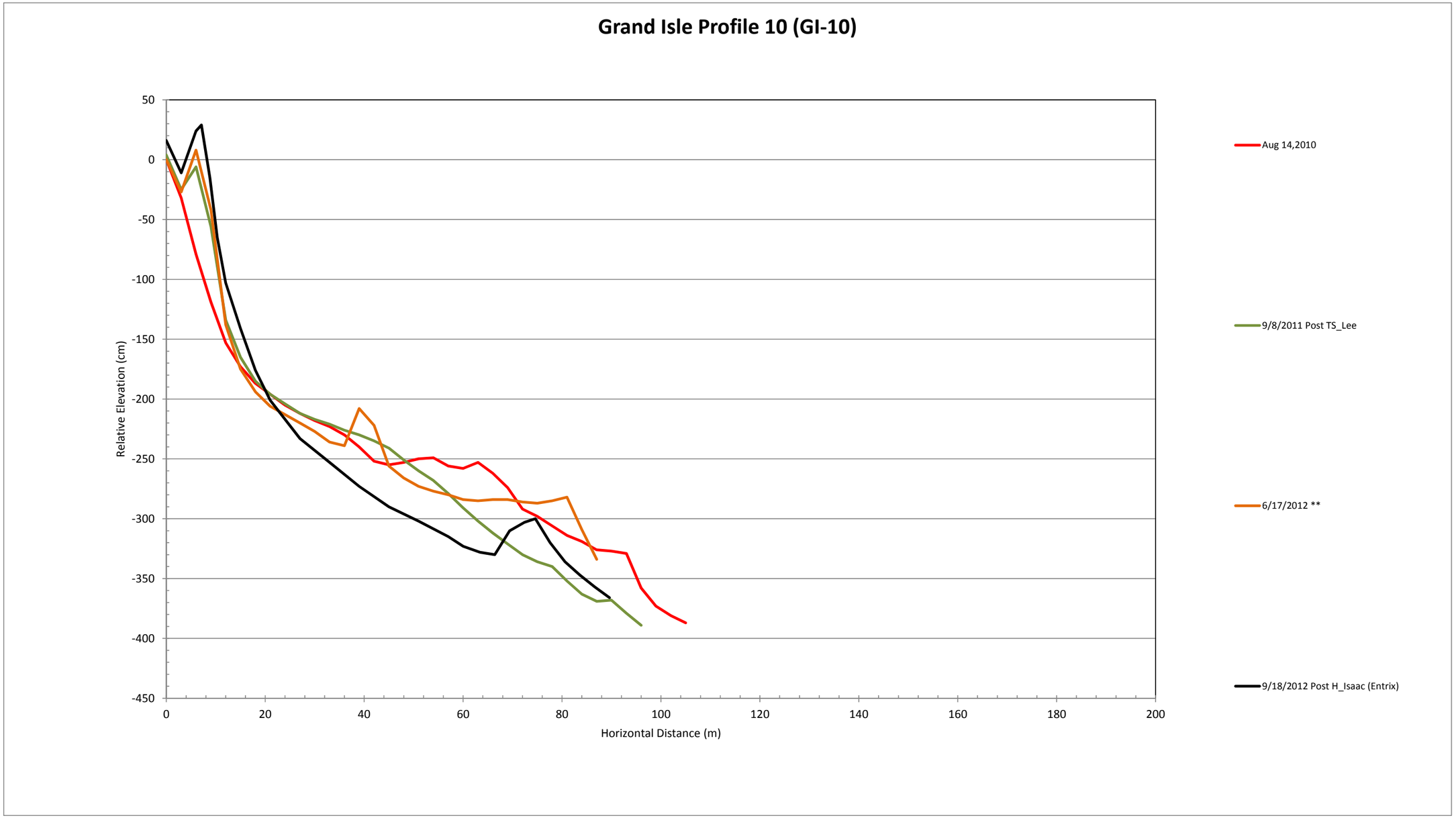


Grand Isle Profile Station #7: Hurricane Isaac eroded below the summer 2010 oiling levels along most of the beach, excepting a 20-m wide swath of beach in the lower supratidal zone.

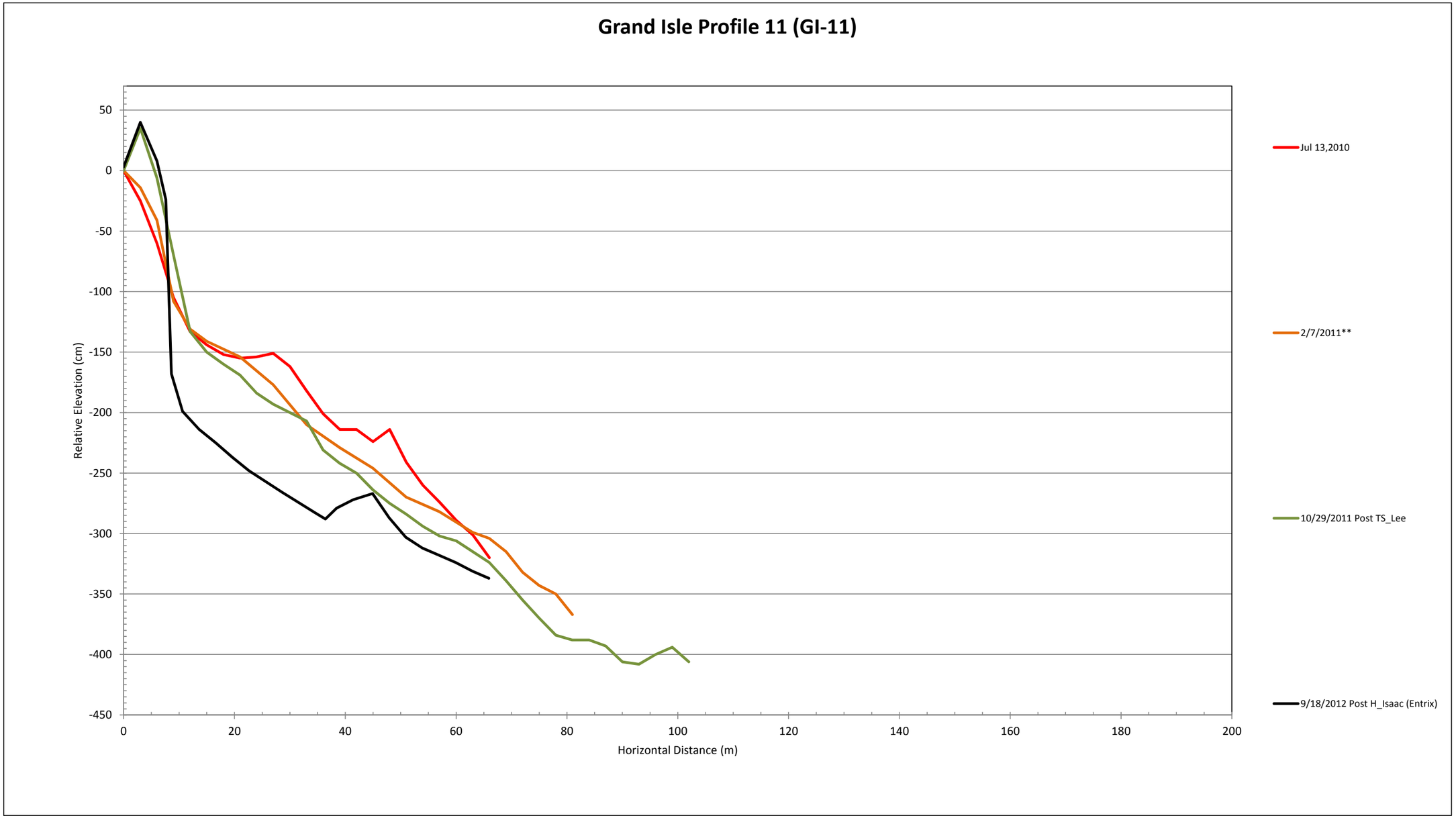
Grand Isle Profile Station #8: Buried oil may exist along the landward half of this beach. Previous storms including Hurrican Isaac, reworked the outer half of the beach to summer 2010 levels. **Survey stake reset.



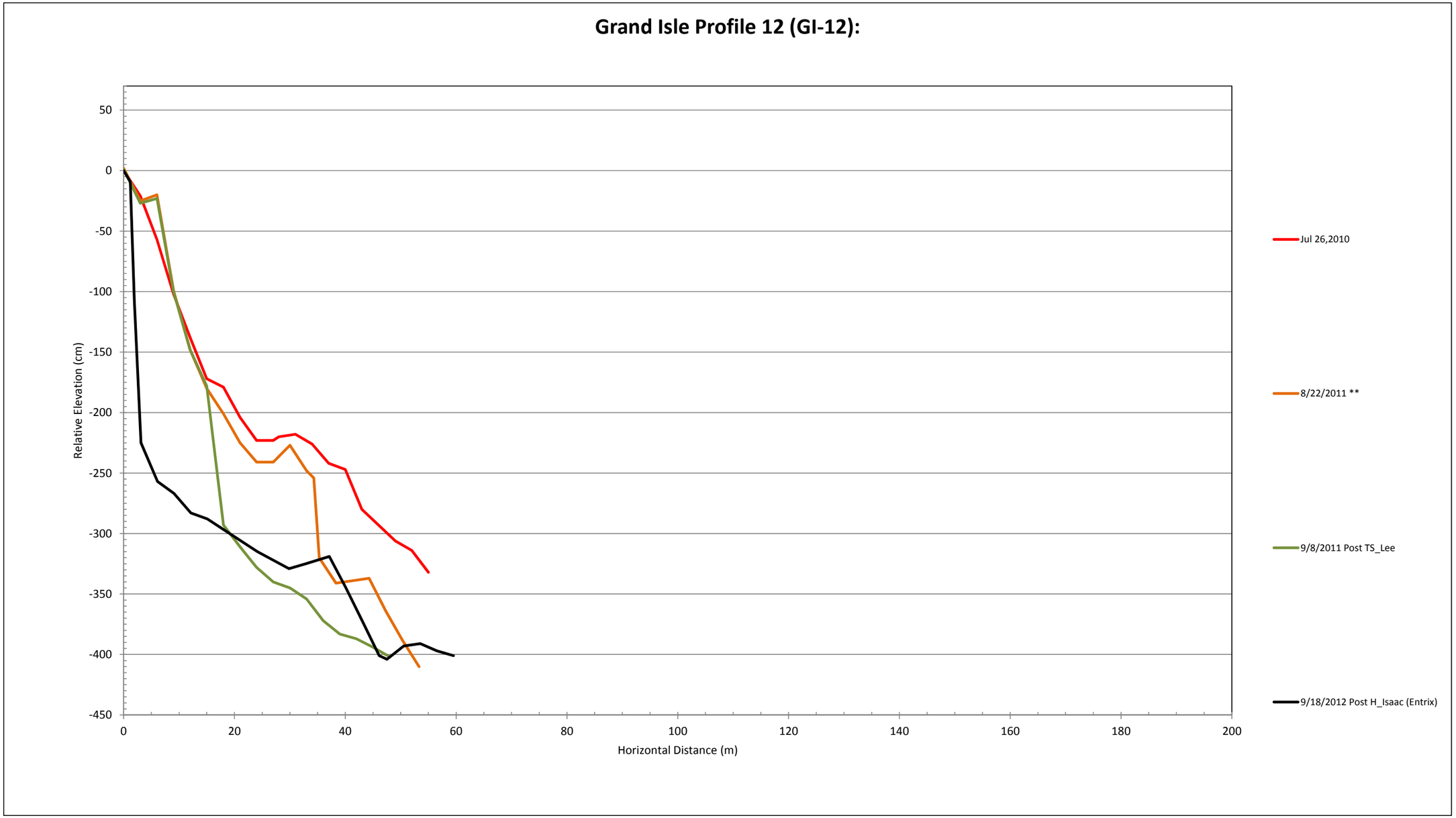
Grand Isle Profile Station #9: Buried oil is not likely to exist along this profile. Previous storms, including Hurricane Isaac reworked the outer beach to summer 2010 levels. ** Survey stake reset.



Grand Isle Profile Station #10: It is unlikely that buried oil exists along this profile because several erosional events, including Hurricane Isaac, have reworked this beach to summer 2010 levels. ** Survey stake reset.



Grand Isle Profile Station #11: It is unlikely that buried oil exits along this profile, because several erosional events, including Hurricane Isaac, have reworked the entire beach to down to summer 2010 levels. ** Survey stake reset.



Grand Isle Profile Station #12: It is unlikely that buried oil exits on this section of beach; the profile has been reworked down to summer 2010 levels. ** Survey stake reset.

Grand Isle | Jefferson Parish, Division 1 | Profile 1

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Coordinates
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 7 December 2012

Grand Isle | Jefferson Parish, Division 1 | Profile 2

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Coordinates
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 7 December 2012

Grand Isle | Jefferson Parish, Division 1 | Profiles 3-4

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Coordinates
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 7 December 2012

Grand Isle | Jefferson Parish, Division 1 | Profiles 5-6

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Coordinates
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 7 December 2012

Grand Isle | Jefferson Parish, Division 1 | Profiles 7-8

Overburden Contour Map

Imagery: BP MC252 Incident, Fall 2012 - Digital Mapping Camera image acquisition, Aero-Metric, Inc.

Overburden Contours: Estimated depth to possible buried oil

- ≥100 cm
- 50-99 cm
- 0-49 cm
- Coordinates
- Operational Zones
- Profile Stake
- ProfileScales

0 75 150 300 Meters

0 250 500 1,000 Feet

N

Created on: 7 December 2012

ID	Lat	Long
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7	29.25974354	-89.95144880
8	29.25964769	-89.95121129
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19	29.25453056	-89.95421533
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33	29.25066248	-89.95945815
34	29.24998362	-89.96146373
35	29.24980348	-89.96122841
36	29.24915754	-89.96305547
37	29.24898948	-89.96288515
38	29.24826545	-89.96477836
39	29.24808629	-89.96461059
40	29.24737754	-89.96662702
41	29.24718419	-89.96646314
42	29.24649940	-89.96839356
43	29.24634273	-89.96821736
44	29.24590611	-89.96789322
45	29.24554948	-89.97029124

46	29.24540124	-89.97021361
47	29.24509155	-89.97004461
48	29.24470659	-89.96973230
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52	29.24367514	-89.97157808
53	29.24348880	-89.97410280
54	29.24336980	-89.97403709
55	29.24318293	-89.97387610
56	29.24265454	-89.97339933
57	29.24247135	-89.97588198
58	29.24232523	-89.97579833
59	29.24216359	-89.97564966
60	29.24164579	-89.97519699
61	29.24141271	-89.97773310
62	29.24128912	-89.97754521
63	29.24091625	-89.97727148
64	29.24062102	-89.97702312
65	29.24040966	-89.97948695
66	29.24025410	-89.97929018
67	29.23978698	-89.97888814
68	29.23968712	-89.97868722
69	29.23936195	-89.98130417
70	29.23914995	-89.98113631
71	29.23868159	-89.98071458
72	29.23858157	-89.98065231
73	29.23828780	-89.98309874
74	29.23807465	-89.98285884
75	29.23769854	-89.98252183
76	29.23755817	-89.98243784
77	29.23725550	-89.98482328
78	29.23699425	-89.98458945
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80	29.23657090	-89.98416026
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83	29.23575484	-89.98609490
84	29.23555955	-89.98592459
85	29.23514849	-89.98834302
86	29.23482837	-89.98805861
87	29.23473964	-89.98796099
88	29.23452930	-89.98772182
89	29.23408162	-89.99016440
90	29.23377208	-89.98985395
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93	29.23309877	-89.99193130
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96	29.23253084	-89.99131217
97	29.23221602	-89.99351819
98	29.23204075	-89.99326460
99	29.23191077	-89.99303850
100	29.23174187	-89.99275460
101	29.23128136	-89.99519831
102	29.23112887	-89.99506085
103	29.23089793	-89.99484153
104	29.23069706	-89.99466472
105	29.23030824	-89.99694749
106	29.23021098	-89.99686886
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108	29.22970042	-89.99648668
109	29.22925771	-89.99889776
110	29.22919913	-89.99884246
111	29.22885156	-89.99854751
112	29.22868265	-89.99843014
113	29.22827029	-90.00081405
114	29.22819801	-90.00076818
115	29.22785685	-90.00046817
116	29.22771607	-90.00039300
117	29.22758196	-90.00150931
118	29.22729926	-90.00269843
119	29.22687352	-90.00210392
120	29.22636315	-90.00451494
121	29.22593980	-90.00399988
122	29.22548194	-90.00622486
123	29.22504246	-90.00582187
124	29.22448500	-90.00804415
125	29.22405718	-90.00766790
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128	29.22238861	-90.01110090