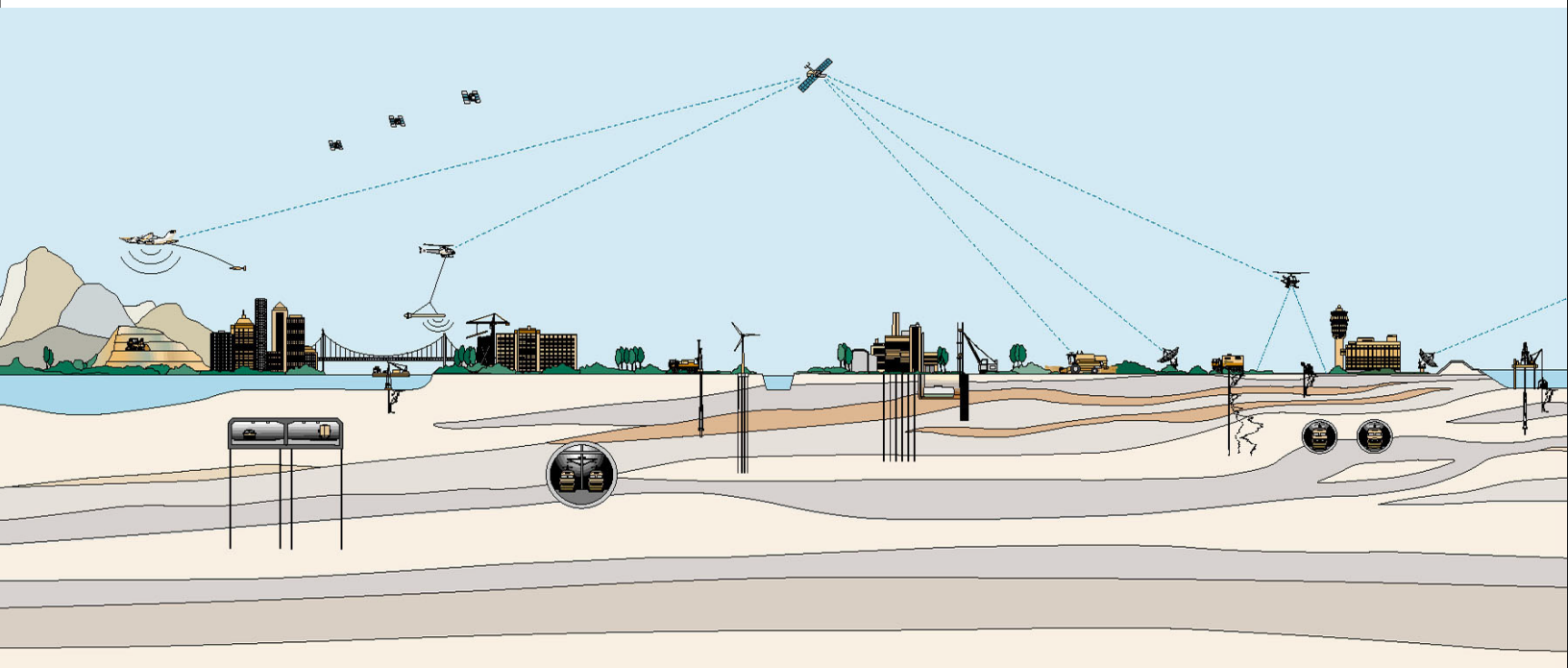
FUGRO CONSULTANTS, INC.

ANNUAL REPORT
JULY 2012 THROUGH JUNE 2013
CALLE DEL BARCO
LANDSLIDE ASSESSMENT DISTRICT
MALIBU, CALIFORNIA

Prepared for:
CITY OF MALIBU

January 2014
Fugro Job No. 04.B3399005



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January 20, 2014
Project No. 04.B3399005

City of Malibu
23825 Stuart Ranch Road
Malibu, California 90265

Attention: Mr. Rob Duboux

Subject: Annual Report, July 2012 through June 2013, Calle del Barco Landslide Assessment District, Malibu, California

Dear Mr. Duboux:

Fugro is pleased to present this annual report for the Calle del Barco Landslide Assessment District. This report summarizes the monitoring and maintenance activities completed during the period of July 2012 through June 2013.

Fugro appreciates this opportunity to be of service to the City of Malibu and the District homeowners. Please contact Chris Dean at (310) 456-2489, x306 or Todd Curtis at (310) 456-2489, x307 if you have any questions regarding this report.

Sincerely,

FUGRO CONSULTANTS, INC.

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1.0 INTRODUCTION

1.1 AUTHORIZATION

Fugro prepared this data report in accordance with our contract with the City of Malibu (City), commencing July 2010.

1.2 BACKGROUND

The Calle del Barco Landslide Assessment District (Assessment District) was established in 1986 by the County of Los Angeles (County) following the activation of a landslide between Rambla Orienta and Calle del Barco in 1978. The Assessment District provides permanent funding to maintain and monitor dewatering facilities with the purpose of stabilizing the landslide. The County administered the Assessment District until 1991 when the City of Malibu incorporated. The Assessment District was reauthorized in May 1998 under Resolution No. 98-033. The City has administered the Assessment District, utilizing consultants to maintain and monitor the district facilities.

1.3 SCOPE OF WORK

This annual report summarizes the monitoring and maintenance of the geotechnical instrumentation and dewatering facilities for the period between July 1, 2012, and June 30, 2013 (hereinafter, the 'monitoring period').

Data collected during this monitoring period included the following:

- Annual rainfall data from a local rain gauge operated by the County of Los Angeles, Department of Public Works - Water Resources Division;
- Monthly groundwater level measurements from 9 standpipes and 19 pneumatic piezometers;
- Monthly dewatering production readings from 11 dewatering wells;
- Monthly dewatering production readings from 17 horizontal drains;
- Quarterly ground deformation measurements from 12 slope inclinometers; and
- Periodic maintenance of dewatering and monitoring facilities.

The operating condition of the instrumentation and dewatering facilities was checked at each field monitoring/observation location and by evaluating preliminary data in the office as they were received. Maintenance was performed as needed, based upon the field observations and preliminary data evaluation.

The scope of services includes monitoring and maintenance of the Assessment District facilities. The services provided on an annual basis for the Assessment District do not include an engineering evaluation of the stability of the landslide.

1.4 REPORT ORGANIZATION

This report summarizes the monitoring data collected during the current monitoring period and presents conclusions regarding the annual monitoring results. The location of the Assessment District is illustrated on Plate 1 - Site Location Map. Locations of the geotechnical instrumentation are shown on Plate 2 - Assessment District Map. Tabulated and graphic summaries of monitoring data are presented in Appendices A through C.

1.5 REPORT AVAILABILITY

The annual Assessment District reports are available for review at Malibu City Hall. Reports may also be viewed on the City's website at http://www.malibucity.org.

2.0 MONITORING

2.1 RAINFALL DATA

Rainfall totals were tabulated based on recorded values from the Los Angeles County Rainfall Station 1239 located at Big Rock Mesa. A graph of historical monthly rainfall and average annual rainfall is shown on Plate 3, Rainfall Graph.

Rainfall data indicate that approximately 8.06 inches of precipitation fell during the monitoring period from July 2012 through June 2013. The average annual rainfall from 1968 to 2012 in the Malibu area for the monitoring period July through June is approximately 16.0 inches.

Rainfall data are usually analyzed in terms of the annual "rain season" that covers the time period October 1 through September 30. Rainfall for October 1, 2012, through September 30, 2013, was approximately 8.10 inches. This is approximately 50 percent of the average annual rainfall of 16.0 inches for the rain seasons of 1968 through 2012.

2.2 GROUNDWATER MONITORING

The groundwater level data collected during the current monitoring period are summarized in Appendix A. Groundwater levels fluctuate throughout the year and from year to year in response to natural and man-made influences. The primary natural influence is varying precipitation. Man-made influences include:

- Infiltration from septic systems;
- Infiltration from irrigation;
- Alterations to surface drainage by grading, landscaping, storm drains, and rain gutters;
- Accidental water discharges from leaking utilities (water, irrigation, sewer, storm drain) and swimming pools; and

- Dewatering activities including pumping dewatering wells and hydraugers.

Typically, groundwater levels rise relatively quickly following significant rainfall and gradually lower after a wet season ends. Groundwater levels measured in standpipe piezometers (wells) and pneumatic piezometers are depicted in Appendix A. Groundwater levels recorded in the Assessment District typically peak around late-March to mid-April and gradually decline from late September through November.

A summary graph of mean high groundwater elevations for the District is presented on Plate 5. Plate 5 also shows the average dewatering output (gpd) and the yearly magnitude of deviation from the mean annual rainfall. The average annual rainfall used for the chart was computed using all of the data from 1988 through the present. This graph illustrates that since 2010-2011, annual rainfall has been generally decreasing. During the same period, the average dewatering output has been decreasing.

2.2.1 Standpipe Piezometers

Nine standpipe piezometers (SI-4, SI-5, SI-7, SI-8, SI-9, SI-13, SI-14, SI-15, and SI-16) were measured over the monitoring period. The locations of the standpipe piezometers are depicted on Plate 2 - Assessment District Map, and groundwater hydrographs are presented in Appendix A.

2.2.2 Pneumatic Piezometers

Each of the inclinometers installed within the Assessment District after 1996 were outfitted with two to four pneumatic piezometer sensors. Twenty-two sensors were measured regularly over the monitoring period. Each sensor records groundwater elevations by measuring differential air pressure between the instrument sensor and groundwater surface across a flexible bladder. Differential pressure is converted into inches of water head and represented as a relative groundwater level. The locations of the piezometers are shown on Plate 2 and hydrographs are presented in Appendix A.

2.2.3 Groundwater Level Discussion

The groundwater data were reviewed by evaluating changes that occurred during the current monitoring period as well as changes in groundwater levels over extended periods. To analyze trends in seasonal groundwater fluctuations, the average (mean) annual and highest annual recorded groundwater elevation for each piezometer were calculated (Appendix A, Plate A-2).

Groundwater levels in individual piezometers were generally lower relative to the previous year, with annual average groundwater elevations generally lower than the prior year averages. Average and peak groundwater levels for Rambla Vista and Rambla Orienta were generally below levels relative to the previous year. Measured groundwater levels around Calle del Barco were below average in standpipes and piezometers, except for SI-11. Measured groundwater levels around Rambla Pacifico were below levels for the prior year. Overall,

groundwater levels continue to show a general decline from the record rainfall of the 2004 to 2005 monitoring period. The average and highest annual groundwater levels are indicated in the following table:

Table 1. Summary of Average Groundwater Elevations by Area

Location	Average Groundwater Elevation	Change from Prior Year Average	Peak Groundwater El. 2012-2013	Change from Prior Year Peak
Rambla Orienta/ Rambla Vista	164.9	-1.4	166.5	-2.3
Calle Del Barco	250.8	-2.2	252.2	-2.1
Rambla Pacifico	350.4	-0.9	351.5	-0.4

Note: All Units are in feet.

2.3 DEWATERING PRODUCTION

Dewatering production data are provided in Appendix B, with dewatering well and hydrauger information presented on Plate B-1. A summary of the dewatering output based upon groundwater levels and rainfall is depicted on Plate 5.

2.3.1 Dewatering Well Production

The average total well production rate for the current monitoring period was approximately 766 gallons per day (gpd). This represents a decrease of 24 percent from the previous monitoring period of 955 gpd. A graph of the production rate for all dewatering wells is presented on Plate 4. Graphs showing production rates of individual wells are provided in Appendix B.

2.3.2 Hydrauger Production

The total production rate for all hydraugers from August 1991 through June 2013 is depicted on Plate 4. Hydrauger production rates for individual hydraugers are presented on Plate B-4 (Appendix B). Additional data regarding hydraugers and production rates are included in Appendix B.

The average hydrauger production rate for all hydraugers over the monitoring period was approximately 185 gpd. This represents approximately 101 percent of last year's hydrauger production rate of 183 gpd.

2.4 SLOPE INCLINOMETER MEASUREMENTS

Fugro monitored 12 slope inclinometers on a quarterly basis to observe subsurface ground deformation. Plots of slope inclinometer measurements (two plots for each monitored slope inclinometer) are presented in Appendix C. The first plot has a baseline reading from the

final round of monitoring in the 2011 through 2012 monitoring year, showing ground movement within the 2012 through 2013 monitoring year. The second plot has a baseline reading from the spring of 2005 (heavy rainfall and ground movement year) through the current monitoring year. Only inclinometer readings that have been checksum validated are presented on the data plots[1].

When reviewing and interpreting the slope inclinometer data plots, instrument limitations and movement history should be considered. Individual plots have been reviewed and interpreted with regard to movement along identified slide planes. Interpreted movement along the identified slide planes is summarized on Plate C-1 in Appendix C. Slope inclinometer plots show a maximum of 0.2 inches (SI-16) of displacement measured at the ground surface during the 2012 through 2013 monitoring period. Measurement along identified slide planes during the 2012 through 2013 monitoring period is less than 0.1 inch.

Inclinometer SI-9 exhibits a pattern of movement measured at the ground surface at a rate of between 0.1 and 0.2 inch/year since 2005, resulting in approximately 1 inch of cumulative displacement since the 2004-05 monitoring period. Movement of the inclinometer appears to be both translational at specific depths between 30 and 55 feet and rotational about a hinge point at about 55 feet below the ground surface.

Inclinometer SI-11 exhibits a maximum displacement of about 0.5 inch at a depth of about 20 feet since the 2004-05 monitoring period. Movement has been recorded to a lesser magnitude throughout the upper 57 feet of the subsurface profile.

Inclinometer SI-13 exhibits a maximum displacement of about 0.5 inch at a depth of about 10 feet since the 2004-05 monitoring period. Movement has been recorded to a lesser magnitude throughout the upper 30 feet of the subsurface profile.

Inclinometer SI-16 exhibits a pattern of movement measured at the ground surface at rates up to 0.35 inch/year since 2005, resulting in approximately 1 inch of cumulative displacement at the ground surface since the 2004-05 monitoring period. Movement of the inclinometer appears to be both translational at specific depths between 0 to 10 feet and between 40 and 85 feet and rotational about a hinge point at about 50 feet below the ground surface. This is similar to the movement observed in inclinometer SI-9 located in close proximity to SI-16.

While the movement observed in inclinometers SI-9 and SI-16 has not produced observed distress in pavements or other development of which Fugro is aware, the movement is nevertheless quantifiable and can be defined by a clear trend.

[1] Checksums are a data validation technique for slope inclinometers where the '0' (downslope) and '180' (upslope) readings are summed and the theoretical result should be zero.

3.0 FACILITY MAINTENANCE

3.1 MAINTENANCE SUMMARY

The operating status of each dewatering well and hydrauger was checked monthly. When necessary, repair work would be scheduled and undertaken as expeditiously as possible, typically within a matter of a few hours or days. Generally, repairs and maintenance consisted of brush and debris clearance for well and hydrauger locations for the 2012 through 2013 monitoring year. The repairs performed are summarized in the following table:

Date	Facility	Work Performed
7/23/2012	HD-7,HD-13	Dirt removal around hydauger
7/24/2012	Dewatering wells	Brush clearance and well box lock lubrication
10/1/2012	W-L	Recalibrate well
10/9/2012	W-L	Cleaned meter
10/16/2012	Hydraugers	Hydraugers and brush clearance
10/25/2012	W-F	Diagnose problem
11/5/2012	W-L,W-F	Observation of pump replacement
11/20/2012	HD-9	Fixed broken hydrauger
2/5/2013	HD-1A	Observation of Drilling for new hydraugers
2/13/2013	HD-1A, HD-2A	Observation of Drilling for new hydraugers
2/14/2013	HD-1A, HD-2A	Observation of Drilling for new hydraugers and conveyance line construction
3/22/2013	W-K	Cleaned meter
4/14/2013	HD-12,13	Hydrauger maintenance and brush clearance
6/11/2013	W-C,W-L	Cleaned meters and well boxes
6/26/2013	W-L	Recalibrate well

3.1.1 New Dewatering Facilities

Two hydraugers, H-1A and H-2A, were installed through the retaining wall on the north side of Rambla Orienta immediately north of the intersection with Rambla Vista in February 2013. These dewatering devices were installed in response to visible seeps on the slope north of the retaining wall, and to increase dewatering production in the District.

4.0 SUMMARY AND CONCLUSIONS

4.1 SUMMARY

The status of the Calle del Barco Landslide Assessment District can be summarized as follows:

- The 2012 through 2013 monitoring year rainfall was below average with 8.06 inches of precipitation. Rainfall during the monitoring period was below the historical average of 16.0 inches per year measured from 1968 through 2012.
- In general, groundwater levels in the assessment district were lower than average for the Rambla Vista/Rambla Orienta, Calle del Barco, and the Rambla Pacifico areas. Groundwater levels generally are continuing to decrease from the levels observed in the record winter of 2004 through 2005.
- In the standpipe piezometers, groundwater levels were generally lower than groundwater levels in monitoring year 1997-1998 when major slope failure occurred.
- Total dewatering production decreased about 19 percent when compared to last year's total production. Well-below average rainfall for the monitoring period, as well as lower than average groundwater levels under the District, contributed to the decreased production.
- Slope inclinometer readings indicate a maximum localized displacement at the ground surface of about 0.15 inch (SI-9) and 0.2 inch (SI-16) located on Calle del Barco with the majority of inclinometers indicating no significant ground movement. These values are slightly above the average annual displacement for each inclinometer location since 2005.
- As per the recommendations in last year's annual report, two hydraugers were installed in the District in February 2013 to increase the dewatering capacity of the landslide stabilization system. Decreased production from hydraugers has occurred in recent years. Over time, hydraugers become clogged and less efficient with removal of water by gravity. Seeps visible on the slope north of the retaining wall before the hydraugers were installed are no longer present.
- Water conservation is encouraged throughout the Calle Del Barco District to reduce the infiltration of domestic water and the potential for future groundwater level increases. Control of groundwater levels within the landslide area is critical to maintaining its stability.
- Groundwater production from existing dewatering wells and hydraugers should be expected to gradually decline over time as the efficiency of the wells and hydraugers decreases due to mineralization and aging of the facilities.

5.0 REFERENCES

Bing Yen and Associates, Inc. (1991),'Monitoring, Instrumentation, and Dewatering Facilities at Calle Del Barco, Puerco Beach, Latigo Canyon, and Rambla Pacifico (two wells) Landslide Sites,' dated October 4.

_____ (1992), 'First Quarter Observation Report: Instrumentation and Dewatering Facilities at Calle Del Barco, Puerco Beach, and Latigo Canyon Landslide Sites,' dated April 7.

_____ (1992), 'Second Quarter Observation Report: Instrumentation and Dewatering Facilities at Calle Del Barco, Puerco Beach, and Latigo Canyon Landslide Sites', dated July 9.

_____ (1993), 'Semi-Annual Observation & Maintenance Report for the Period January to July 1993, Calle Del Barco, Malibu, California,' dated September.

_____ (1994), 'Annual Observation & Maintenance Report for the Period July 1993 to July 1994, Calle Del Barco, Malibu, California,' dated September.

_____ (1995), 'Annual Observation & Maintenance Report for the Period July 1994 to July 1995, Calle Del Barco, Malibu, California,' dated September.

_____ (1996), 'Annual Observation & Maintenance Report for the Period July 1995 to July 1996, Calle Del Barco, Malibu, California,' dated August.

_____ (1997), 'Annual Observation & Maintenance Report for the Period July 1996 to July 1997, Calle Del Barco, Malibu, California,' dated July.

_____ (1998), 'Annual Observation & Maintenance Report for the Period July 1997 to April 1998, Calle Del Barco, Malibu, California,' dated April.

_____ (1999), 'Annual Observation & Maintenance Report for the Period April 1998 to March 1999, Calle Del Barco, Malibu, California,' dated April.

_____ (2000), 'Annual Observation & Maintenance Report for the Period April 1999 to June 2000, Calle Del Barco, Malibu, California,' dated August.

_____ (2001), 'Annual Observation & Maintenance Report for the Period April 2000 to June 2001, Calle Del Barco, Malibu, California,' dated August.

_____ (2003), 'Annual Observation & Maintenance Report for the Period April 2001 to June 2002, Calle Del Barco, Malibu, California,' dated January.

_____ (2003), 'Annual Observation & Maintenance Report for the Period April 2002 to June 2003, Calle Del Barco, Malibu, California,' dated October 2003.

David Taussig & Associates, Inc. (2013), "Annual Assessment District No. 98-2 (Calle del Barco) FY 2012-2013," dated June 11.

Fugro West Inc. (2004), 'Annual Report, July 2003 through June 2004, Calle Del Barco Landslide Assessment District, Malibu, California,' dated November.

_____ (2005), 'Annual Report, July 2004 through June 2005, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2006), 'Annual Report, July 2005 through June 2006, Calle Del Barco Landslide Assessment District, Malibu, California,' dated August.

_____ (2007), 'Annual Report, July 2006 through June 2007, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2008), 'Annual Report, July 2007 through June 2008, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

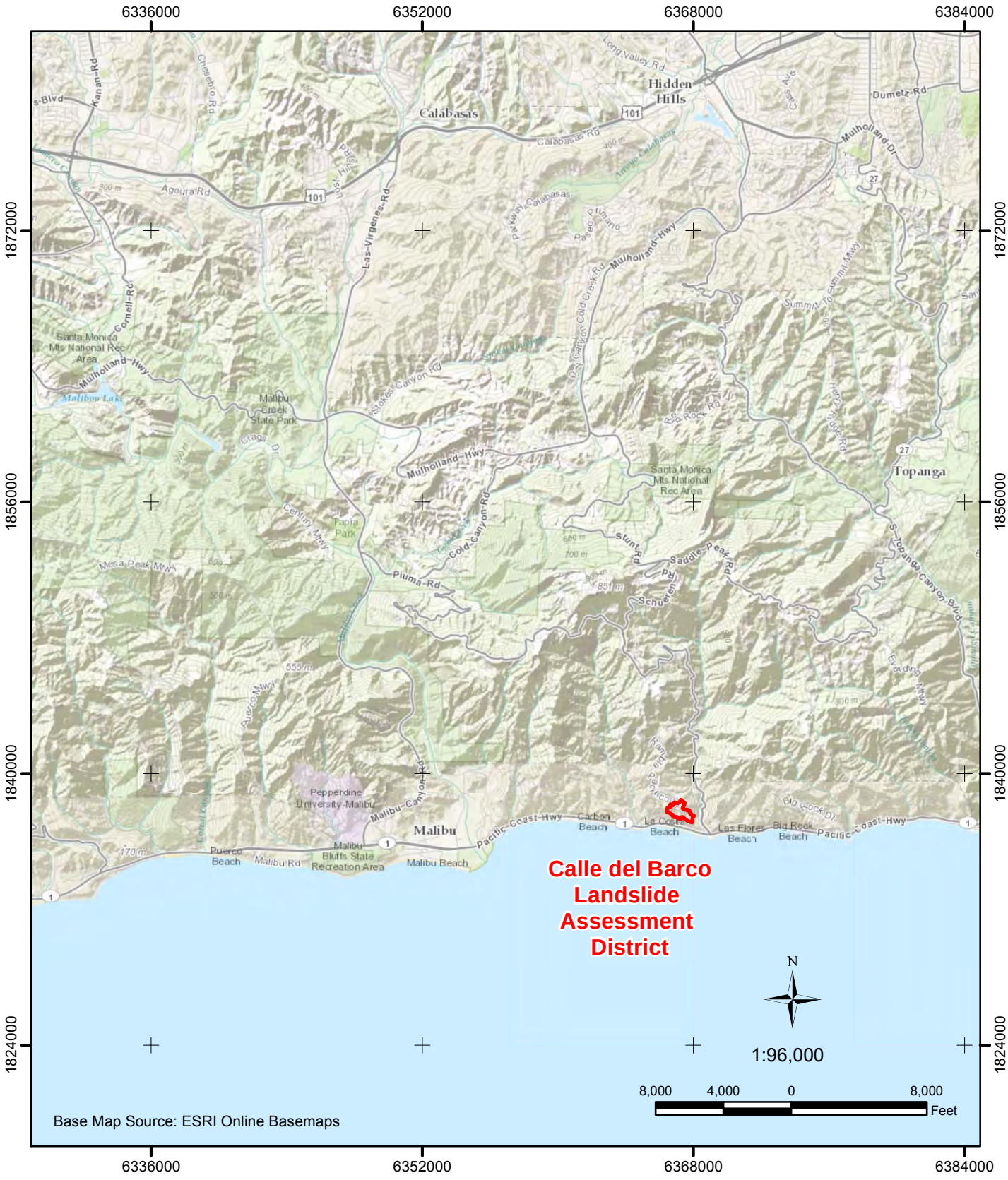
_____ (2009), 'Annual Report, July 2008 through June 2009, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2010), 'Annual Report, July 2009 through June 2010, Calle Del Barco Landslide Assessment District, Malibu, California,' dated April.

_____ (2011), 'Annual Report, July 2010 through June 2011, Calle Del Barco Landslide Assessment District, Malibu, California,' dated November.

_____ (2012), "Annual Report, July 2011 through June 2012 Calle del Barco Landslide Assessment District, Malibu, California," dated September 2012.

PLATES



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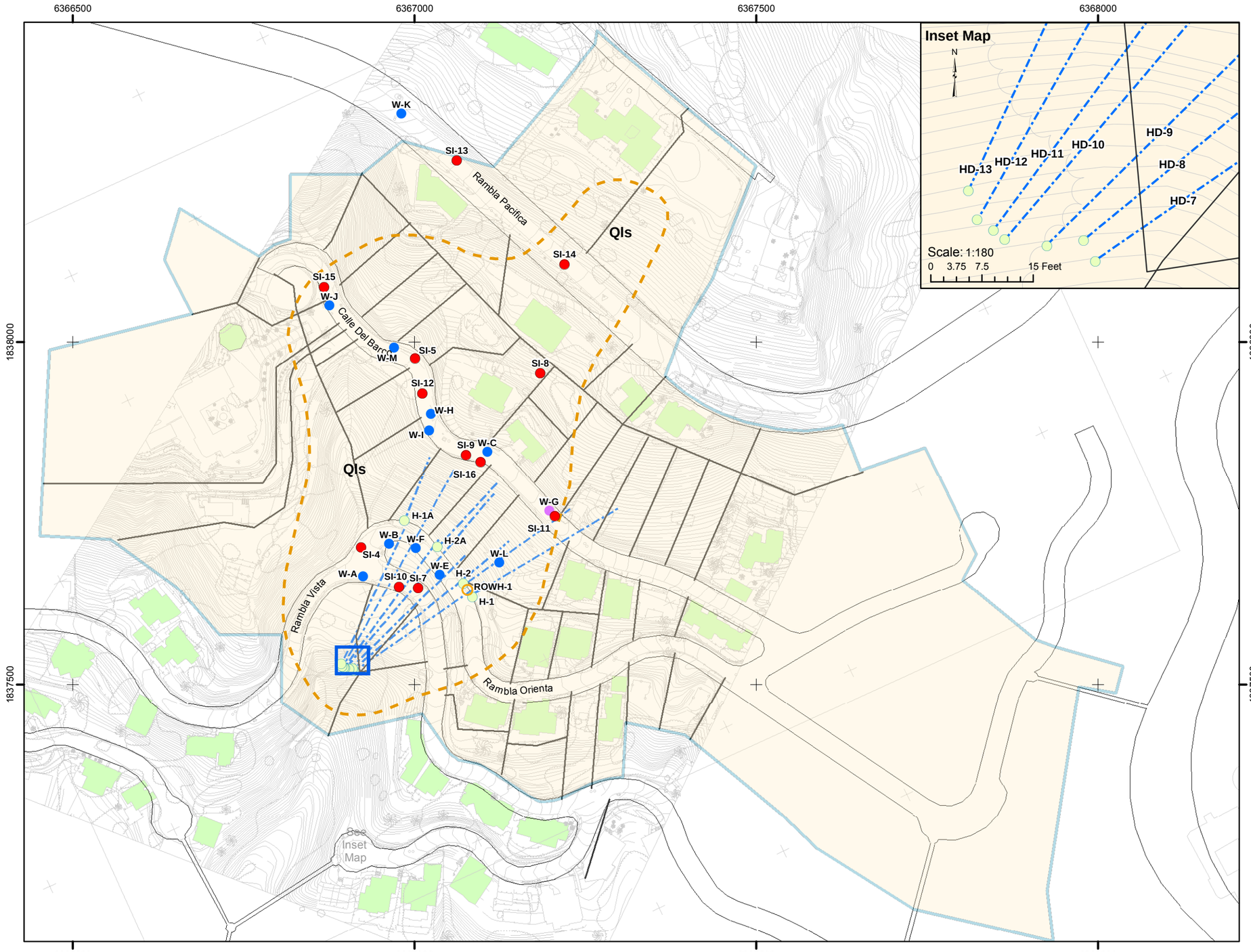
SITE LOCATION MAP
Calle del Barco Landslide Assessment District
Malibu, California

PLATE 1



LEGEND

- Active Dewatering Well
- Inactive Dewatering Well
- Slope Inclinometer/Standpipe
- ROWH-1 -Conveyance Line for H-2
- Horizontal Drain (Hydrauger)
- QIs — Approximate Limits of Landslide
- Assessment District Boundary
- Extent of Horizontal Drain (Hydrauger) Inset
- Coordinate Grid: California State Plane, Zone 5, NAD 83, Feet

N

Scale: 1:1,800

150 75 0 150 Feet

ASSESSMENT DISTRICT MAP
Calle del Barco Landslide Assessment District
Malibu, California

PLATE 2

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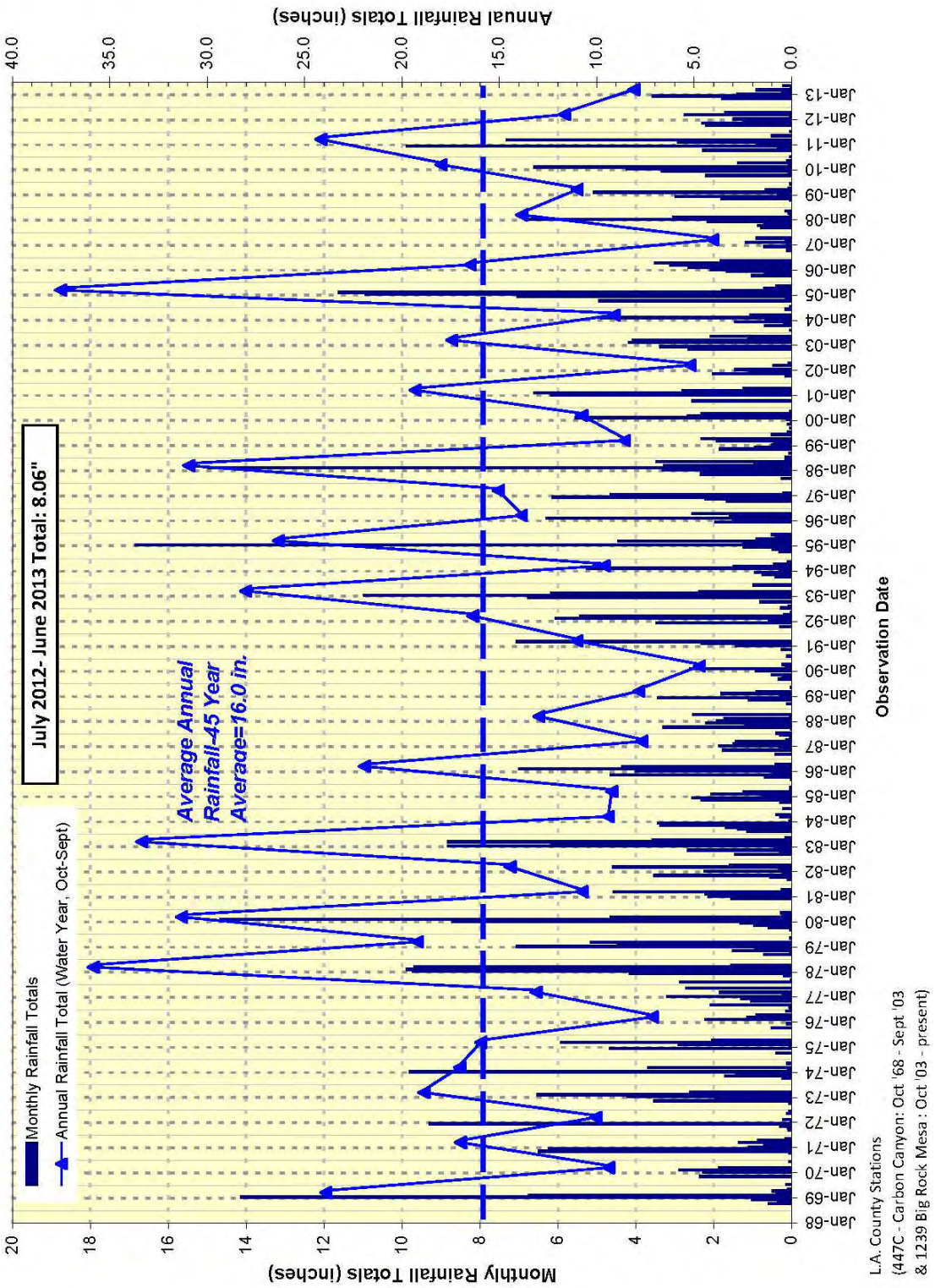
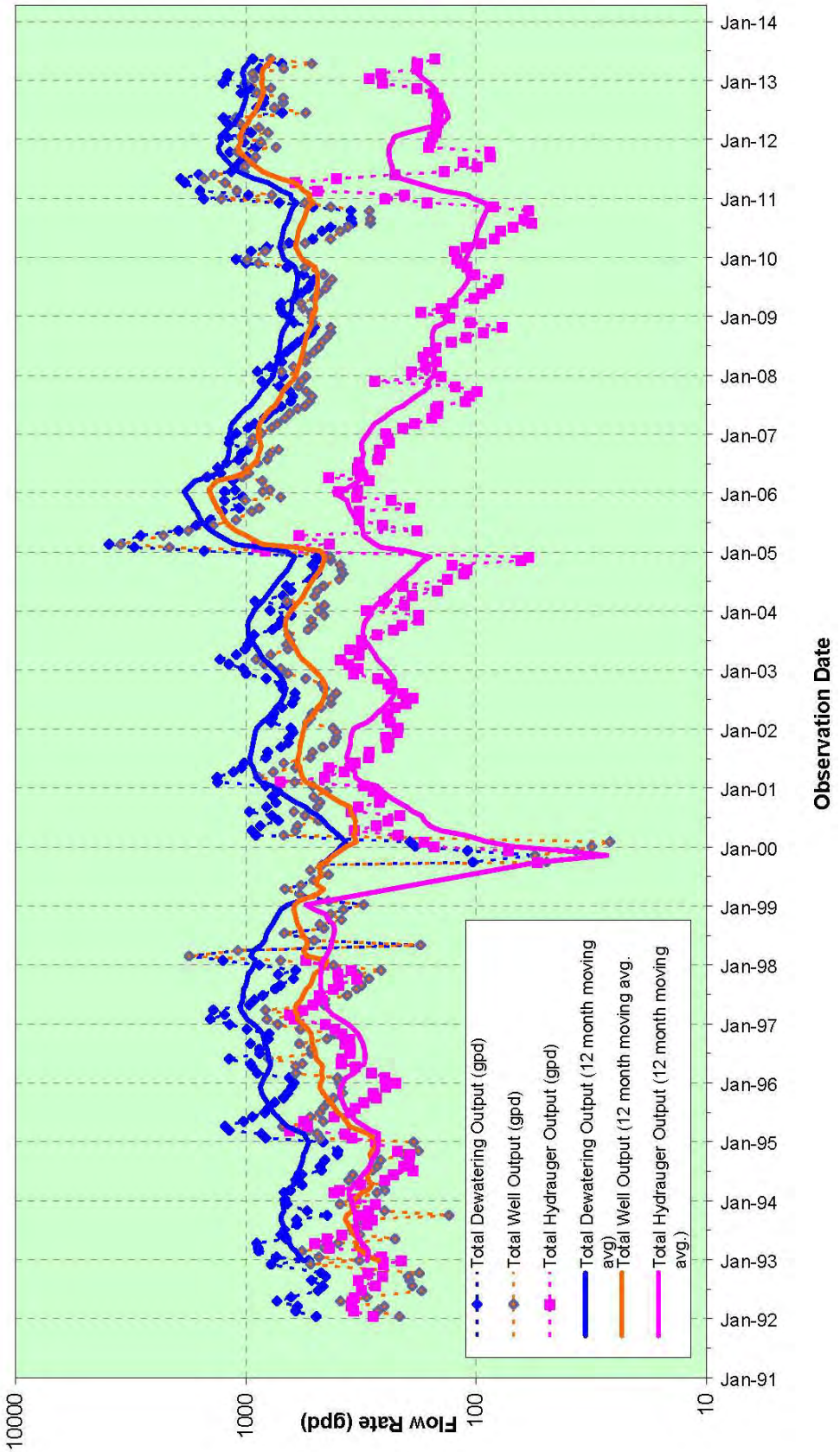
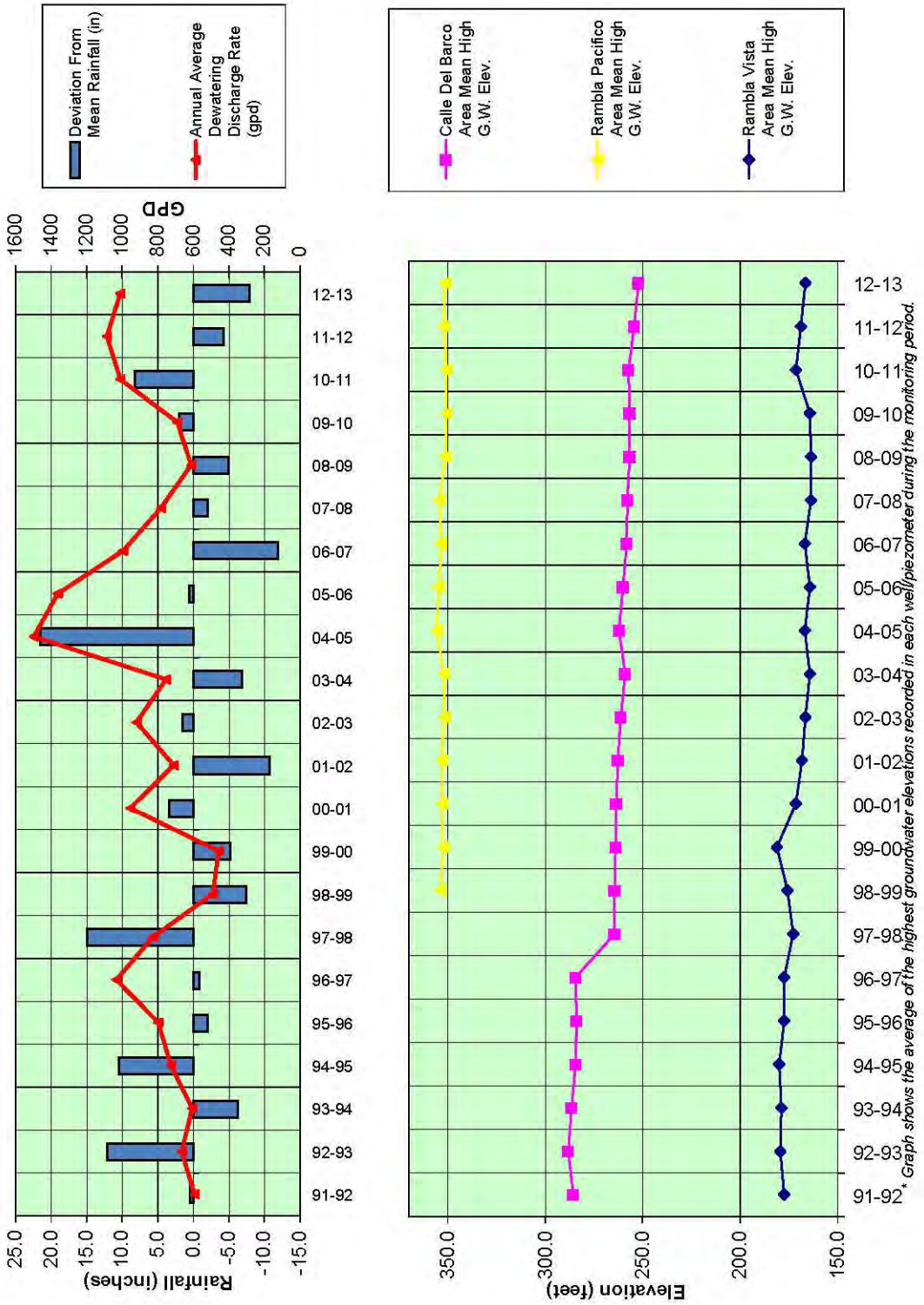


RAINFALL GRAPH
Calle del Barco Landslide Assessment District
Malibu, California



TOTAL DISCHARGE - WELLS AND HYDRAUGERS
Calle del Barco Landslide Assessment District
Malibu, California



GROUNDWATER LEVELS, DEWATERING, AND RAINFALL
Calle del Barco Landslide Assessment District
Malibu, California

APPENDIX A
GROUNDWATER DATA

CALLE DEL BARCO LAD - Standpipe Piezometer Information					
Standpipe ID	**Reference Elevation (ft)**	**Casing Depth (ft)**	**Perforation Interval**	**Installed By**	**Notes**
SI-4	207.0	81.0	Unknown	Unknown	
SI-5	302.0	100.0	Unknown	Unknown	
SI-7	201.0	106.0	Unknown	Unknown	
SI-8	352.0	131.0	Unknown	Unknown	
SI-9	298.0	100.0	Unknown	Unknown	
SI-13	424.0	82.0	Unknown	Unknown	
SI-14	408.0	80.0	Unknown	Unknown	
SI-15	301.0	78.0	Unknown	Unknown	
SI-16	297.0	90.0	Unknown	Unknown	

CALLE DEL BARCO LAD - Pneumatic Piezometer Information						
Piezomenter ID	**Tip No.**	**Reference Elev. (ft)**	**Tip depth (ft)**	**Tip Elev. (ft)**	**Installed By**	**Notes**
SI-9	1	298	68	230	BYA	
	2		38	260	BYA	
SI-10	1	202	60	142	BYA	
	2*		50	152	BYA	
	3		40	162	BYA	GW Below Tip El.
	4*		20	182	BYA	
SI-11	1	291.5	60	231.5	BYA	
	2		50	241.5	BYA	
	3*		40	251.5	BYA	
	4*		20	271.5	BYA	
SI-12	1	301	60	241	BYA	
	2		50	251	BYA	
	3		40	261	BYA	
	4		20	281	BYA	GW Below Tip El.
SI-13	1	424	70	354	BYA	
	2*		50	374	BYA	
SI-14	1	408	68	340	BYA	
	2*		48	360	BYA	
SI-15	1	301	66	235	BYA	
	2		36	265	BYA	
SI-16	1	297	70	227	BYA	
	2		40	257	BYA	

* - Piezometer not functioning

PIEZOMETER INFORMATION
Calle del Barco Landslide Assessment District,
Malibu, California

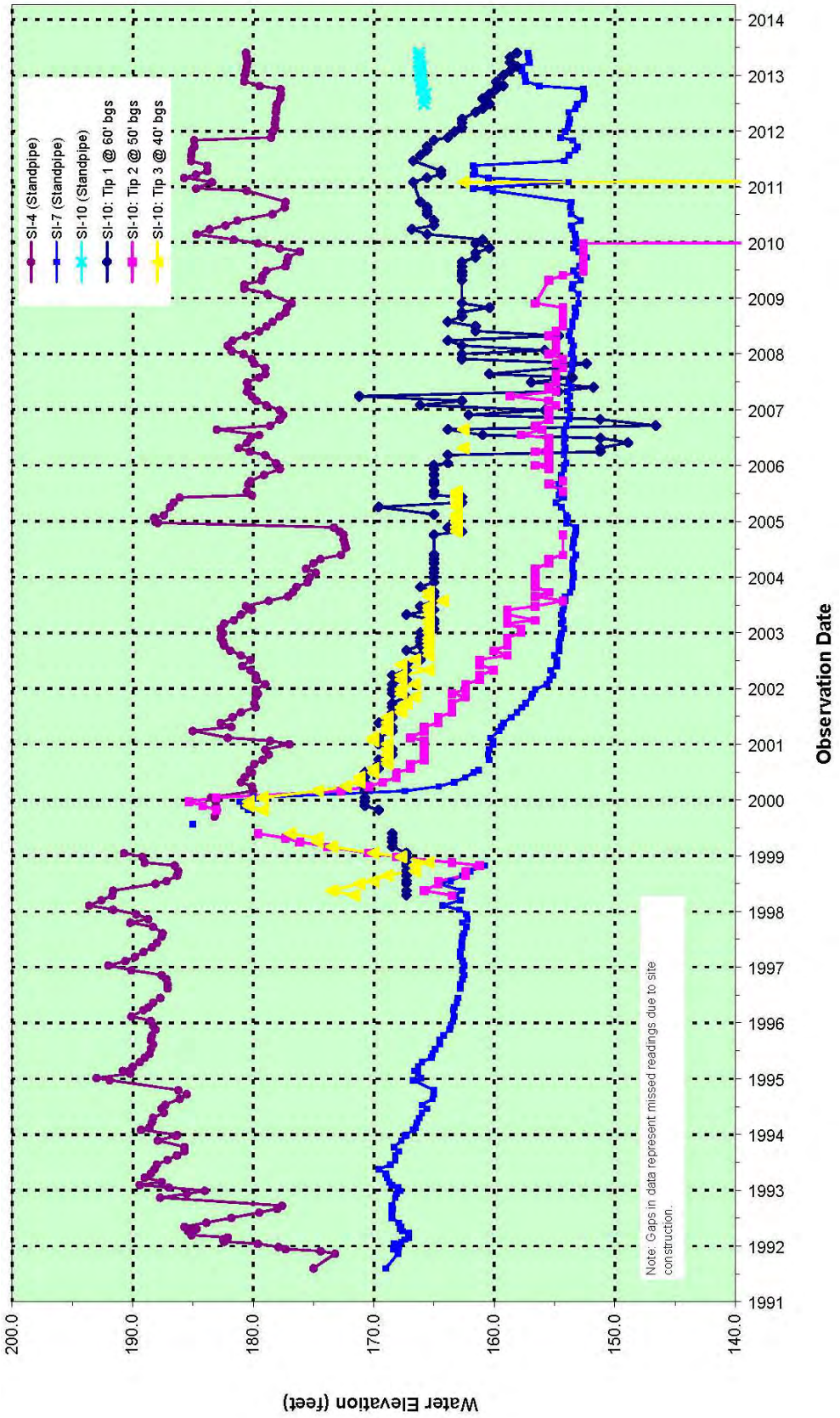
CALLE DEL BARCO - SUMMARY OF GROUNDWATER DATA

Piezometer I.D.		91-92*	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00**	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	Highest Ever Recorded	Mean '91 - '13	Stand. Dev.	12-13 vs 97-98	12-13 vs 11-12	12-13 vs Mean
Rambla Vista																													
SI-4	Mean El.	180.9	184.9	187.3	188.9	188.6	188.8	190.1	187.9	182.0	180.4	180.1	181.8	176.1	180.5	179.6	179.5	180.4	178.7	179.8	182.0	181.1	179.6	Mar-98	182.7	4.1	-10.5	-1.5	-3.1
	Max El.	185.7	189.4	189.3	193.0	190.1	192.0	193.6	190.7	183.5	185.0	181.7	182.7	180.6	188.2	181.2	183.0	182.1	180.7	184.7	185.7	185.2	180.7	193.6	185.9	4.3	-12.9	-4.4	-5.1
SI-7	Mean El.	167.8	168.5	167.3	165.8	163.9	162.7	162.8	162.7	173.9	160.3	156.5	154.5	153.6	153.8	154.3	153.9	153.6	153.2	153.1	158.2	153.7	155.7	Aug-99	159.5	6.3	-7.0	**2.0**	-3.8
	Max El.	169.0	169.6	168.6	166.7	165.1	163.0	164.3	164.6	185.0	161.7	158.6	155.0	154.2	154.9	154.6	154.2	153.8	153.6	153.6	161.8	154.5	157.7	185.0	161.1	7.8	-6.6	**3.2**	-3.4
SI-10	Mean El.							167.3	167.7	170.6	169.3	168.1	166.0	165.2	164.5	161.2	158.2	158.5	162.4	163.0	165.5	163.9	159.3	Apr-07	164.4	3.8	-8.0	-4.6	-5.1
TIP-1	Max El.							167.3	168.5	170.8	170.8	168.5	167.3	166.2	169.6	165.0	171.2	163.9	163.9	166.8	166.7	166.7	161.0	171.2	167.1	2.8	-6.3	-5.8	-6.1
SI-10	Mean El.							164.7	168.7	177.0	166.2	162.4	158.8	155.9	154.3	155.5	156.0	154.9	154.8	152.6	–	–	–	Jan-99	160.1	7.2	–	–	–
TIP-2	Max El.							165.8	179.6	185.4	168.1	164.7	161.2	156.6	154.3	156.6	158.7	155.5	156.6	152.6	–	–	–	185.4	162.7	10.0	–	--	--
Area	Mean El.	174.4	176.7	177.3	177.4	176.3	175.7	171.2	171.7	175.9	169.0	166.8	165.3	162.7	163.3	162.6	161.9	161.8	162.3	162.1	168.6	166.2	164.9		168.8	5.9	-6.3	-1.4	-3.9
Average	Max El	177.4	179.5	179.0	179.9	177.6	177.5	172.8	175.8	181.2	171.4	168.4	166.6	164.4	166.8	164.4	166.8	163.8	163.7	164.4	171.4	168.8	166.5		171.3	6.1	-6.3	-2.3	-4.8
Change vs	Mean El.		2.3	0.6	0.0	-1.1	-0.5	-4.5	0.5	4.1	-6.8	-2.2	-1.5	-2.6	0.6	-0.7	-0.7	-0.1	0.4	-0.1	6.4	-2.3	-1.4						
Prior	Max El.		2.2	-0.6	0.9	-2.3	-0.1	-4.8	3.1	5.3	-9.8	-3.0	-1.8	-2.2	2.4	-2.4	2.4	-3.0	-0.1	0.7	7.0	-2.6	-2.3						
Calle Del Barco																													
SI-5	Mean El.	271.9	273.5	278.9	280.1	279.9	278.8	282.6	282.6	278.9	279.1	279.9	278.8	278.8	281.2	283.9	280.6	278.7	277.2	276.5	278.1	277.1	273.3	Mar-98	278.6	3.0	-9.3	-3.8	-5.3
	Max El.	275.9	283.5	280.9	285.1	282.6	280.2	287.5	285.1	279.9	281.1	280.6	279.7	279.6	287.0	285.1	283.7	280.8	278.7	279.2	279.4	277.8	276.6	287.5	281.4	3.2	-10.9	-1.2	-4.8
SI-8	Mean El.	288.6	290.0	287.5	279.8	283.8	286.0	290.7	293.0	291.9	292.2	290.5	289.8	289.6	293.2	293.7	290.7	287.2	286.9	286.8	286.9	–	–	Apr-05	288.9	3.5	--	--	--
	Max El.	295.4	292.6	292.1	284.0	285.3	288.7	296.6	294.2	295.2	295.2	292.7	291.8	291.6	297.7	294.7	293.6	288.8	287.5	286.8	286.9	–	–	297.7	291.6	4.0	–	--	--
SI-9	Mean El.							228.2	225.6	228.2	228.7	226.8	225.8	225.6	226.1	227.7	226.1	224.7	224.2	224.2	224.0	224.6	223.4	Apr-98	225.9	1.7	-4.8	-1.2	-2.5
	Max El.							230.5	226.7	229.7	229.0	228.3	226.6	226.7	229.2	228.8	227.2	225.1	224.8	224.6	224.5	225.4	224.1	230.5	226.9	2.1	-6.4	-1.3	-2.9
SI-15	Mean El.								261.0	263.1	263.3	264.2	264.3	264.9	265.5	266.9	266.3	265.5	264.9	264.6	265.4	265.9	265.4	Jul-05 & Aug-05	264.7	1.5		-0.6	**0.6**
	Max El.								263.7	263.3	264.2	265.2	265.2	265.3	267.7	267.8	267.3	265.8	265.5	265.8	265.9	266.4	265.9	267.8	265.7	1.3		-0.6	**0.2**
SI-16	Mean El.													229.8	231.6	232.7	230.1	228.5	227.9	227.9	227.7	228.8	227.6	Apr-05	229.3	1.8		-1.2	-1.6
	Max El.													230.9	236.1	234.5	231.7	228.8	228.5	228.3	228.7	229.9	228.5	236.1	230.6	2.8		-1.4	-2.1
SI-9	Mean El.							244.1	246.7	248.7	245.9	243.5	242.1	242.3	245.2	244.1	242.0	236.8	235.7	237.6	240.2	239.0	235.5	Jan-Feb-00	241.8	4.0	-8.6	-3.5	-6.3
TIP-1	Max El.							249.6	247.3	254.2	247.3	245.0	243.8	243.8	248.4	245.0	243.8	239.2	239.8	240.8	240.9	240.9	236.3	254.2	244.1	4.5	-13.2	-4.6	-7.8
SI-9	Mean El.							267.8	263.8	261.2	262.9				266.5	261.2								Mar-98	263.9	2.8			
TIP-2	Max El.							274.3	266.9	261.2	263.5				270.4	261.2								274.3	266.2	5.3			
SI-11	Mean El.							235.0	234.4	237.5	236.8	236.3	235.3	235.2	240.0	235.7	235.3	235.0	234.7	234.5	235.0	234.3	240.3	Apr-05	236.0	1.9	5.4	**6.0**	**4.4**
TIP-1	Max El.							236.1	239.6	238.4	237.3	237.3	236.1	236.1	245.3	239.6	238.2	235.5	235.5	235.0	239.0	235.6	242.4	245.3	237.9	2.8	6.3	**6.9**	**4.5**
SI-11	Mean El.							242.7	243.7	243.8	242.8	242.8	242.7		242.9	242.7	242.7	242.8	242.9	242.5	242.1	242.1	242.1	Jan-00	242.7	0.5	-0.6	0.0	-0.7
TIP-2	Max El.							242.7	245.0	246.1	243.8	243.8	242.7		245.0	243.2	243.2	243.2	243.8	242.7	242.1	242.1	242.1	246.1	243.4	1.2	-0.6	0.0	-1.3
SI-12	Mean El.							273.2	269.1	268.0	266.9	266.4	264.6	264.4	264.6	268.5	268.1	266.9	265.9	265.5	264.7	263.6	260.1	May-98	266.3	2.9	-13.1	-3.5	-6.1
TIP-1	Max El.							275.5	269.8	268.6	267.5	267.5	265.2	265.2	268.6	269.8	269.8	268.6	267.5	266.3	265.7	265.7	261.1	275.5	267.6	3.1	-14.4	-4.6	-6.5
SI-12	Mean El.							275.2	273.9	272.5	270.9	268.7	266.9	267.1	267.1	269.2	266.7	266.7	265.2	264.8	264.6	263.0	258.9	Jun-98	267.6	4.1	-16.2	-4.1	-8.7
TIP-2	Max El.							276.3	275.2	272.9	271.7	270.6	267.1	267.1	271.7	270.6	268.3	270.6	268.8	266.5	266.5	265.4	260.2	276.3	269.3	4.0	-16.1	-5.2	-9.1
SI-12	Mean El.							274.2	270.8	269.8	269.7	268.3	266.4	266.1	268.8	270.7	267.9	269.9	268.9	267.9	266.6	265.6	263.9	Oct-07	268.5	2.5	-10.3	-1.7	-4.5
TIP-3	Max El.							274.8	272.5	272.5	273.7	270.2	267.9	267.9	273.7	273.7	269.1	274.8	271.9	269.1	268.5	267.3	264.5	274.8	270.7	3.1	-10.4	-2.9	-6.3
SI-15	Mean El.								271.2	270.4	270.6	271.1	271.0	271.6	274.0	273.0	271.6	271.6	270.1	270.2	271.3	269.0	264.0	Mar-05 & Apr-05	270.7	2.2		-5.0	-6.7
TIP-1	Max El.								271.8	271.8	274.1	273.0	274.1	273.0	276.4	274.1	273.5	273.5	270.7	271.2	274.7	271.2	267.2	276.4	272.7	2.2		-4.0	-5.5
SI-15	Mean El.								277.7	276.1	276.4	276.8	274.8	268.9	267.1	266.8	266.0	270.8	273.1	275.2	279.1	277.7	273.0	May-11	273.3	4.4		-4.7	-0.3
TIP-2	Max El.								278.8	276.5	280.0	277.7	276.5	276.5	267.3	273.1	266.2	277.1	274.2	278.8	282.8	279.4	277.1	282.8	276.1	4.5		-2.3	**1.0**
SI-16	Mean El.													238.3	239.3	238.5	238.5	237.7	236.2	236.1	233.7	233.7	232.4	Jan-05	236.4	2.4		-1.3	-4.1
TIP-1	Max El.													239.7	244.3	239.7	239.1	238.5	236.8	239.7	235.6	235.6	232.8	244.3	238.2	3.1		-2.9	-5.4
SI-16	Mean El.													259.9	262.9	259.4	257.6	257.6	257.6	257.6	258.2	257.6		Mar-05	258.7	1.8		--	--
TIP-2	Max El.													261.6	265.1	260.5	257.6	257.6	257.6	257.6	258.2	257.6		265.1	259.2	2.6		--	--
Area	Mean El.	280.3	281.8	283.2	279.9	281.8	282.4	261.4	262.6	262.3	262.0	261.3	260.2	257.3	258.5	258.4	256.7	256.0	255.4	255.5	255.8	253.0	250.8		264.4	11.2	-10.6	-2.2	-13.6
Average	Max El	285.7	288.1	286.5	284.6	284.0	284.5	264.4	264.3	263.9	263.7	262.6	261.4	258.9	262.1	260.1	258.1	257.9	256.8	256.8	257.3	254.3	252.2		266.7	12.2	-12.2	-2.1	-14.5
Change vs	Mean El.		1.5	1.4	-3.3	1.9	0.6	-21.0	1.2	-0.3	-0.3	-0.7	-1.1	-2.9	1.2	-0.1	-1.7	-0.7	-0.6	0.0	0.4	-2.8	-2.2						
Prior	Max El.		2.4	-1.6	-1.9	-0.6	0.5	-20.1	0.0	-0.5	-0.2	-1.1	-1.2	-2.5	3.2	-2.0	-1.9	-0.3	-1.1	0.0	0.5	-3.0	-2.1						
Rambla Pacifico																													
SI-13	Mean El.								361.3	359.3	360.3	360.2	360.0	360.5	361.7	363.4	362.4	360.4	360.0	359.1	359.0	359.9	358.6	Apr-05	360.4	1.3		-1.3	-1.8
	Max El.								362.4	359.9	361.2	360.8	361.1	361.1	365.1	364.5	363.4	361.1	360.5	359.5	359.3	360.5	359.4	365.1	361.3	1.8		-1.1	-1.9
SI-13	Mean El.								362.9	361.1	362.5	362.5	361.4	361.5	361.9	363.3	362.3	361.2	359.0	358.6	359.3	359.5	357.5	Nov-07	361.0	1.8		-2.0	-3.5
TIP-1	Max El.								363.2	362.1	363.2	363.2	363.2	362.1	365.5	364.4	364.4	367.8	360.3	359.8	359.8	360.3	359.2	367.8	362.5	2.4		-1.1	-3.4
SI-14	Mean El.								342.0	341.6	341.7	342.2	341.7	341.8	342.8	344.1	343.6	342.8	342.8	342.1	342.4	342.5	342.1	May-05	342.4	0.7		-0.5	-0.3
	Max El.								342.2	341.7	342.3	342.5	341.9	341.9	346.3	345.8	344.3	343.1	343.0	342.5	342.9	342.8	343.2	346.3	343.1	1.4		**0.4**	**0.1**
SI-14	Mean El.								345.9	345.7	345.0	344.0	341.2	342.5	343.2	342.5	340.7	342.3	340.8	340.8	341.5	343.4	343.3	Nov-98	342.9	1.7		-0.1	**0.4**
TIP-1	Max El.								346.9	345.8	345.8	345.8	341.2	343.5	345.8	343.5	341.7	345.8	341.2	341.7	341.7	344.0	344.0	346.9	343.9	2.0		0.0	**0.2**
Area	Mean El.								353.0	351.9	352.4	352.2	351.1	351.6	352.4	353.3	352.3	351.7	350.6	350.2	350.6	351.3	350.4		351.7	1.0		-1.0	-1.3
Average	Max El								353.7	352.4	353.1	353.1	351.8	352.1	355.7	354.5	353.4	354.4	351.2	350.9	350.9	351.9	351.5		352.7	1.4		-0.5	-1.3
Change vs	Mean El.									-1.1	0.5	-0.2	-1.1	0.5	0.9	0.9	-1.1	-0.6	-1.0	-0.5	0.4	0.8	-1.0						
Prior	Max El.									-1.3	0.8	-0.1	-1.2	0.3	3.5	-1.1	-1.1	1.0	-3.2	-0.4	0.0	1.0	-0.5						

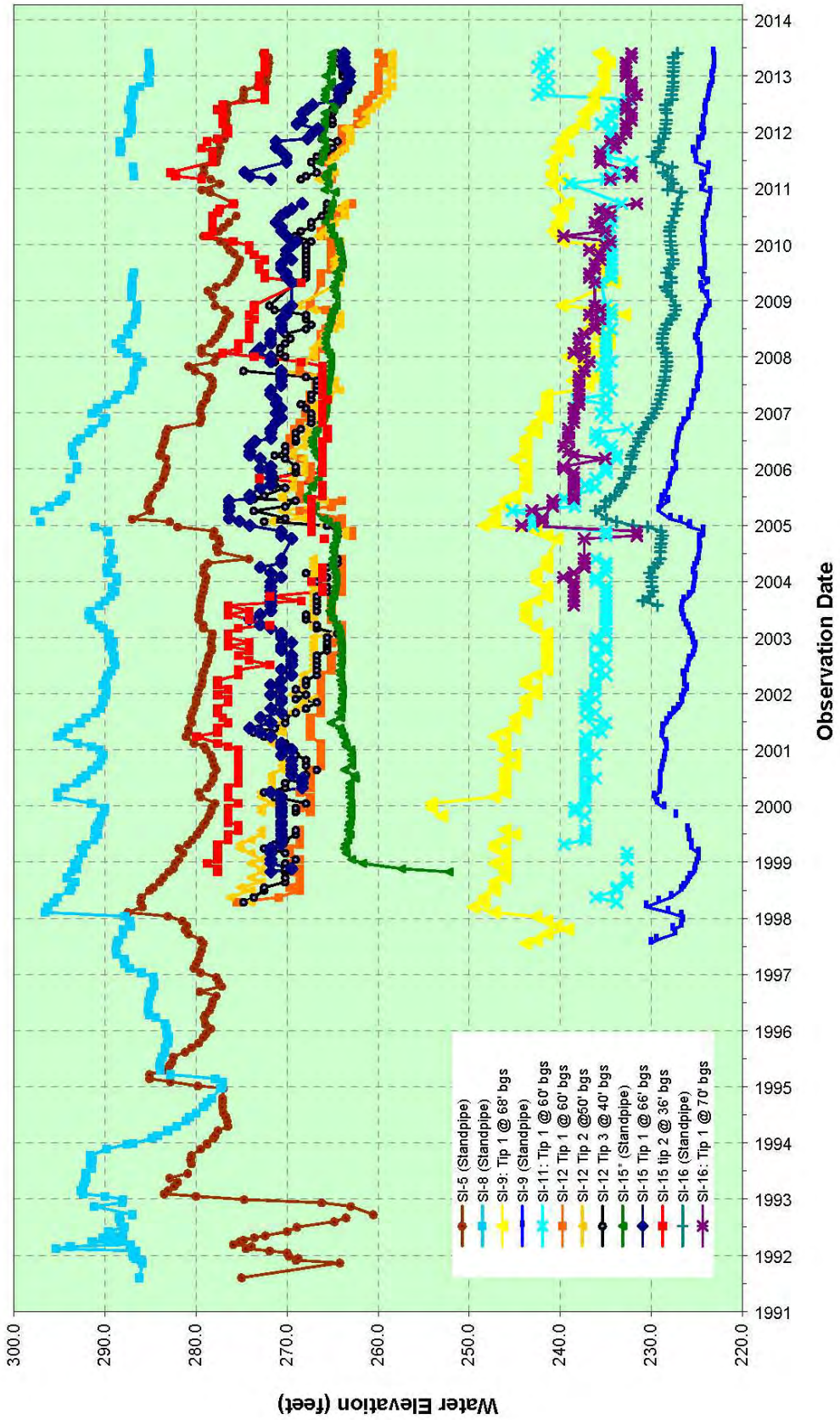
Piezometer Not Installed | No Data Recorded | – Piezomater Not Functioning

SUMMARY OF GROUNDWATER DATA
Calle del Barco Landslide Assessment District
Malibu, California

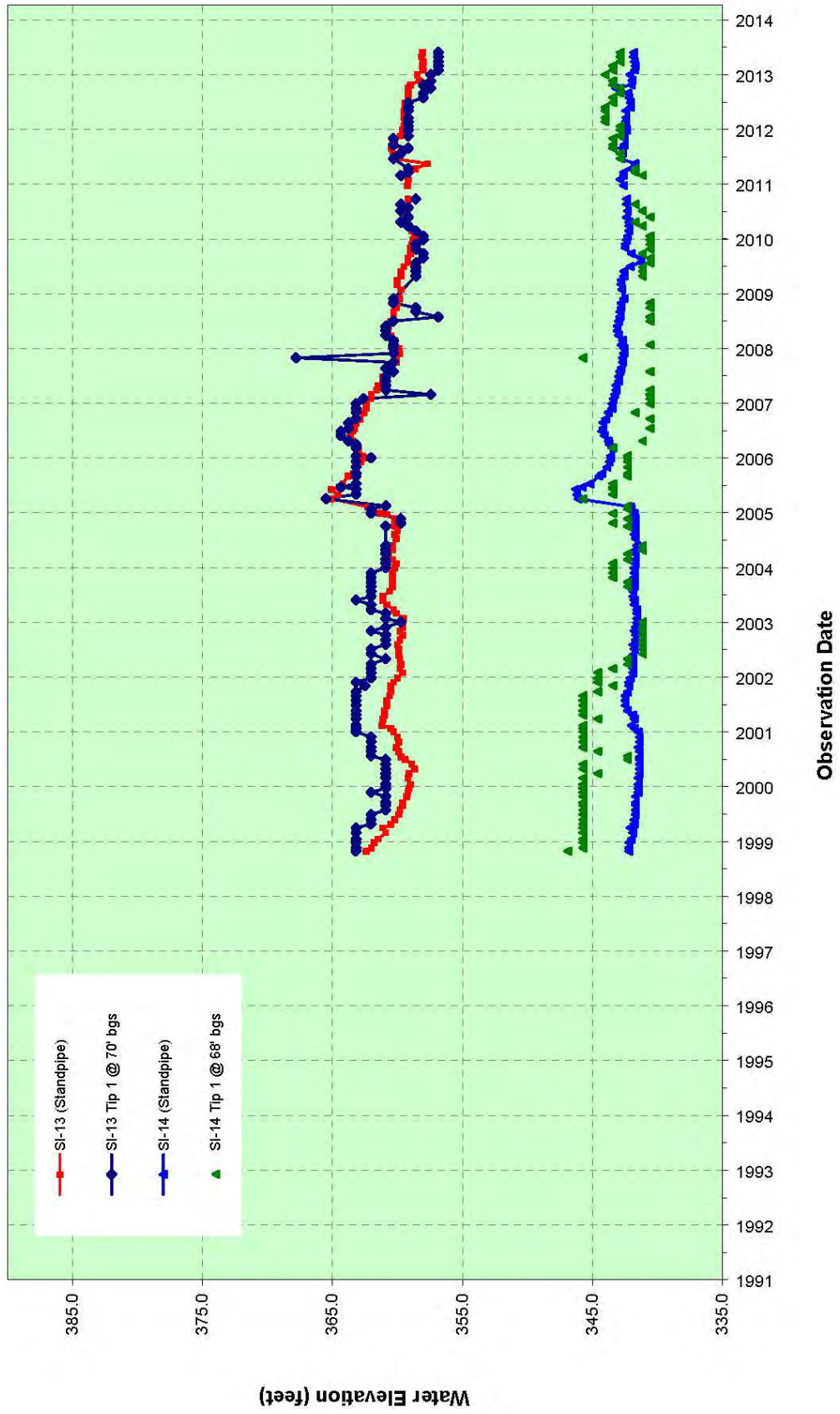
PLATE A-2



GROUNDWATER HYDROGRAPH
Rambla Vista
Calle del Barco Landslide Assessment District
Malibu, California



GROUNDWATER HYDROGRAPH
Calle del Barco
Calle del Barco Landslide Assessment District
Malibu, California



GROUNDWATER HYDROGRAPH
Rambla Pacífico
Calle del Barco Landslide Assessment District
Malibu, California

APPENDIX B
DEWATERING DATA

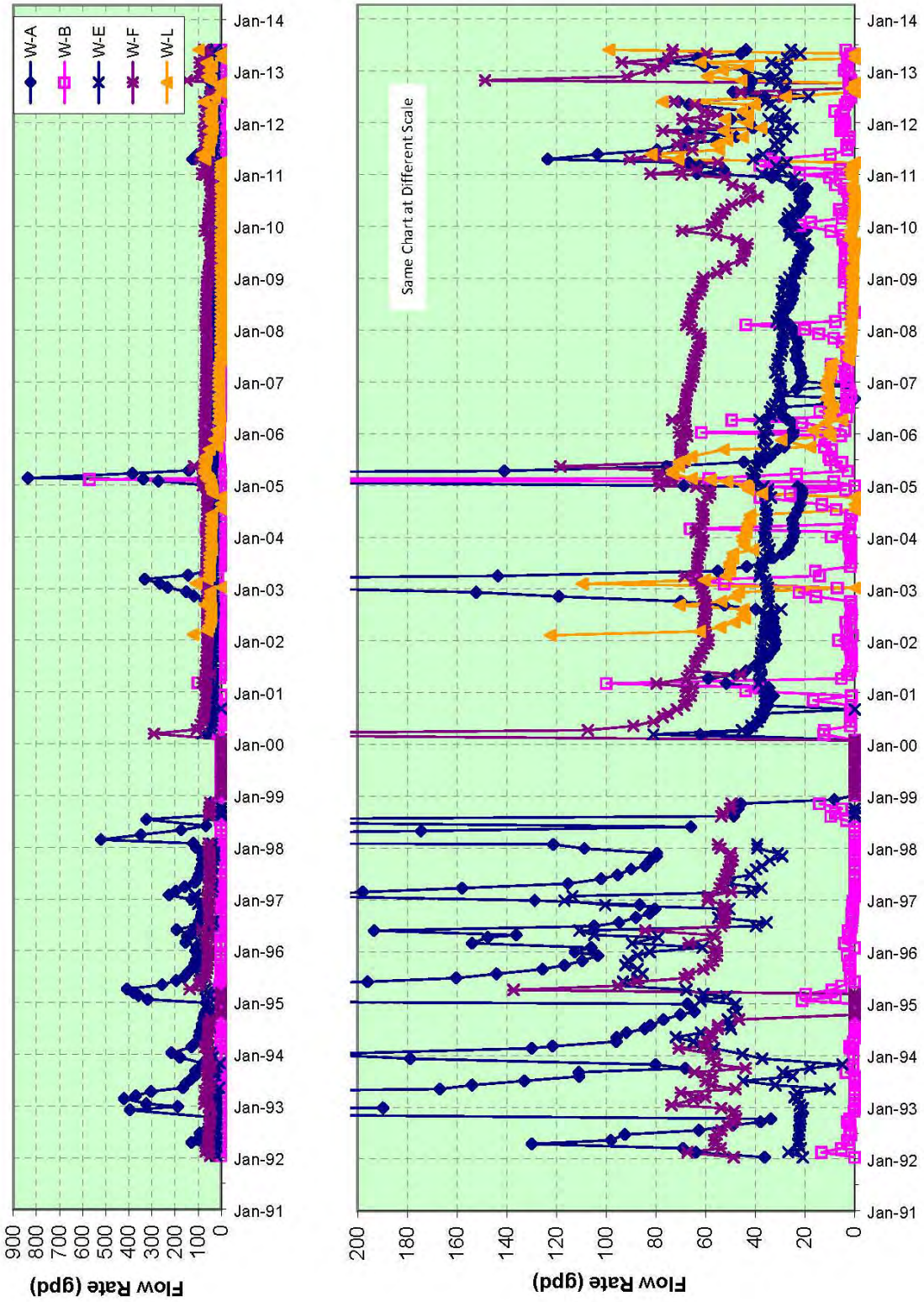
CALLE DEL BARCO LAD - Dewatering Well Information							
Well ID	Vault Elevation (ft.)	Bottom Elevation (ft.)	Pump Elevation (ft.)	Pump Size (hp)	2012-2013 Pumping Rate (gpd)	% of Total Well Production	Comment
W-A	196.0	Unknown	45.0	1/2	48	6%	
W-B	204.0	Unknown	54.0	1/2	2	0%	
W-C	295.0	Unknown	233.0	1/2	55	7%	
W-D*	297.0	Unknown	Unknown	none	0	0%	dry - no pump
W-E	215.0	Unknown	116.5	1/2	28	4%	
W-F	210.0	109.0	112.0	1/2	65	8%	
W-G*	292.0	222.0	223.0	1/3	0	0%	dry
W-H	299.5	234.5	242.5	1/3	1	0%	
W-I	298.0	238.0	248.0	1/3	38	5%	
W-J	304.0	244.0	254.0	1/3	343	45%	
W-K	430.0	370.0	380.0	1/3	61	8%	
W-L	258.0	189.0	192.5	1/2	33	4%	
W-M	302.0	237.0	Unknown	Unknown	92	12%	

*Note: * Non-functioning Dewatering Wells*

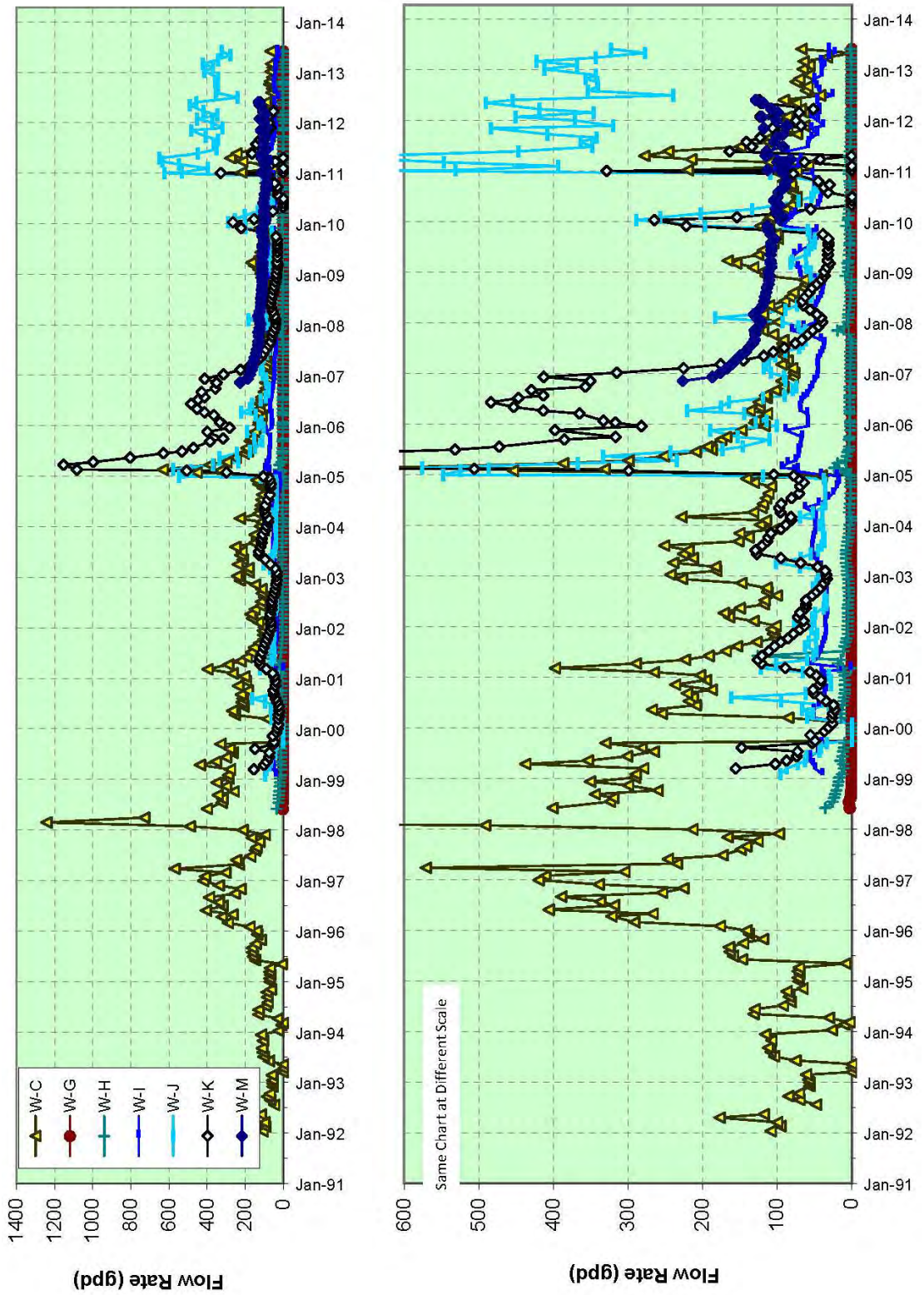
CALLE DEL BARCO LAD - Hydrauger Information						
Hydrauger ID	Installed Length (ft)	Functional Length (ft)	2012-2013 Flow Rate (gpd)	% of Total Production	Installed By	Comment
HD-1[2]	93	unknown	0	0%	BYA	
HD-2[2]	127	unknown	0	0%	BYA	
HD-3[2]	155	unknown	0	0%	BYA	
HD-4[2]	80	unknown	0	0%	BYA	
HD-5[2]	65	unknown	0	0%	BYA	
HD-6[2]	97	unknown	0	0%	BYA	
HD-7[2]	227	unknown	0	0%	BYA	
HD-8[2]	290	unknown	0	0%	BYA	
HD-9	230	unknown	0	0%	BYA	
HD-10[2]	330	unknown	0	0%	BYA	
HD-11[2]	230	unknown	0	0%	BYA	
HD-12[2]	330	unknown	0	0%	BYA	
HD-13	210	unknown	13	7%	BYA	
H-1	240	unknown	135	73%	LA County	
H-2	180	unknown	0	0%	LA County	No outlet to monitor
ROWH-1	--	unknown	26	14%	BYA	discharge diverted from H-2
H-3[1]	235	unknown	0	0%	LA County	
H-4[1]	140	unknown	0	0%	LA County	
H-5[1]	260	unknown	0	0%	LA County	
H-6[1]	140	unknown	0	0%	LA County	
H-7[1]	205	unknown	0	0%	LA County	
H-1A	100	92	0	0%	Fugro	
H-2A	130	125	11.3	6%	Fugro	

Note: 1 - Destroyed in 1998 Landslide
2 - Non-producing Hydraugers

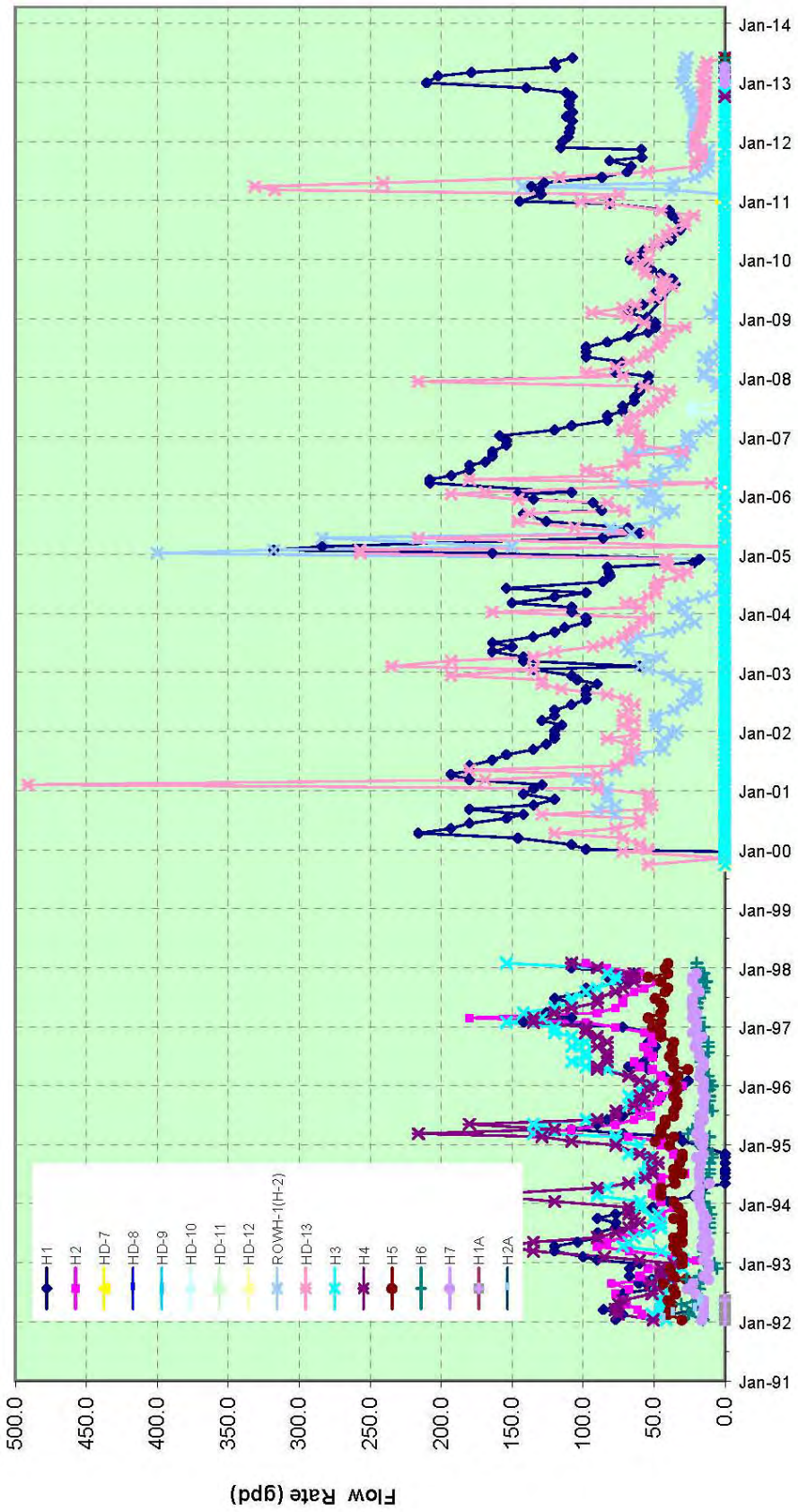
DEWATERING WELL/HYDRAUGER INFORMATION
Calle del Barco Landslide Assessment District
Malibu, California



DEWATERING WELL GRAPH
Rambla Orienta and Slope
Calle del Barco Landslide Assessment District
Malibu, California



DEWATERING WELL GRAPH
Calle del Barco and Rambla Pacífico
Calle del Barco Landslide Assessment District
Malibu, California



HYDRAUGER GRAPH
Discharge Rate for all Hydraugers
Calle del Barco Landslide Assessment District
Malibu, California

APPENDIX C
SLOPE INCLINOMETER DATA

CALLE DEL BARCO - Slope Inclinometer Interpretation Summary																	
	SI-1*	SI-1A	SI-2**	SI-3	SI-4	SI-5	SI-6	SI-7	SI-8	SI-9	SI-10	SI-11	SI-12	SI-13	SI-14	SI-15	SI-16
Installation Details																	
Surface Elev. (ft) 4/00	295.0	297.0	298.0	207.0	206.0	302.0	295.0	200.0	335.0	298.0	202.0	291.5	301.0	405.0	398.0	304.0	295.0
Original DEPTH (ft.)	64.0	NI	NI	NI	76.0	100.0	NI	100.0	130.0	100.0	60.0	60.0	60.0	80.0	78.0	76.0	88.0
Current DEPTH (ft.)	64.0	NI	NI	NI	78.0	96.0	NI	102.0	130.0	96.0	62.0	57.0	56.0	78.0	76.0	72.0	86.0
STATUS	D	D	D	D	F	F	D	F	F	F	F	F	F	F	F	F	F
READING INTERVAL	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly
DATE OF INSTALLATION	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	3/13/98	3/12/98	3/12/98	9/1998	9/1998	9/1998	8/8/03
DATE FIRST BASE READING	NI	NI	NI	NI	NI	NI	NI	NI	NI	12/22/97	3/16/98	3/13/98	3/16/98	10/12/98	10/12/98	10/23/98	8/13/03
*DEPTH of MOVEMENT (ft)****	NI	NI	NI	NI	17-22	0-10, 36-38	15.0	40.0	15-17	53.0	35-38	0-55	54	0-30	8.0	0-25, 77	46, 87
A+ Axis orientation	NI	NI	NI	NI	0	38.0	NI	28.0	22.0	212.0	244.0	258.0	238.0	210.0	224.0	190.0	210 est.
Interpretation Movement (inches)																	
2012-2013	NR	NR	NR	NR	<0.1	0.1	NR	<0.1	<0.1	0.15	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2
2011-2012	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	0.1	0.15	<0.1	0.2	<0.1	<0.1	0.1	0.1	0.35
2010-2011	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2009-2010	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
2008-2009	NR	NR	NR	NR	<0.1	<0.1	NR	NA	<0.1	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
2007-2008	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
2006-2007	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2
2005-2006	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	0.1
2004-2005	NR	NR	NR	NR	--	0.45	NR	<0.1	0.1	0.5	--	<0.1	0.11	--	--	--	0.35
2003-2004	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2002-2003	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2001-2002	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2000-2001	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
1999-2000	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
1998-1999	NR	NR	NR	NR	--	0.16	NR	0.11	--	2.19	--	--	--	--	--	--	--
1997-1998	NR	NR	NR	NR	0.22	0.4	NR	0.66	0.32	13	0.22	--	--	NR	NR	NR	NR
1996-1997	NR	NR	NR	NR	NA	NA	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1995-1996	NR	NR	NR	NR	NA	NA	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR

KEY:

D	Destroyed	**--**	No clearly defined interpreted movement
F	Functioning	**NR**	No reading
B	New baseline in 1999	**NA**	Data not available
NI	No information		
--	Shaded yellow to indicate inclinometer does penetrate basal rupture.		
--	Shaded blue to indicate inclinometer does NOT penetrate basal rupture.		
--	Shaded gray to indicate inclinometer is no longer monitored.		

NOTES:

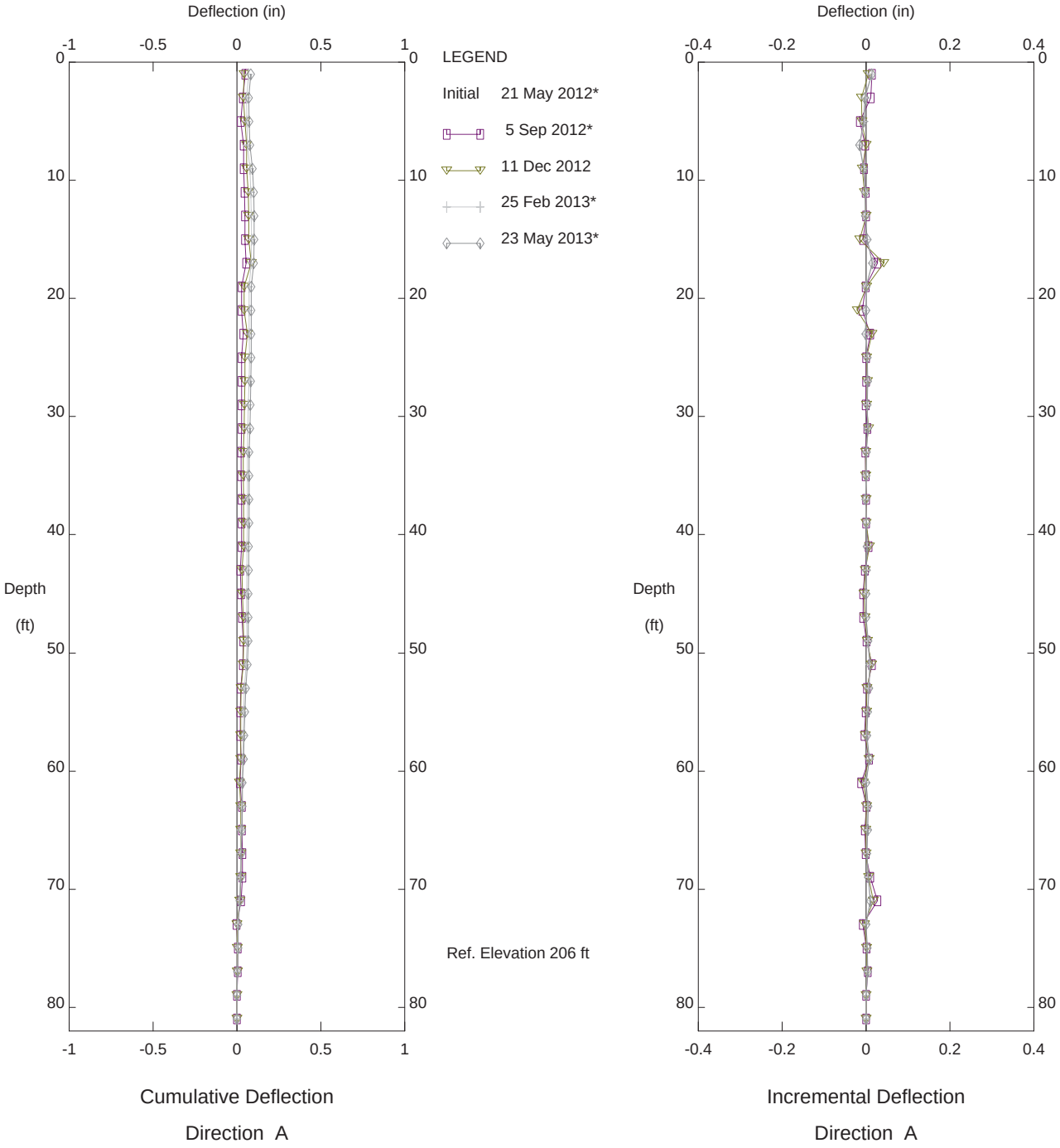
* Original SI-1 installed in 1978, and was destroyed. SI-65 (installed in 1979) was renamed to SI-1

** Original SI-2 installed in 1978, and was destroyed. SI-90 (installed in 1979) was renamed to SI-2

*** Referenced to current depth of SI (see note below)

****SI-4, SI-7, and SI-10 were extended 6 feet upwards during reconstruction of the road in 1999 and interpretations are referenced to their current depth.

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-4

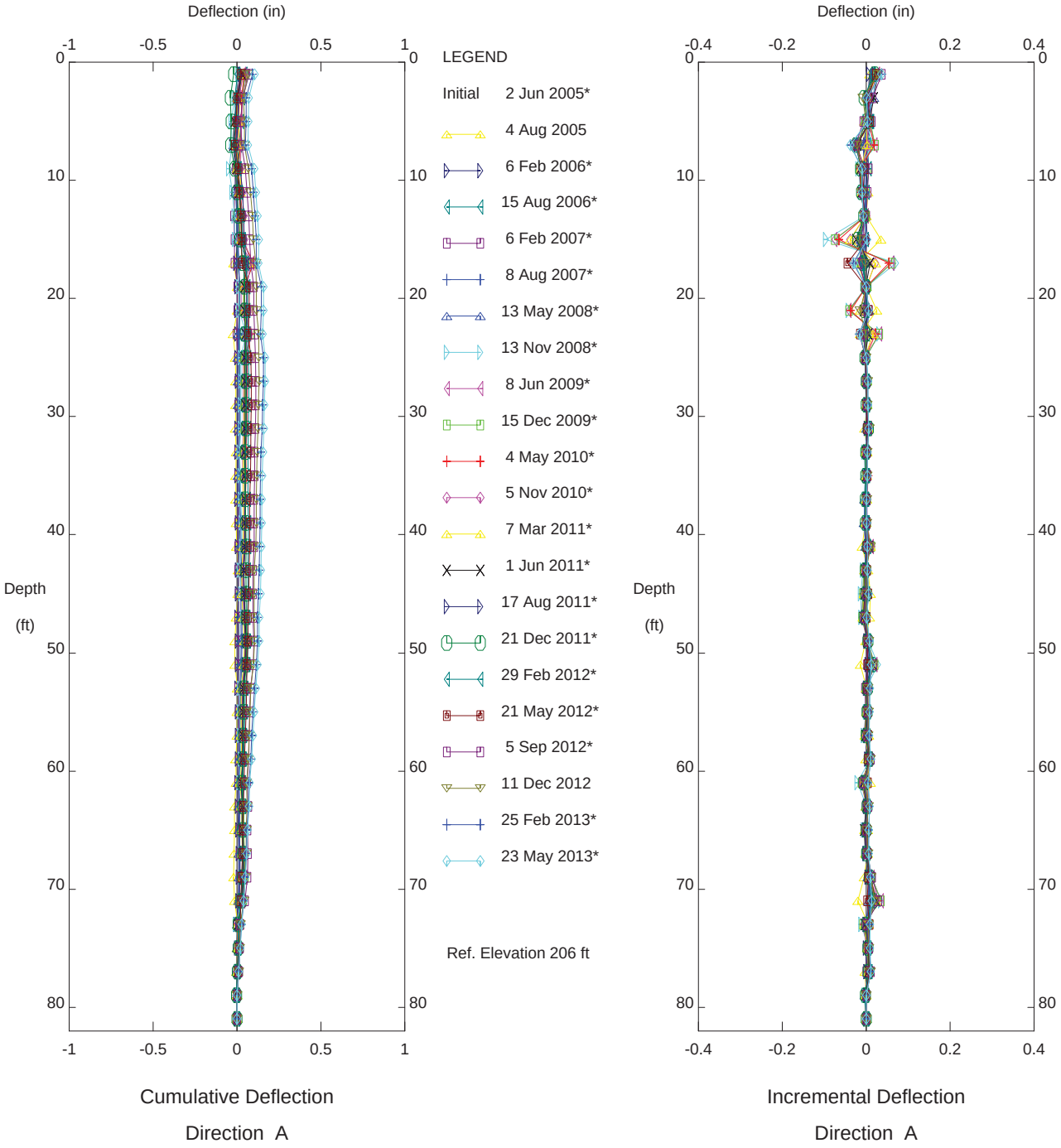
Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI4.GTL

PLATE C-2a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-4

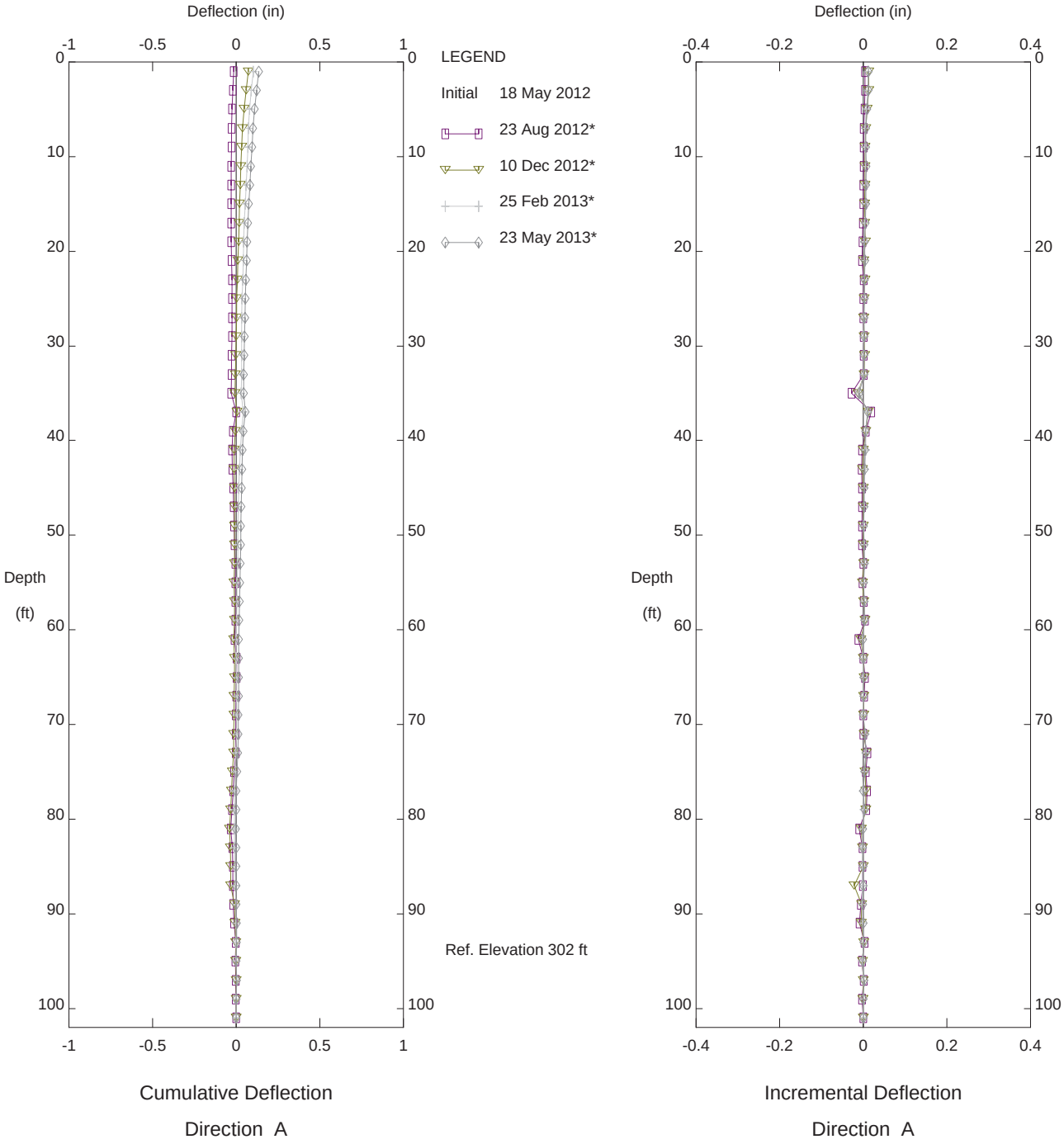
Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

C:\USERS\JREEVES\DESKTOP\FUGRO STUFF\DATA\CALLE DEL BARCO\SI DATA\SI4.GTL

PLATE C-2b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-5

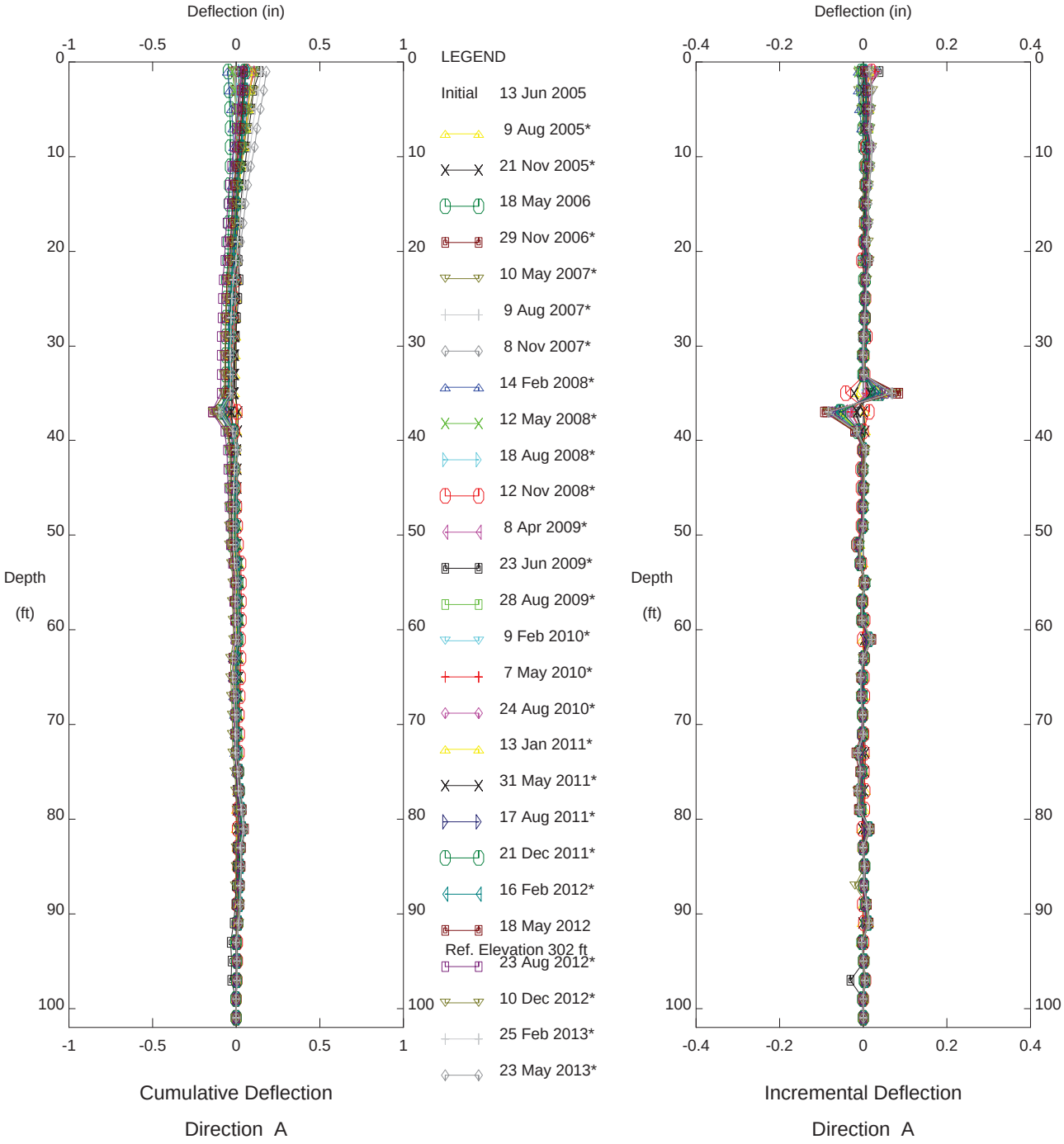
Depth of readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI5.GTL

PLATE C-3a

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-5

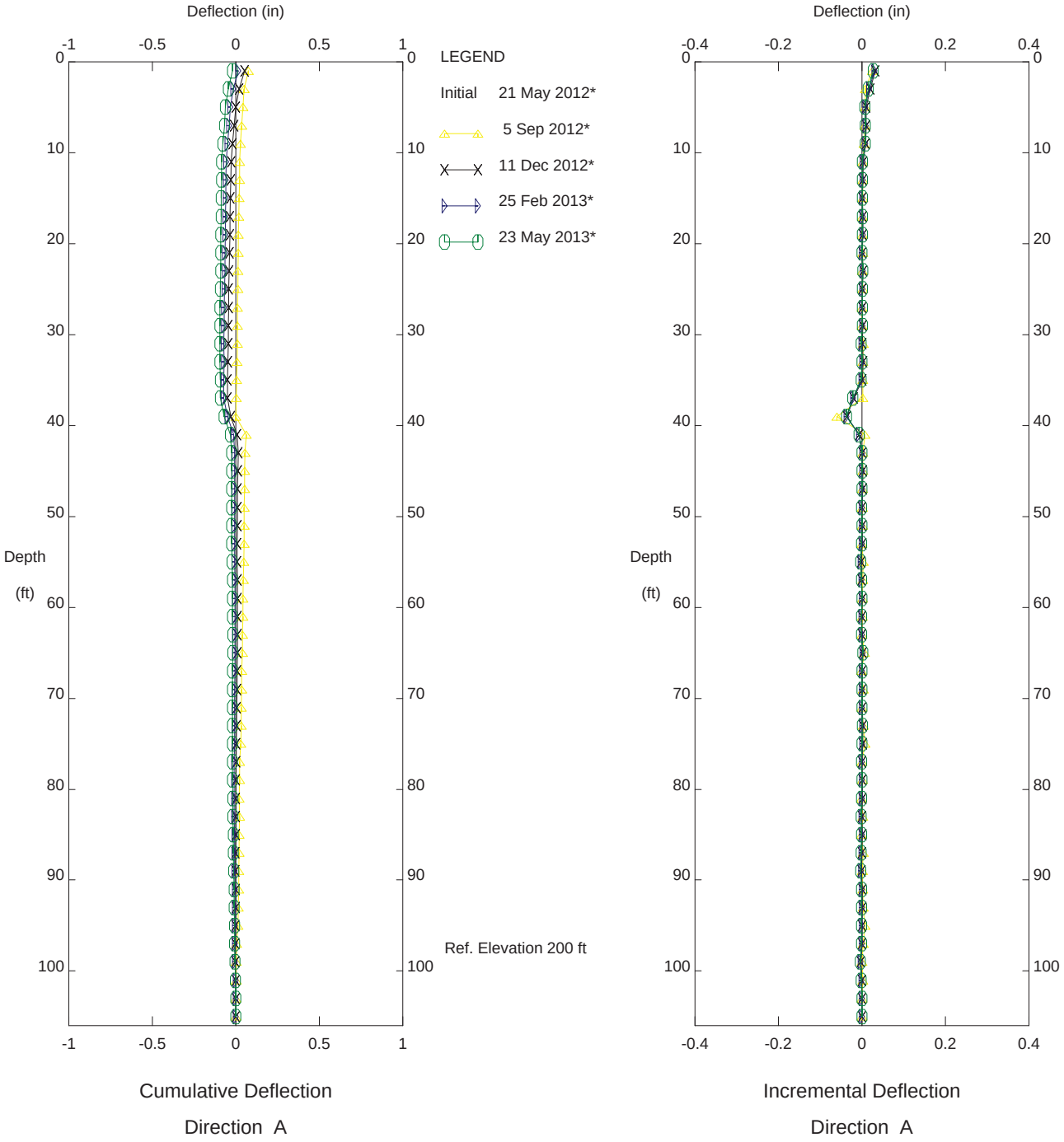
Depth of readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI5.GTL

PLATE C-3b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-7

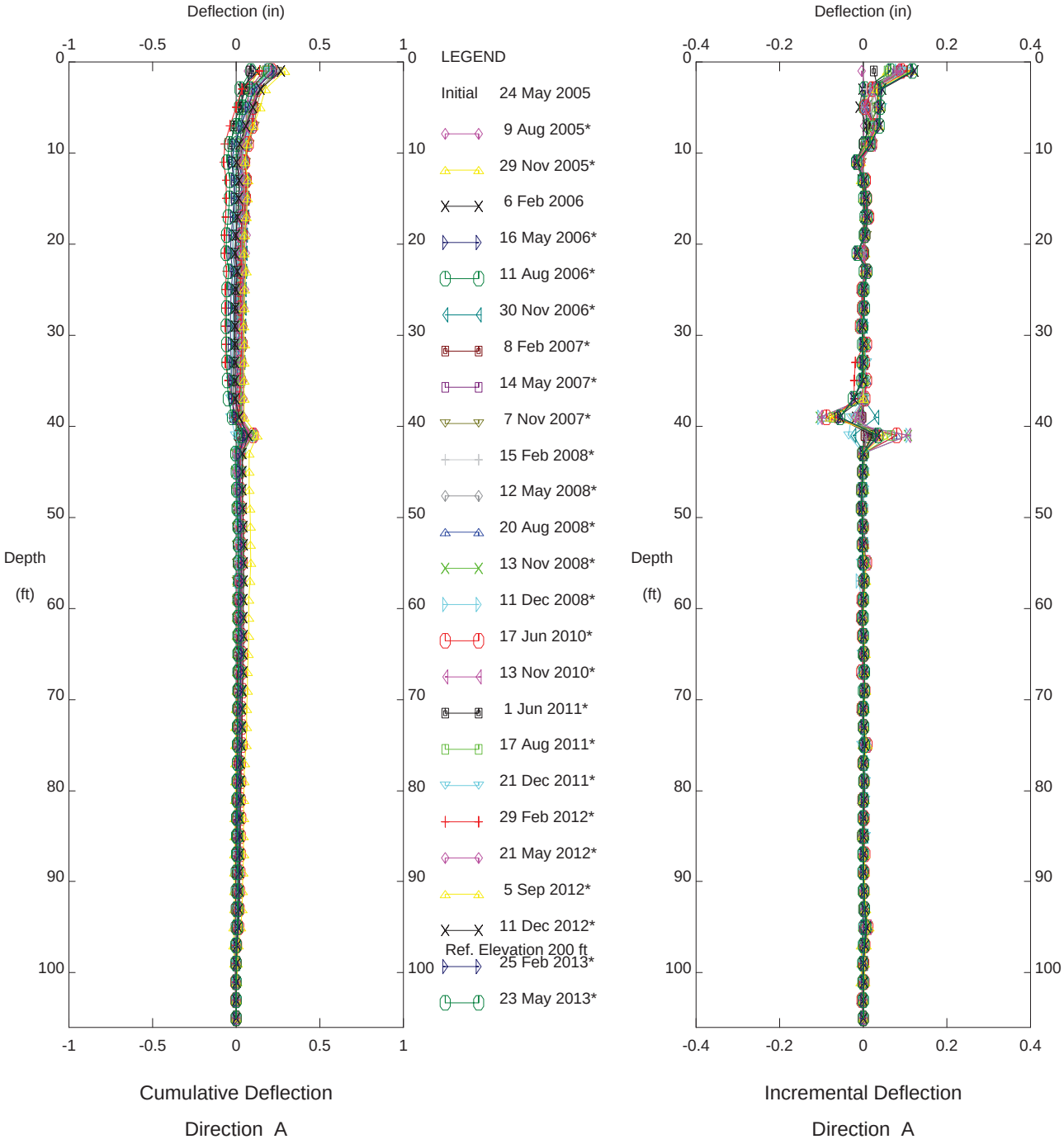
Depth of readings = 102 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI7.GTL

PLATE C-4a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-7

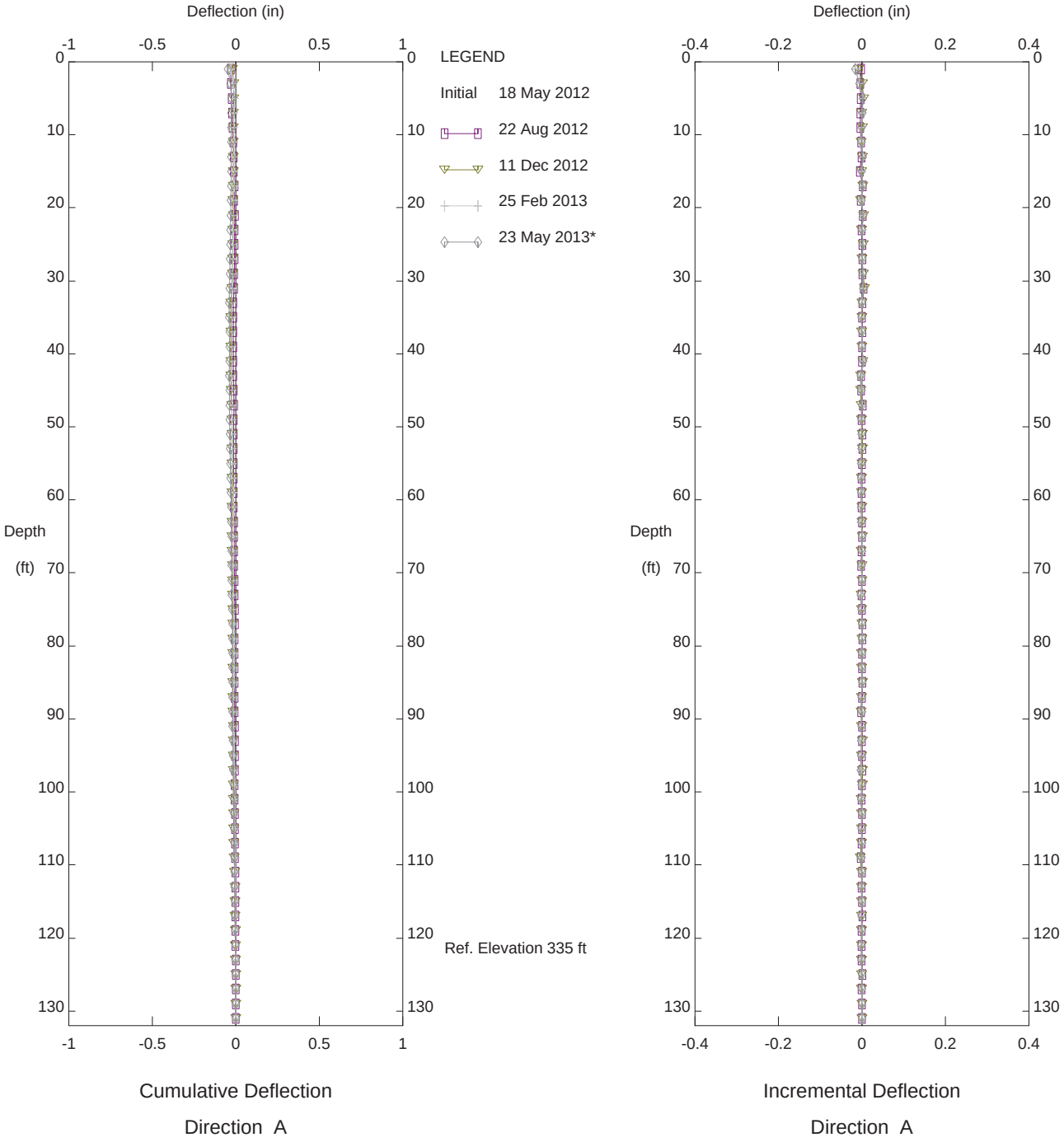
Depth of readings = 102 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI7.GTL

PLATE C-4b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-8

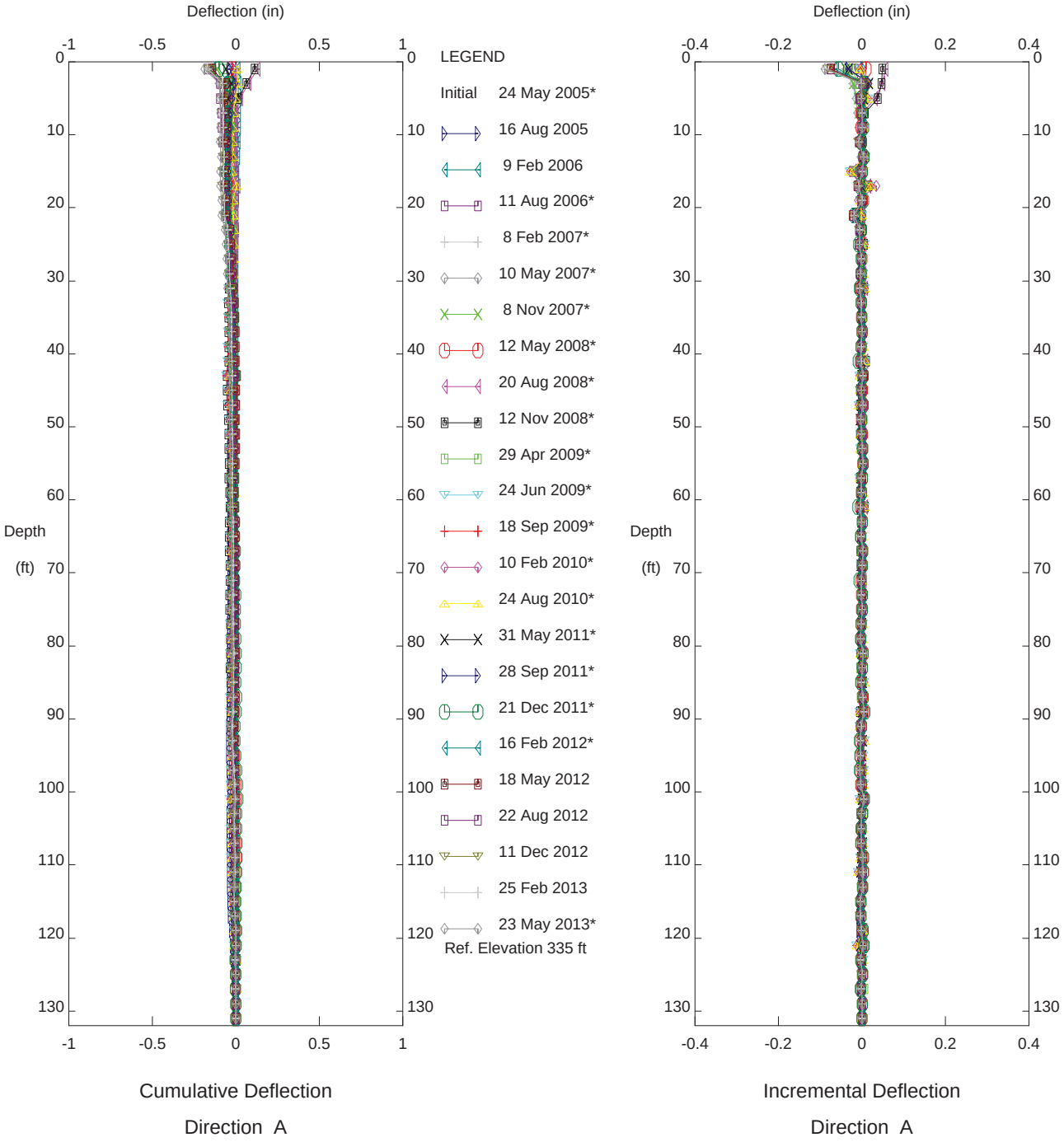
Depth of readings = 128 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI8.GTL

PLATE C-5a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-8

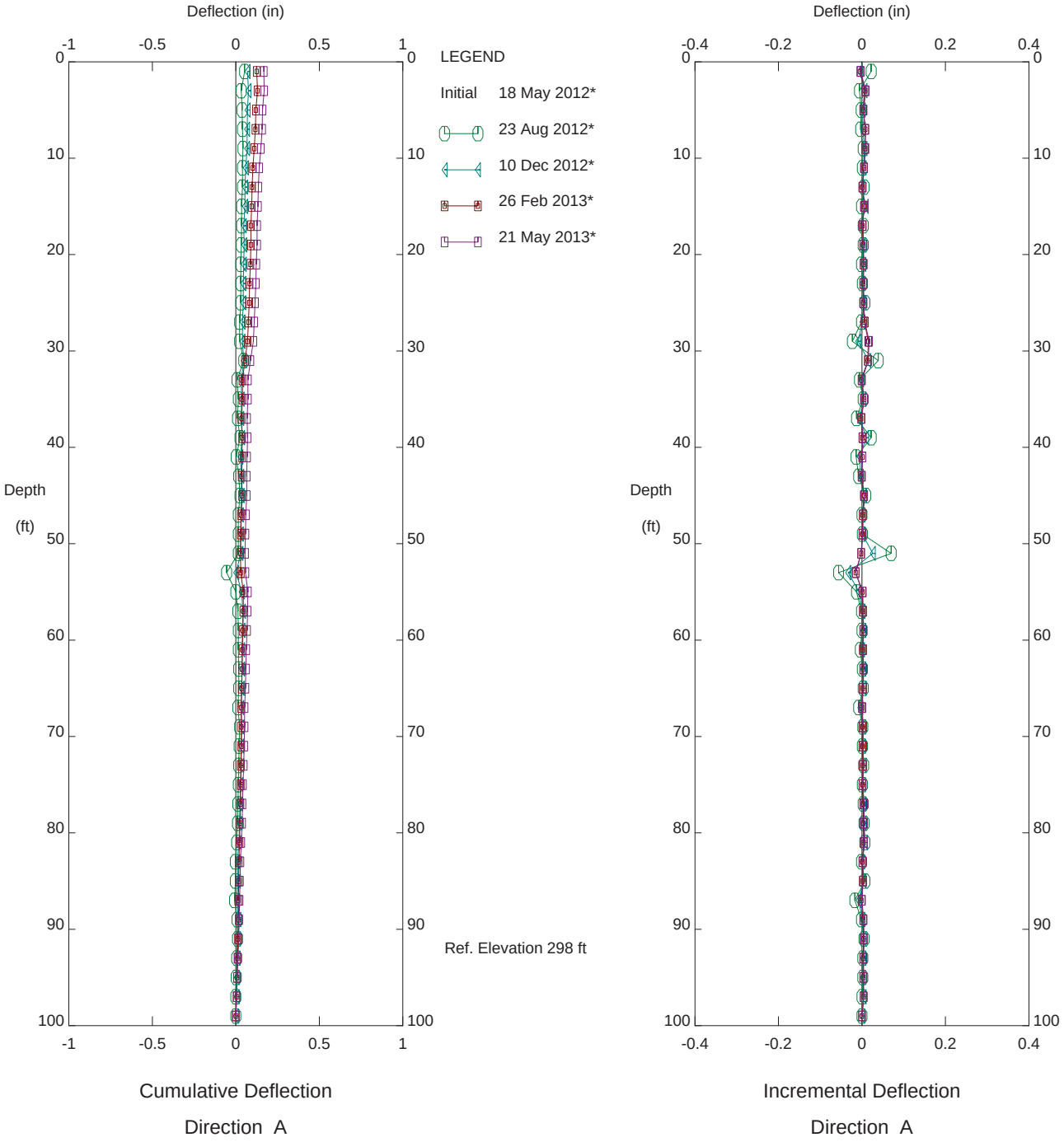
Depth of readings = 128 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI8.GTL

PLATE C-5b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-9

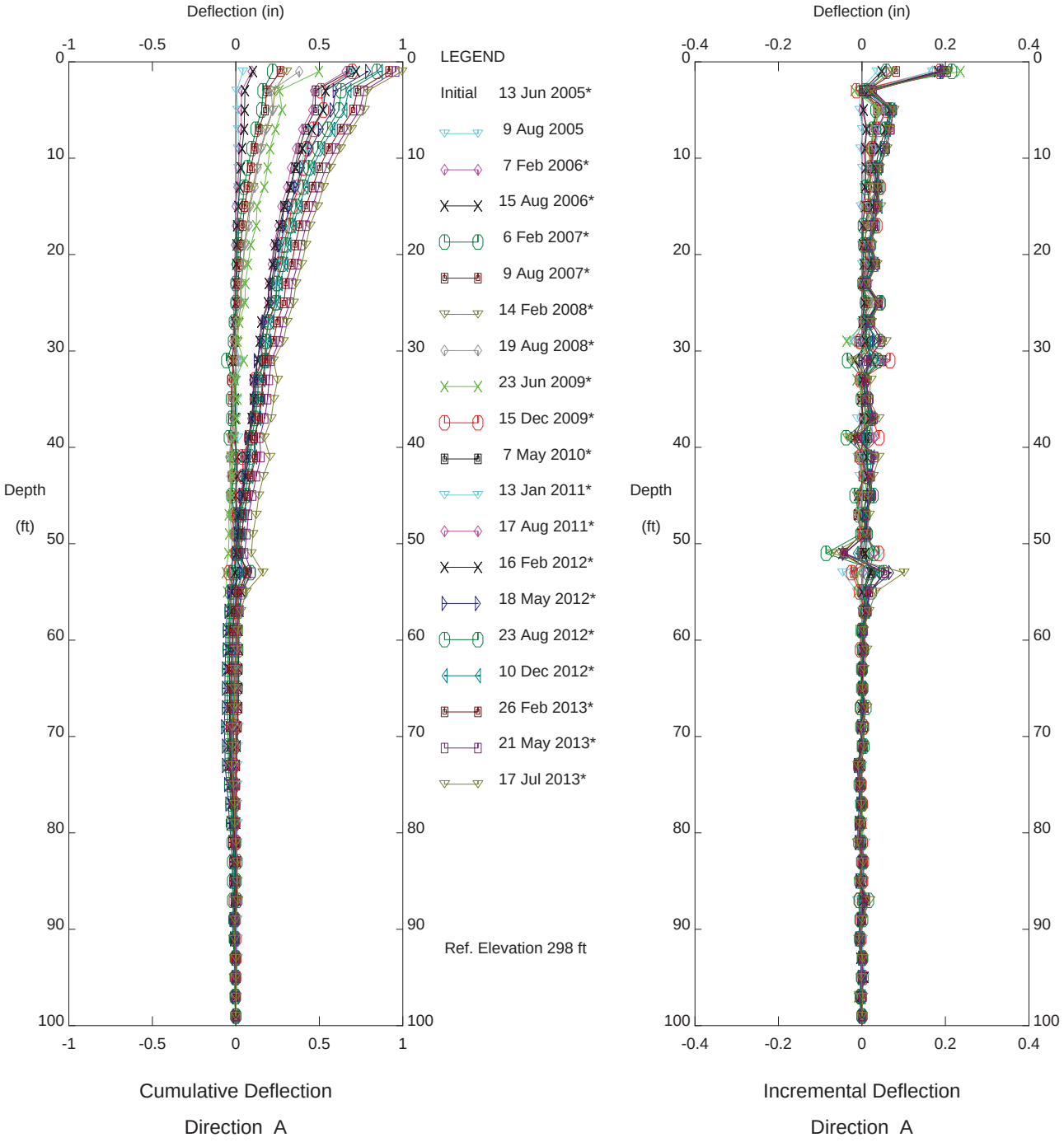
Depth of Readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI9.GTL

PLATE C-6a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-9

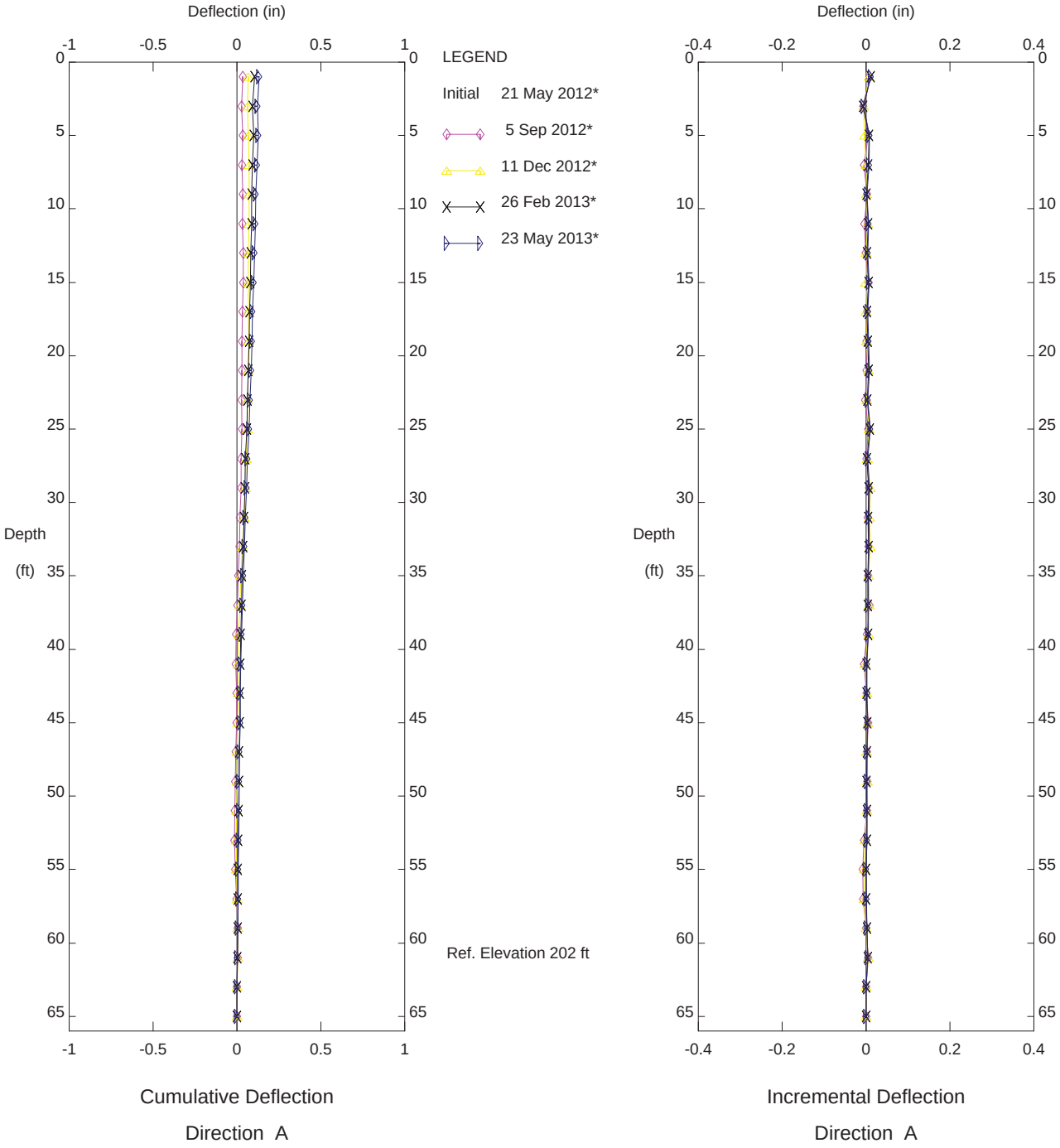
Depth of Readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI9.GTL

PLATE C-6b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-10

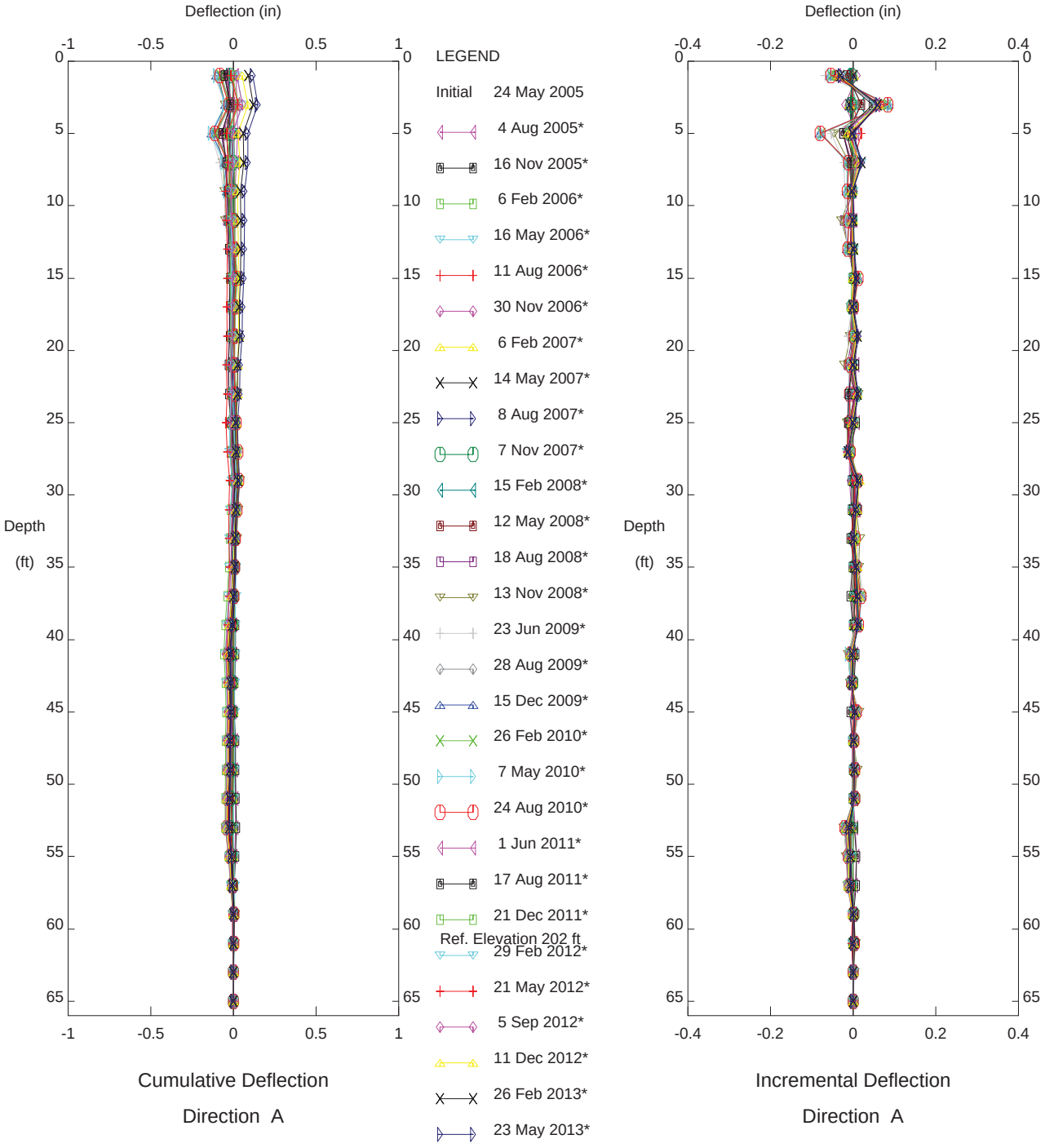
Depth of readings = 62 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI10.GTL

PLATE C-7a

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-10

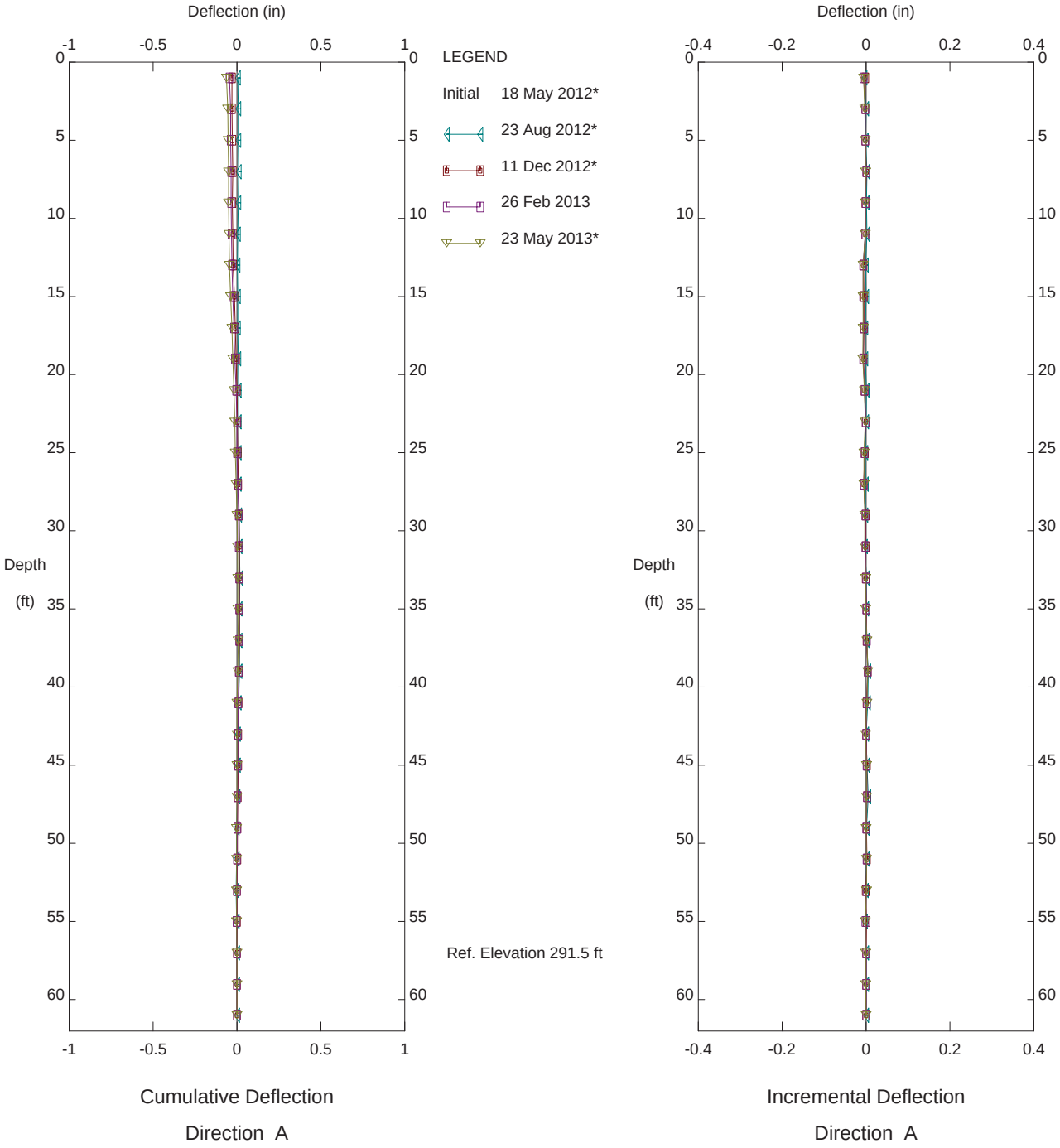
Depth of readings = 62 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI10.GTL

PLATE C-7b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-11

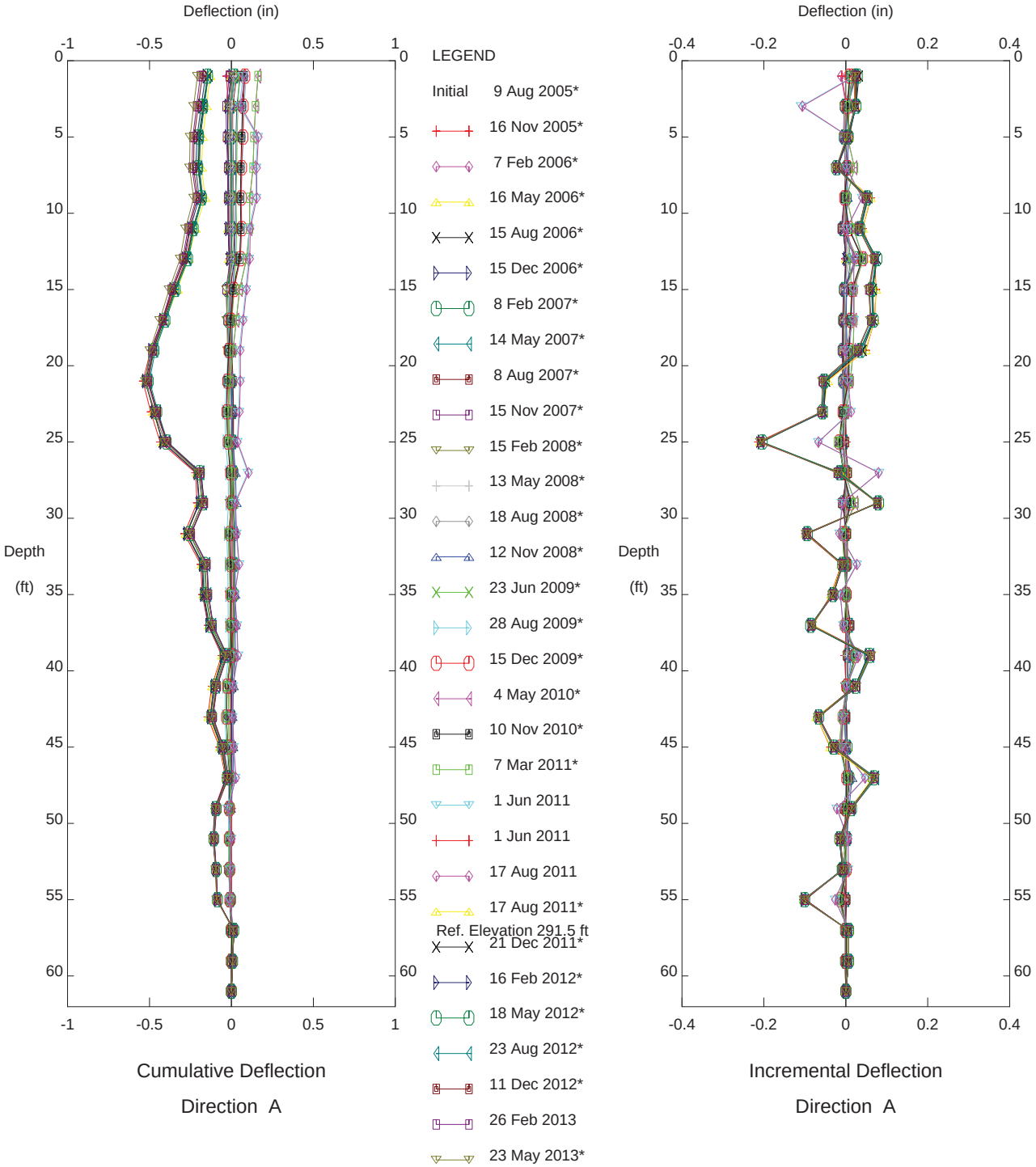
Depth of readings = 57 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI11.GTL

PLATE C-8a

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-11

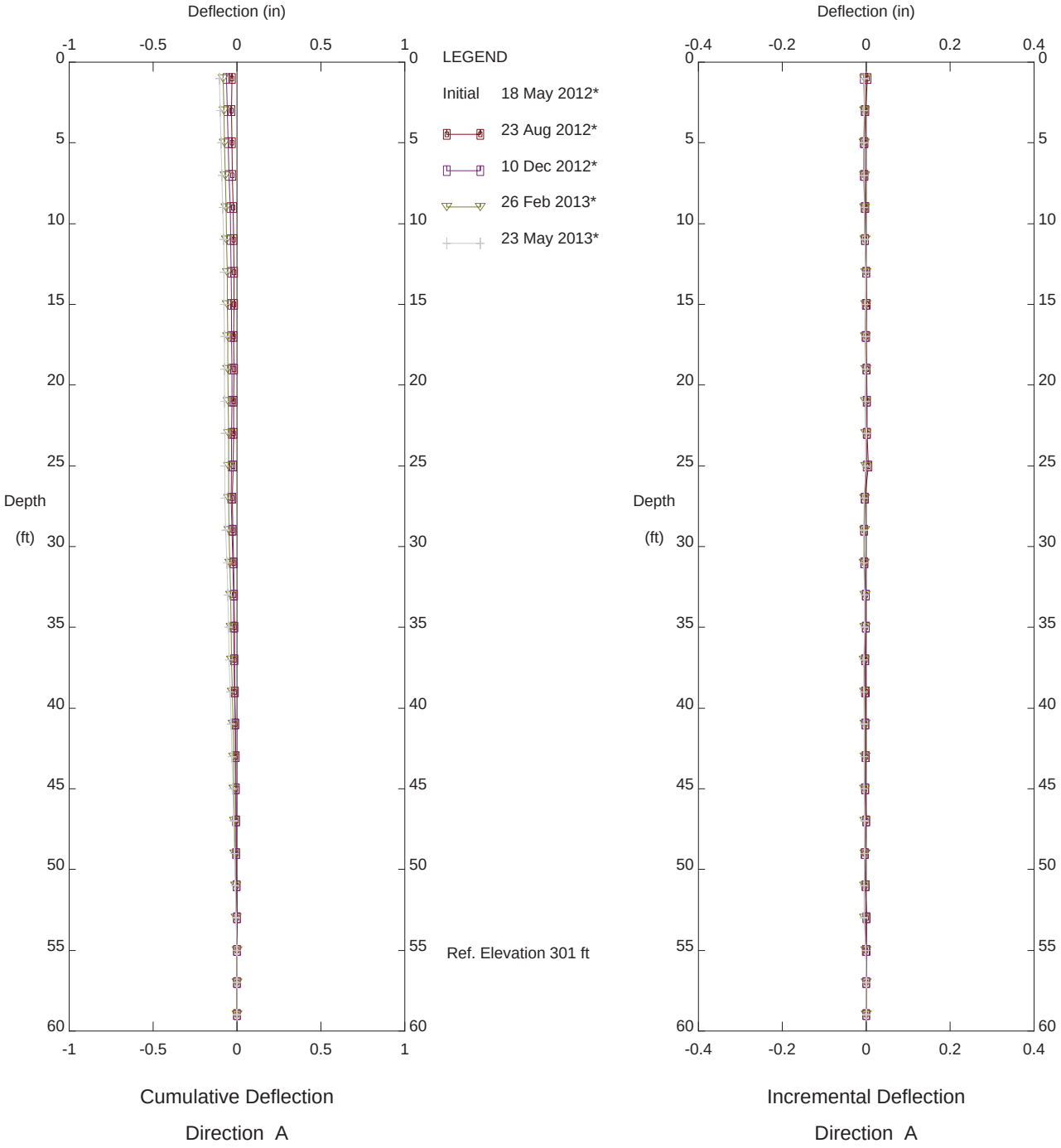
Depth of readings = 57 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI11.GTL

PLATE C-8b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-12

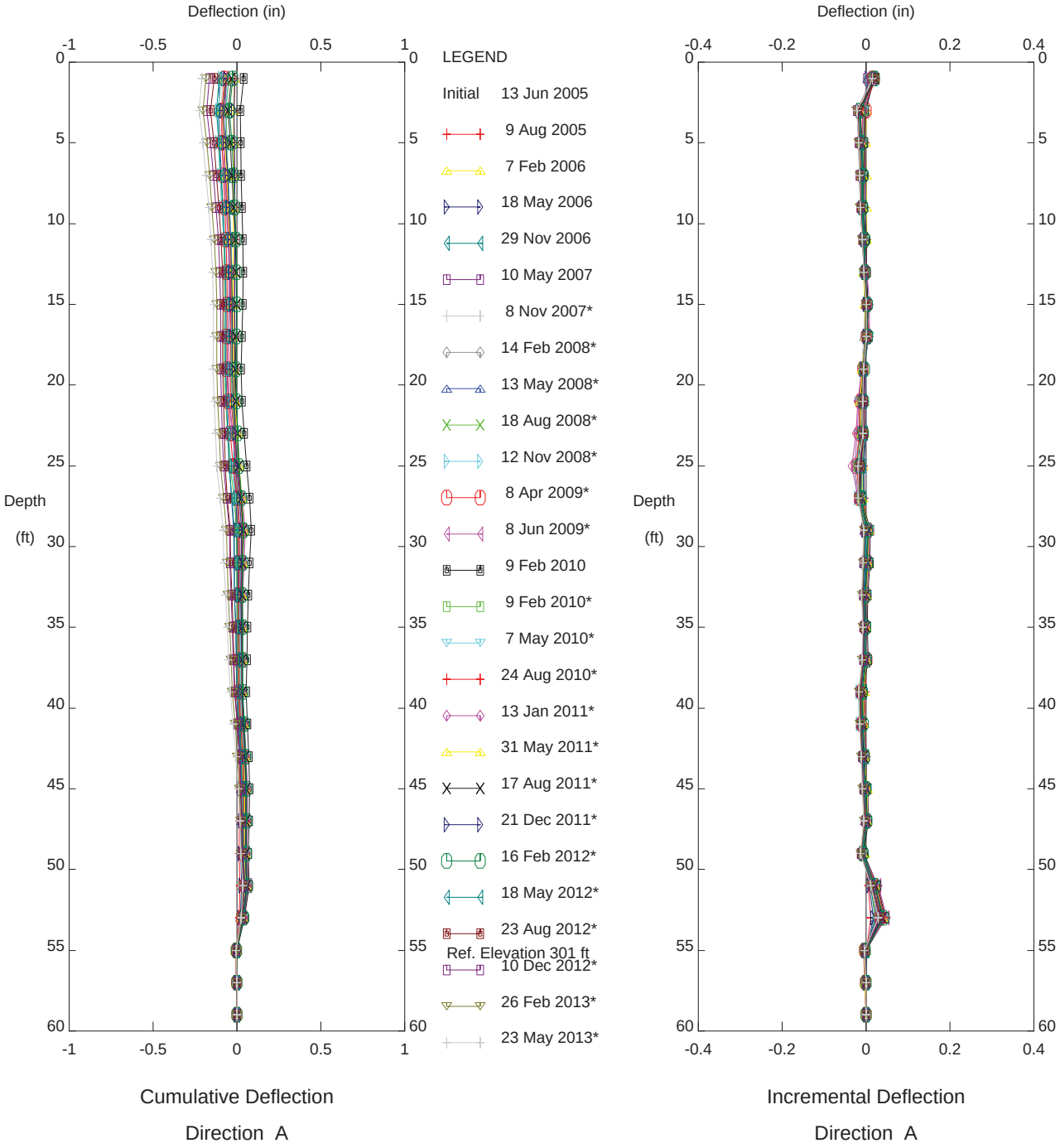
Depth of readings = 56 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI12.GTL

PLATE C-9a

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-12

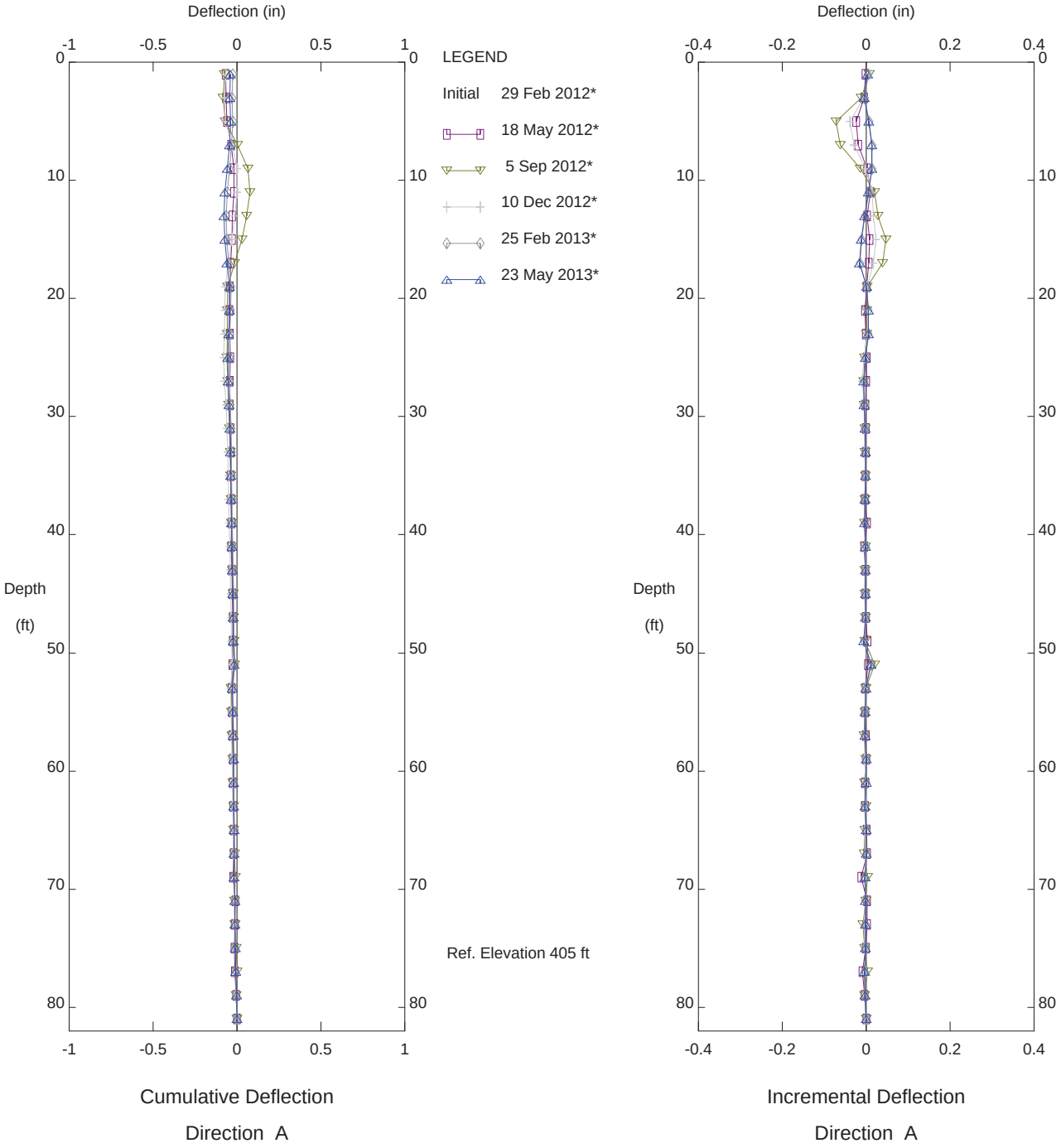
Depth of readings = 56 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI12.GTL

PLATE C-9b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-13

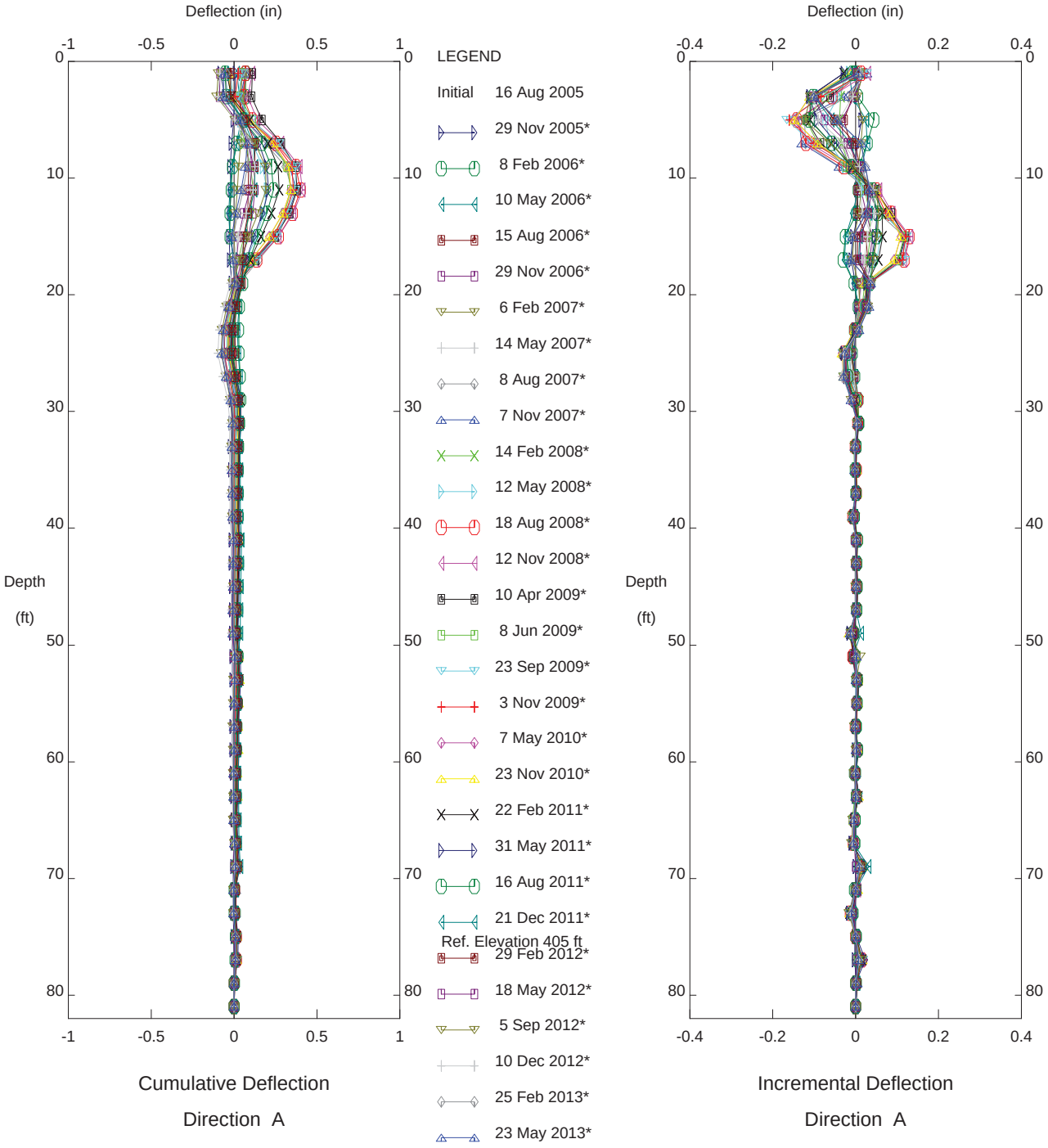
Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI13.GTL

PLATE C-10a

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-13

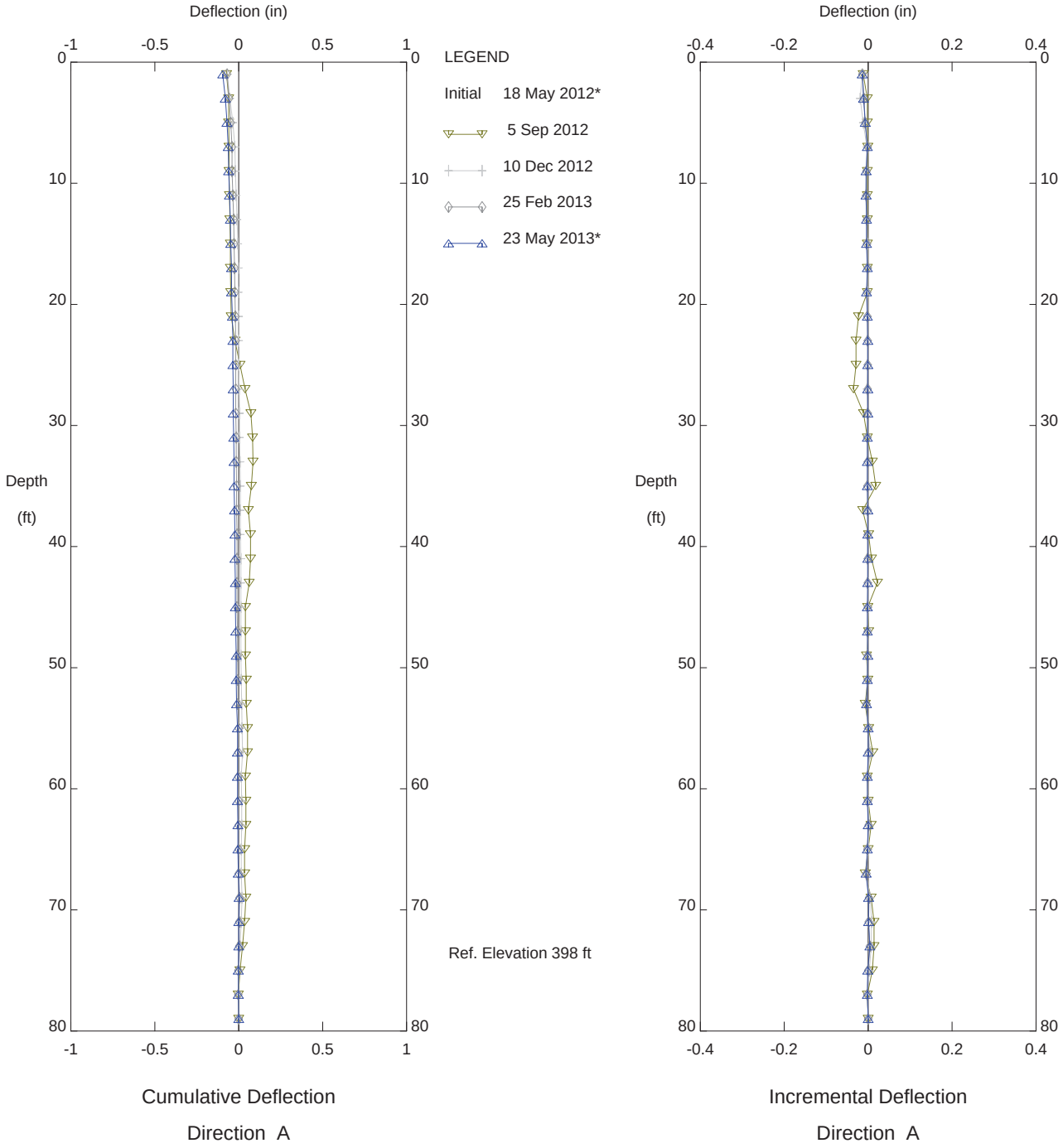
Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI13.GTL

PLATE C-10b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-14

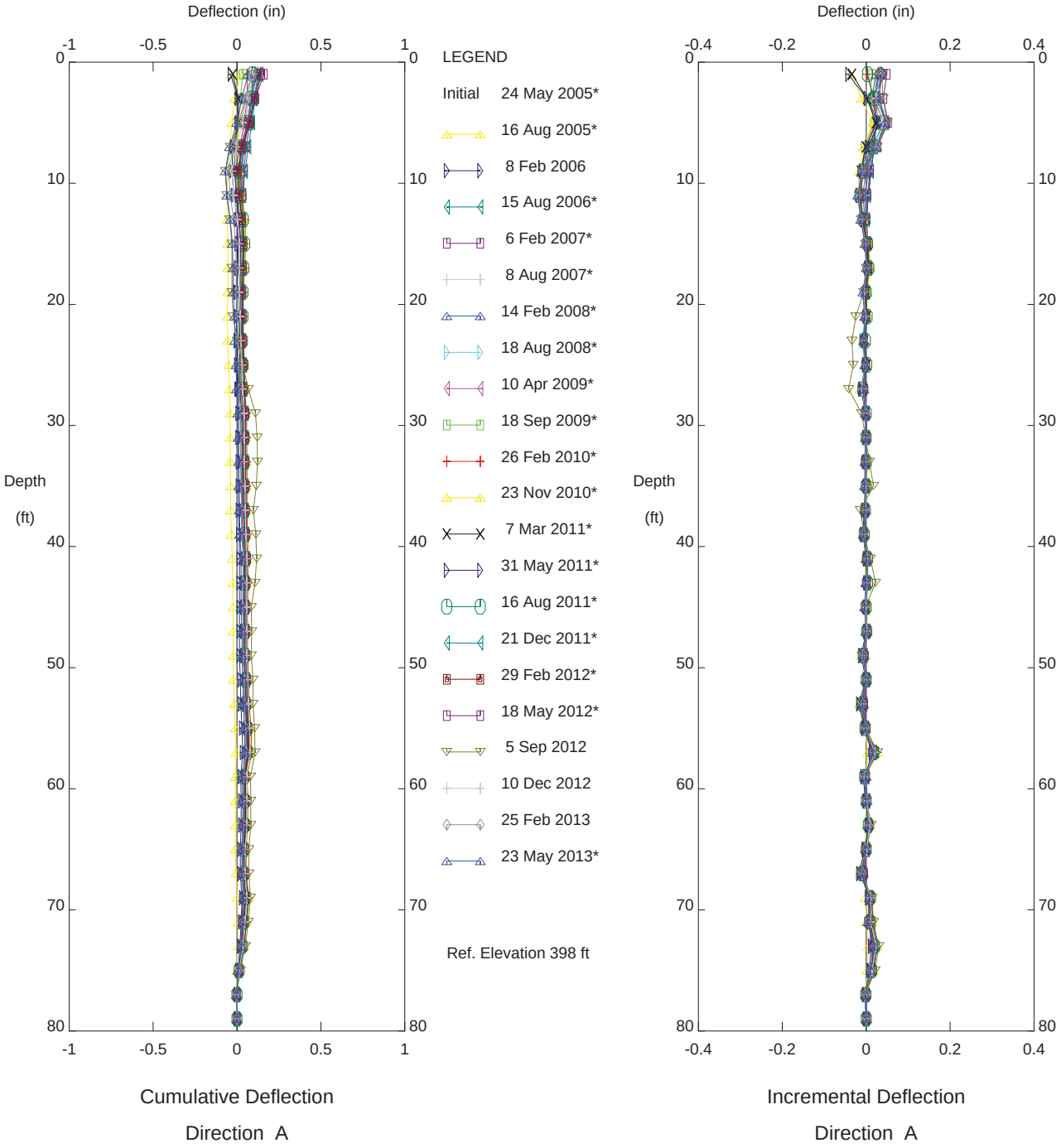
Depth of readings = 76 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI14.GTL

PLATE C-11a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-14

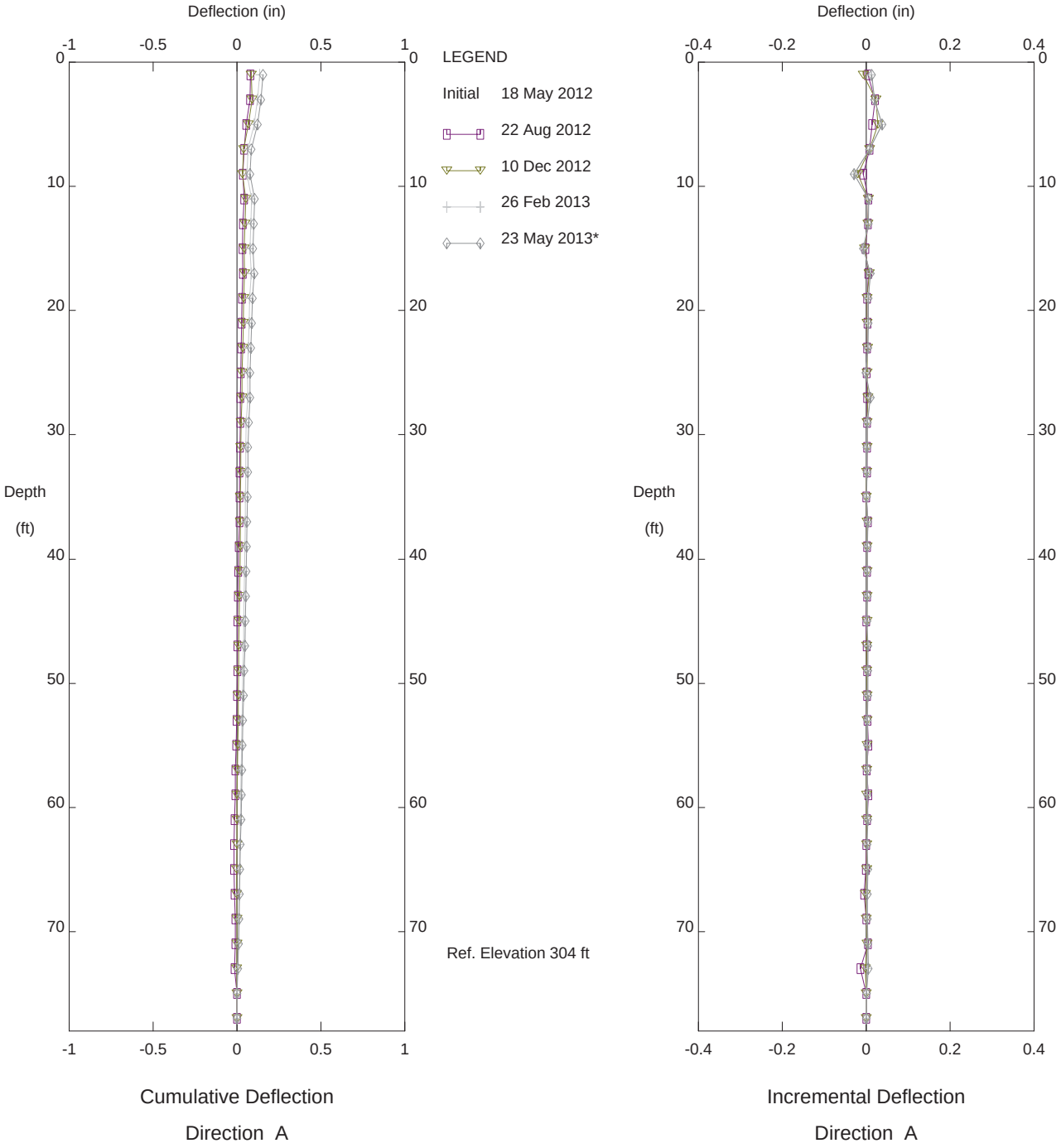
Depth of readings = 76 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI14.GTL

PLATE C-11b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI-15

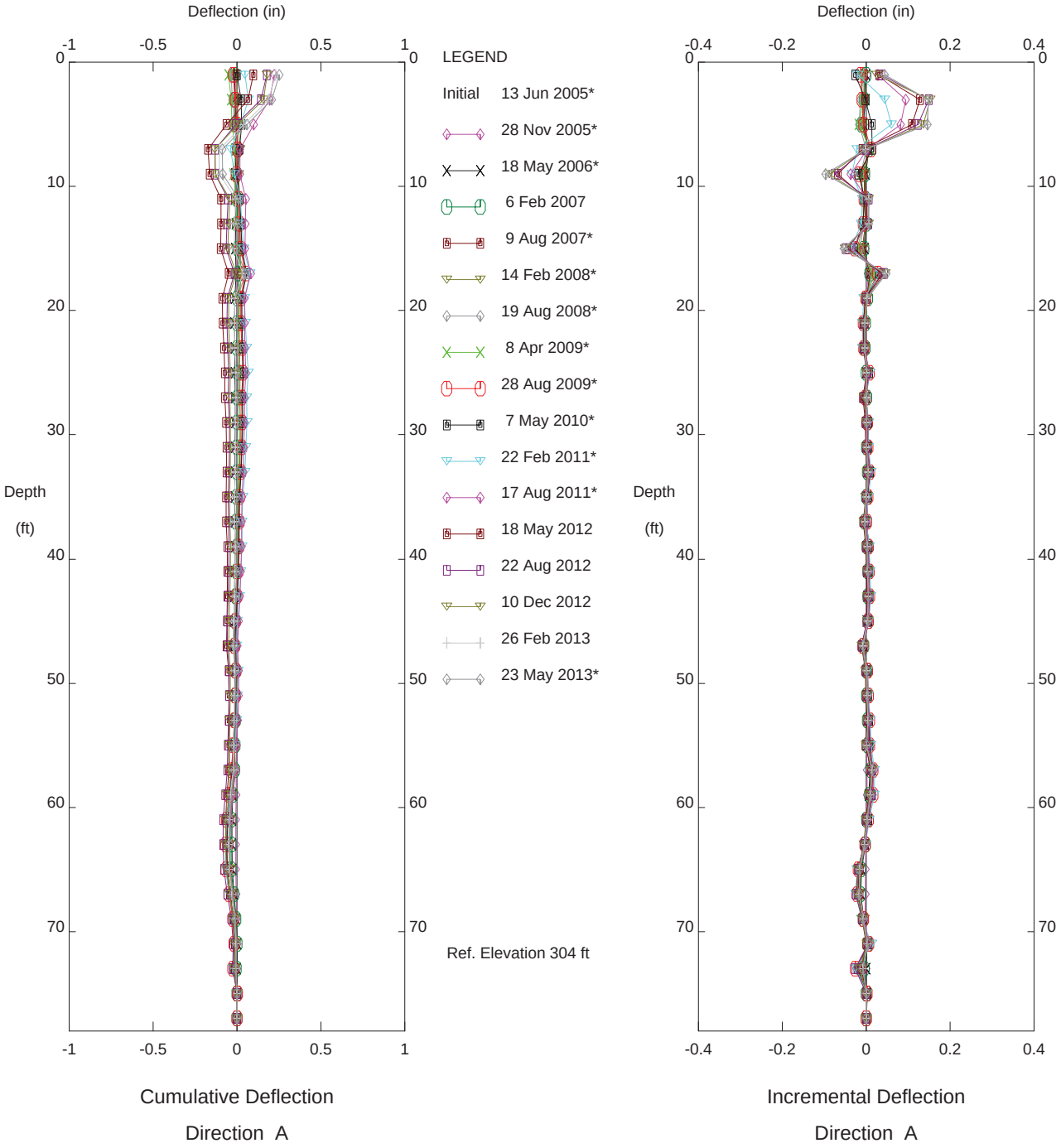
Depth of readings = 72 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI15.GTL

PLATE C-12a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI-15

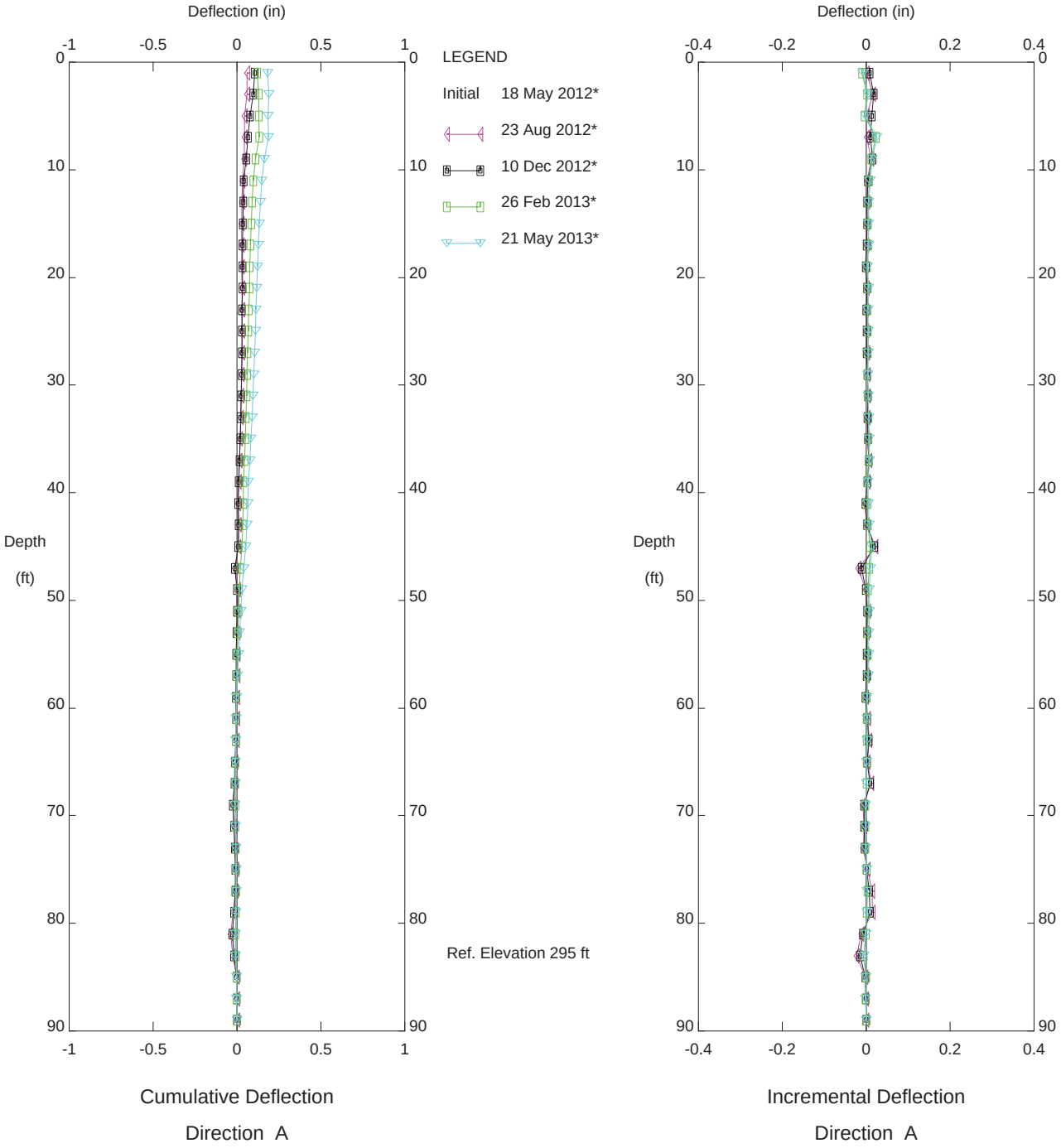
Depth of readings = 72 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI15.GTL

PLATE C-12b

Fugro West, Inc. - Ventura, CA



CALLE DEL BARCO, Inclinometer SI16

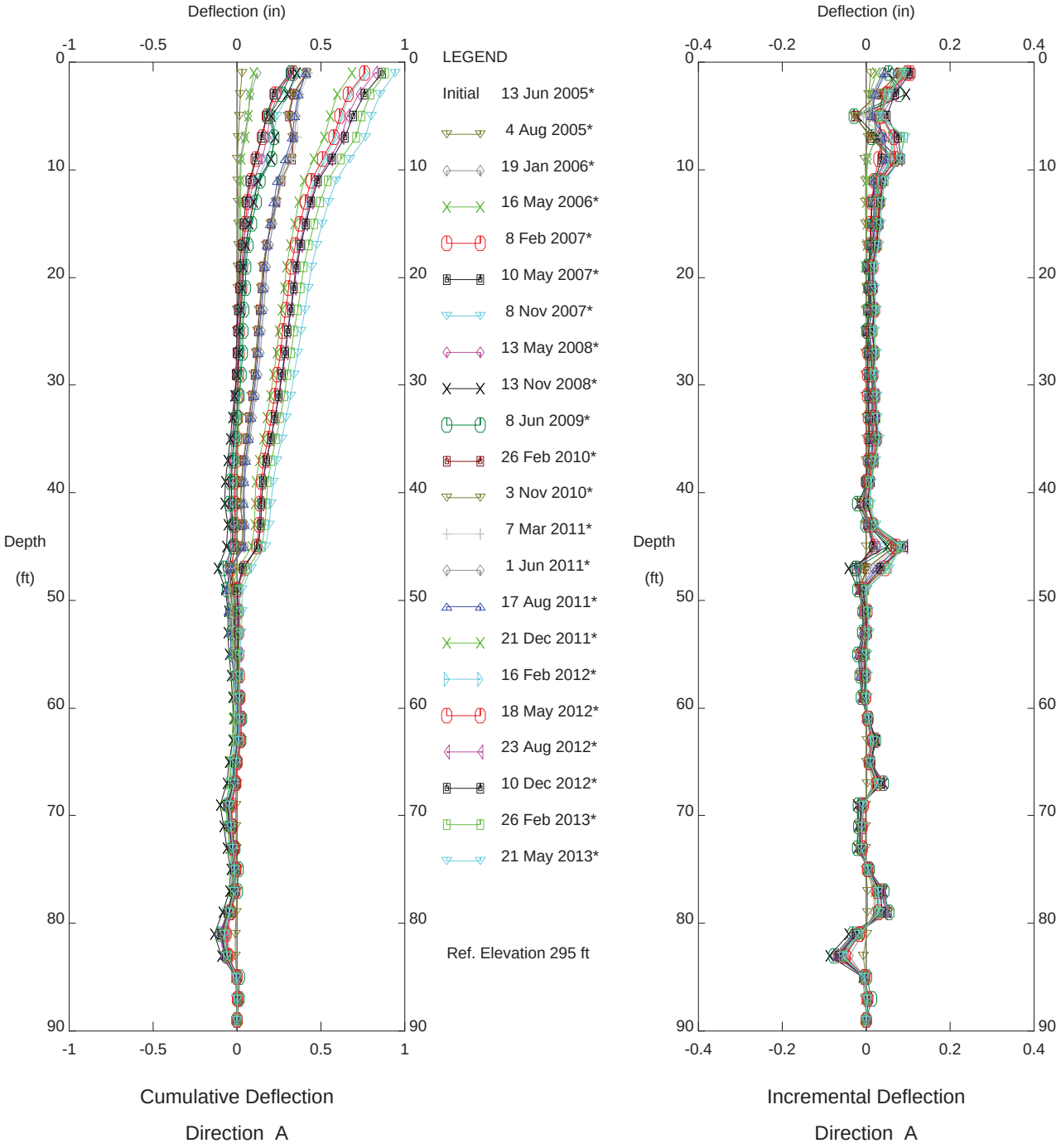
Depth of readings = 86 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI16.GTL

PLATE C-13a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI16

Depth of readings = 86 ft

Sets marked * include zero shift and/or rotation corrections.

\\VENWEST06\DATA6\MANAGEMENT\3399_MALIBU\3399-005_CALLE_DEL_BARCO\03_DATA\SI_DATA\2012-2013\SI16.GTL

PLATE C-13b