

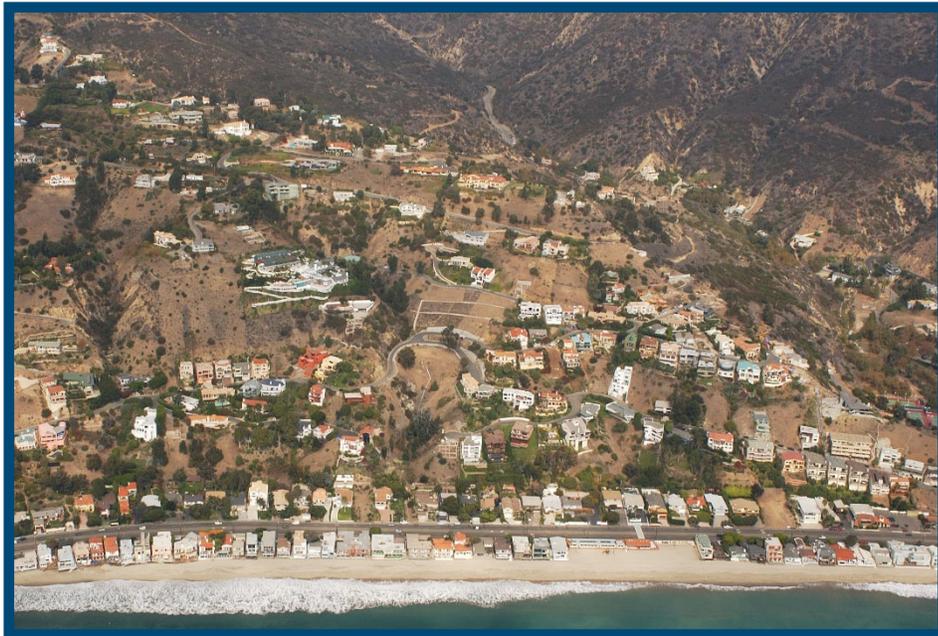
FY22/23 Maintenance and Monitoring

AD98-2, Calle del Barco

City of Malibu, California

Yeh Project No.: 220-277

December 9, 2023



Prepared for:

City of Malibu

23825 Stuart Ranch Rd.

Malibu, California 90265

Attn: Mr. Arthur Aladjajian

Prepared by:

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December 9, 2023

Project No. 220-277

City of Malibu
23825 Stuart Ranch Rd.
Malibu, California 90265

Attn: Mr. Arthur Aladjajian, Public Works Superintendent

Subject: Annual Monitoring and Maintenance Report FY22/23, City of Malibu Assessment District 98-2, Calle del Barco, Malibu, CA

Dear Mr. Aladjajian:

Yeh and Associates, Inc. is pleased to submit this monitoring and maintenance report for FY22/23 City of Malibu Assessment District AD-2, Calle del Barco in Malibu, California. This report was prepared in accordance with our Agreement for Professional Services, dated June 22, 2020, between the City of Malibu and Yeh and Associates, Inc. This report provides a geotechnical and annual summary of monitoring and maintenance for the project over fiscal year July 1, 2022, to June 30, 2023.

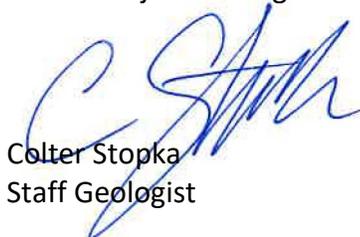
The geotechnical services consisted of monitoring and maintenance, data management, public outreach, reporting, and capital improvements. A map showing the location of the maintenance and monitoring facilities is provided on Plate 1. Plate 2 provides a summary of maintenance activities performed during the monitoring year.

We appreciate the opportunity to be of service. Please contact Nick Simon at 805-414-0991 or nsimon@yeh-eng.com if you have questions or require additional information.

Sincerely,
YEH AND ASSOCIATES, INC.



Nick Simon
Senior Project Geologist



Colter Stopka
Staff Geologist



Loree A. Berry, PE
Senior Project Manager



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1. PURPOSE AND SCOPE OF STUDY

Yeh and Associates (Yeh) was retained by the City of Malibu (City) to perform maintenance and monitoring of the existing geotechnical instrumentation and dewatering facilities within the City of Malibu's Calle del Barco Landslide Assessment District, 98-2. The project location is shown by the polygon in Figure 1. This report presents monitoring results, a maintenance summary, and facilities status for July 2022 through July 2023 (monitoring year). Yeh monitors groundwater levels, surveys slope inclinometers, and measures the dewatering flow from dewatering wells and horizontal drains. Yeh also oversees and maintains function of the monitoring and dewatering facilities. Plate 1 shows the approximate locations of the assessment district facilities. Table 1 summarizes the equipment inventory and the approximate frequency of monitoring and maintenance over the monitoring year. Section 5.0 of this report provides a detailed summary of the maintenance activities performed during this monitoring period.

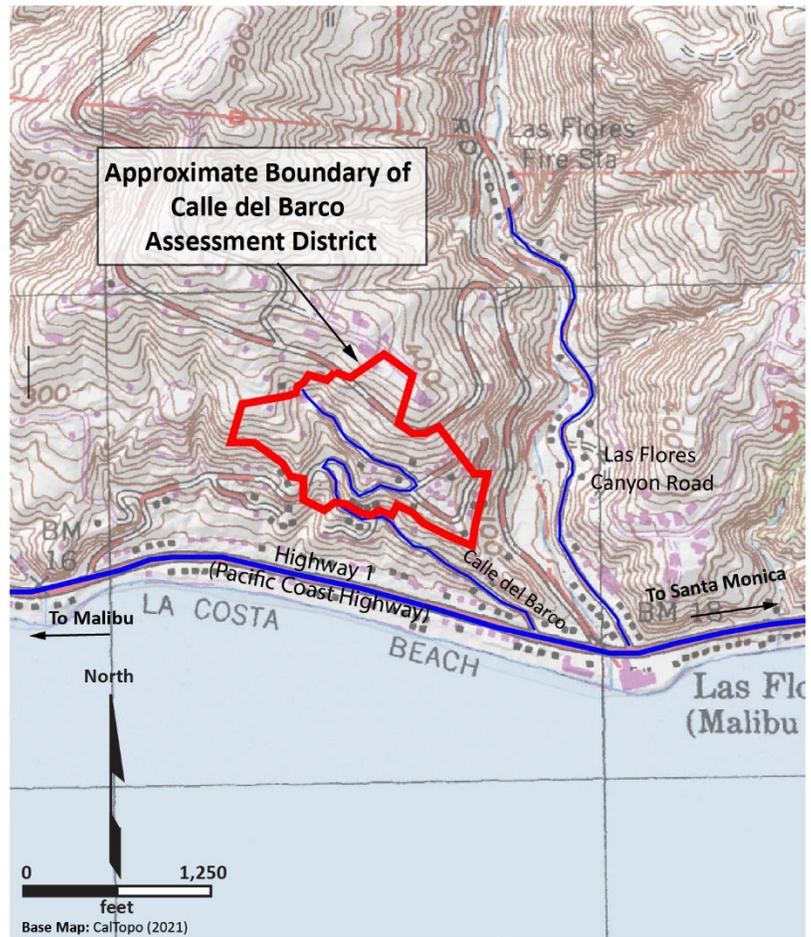


Figure 1: Project Location Map

Table 1. Summary of Annual Monitoring and Maintenance

Type of Monitoring Instrument or Dewatering Device	Number of Locations	Brief Description	Monitoring Frequency	Maintenance Effort ¹
Standpipe piezometer	8	2.75-inch perforated PVC casing used to measure depth to groundwater using electric sounder or by a transducer/datalogger	monthly; hourly data from pressure transducer	low
Inclinometer survey casings	12	1.5-inch and 2.75-inch diameter grooved casings made of PVC, used to survey for shear displacement by an inclinometer probe	quarterly	low
Dewatering wells	11	6-inch or 12-inch diameter steel or PVC casings equipped with 0.5 to 1.5HP submersible pump and connected to electrical controls, pumped water flows through meter and into conveyance piping to discharge	monthly	high
Horizontal Drains (hydraugers)	11	1-inch to 1.5-inch perforated PVC casings drilled slightly higher than horizontal into slope through the soldier pile wall along Rambla Orienta and at the toe of the landslide below Rambla Vista. Installed hundreds to thousands of feet into the slope and used to drain groundwater that intercepts the casing. Flow can be measured from the hydraugers before it flows to discharge	monthly	medium
Big Rock Mesa Rain Gauge #1239	1	Documented Rainfall, Data obtained from Los Angeles County Public Works	monthly	N/A
Notes: ¹ - maintenance effort (generalized): "high" – services monthly, "medium" – services quarterly, "low" – services annually				

2. MONITORING

The following provides the results of water level monitoring in standpipe piezometers and the results of inclinometer surveys performed. For the purposes of discussion and context throughout the report, the monitoring results are discussed with respect to three areas within the landslide boundaries: Rambla Vista, Calle Del Barco and Rambla Pacifico:

- **Rambla Vista** is located in the southern portion of the 1978 landslide boundary, near the mapped toe of the landslide.
- **Calle del Barco** encompasses the middle portion of the 1978 Landslide. District facilities are located along the paved way of Calle Del Barco and on the slope south of Calle del Barco. This area includes the headscarp area of the repaired 1998 shallow failure.
- **Rambla Pacifico** is the northern-most area and includes the presumed headscarp portion of the 1978 landslide.

2.1 GROUNDWATER LEVELS

Groundwater levels were measured approximately monthly in 8 standpipe piezometers located on Plate 1. Water levels are acquired by lowering an electric probe into the standpipe to



contact the groundwater surface and manually recording the depth to water. Groundwater hydrographs for individual standpipes that extend through the end of the current monitoring year are presented in Appendix A.

Pneumatic piezometers were installed with some of the inclinometers up until 1998. Most of the existing pneumatic piezometers no longer function and the reliability of some of the remaining locations are not certain. Pneumatic piezometers were not measured during the monitoring year. Appendix A includes historic pneumatic piezometer results.

Table 2 summarizes the average groundwater levels over the monitoring year for each of the three areas, their change from the prior monitoring year’s area averages and change from the historical area averages. Average annual groundwater elevations for the three areas remained relatively consistent over the monitoring year with increases from the prior monitoring year ranging between 0.4 feet to 1.5 feet. In general water levels in individual standpipes increased following the rainfall events between December and May. Additional discussion by area is provided in the following sections:

Table 2: Summary of Area Average Groundwater Elevations¹

Area Averaged	Total No. of Standpipes Monitored	2022-2023 Area Average Groundwater Elevation (ft)	Change in Area Averaged Groundwater Elevation from Prior Monitoring Year (ft)	2022-2023 Area Average Groundwater Elevation from Historical Area Average Groundwater Elevation (ft)
Rambla Vista	2	161.8	+0.4	-5.0
Calle Del Barco	4	243.7	+1.5	-15.5
Rambla Pacifico	2	350.6	+0.7	-0.3
Notes: ¹ Comparison between the current and prior monitoring periods for the eight standpipe piezometers measured during the current monitoring year: SI-4, SI-5, SI-7, SI-9, SI-13, SI-14, SI-15, SI-16				

2.1.1 RAMBLA VISTA

Two standpipes are used for groundwater level monitoring in the Rambla Vista Area; SI-4 and SI-7. Table 3 summarizes the recorded measurements over the monitoring year and changes from historic water level averages for each standpipe. It is not atypical for water levels in SI-4 to vary seasonally on the order of 10 to 15 feet. During the monitoring year, water levels in SI-7 declined from a 2022 seasonal high recorded in April 2022 until January 2023. Water levels in SI-7 rose 17.7 feet in response to 2023 rain events that generally began in January. The groundwater level in SI-7 peaked in April 2023 and has since begun to decline.



Table 3: Rambla Vista Area Water Level Monitoring

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SI-4	+13.9	172.3	+0.1	179.7	-7.4
SI-7	+1.0	151.2	+0.6	157.2	-6.0

2.1.2 CALLE DEL BARCO

Five standpipes are in use for groundwater level monitoring in the Calle Del Barco Area; SI-5, SI-8, SI-9, SI-15 and SI-16. Table 4 summarizes the recorded measurements over the monitoring year and changes from historic water level averages for each standpipe. SI-8 was not able to be measured due to limited private property access. Standpipes SI-9, -15 and -16 all recorded water level increases of 5 feet or less after January 2023 and have all since begun to decline or have already dissipated to near prior measured levels. Water levels in standpipe SI-5 have been generally increasing since September 2022 and are known to be influenced by pumping rates in well W-M. Well W-M had intermittent electrical issues starting sometime in September 2022 which were resolved by November 2022. The response to the repairs can be seen in the SI-5 hydrograph; however, water levels in SI-5 remain elevated despite continued above average production from W-M and will be investigated further.

Table 4: Calle del Barco Area Water Level Monitoring

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SI-5	+13.1	266.3	+5.7	272.6	-6.3
SI-8	Not Measured during FY22/23				
SI-9	+0.6	221.4	+0.1	224.2	-2.8
SI-15	+2.5	263.3	+0.5	264.0	-0.7
SI-16	+1.0	223.6	-0.5	226.9	-3.3

2.1.3 RAMBLA PACIFICO

Two standpipes are in use for groundwater level monitoring in the Rambla Pacifico Area; SI-13 and SI-14. Table 5 summarizes the recorded measurements over the monitoring year and changes from historic water level averages for each standpipe. During the current monitoring year, water levels in SI-13 remained consistent until February 2023 when they increased by 2.8 feet through June 2023. Water levels in SI-14 remained consistent until March 2023, then



increased by 2.5 feet through June 2023. The only district dewatering facility in the Rambla Pacifico Area is well W-K, which has been dry since 2015.

Table 5: Rambla Pacifico Area Water Level Monitoring

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SI-13	+2.9	358.8	+0.7	358.9	-0.1
SI-14	+2.5	342.3	+0.6	341.9	+0.4

2.2 SLOPE INCLINOMETERS

2.2.1 SUMMARY OF SLOPE INCLINOMETER MONITORING EVENTS

Appendix B provides a summary of the Calle del Barco inclinometers information, status, and past survey results along with cumulative and incremental profile change plots in the A and B axis directions for each of the inclinometers surveyed over the monitoring year. Inclinometers were assessed for distinct shear-type movement. Due to depth positioning errors introduced by a replacement inclinometer cable in Q1 of 2021, new baseline surveys were performed for each of the Inclinometers in April or March of 2021 except for SI-4 and SI-13 which were baseline surveyed in August 2021. Inclinometer survey results for each of the three Calle del Barco areas are summarized below:

2.2.2 RAMBLA VISTA

Three inclinometers are currently monitored within the Rambla Vista Area: SI-4, SI-7 and SI-10. The inclinometers did not display discernable shear-type movement over the monitoring year. Inclinometers SI-4 and SI-10 both displayed depth positioning errors in the B direction.

Inclinometer SI-10 is deformed above approximately 12 feet and the probe traverse is impeded at that depth and is potentially damaging to the probe. The existing deformation may be the result of previous construction and the replacement of the upper part of the casing in 1999. SI-10 will no longer be surveyed and is earmarked for replacement.

2.2.3 CALLE DEL BARCO

There are seven inclinometers located in the Calle del Barco Area: SI-5, SI-8, SI-9, SI-11, SI-15 and SI-16. SI-8 was not surveyed during the monitoring year due to lack of access to a private property. The six inclinometers surveyed did not display discernable shear-type movement over that time.



Inclinometers SI-9 and SI-16 may have recorded possible, small casing lean type deformation above approximately 50-feet. These findings would be consistent with past monitoring of these inclinometers, however because SI-9 and SI-16 have accumulated deformation at the depths of prior movement, creep rates are probably below the margin of error for a traversing type probe and cannot be confirmed. In-place monitoring devices could be beneficial to confirm the presence or absence of ongoing creep.

2.2.4 RAMBLA PACIFICO

There are two inclinometers surveyed in the Rambla Pacifico Area; SI-13 and SI-14. Neither inclinometer displayed discernable shear displacement during the monitoring year.

Inclinometer SI-13 continues to display an error in the upper 28 feet. Inconsistent curves have displayed on the cumulative displacement plots for SI-13 since the first survey after installation and are therefore probably the result of depth positioning error on highly curved or kinked casing that occurred during installation.

3. WATER BUDGET TRACKING

3.1 RAINFALL DATA

Yeh obtained rainfall data for the monitoring year from the Big Rock Mesa Rain Gauge #1239 operated by the Los Angeles County Department of Public Works (LADPW). Prior to 1984, rainfall data was obtained from the Carbon Canyon Rain Gauge #447C and after 1984 from the Big Rock Mesa Rain Gauge #1239. This monitoring year Yeh also obtained complete, historical annual rainfall data from the LADPW for both gauges back to 1968 and updated missing or conflicting data and adjusted historical rainfall amounts and averages accordingly. For this report, the Big Rock Mesa Rain Gauge 40-year rainfall average replaces the previously used "Area Average".

Plate 2 - Rainfall Graph displays historical monthly and average annual rainfall from October 1968 through September 2023. Recorded rainfall over the monitoring year totaled 31.26 inches, which is 15.12 inches above the 40-year Big Rock Mesa Rain Gauge running average of 16.14 inches and was the most annual rainfall recorded since 2005.

Plate 4 – Discharge Rates vs Rainfall Totals presents rainfall deviation from the 40-year mean and compares rainfall amounts to total dewatering output.

3.2 DEWATERING

Yeh tracks dewatering production for the pumping dewatering wells installed across the district and the horizontal gravity drains (hydraugers) installed along Rambla Orienta and at the toe of



the landslide. The combined dewatering production for the monitoring year averaged 610 gallons per day (gpd), which is an increase of 48-percent from the previous monitoring years' average production of 411 gpd and was the highest annual average dewatering production since the 2013-2014 monitoring year. The dewatering production increased with above average rainfall from December through March. Approximately 64-percent of the total dewatering production was pumped from dewatering wells and 36-percent was generated from hydraugers.

3.2.1 DEWATERING WELL PRODUCTION

Yeh performed monthly monitoring of production for the 11 active dewatering wells. Well production is measured approximately monthly for each well by reading flow totalizers that are installed along the discharge line. A summary of well production and well status is presented in Appendix C. A plot for historical production and a plot for monitoring year production vs daily rainfall for each individual well are included in Appendix C. A graph showing total dewatering production since 1992 is included on Plate 3 and total production vs daily rainfall for the monitoring year is included on Plate 4.

Average monthly total well production for the monitoring year was 393 gpd which is 37-percent higher than last year's average production of 287 gpd, 24-percent less than the historical production average of 518 gpd calculated from 1992 to present. This monitoring years' annual average well production was the highest since the 2014-2015 monitoring year with March 2023 recording the highest average production since January 2014.

Well production typically varies in response to rainfall totals. The dewatering well production increase over this monitoring year is consistent with the high rainfall totals.

3.2.2 HYDRAUGER PRODUCTION

Hydrauger production is measured directly from a sampling port installed along each hydrauger casing where it daylights the slope face. Yeh performed monthly monitoring to measure flow from 11 hydraugers. Two locations, HD-13 and H-1 have recorded consistent flow in recent years. Hydrauger H-2A flows intermittently in response to rainfall. Production data and status for individual hydraugers is included in Appendix C. A graph showing total hydrauger production since 1992 is presented on Plate 4.

The average monthly hydrauger production over the monitoring year was 217 gpd which is 75-percent more than last year's average monthly production of 124 gpd and 4-percent less than the historical average production of 225 gpd calculated from 1992 to present. The values



recorded during the monitoring year are 52-percent less than the maximum average annual production of 455 gpd recorded during the 1996-1997 monitoring year.

Hydrauger production typically varies in response to rainfall totals. The increase in average hydrauger production over this monitoring year from the previous monitoring year is primarily due to an increase in production at H-2A which has not been producing since late 2020 but started producing again after the rainfall events in January and March.

4. SEISMIC EVENTS SUMMARY

One earthquake with a magnitude of 4.0 or greater was recorded within a 100-mile radius of the project area. On January 25, 2023, a M 4.2 event occurred approximately 16 kilometers south of Malibu Beach, a M 3.6 aftershock occurred approximately 3 minutes later. The epicenters were located approximately 11.2 miles south-southwest from the Calle Del Barco LAD boundary.

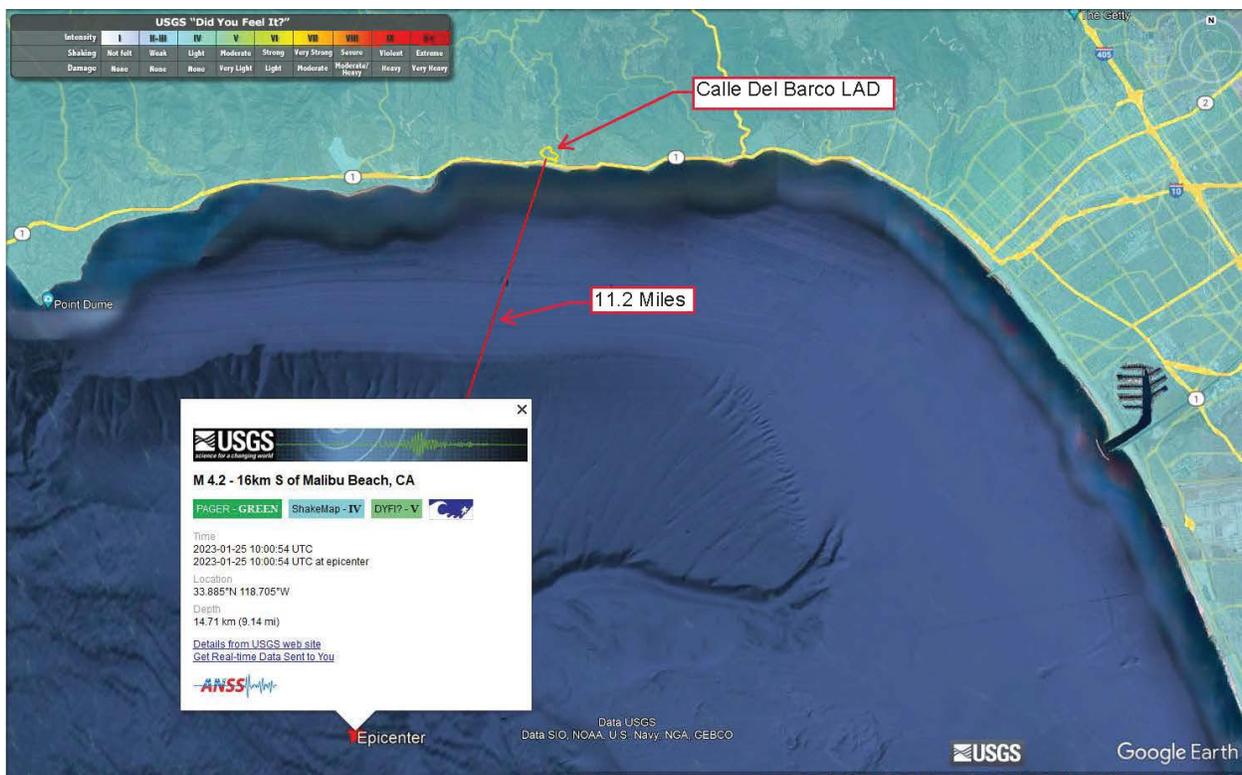


Figure 2: Epicenter of January 25, 2023 M4.2 EQ relative to Calle Del Barco LAD

Yeh personnel performed post-earthquake observations and measurements. No movement secondary to the earthquake was interpreted on the inclinometers surveyed. Yeh staff did not observe surface displacements related to the earthquake and is unaware of reports of damage local to the Calle Del Barco Landslide AD resulting from the earthquake.

5. MAINTENANCE

Table 4 summarizes the maintenance activities performed over the monitoring year. Typical maintenance activities to dewatering wells include assessing and replacing or repairing dewatering well pumps, well electronics and well controls. Typical maintenance to hydraugers included PVC repairs within the conveyance piping and discharge locations.

Table 4: Summary of Facility Maintenance and Improvements

Date Identified	Maintenance Item Description	Assessment	Status
January 2022	Well control box for W-J damaged by rockfall	Well controls are exposed to weather will need to replace	8.10.2022 Quest Electric replaced control box and mounting pole
October 2022	Well W-M no Production	November 2022, Yeh assessed pump, recalibrated pump saver, pump appears to be operating normally No production again in December	1.7.23 circuit breaker found off at main panel. Breaker turned back on and well has been operating normally since. Breaker issue may be related to a short on common panel with well W-I which has been repaired. Will continue to monitor.
October 2022	Well W-I no Production noted after October production checks	Yeh assess, pump Shuts off immediately at pump saver. There is power to panel. Well is low producing, may be dry or not enough recharge to assess. No water level access through well cap. 1.7.23 Yeh re-assessed after continued production after rainfall. well shuts off immediately at 0.029A. Well contractor to assess. Pump turned off. 1.13.23 well contractor assess well, issue is electrical and downhole will need to pull pump.	5.22.23 pump removed, was found to be clogged at intake, motor/pump impeller are damaged 5.22.23 Replaced with new 505-9 Grundfos stainless pump and 1/3 HP motor. Set at 50-feet PVC sounding tube installed through well cap for water level access. Back in service pumping 8gpm at 3.8Amps.
January 2023	Assess all wells after electrical issues at W-I and W-M	Yeh assessed all wells for Amps, Volts, gpm production and water levels	All wells except W-I operating normally, W-I to be assessed by well contractor

6. ADDITIONAL OBSERVATIONS AND MONITORING

The following additional field observations were made by Yeh staff over the monitoring year that will continue to be considered and tracked for future improvement projects.

- Rainfall totals for the 2022-2023 monitoring year were the highest since the 2004-2005 monitoring year.
- Surficial erosion was noted within the District boundaries during and after the intermittent rain events between December and May and include: Rambla Orienta at the east end of the soldier pile wall, fronting the residence at 3958 Rambla Vista; and on the slopes above the Calle del Barco cul-de-sac.



7. CAPITAL IMPROVEMENTS AND SPECIAL PROJECTS

Capital improvements include replacement and rehabilitation of existing facilities and special projects to improve the monitoring and maintenance capabilities. The following improvements have been identified and are being tracked and planned for future consideration.

- A modern form of repeatable surface survey should be re-introduced and continued for the project as a consistent means to observe and evaluate potential land movement throughout the extent of the assessment district area and more specifically in-between inclinometer casing locations.
- Install in-place sensors across known zones of displacement within inclinometers SI-9 and SI-16
- Replace inclinometer SI-10, install new inclinometer with a vibrating wire piezometer and a time domain refractometry cable.
- Install replacement hydraugers near the toe of the landslide to replace hydraugers that are dry, degraded, damaged, and vulnerable to being buried by soil and rock debris.
- Upgrade dewatering well flow meters with near real-time data transmission capability.

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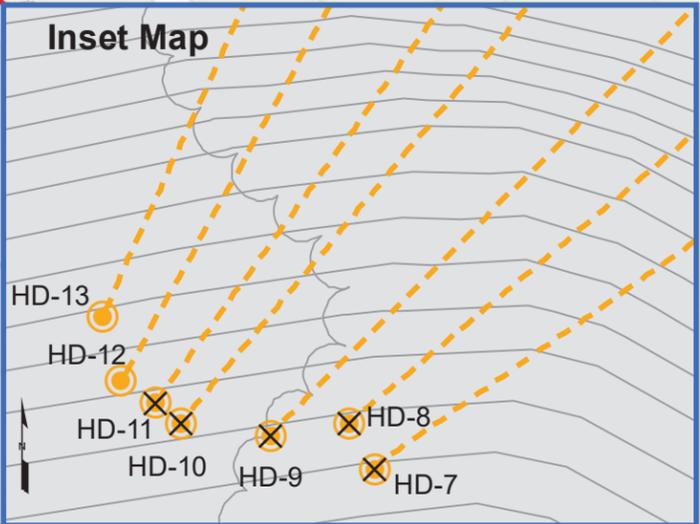
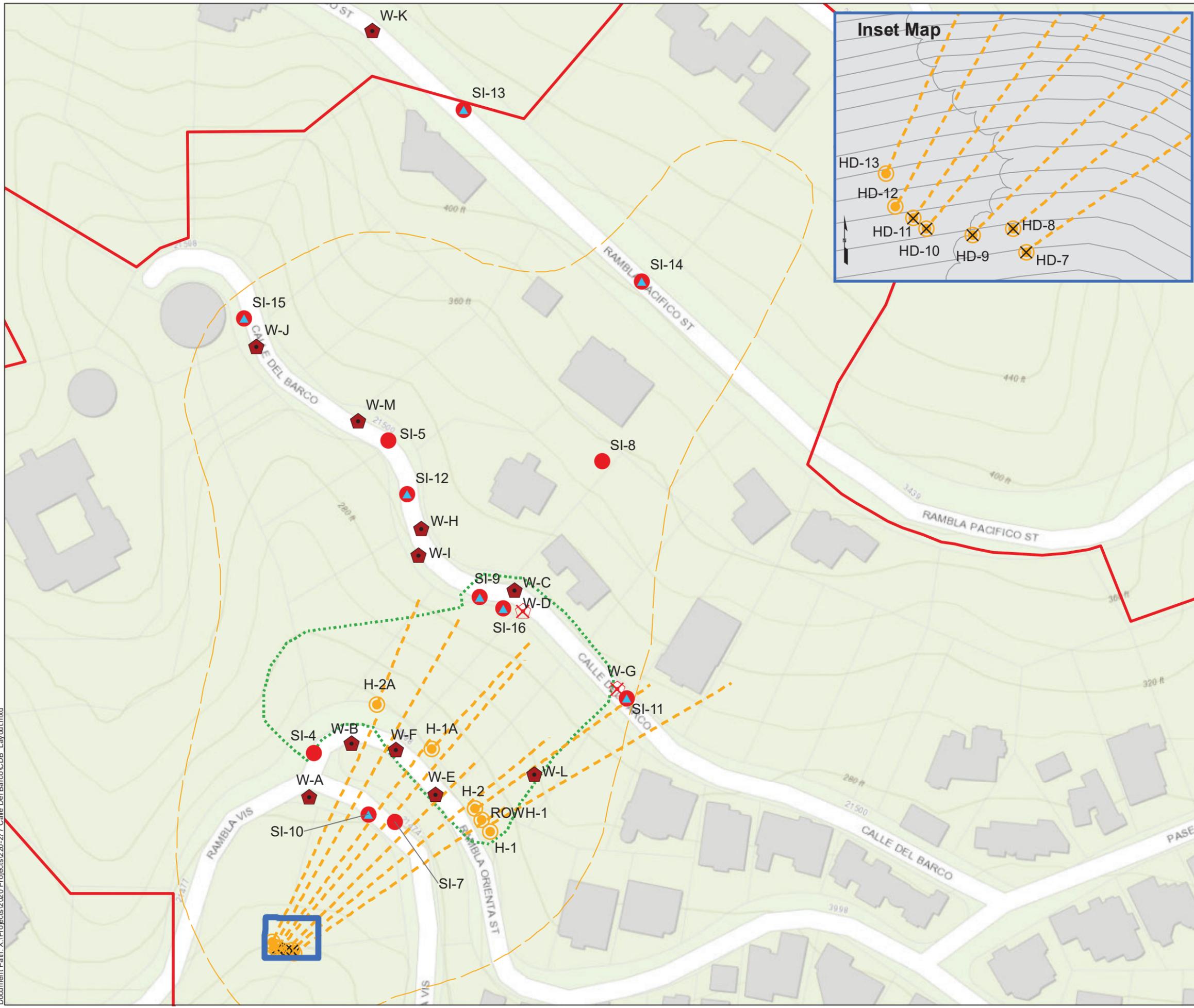
_____(2004), 'Annual Report, July 2003 through June 2004, Calle Del Barco Landslide Assessment District, Malibu, California,' dated November.

Yeh and Associates, Inc. (Yeh) (2022), "Annual Report, July 2020 through June 2021, Calle Del Barco Landslide Assessment District, Malibu, California," dated June 2022.

Yeh and Associates, Inc. (Yeh) (2022), "Annual Report, July 2021 through June 2022, Calle Del Barco Landslide Assessment District, Malibu, California," dated November 2022.

**CALLE DEL BARCO LANDSLIDE
ASSESSMENT DISTRICT
MALIBU, CALIFORNIA
MONITORING INSTRUMENTATION
AND
DEWATERING FACILITIES MAP**

Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

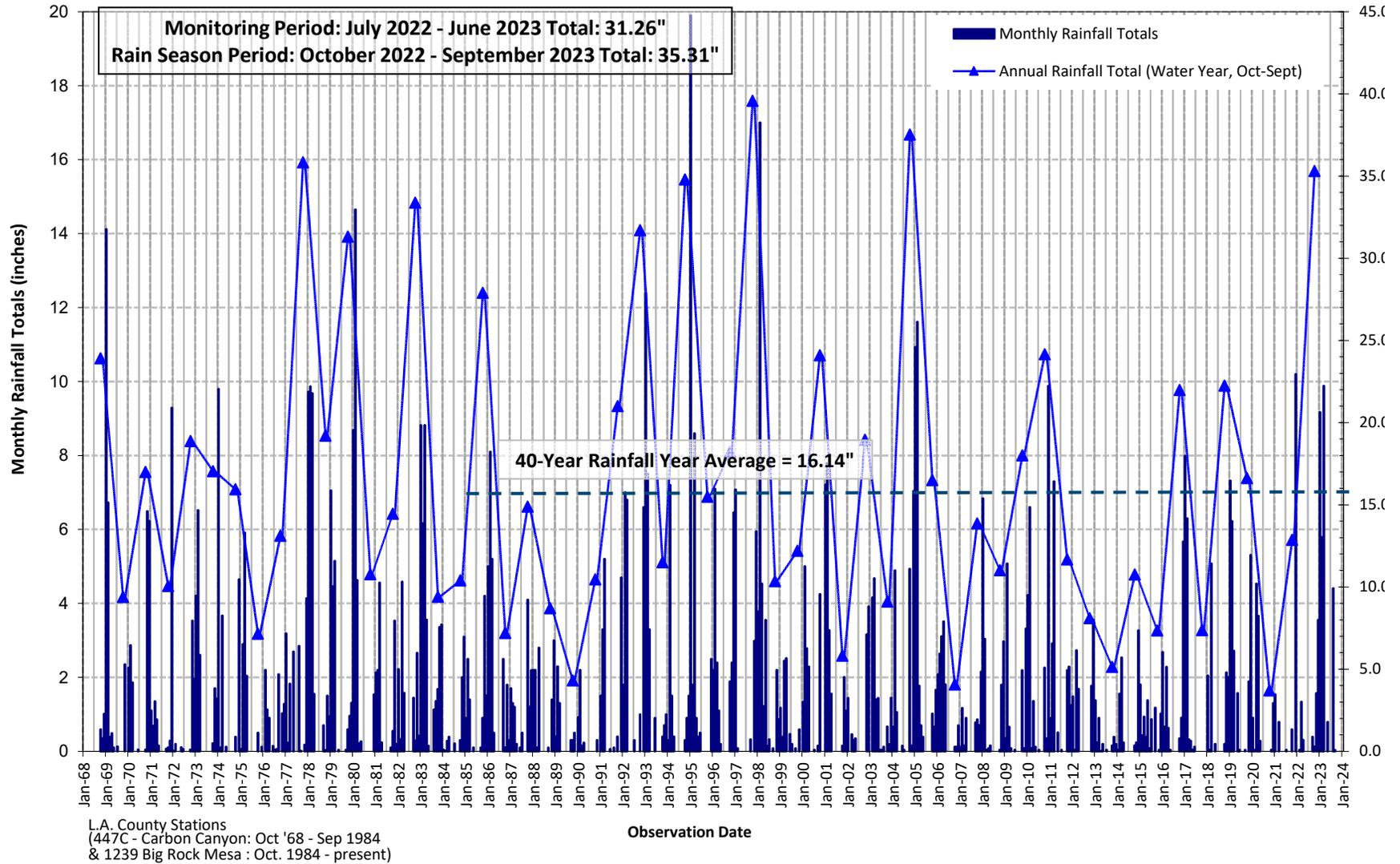


- Active Dewatering Well
- Inactive Dewatering Well
- Slope Inclinometer/Standpipe Piezometer
- Pneumatic Piezometers
- Nonproducing Hydrauger
- Producing Hydrauger
- Hydrauger Installed Length
- District Boundary
- Approximate Limits of Deep Seated Landslide
- Approximate Limits of 1998 Shallow Slope Failure (BYA, 1999)



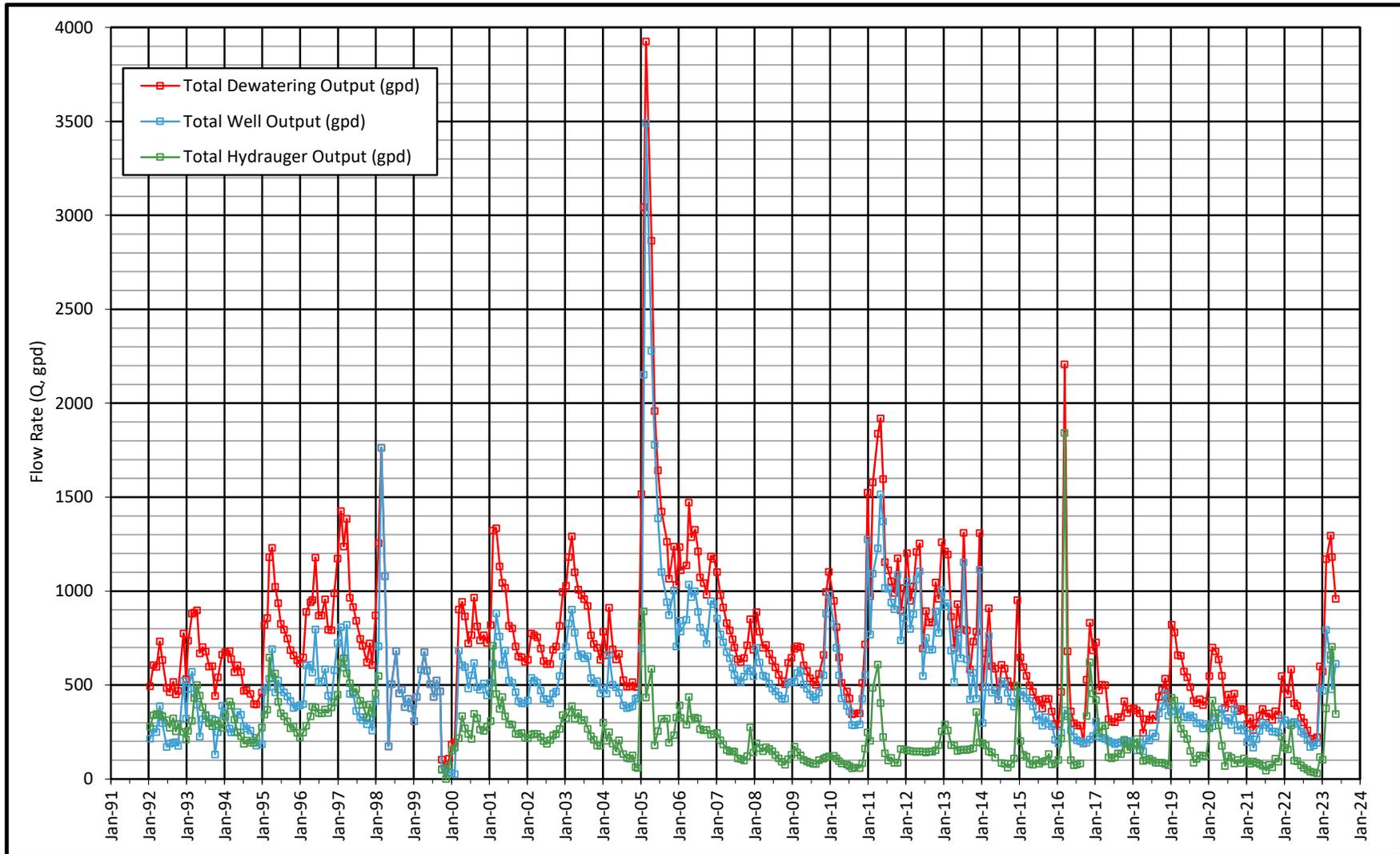
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DRAWN BY:	APPROVED BY:	

Document Path: X:\Projects\2020 Projects\220-277 Calle Del Barco\CDB_Layout.mxd



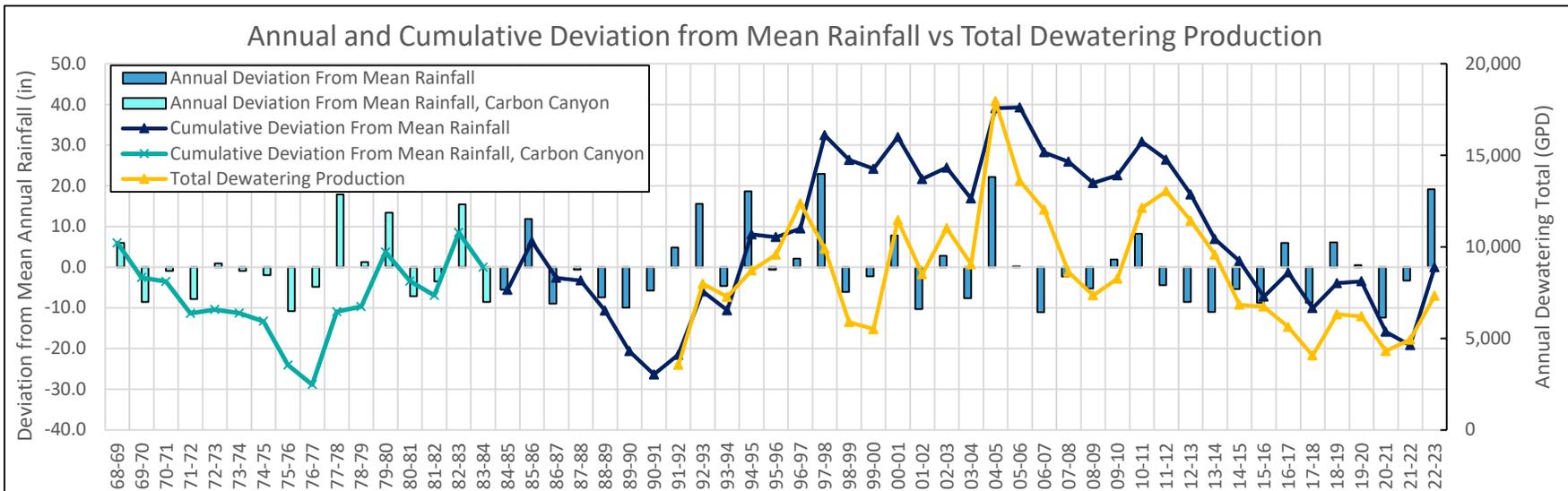
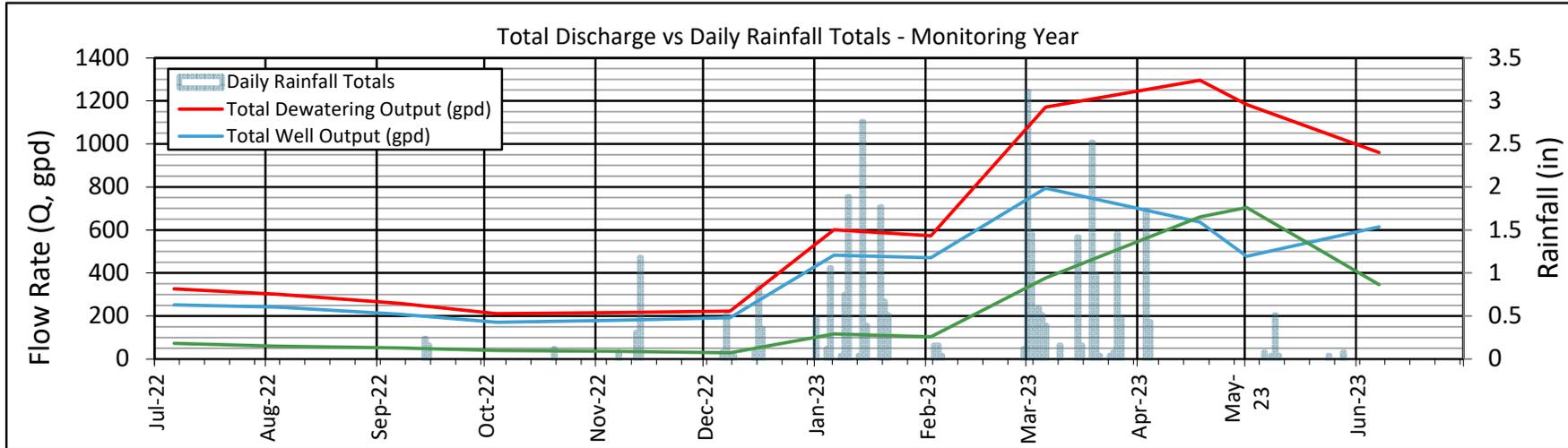
RAINFALL GRAPH

Calle del Barco Landslide Assessment District
 Malibu, California



TOTAL DISCHARGE - WELLS AND HYDRAUGERS (HISTORIC)

Calle del Barco Landslide Assessment District
Malibu, California



DISCHARGE RATES VS RAINFALL TOTALS
 Calle del Barco Landslide Assessment District
 Malibu, California

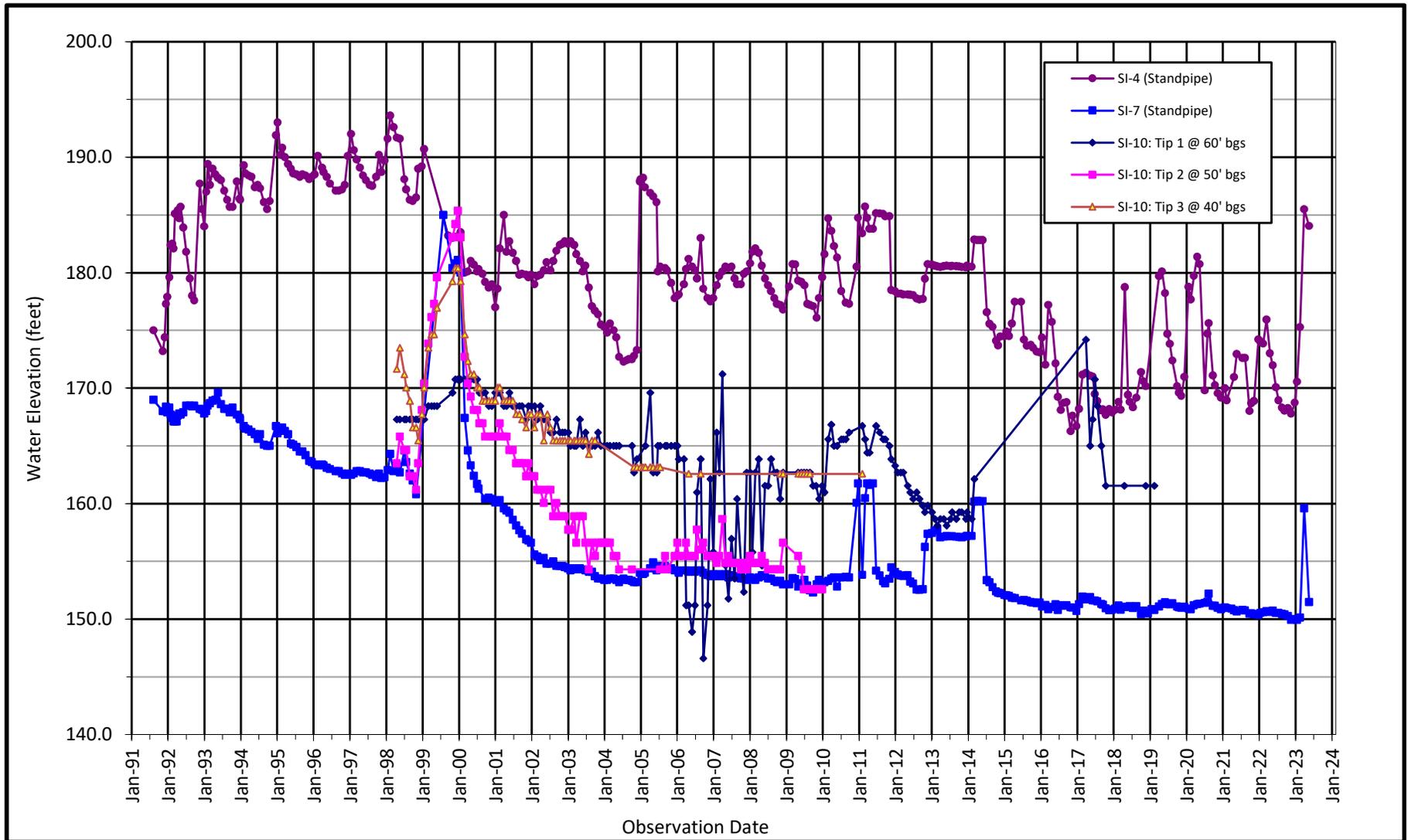
APPENDIX A - GROUNDWATER LEVELS

CALLE DEL BARCO LAD - Standpipe Piezometer Information					
Standpipe ID	Reference Elevation (ft)	Casing Depth (ft)	Perforation Interval (ft)	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	75-80	BYA	
SI-14	408.0	80.0	73-78	BYA	
SI-15	301.0	78.0	71-76	BYA	
SI-16	297.0	90.0	Unknown	Unknown	

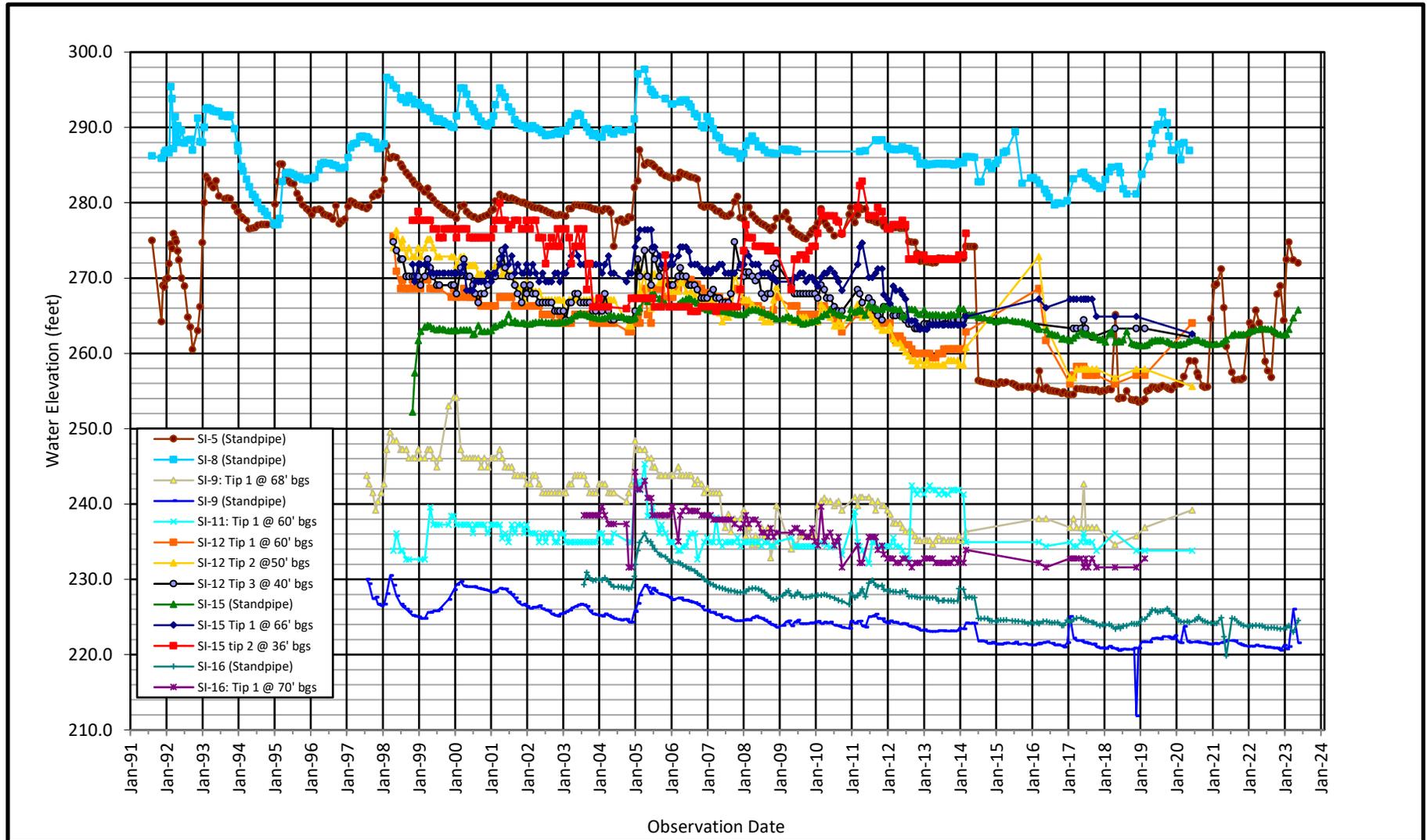
CALLE DEL BARCO LAD - Pneumatic Piezometer Information						
Piezometer ID	Tip No.	Reference Elev. (ft)	Tip depth (ft)	Tip Elev. (ft)	Installed By	Notes
SI-9	1	298	68	230	BYA	functioning as of 2020
	2 ^a		38	260	BYA	0 PSI as of 2020
SI-10	1	202	60	142	BYA	functioning as of 2020
	2*		50	152	BYA	blocked air line
	3 ^a		40	162	BYA	0 PSI as of 2020
	4 ^a		20	182	BYA	0 PSI as of 2020
SI-11	1	291.5	60	231.5	BYA	functioning as of 2020
	2		50	241.5	BYA	functioning as of 2020
	3*		40	251.5	BYA	air line leak
	4*		20	271.5	BYA	blocked air line
SI-12	1	301	60	241	BYA	functioning as of 2020
	2		50	251	BYA	functioning as of 2020
	3 ^a		40	261	BYA	functioning as of 2020
	4*		20	281	BYA	0 PSI as of 2020
SI-13	1*	424	70	354	BYA	readings <0.3PSI as of 2020
	2*		50	374	BYA	above water level since installation
SI-14	1	408	68	340	BYA	functioning as of 2020
	2		48	360	BYA	above water level since installation
SI-15	1	301	66	235	BYA	functioning as of 2020
	2*		36	265	BYA	non functioning
SI-16	1	297	70	227	BYA	functioning as of 2020
	2		40	257	BYA	functioning as of 2020

* - Piezometer not functioning
^a - functionality not certain

**CALLE DEL BARCO LANDSLIDE ASSESSMENT DISTRICT
FY21/22 ANNUAL REPORT
MALIBU, CALIFORNIA**



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

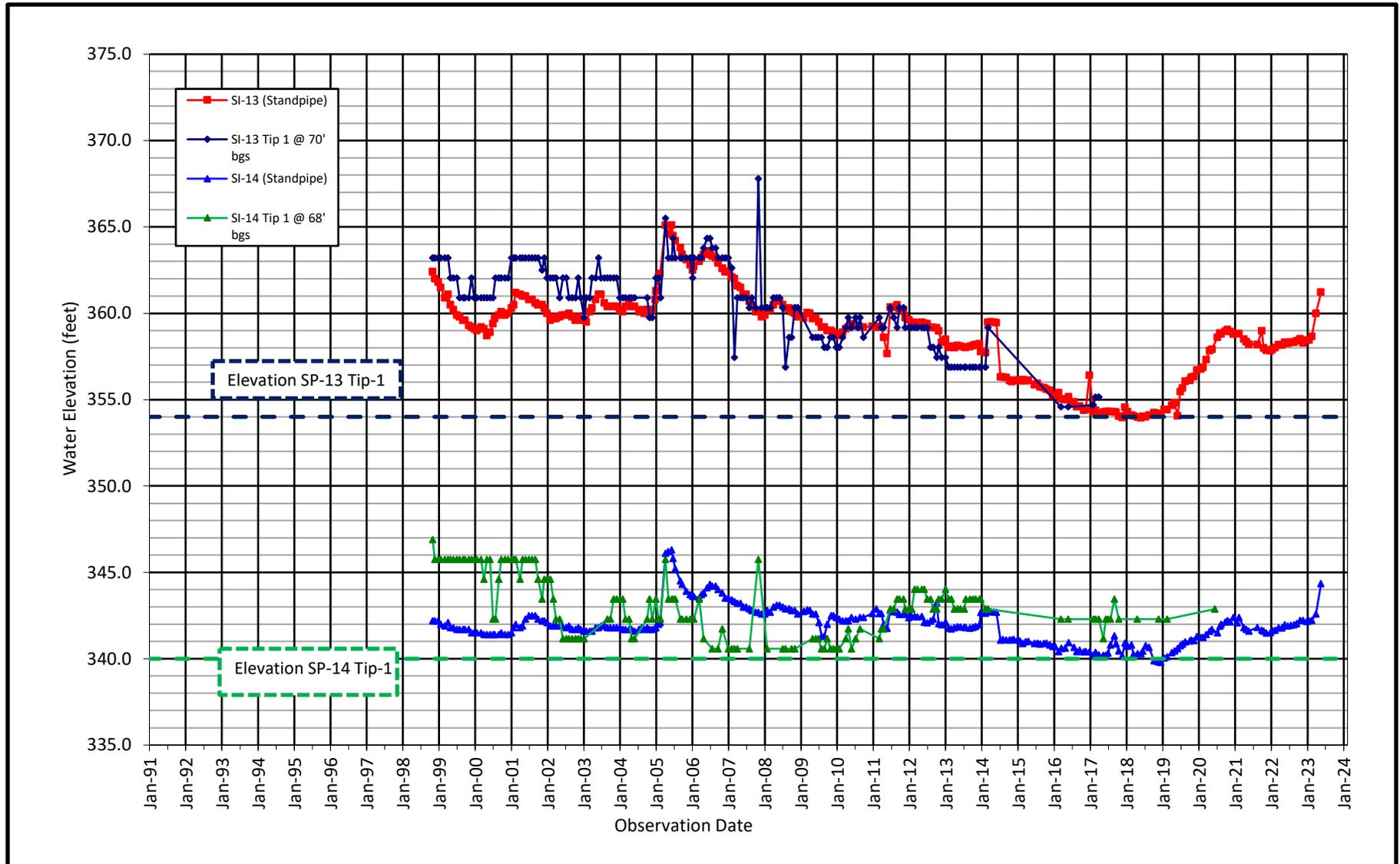


GROUNDWATER HYDROGRAPH

Calle del Barco

Calle del Barco Landslide Assessment District

Malibu, California



GROUNDWATER HYDROGRAPH

Rambla Pacifico

Calle del Barco Landslide Assessment District
 Malibu, California

APPENDIX B - SLOPE INCLINOMETERS

Slope Inclinerometer 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	N/A	N/A	N/A	N/A	Semi	Semi	N/A	Semi	Semi	Qrtly	Semi	Semi	Semi	Semi	Semi	Semi	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, 44	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)																	
2022-2023	NR	NR	NR	NR	--	--	NR	--	NR	--	--	--	--	--	--	--	--
2021-2022	NR	NR	NR	NR	--	--	NR	--	NR	--	--	--	--	--	--	--	--
2020-2021	NR	NR	NR	NR	--	--	NR	--	NR	--	--	--	--	--	--	--	--
2019-2020	NR	NR	NR	NR	--	--	NR	--	0.1	0.2	--	--	--	--	--	--	--
2018-2019	NR	NR	NR	NR	0.1	--	NR	--	--	--	--	--	--	--	--	--	--
2017-2018	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2016-2017	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	<0.1
2015-2016	NR	NR	NR	NR	--	<0.05	NR	--	--	0.2	--	--	--	--	--	--	--
2014-2015	NR	NR	NR	NR	--	0.1	NR	--	--	--	--	--	--	--	--	--	<0.1
2013-2014	NR	NR	NR	NR	--	0.1	NR	--	--	--	--	--	--	--	--	--	<0.1
2012-2013	NR	NR	NR	NR	--	0.1	NR	--	--	0.15	0.1	--	0.1	--	--	--	0.2
2011-2012	NR	NR	NR	NR	--	--	NR	<0.05	0.1	0.15	--	0.2	--	--	--	0.1	0.35
2010-2011	NR	NR	NR	NR	--	--	NR	<0.05	0.05	<0.05	--	--	--	--	--	--	--
2009-2010	NR	NR	NR	NR	--	--	NR	--	--	0.2	--	0.1	--	--	--	--	0.1
2008-2009	NR	NR	NR	NR	--	--	NR	NA	--	0.1	--	--	--	--	--	--	--
2007-2008	NR	NR	NR	NR	--	--	NR	--	--	0.1	--	--	--	--	--	--	--
2006-2007	NR	NR	NR	NR	--	<0.1	NR	--	--	0.2	--	--	--	--	0.2	--	0.2
2005-2006	NR	NR	NR	NR	--	--	NR	--	--	0.1	--	--	<0.1	--	0.15	--	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	--	--	--	--	--	--	--	--	--	NA
2002-2003	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	NI
2001-2002	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	NI
2000-2001	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	NI
1999-2000	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	NI
1998-1999	NR	NR	NR	NR	--	0.16	NR	0.11	--	2.19	--	--	--	--	--	--	NI
1997-1998	NR	NR	NR	NR	0.22	0.4	NR	0.66	0.32	13	0.22	--	--	NI	NI	NI	NI
1996-1997	NR	NR	NR	NR	--	--	0.36	0.12	--	NI	NI	NI	NI	NI	NI	NI	NI
1995-1996	NR	NR	NR	NR	--	0.12	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI

KEY:

D	Destroyed	--	No clearly defined interpreted movement
F	Functioning	NR	No reading
B	New baseline in 1999	NA	Data not available
NI	Not Installed		
--	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.		

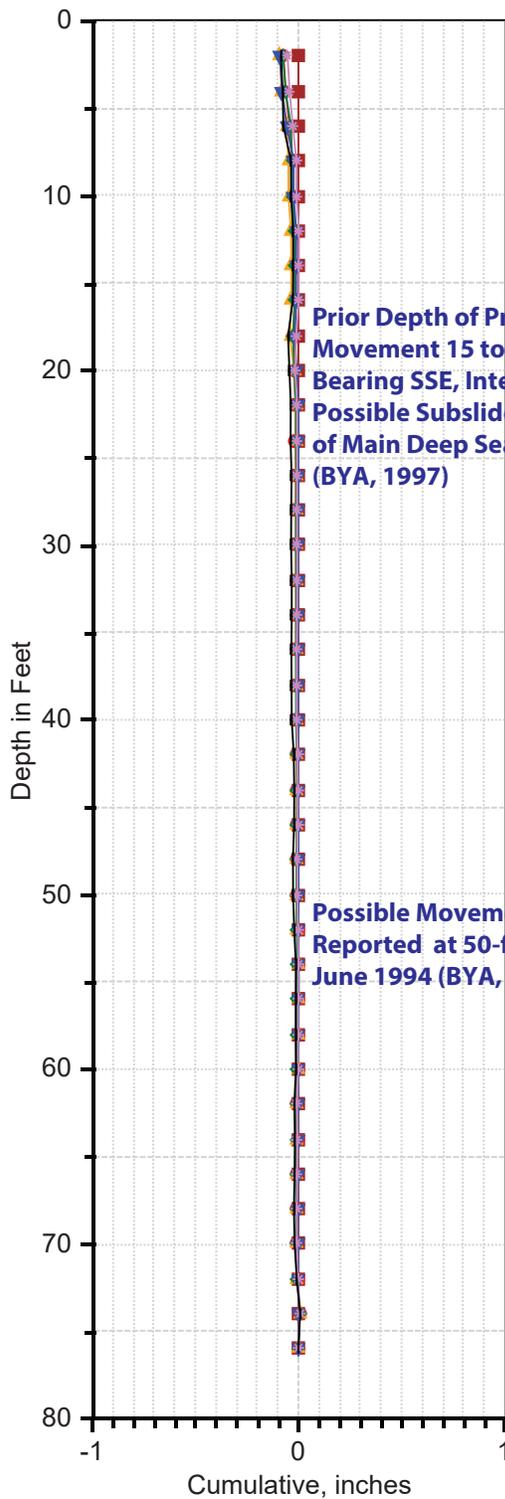
NOTES:

- * 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.

SUMMARY OF SLOPE INCLINOMETERS

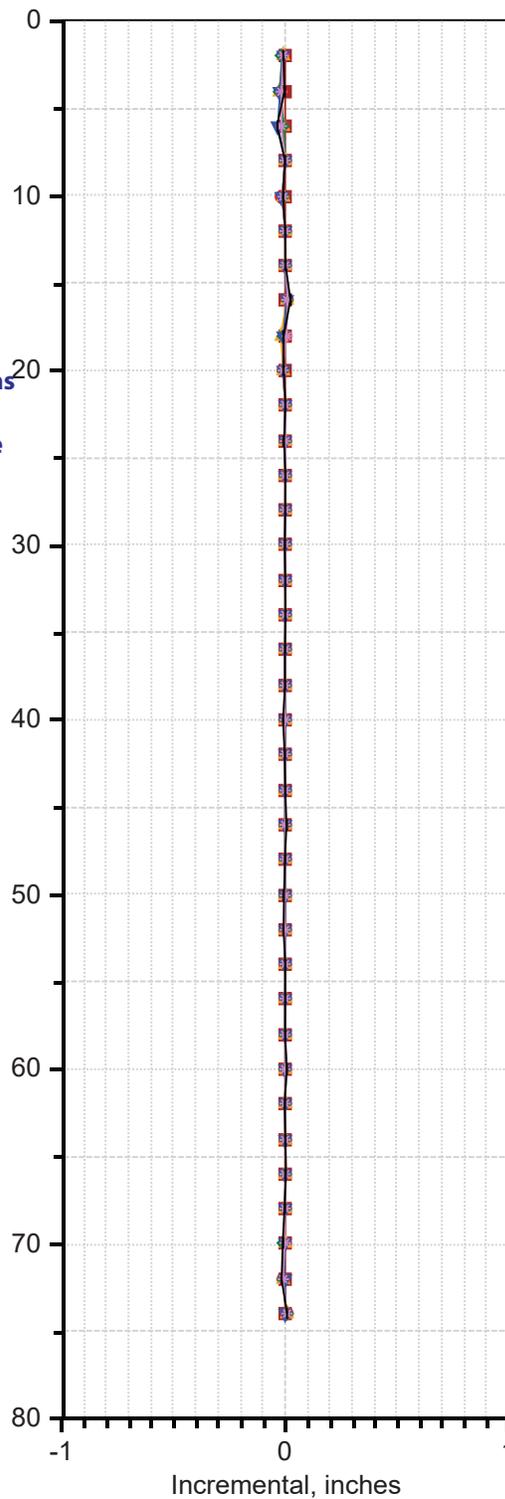
Calle del Barco Landslide Assessment District
Malibu, California

A-
180°



- 8/4/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/19/2023
- + 6/7/2023

A+
0°



- 8/4/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/19/2023
- + 6/7/2023

Plot of Slope Inclinometer

SI-4

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 78		Baseline Date: 8/4/21	
Install Date: <9/1992		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 76		Interpreted Movement Monitoring Year (in): 0	

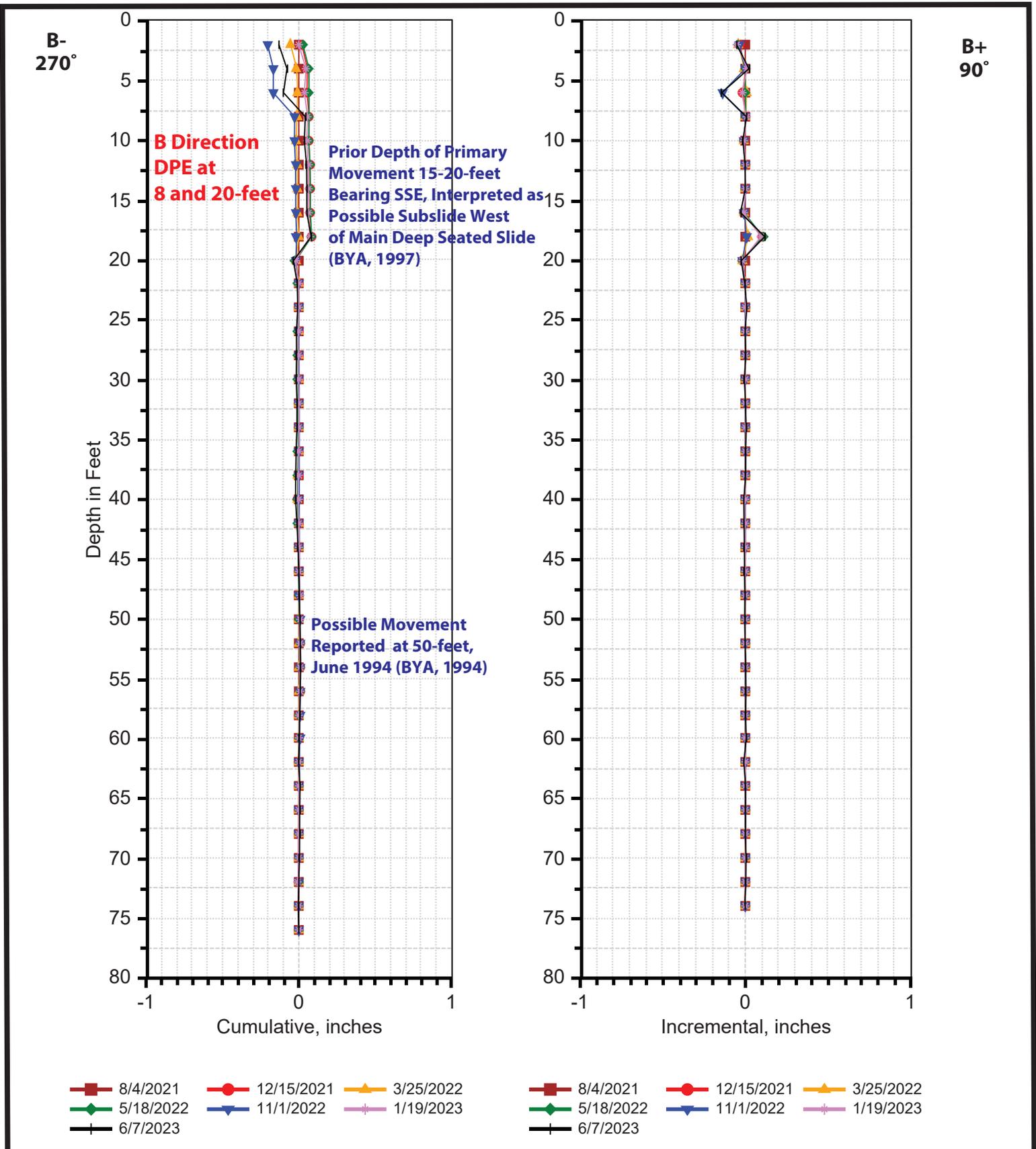


Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

PROJECT: **Calle del Barco LAD**
Malibu, CA

PROJECT NUMBER:
220-277

REVISION DATE: 8/7/2023

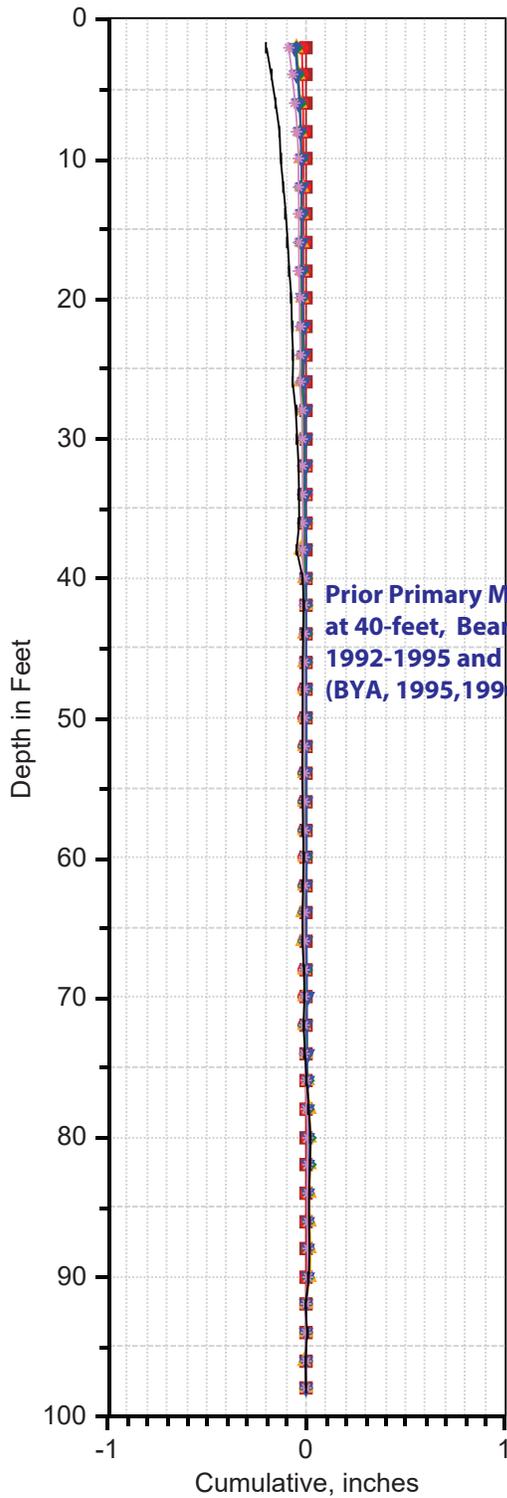


- 8/4/2021
- 12/15/2021
- ▲ 3/25/2022
- 8/4/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/19/2023
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/19/2023
- 6/7/2023
- 6/7/2023

Plot of Slope Inclinometer <h1 style="margin: 0;">SI-4</h1>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft): 78	Baseline Date: 8/4/21	Corrections: None
	Install Date: <9/1992	Installed Depth (ft): 76	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0	

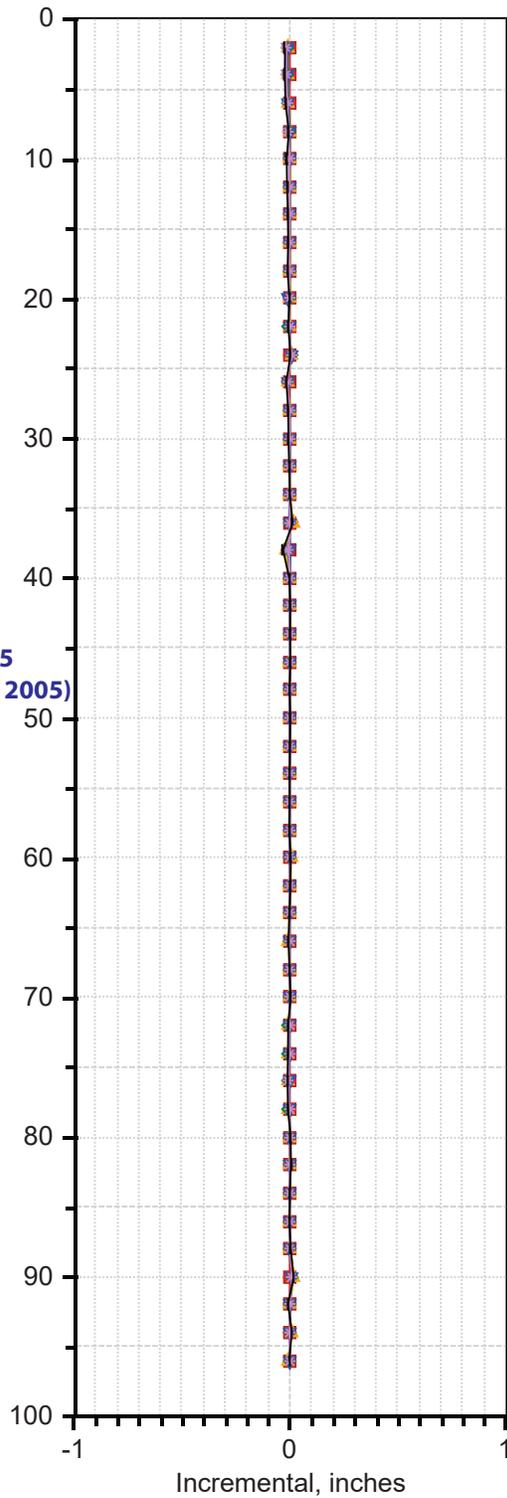
<p>Yeh and Associates, Inc. Geotechnical • Geological • Construction Services</p>	PROJECT: Calle del Barco LAD Malibu, CA	PROJECT NUMBER: 220-277
	REVISION DATE: 8/7/2023	

A-
218°



- 5/3/2021 ● 8/4/2021 ▲ 12/9/2021
- ◆ 5/18/2022 ▼ 11/1/2022 ✦ 1/18/2023
- 6/7/2023

A+
38°



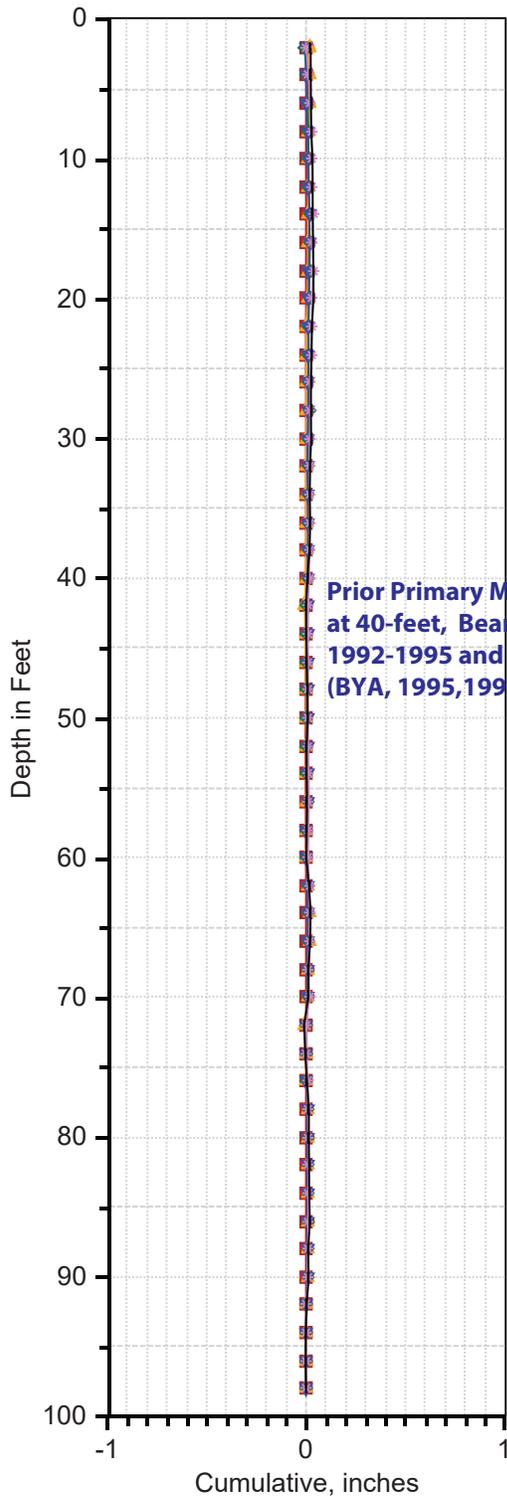
- 5/3/2021 ● 8/4/2021 ▲ 12/9/2021
- ◆ 5/18/2022 ▼ 11/1/2022 ✦ 1/18/2023
- 6/7/2023

Plot of Slope Inclinometer

SI-5

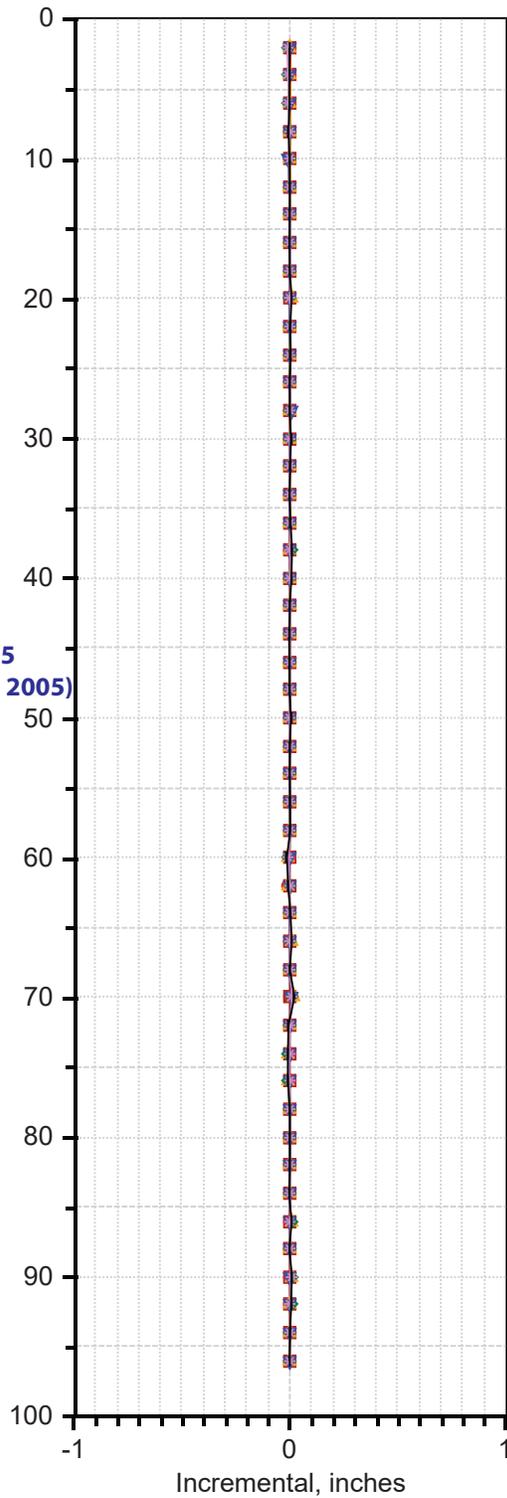
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Depth of Survey (ft): 96		Baseline Date: 5/3/21	
Install Date: <7/1992		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 100		Interpreted Movement Monitoring Year (in): 0	

**B-
308°**



- 5/3/2021 ● 8/4/2021 ▲ 12/9/2021
- ◆ 5/18/2022 ▼ 11/1/2022 ✦ 1/18/2023
- 6/7/2023

**B+
128°**



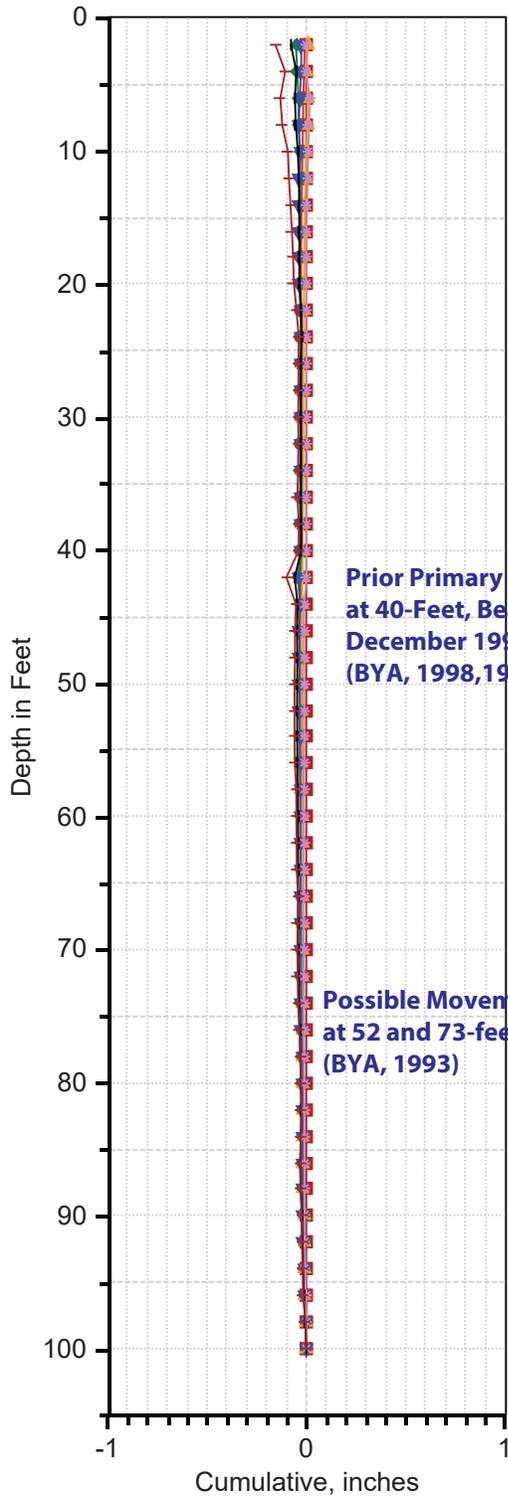
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- ◆ 5/18/2022 ▼ 11/1/2022 ✦ 1/18/2023
- 6/7/2023

Plot of Slope Inclinometer

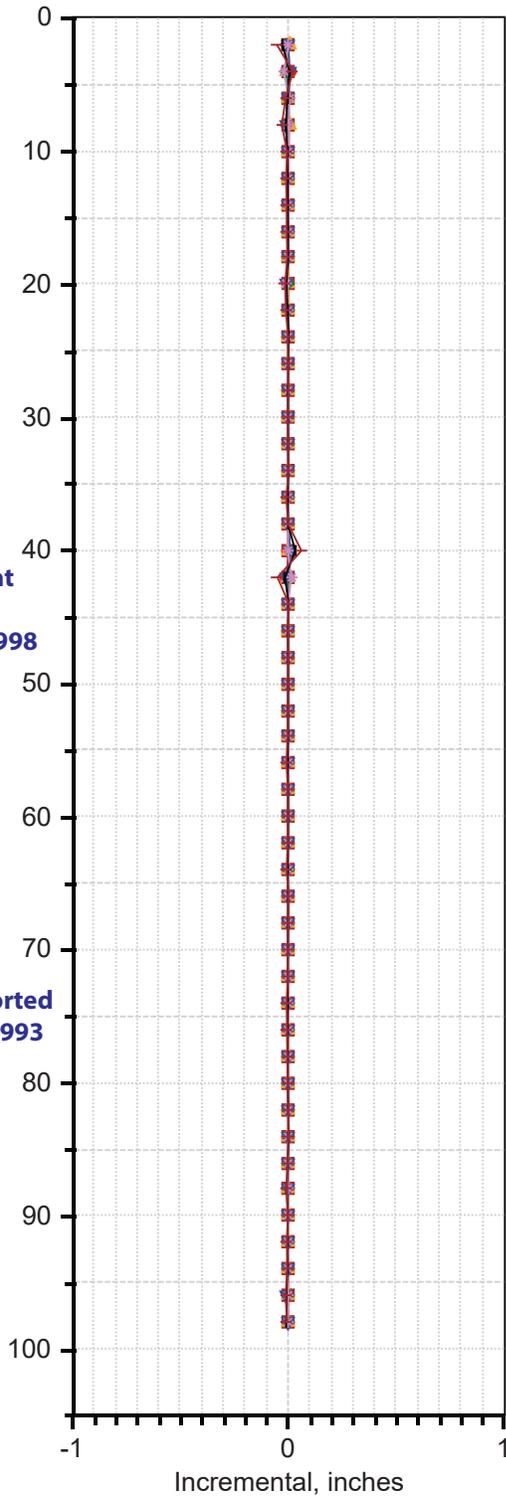
SI-5

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 96		Baseline Date:	
Install Date: <7/1992		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 100		Interpreted Movement Monitoring Year (in): 0	

A-208°



A+28°



- 5/4/2021
- 8/4/2021
- ▲ 12/15/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- ⊖ 6/7/2023

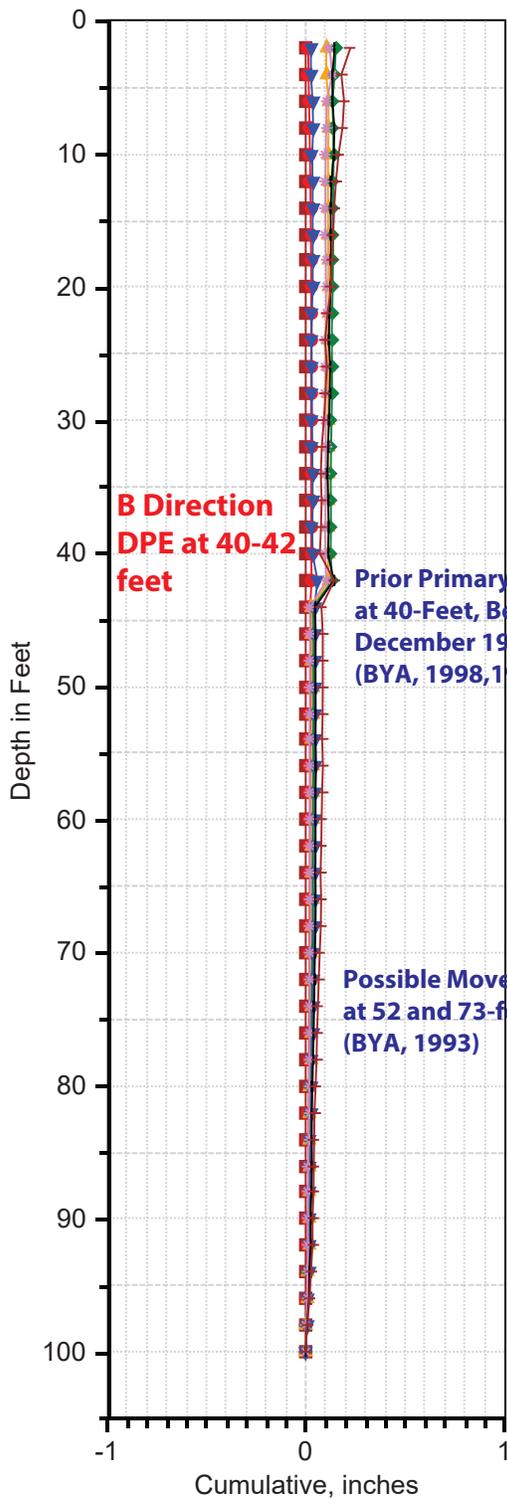
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- 8/4/2021
- ▲ 12/15/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- ⊖ 6/7/2023

Plot of Slope Inclinometer

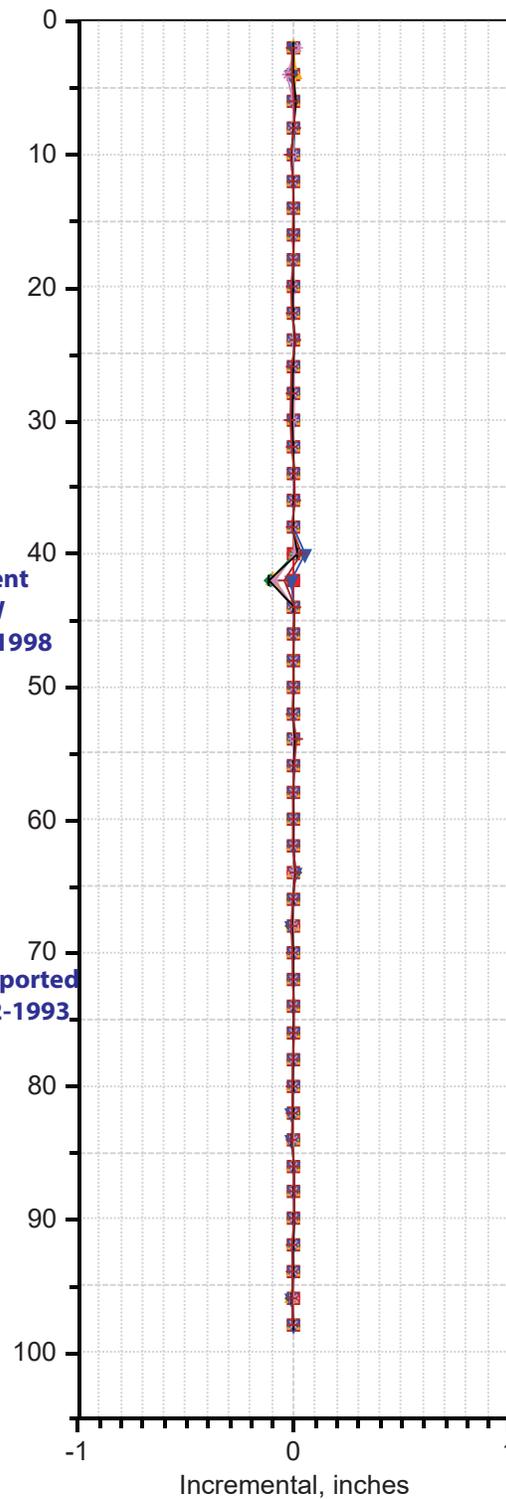
SI-7

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 102		Baseline Date: 5/4/21	
Install Date: <7/1992		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 100		Interpreted Movement Monitoring Year (in): 0	

B-
298°



B+
118°



- 5/4/2021
- 8/4/2021
- ▲ 12/15/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- 6/7/2023

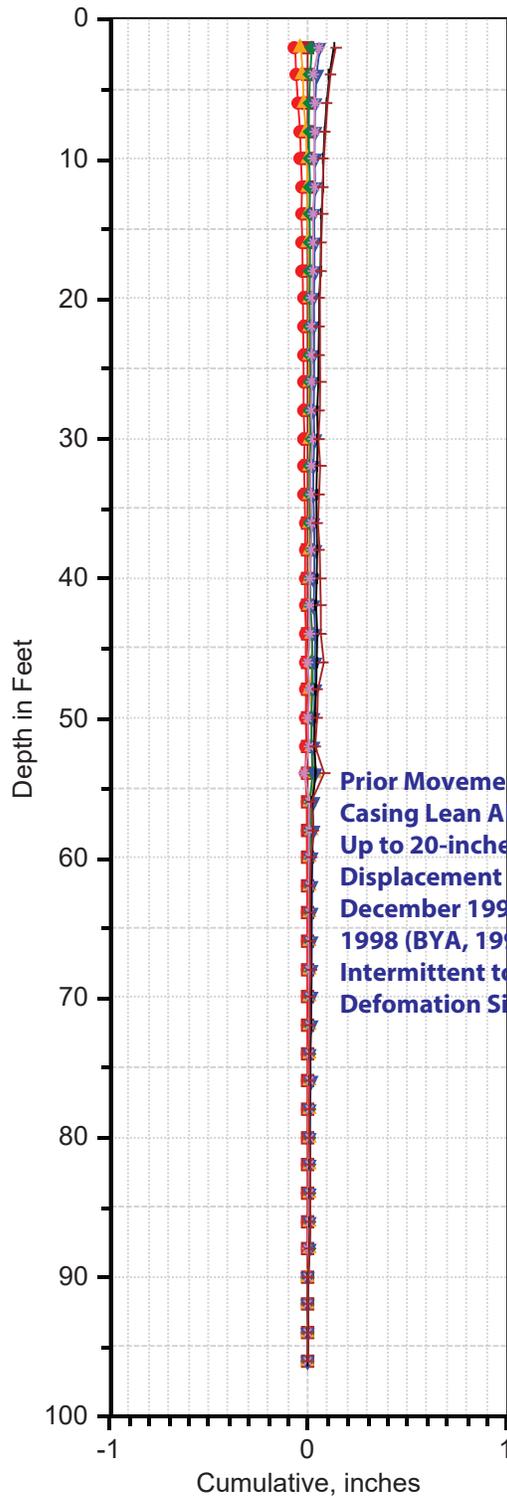
- 5/4/2021
- 8/4/2021
- ▲ 12/15/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- 6/7/2023

Plot of Slope Inclinometer

SI-7

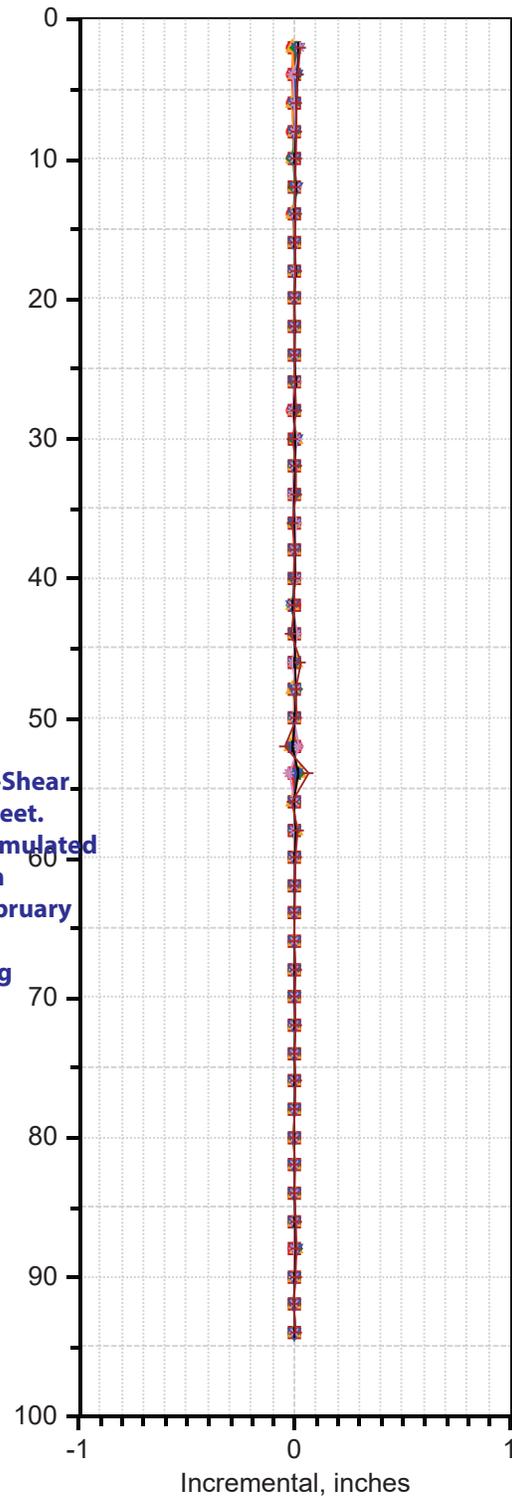
Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 102		Baseline Date: 5/4/21	
Install Date: <7/1992	Installed Depth (ft): 100	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

A-
32°



Prior Movement is Non-Shear
Casing Lean Above 60-feet.
Up to 20-inches of Accumulated
Displacement between
December 1997 and February
1998 (BYA, 1998).
Intermittent to Creeping
Deformation Since 1998

A+
212°



- 5/3/2021
- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- ⊖ 6/7/2023

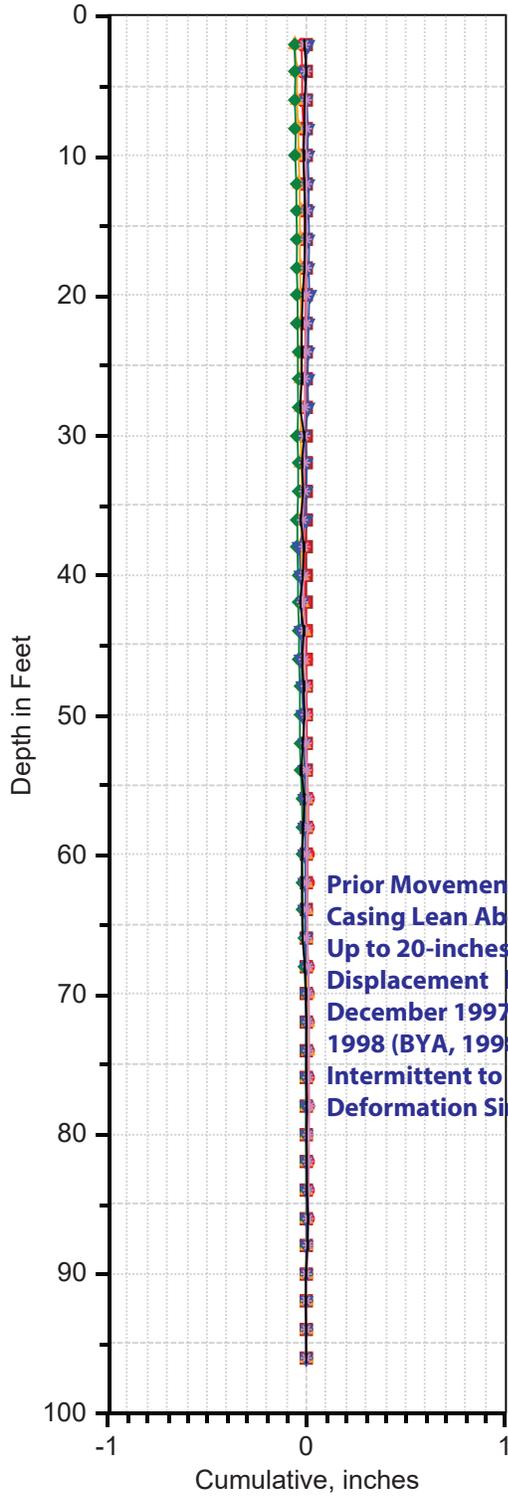
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- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊕ 1/19/2023
- ⊖ 6/7/2023

Plot of Slope Inclinometer

SI-9

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 96		Baseline Date: 5/3/21	
Install Date: <12/1997		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 100		Interpreted Movement Monitoring Year (in): 0	

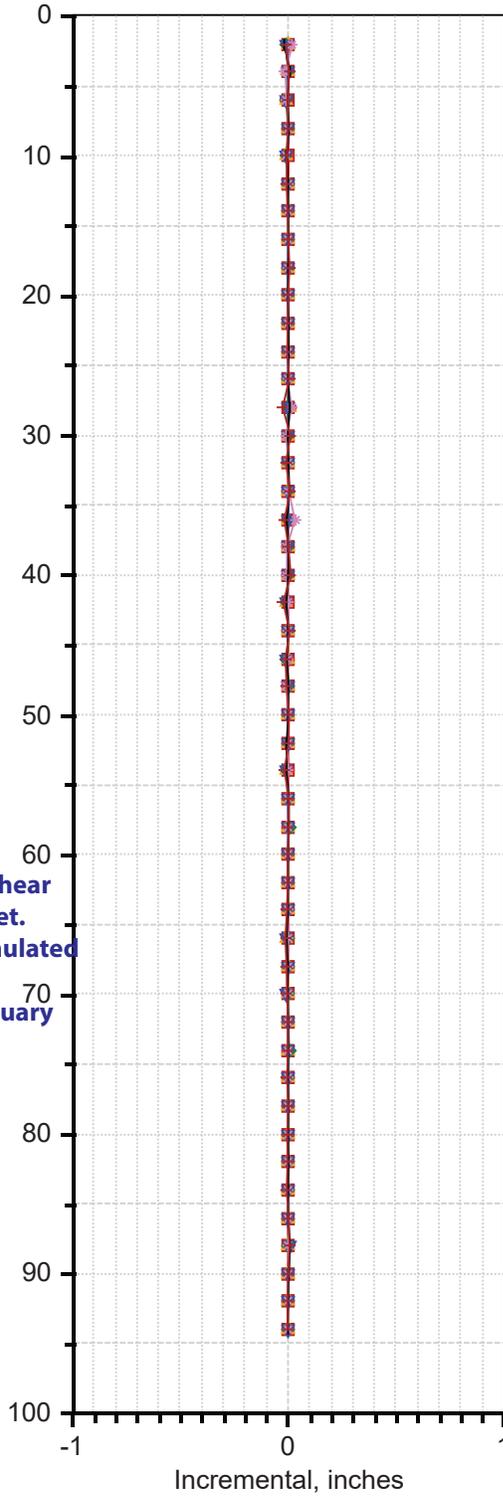
B-
122°



Prior Movement is Non-Shear
Casing Lean Above 60-feet.
Up to 20-inches of Accumulated
Displacement between
December 1997 and February
1998 (BYA, 1998).
Intermittent to Creeping
Deformation Since 1998

- 5/3/2021 ● 12/9/2021 ▲ 3/25/2022
- ◆ 5/18/2022 ▼ 11/1/2022 ◆ 11/19/2023
- 6/7/2023

B+
302°



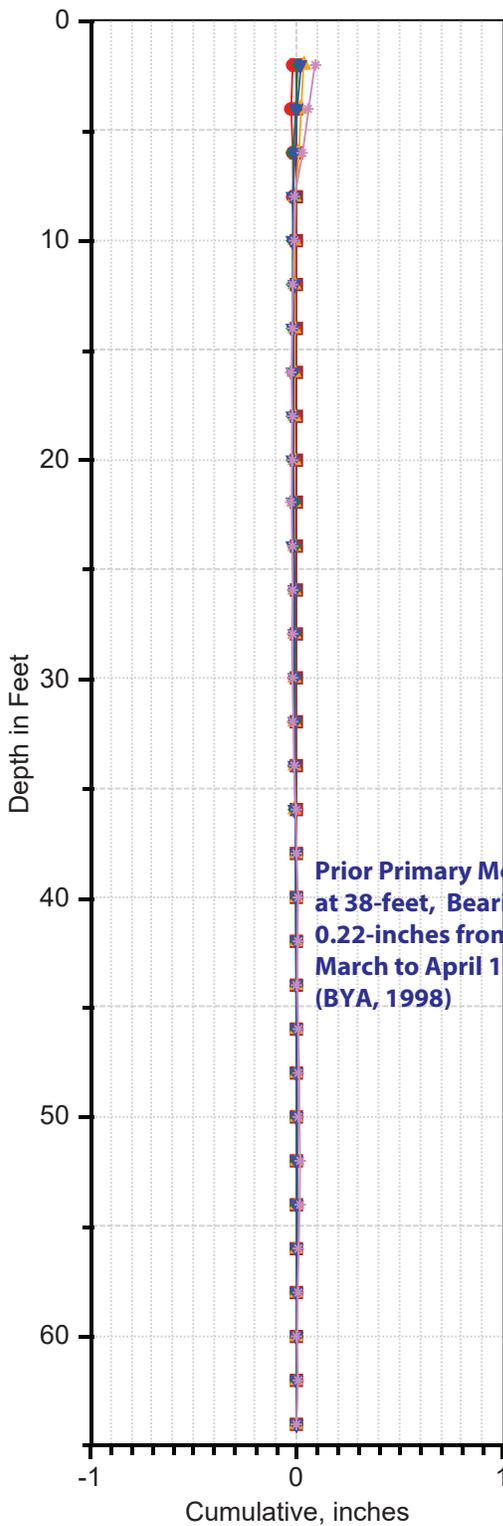
- 5/3/2021 ● 8/4/2021 ▲ 12/9/2021
- ◆ 3/25/2022 ▼ 5/18/2022 ◆ 11/1/2022
- 11/19/2023 — 6/7/2023

Plot of Slope Inclinometer

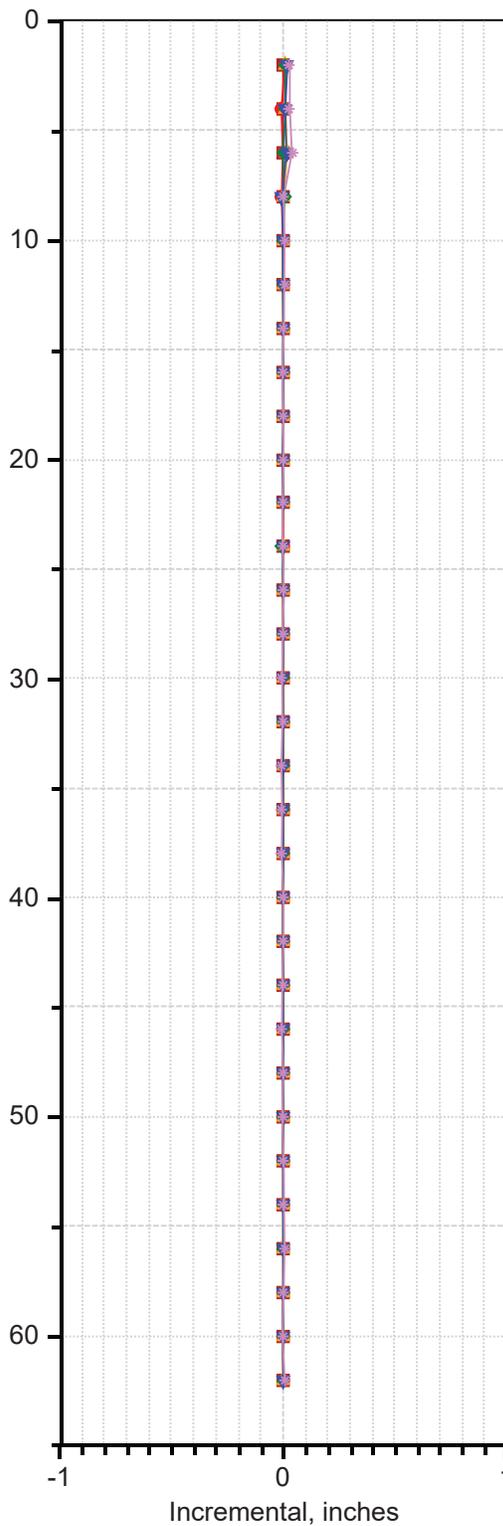
SI-9

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 96		Baseline Date: 5/3/21	
Install Date: <12/1997		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 100		Interpreted Movement Monitoring Year (in): 0	

A-
64°



A+
244°



■ 8/4/2021 ● 12/15/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/7/2023

■ 8/4/2021 ● 12/15/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/7/2023

Plot of Slope Inclinometer

SI-10

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
Depth of Survey (ft): 62	Baseline Date: 8/4/20	Corrections: None
Install Date: 3/1998	Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0



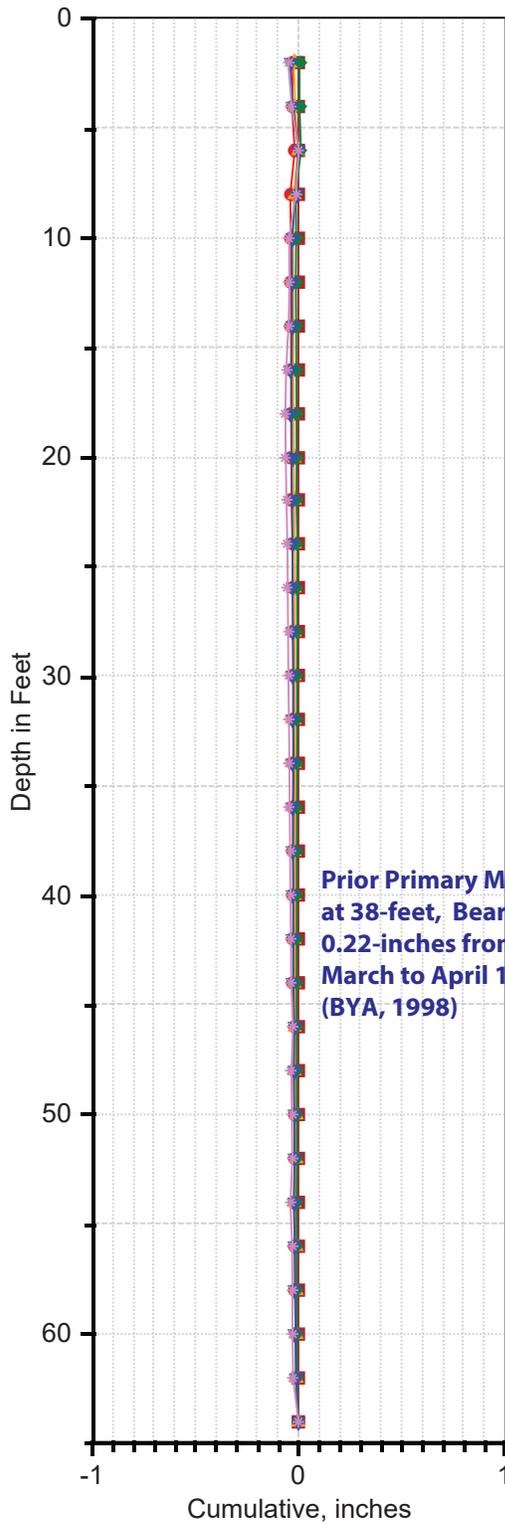
Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

PROJECT: Calle del Barco LAD
Malibu, CA

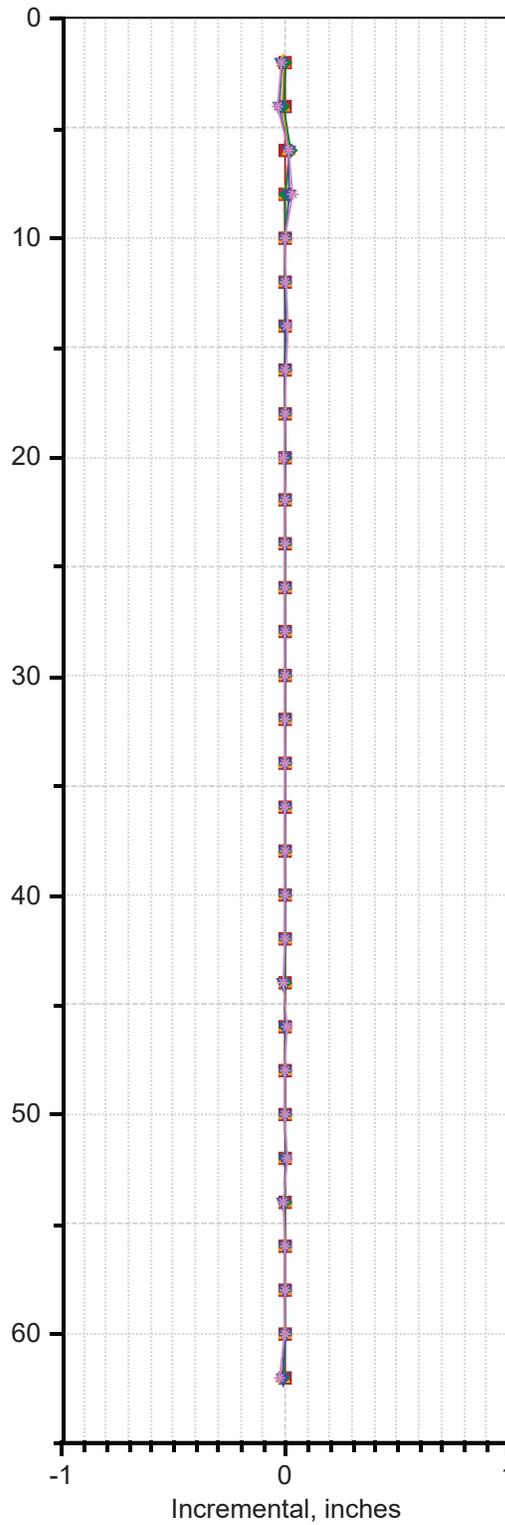
PROJECT NUMBER: 220-277

REVISION DATE: 8/7/2023

**B-
154°**



**B+
334°**



■ 8/4/2021 ● 12/15/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/7/2023

■ 8/4/2021 ● 12/15/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/7/2023

Plot of Slope Inclinometer

SI-10

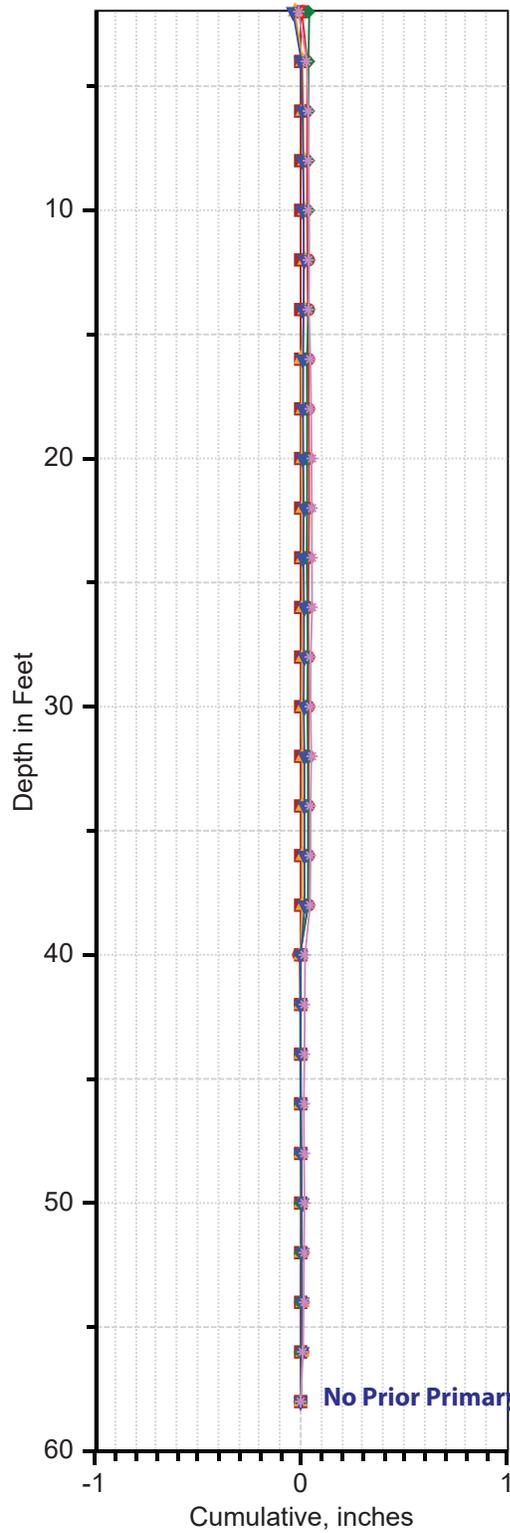
Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
Depth of Survey (ft): 62	Baseline Date: 8/4/21	Corrections: None
Install Date: 3/1998	Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0



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PROJECT: Calle del Barco LAD Malibu, CA	PROJECT NUMBER: 220-277
REVISION DATE: 8/7/2023	

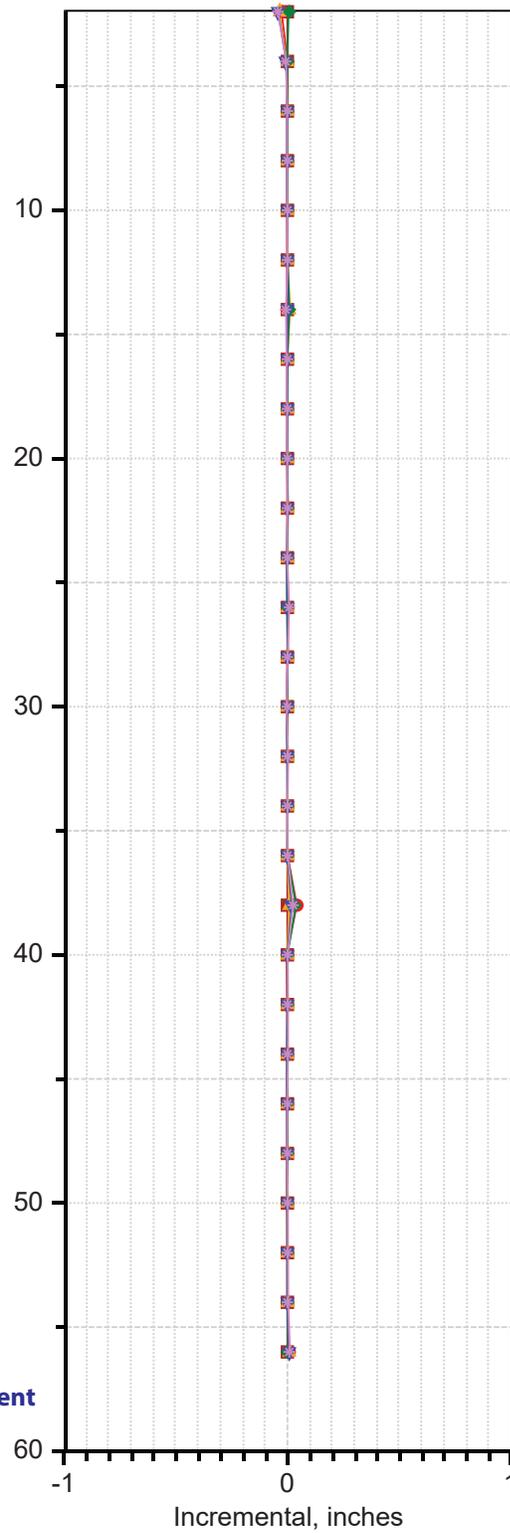
A-
78°



No Prior Primary Movement

8/4/2021 12/9/2021 5/18/2022
11/1/2022 1/19/2023 6/9/2023

A+
258°



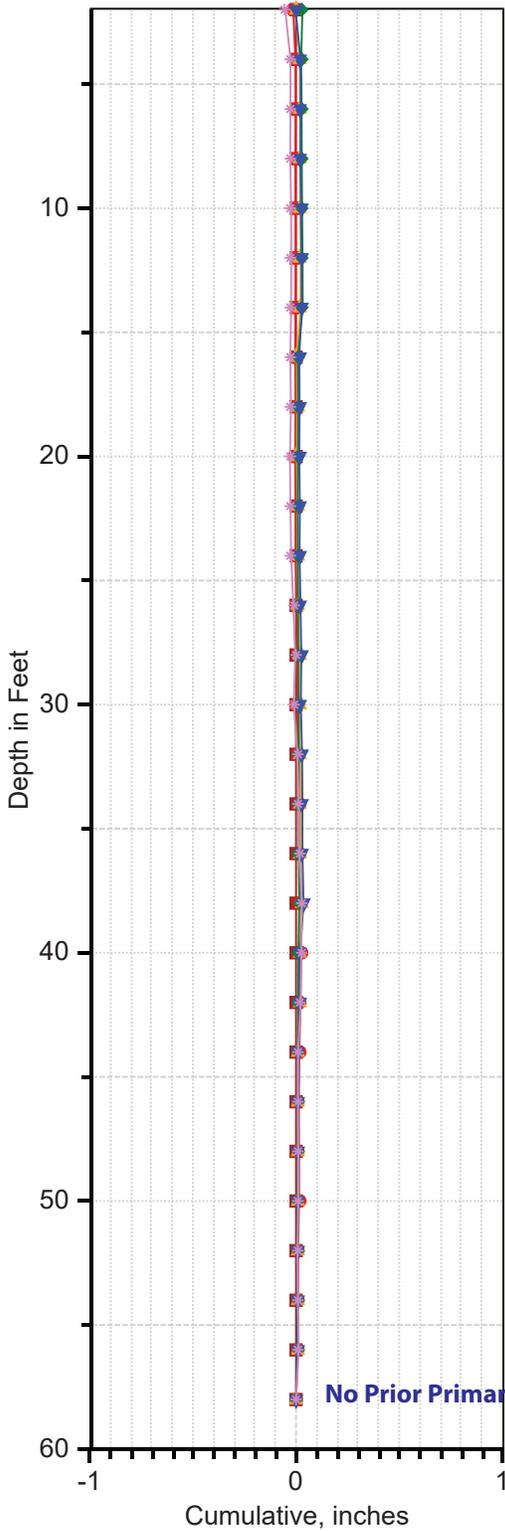
8/4/2021 12/9/2021 5/18/2022
11/1/2022 1/19/2023 6/9/2023

Plot of Slope Inclinometer

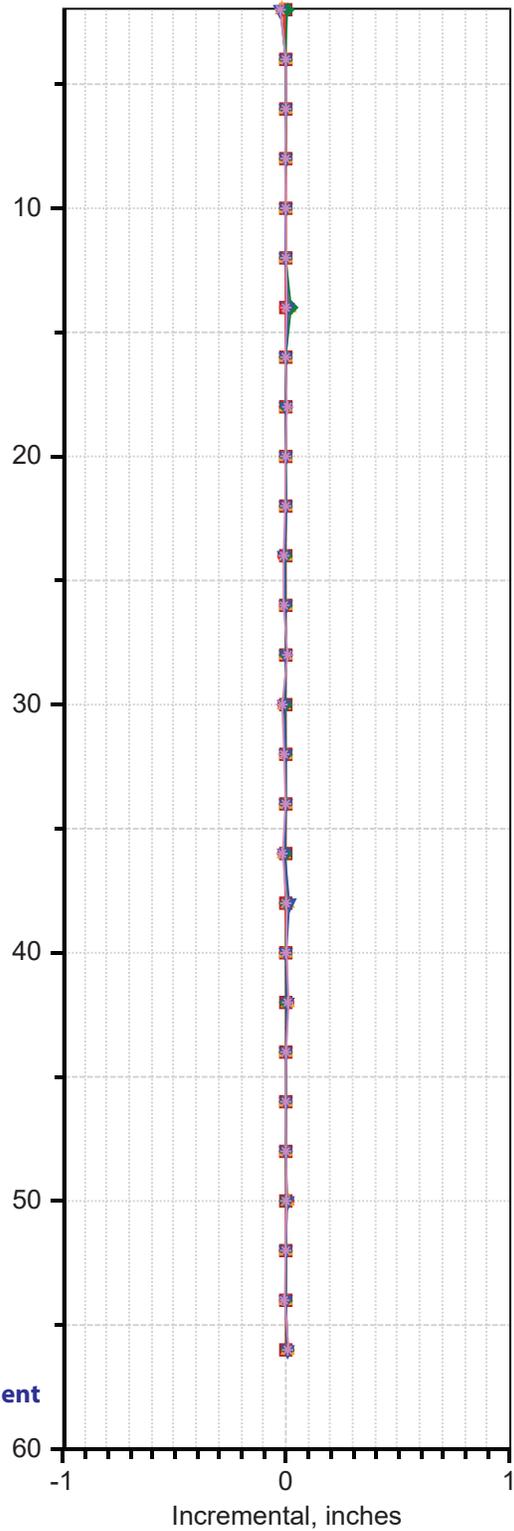
SI-11

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 57		Baseline Date: 8/4/21	
Install Date: 3/1998		Corrections: None	
Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	

B-
168°



B+
348°



■ 8/4/2021 ● 12/9/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/9/2023

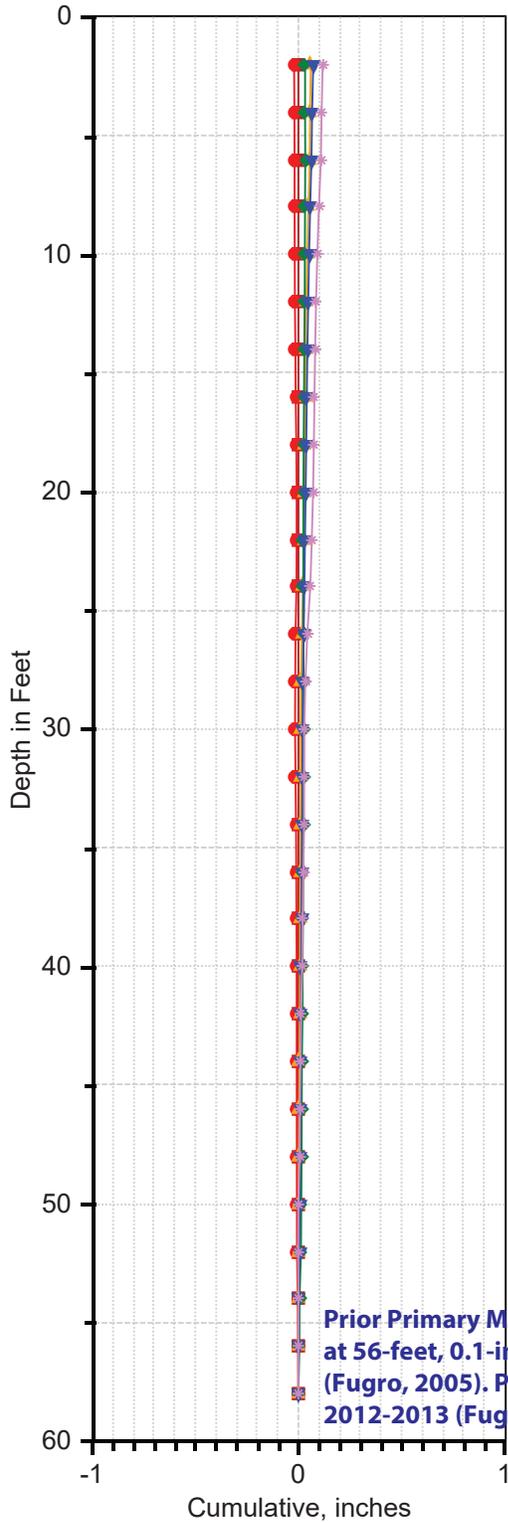
■ 8/4/2021 ● 12/9/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/9/2023

Plot of Slope Inclinerometer

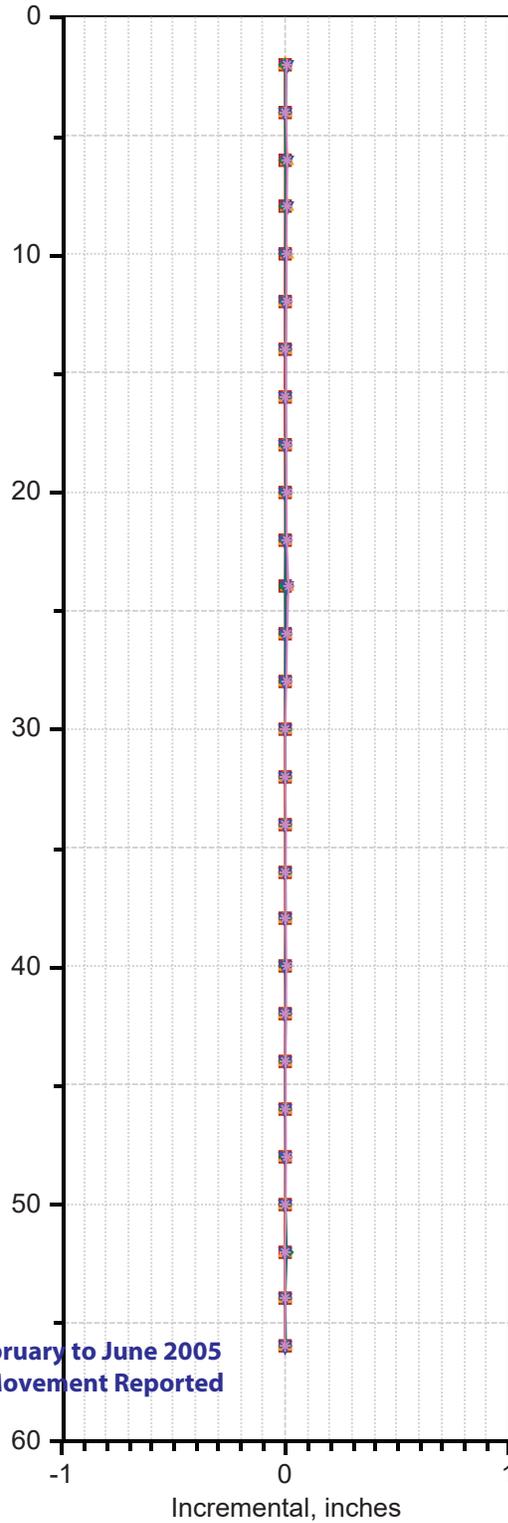
SI-11

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
Depth of Survey (ft): 57	Baseline Date: 8/4/21	Corrections: None
Install Date: 3/1998	Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0

A-
58°



A+
238°



■ 9/14/2021 ● 12/9/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/9/2023

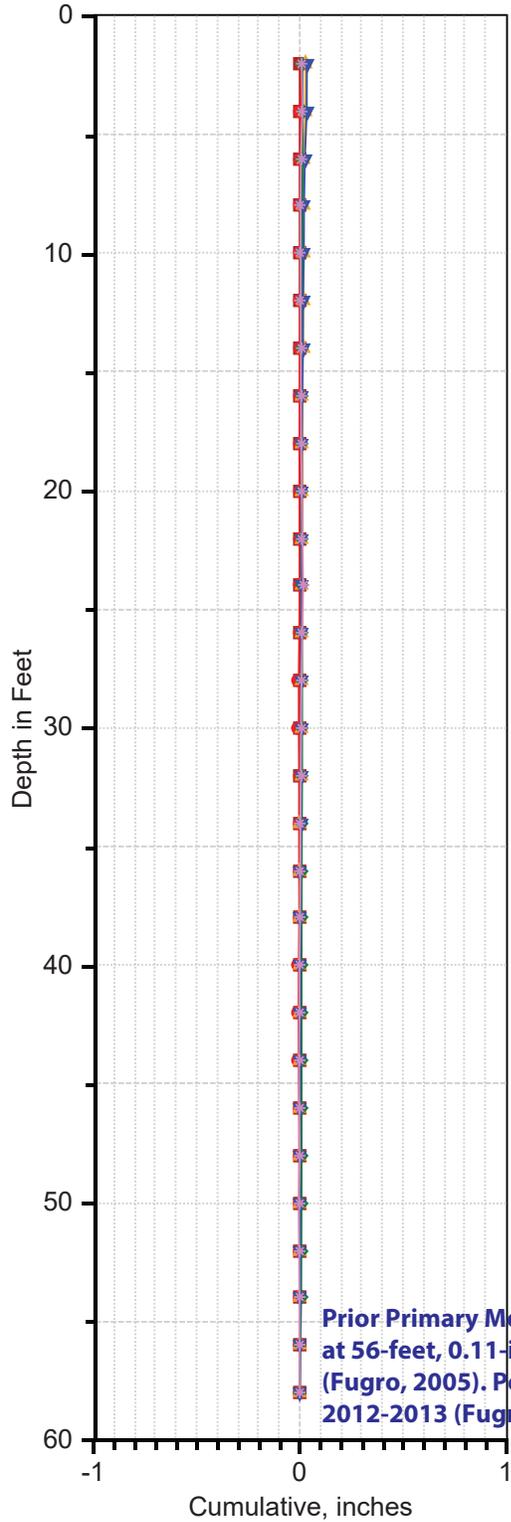
■ 9/14/2021 ● 12/9/2021 ▲ 5/18/2022
◆ 11/1/2022 ▼ 1/19/2023 ✦ 6/9/2023

Plot of Slope Inclinometer

SI-12

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 56		Baseline Date: / /20	
Install Date: 3/1998	Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

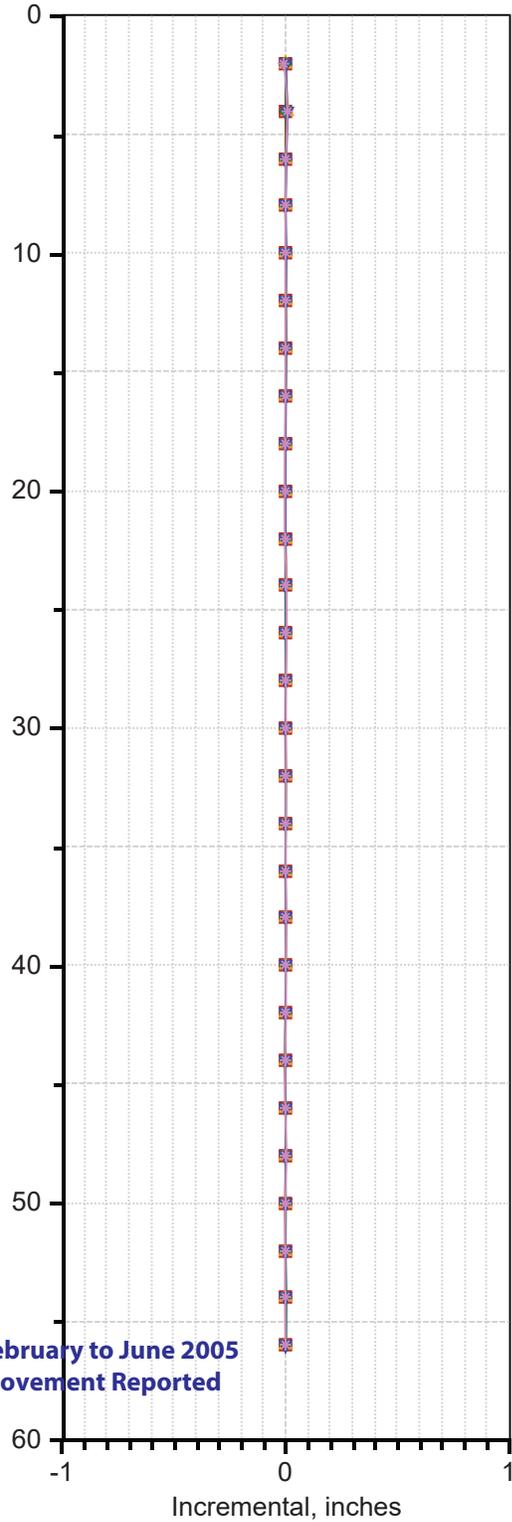
B-
148°



Prior Primary Movement
at 56-feet, 0.11-inches February to June 2005
(Fugro, 2005). Possible Movement Reported
2012-2013 (Fugro, 2013)

9/14/2021 12/9/2021 5/18/2022
11/1/2022 1/19/2023 6/9/2023

B+
328°



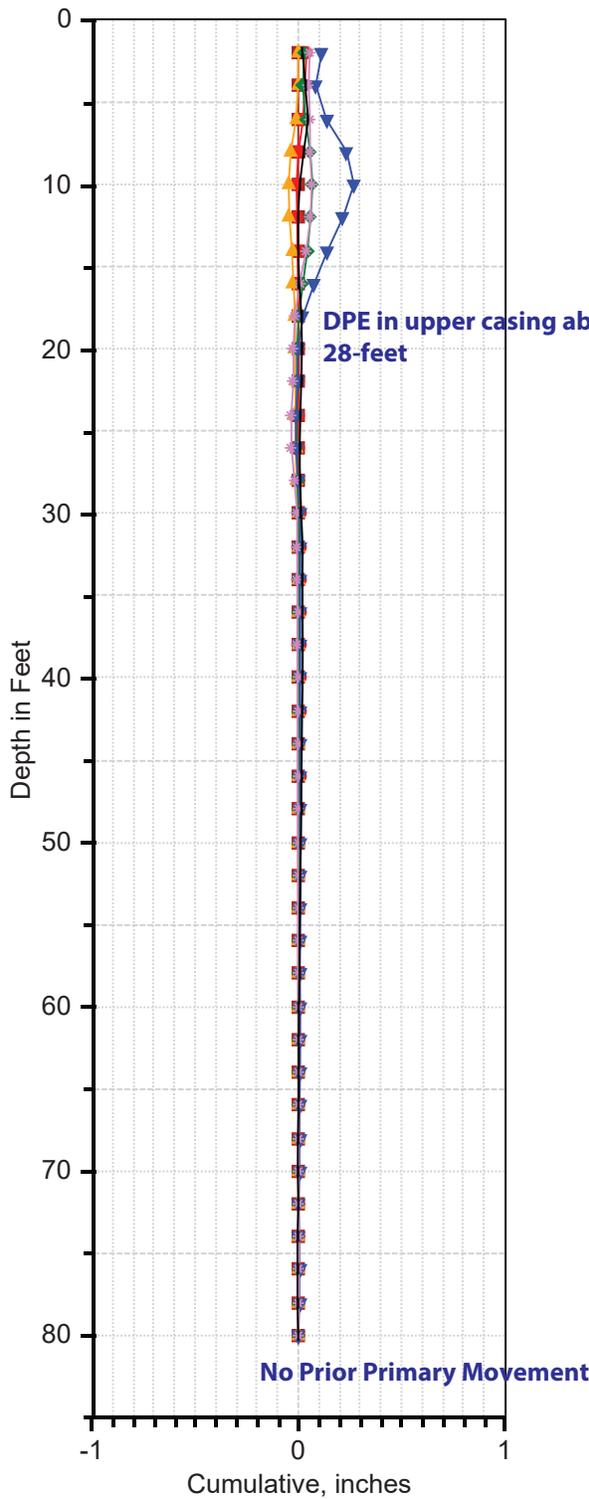
9/14/2021 12/9/2021 5/18/2022
11/1/2022 1/19/2023 6/9/2023

Plot of Slope Inclinometer

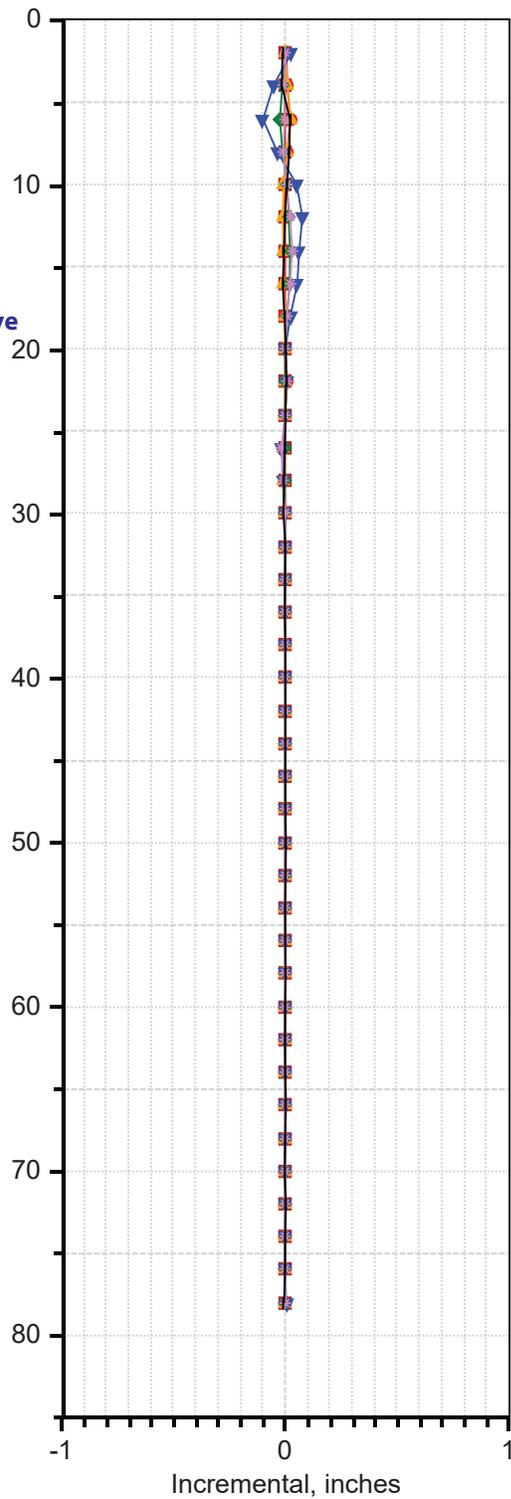
SI-12

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 56		Baseline Date: 9/14/21	
Install Date: 3/1998		Corrections: None	
Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	

A-
30°



A+
210°



- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/18/2023
- + 6/7/2023

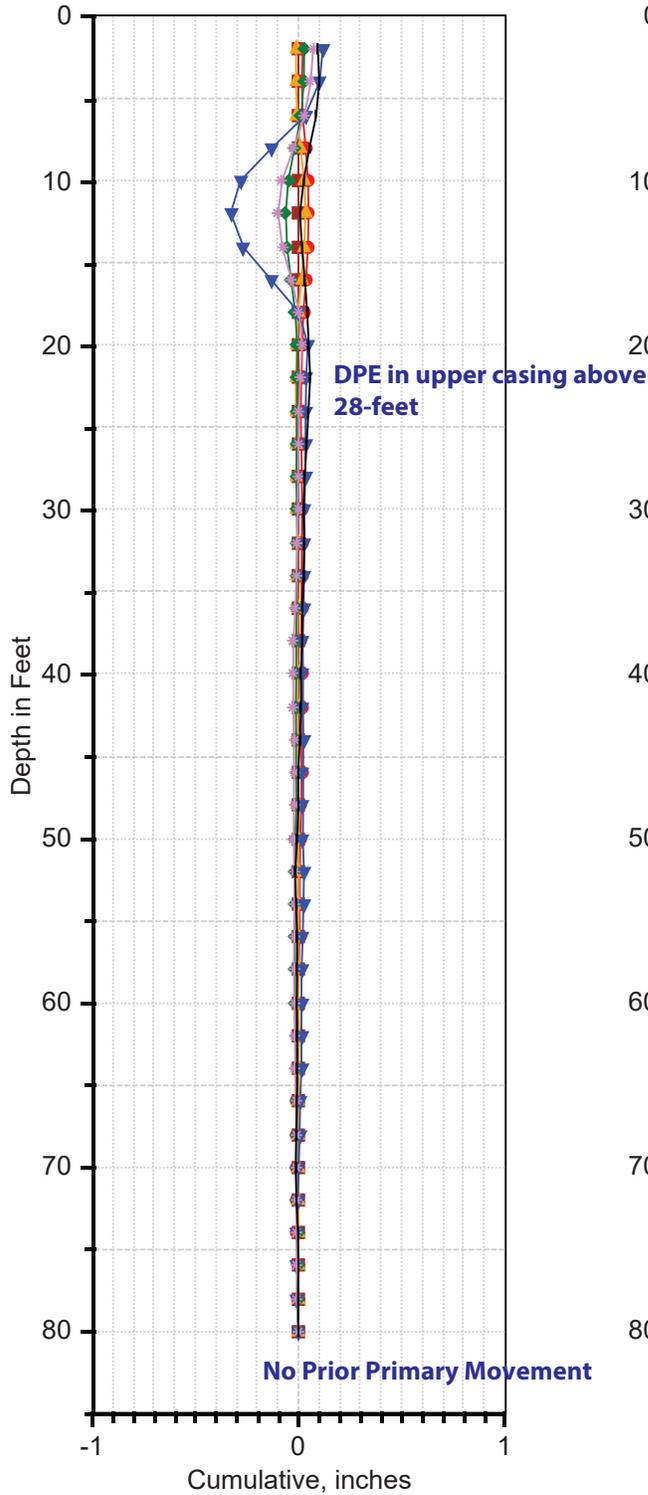
- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/18/2023
- + 6/7/2023

Plot of Slope Inclinometer

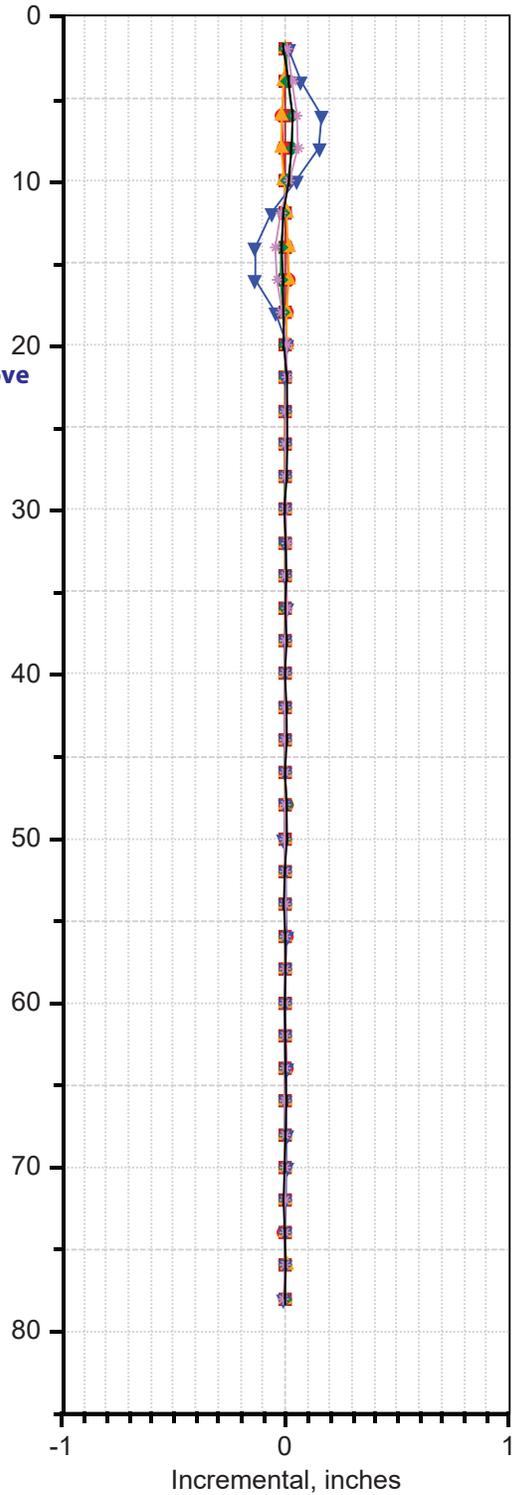
SI-13

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
Depth of Survey (ft): 78	Baseline Date: 8/9/21	Corrections: None
Install Date: 9/1998	Installed Depth (ft): 80	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0

B-120°



B+300°



- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ◆ 1/18/2023
- 6/7/2023

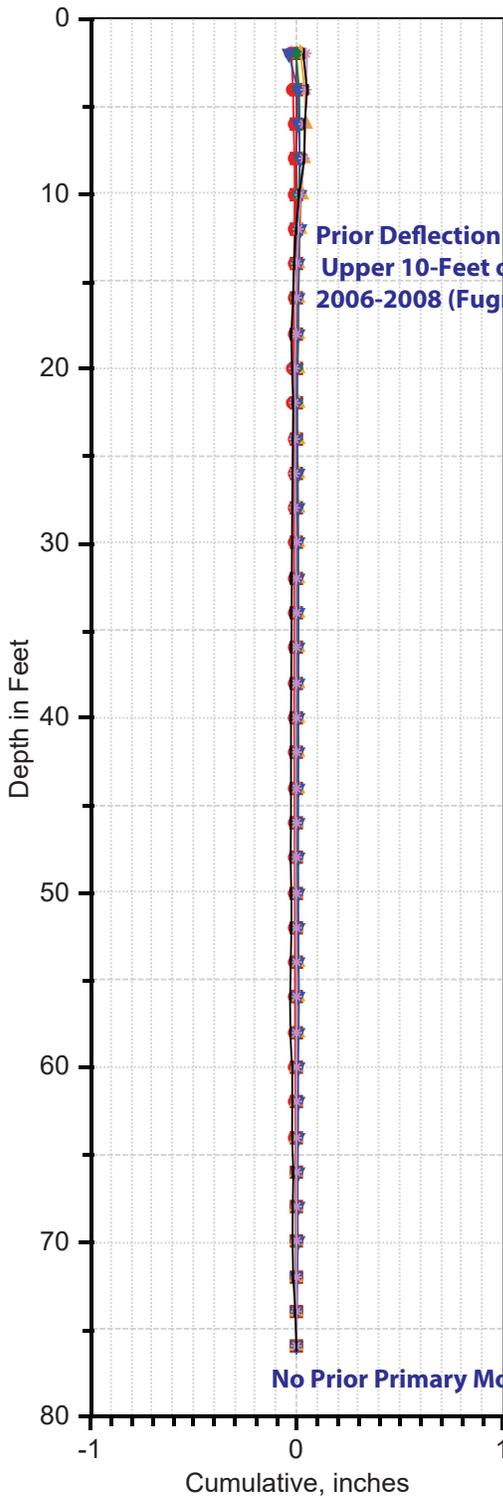
- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ◆ 1/18/2023
- 6/7/2023

Plot of Slope Inclinometer

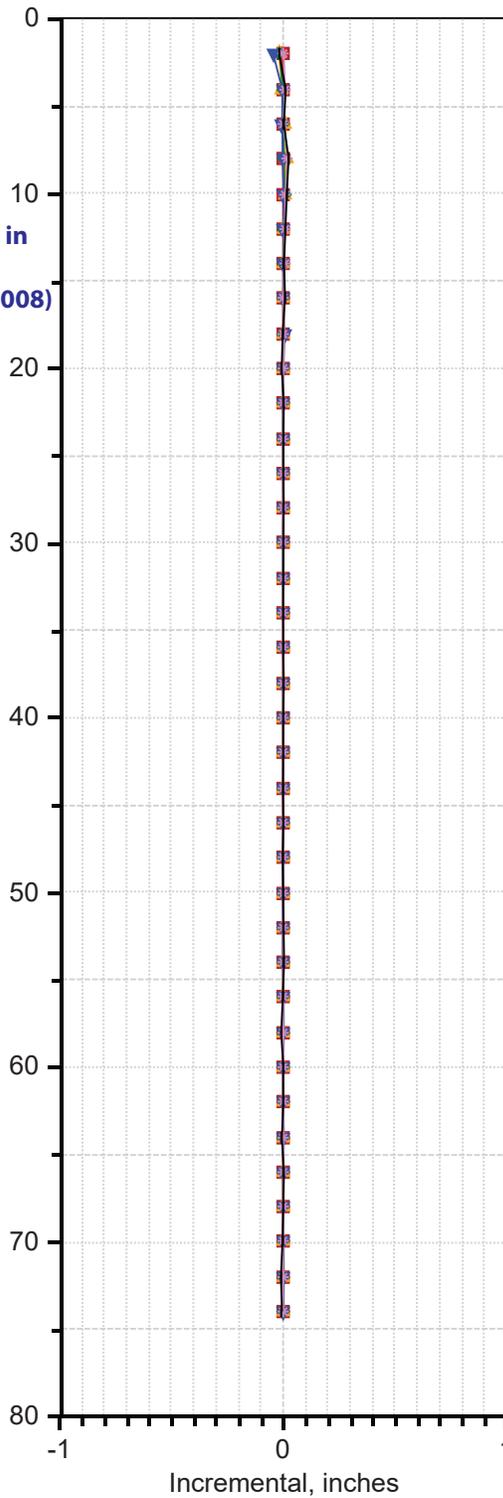
SI-13

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
Depth of Survey (ft): 78	Baseline Date: 8/9/21	Corrections: None
Install Date: 9/1998	Installed Depth (ft): 80	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0

A-44°



A+224°



- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ◆ 1/18/2023
- + 6/7/2023

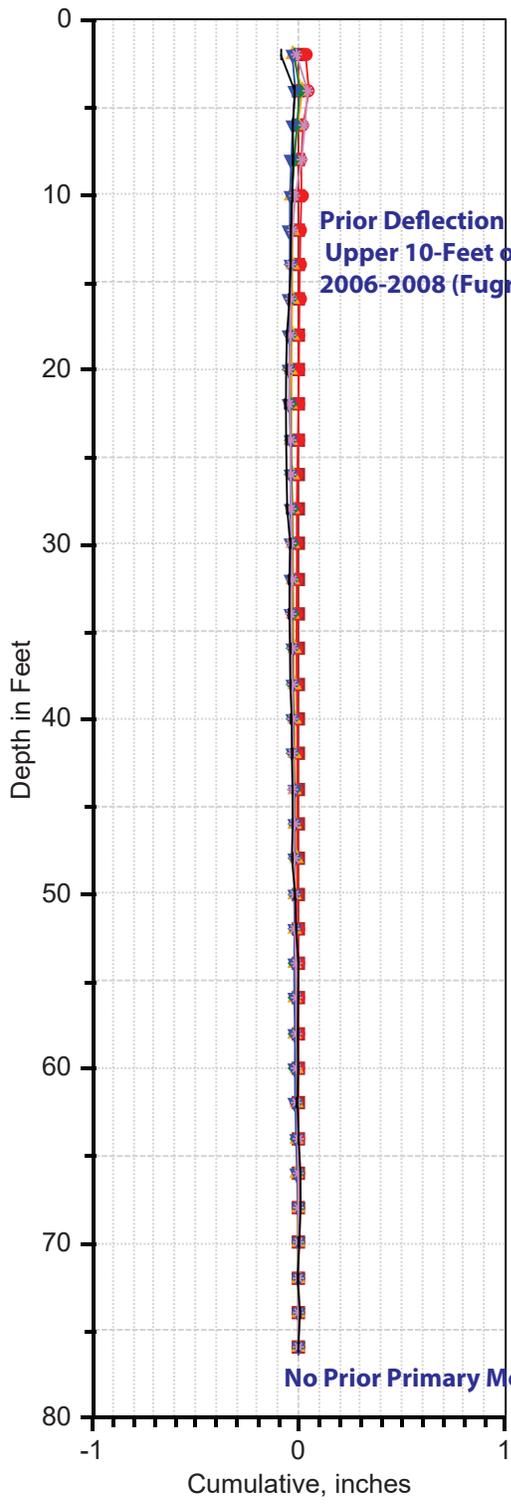
- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ◆ 1/18/2023
- + 6/7/2023

Plot of Slope Inclinometer

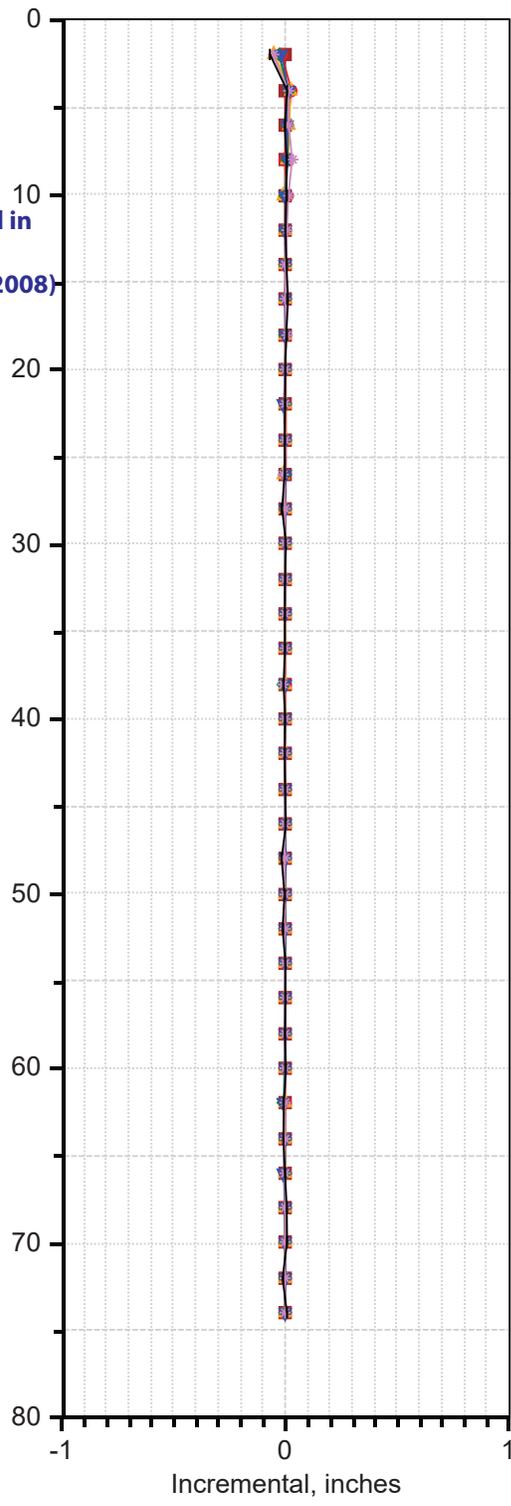
SI-14

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
Depth of Survey (ft): 76	Baseline Date: 8/9/21	Corrections: None
Install Date: 9/1998	Installed Depth (ft): 78	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0

B-134°



B+314°



- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/18/2023
- 6/7/2023

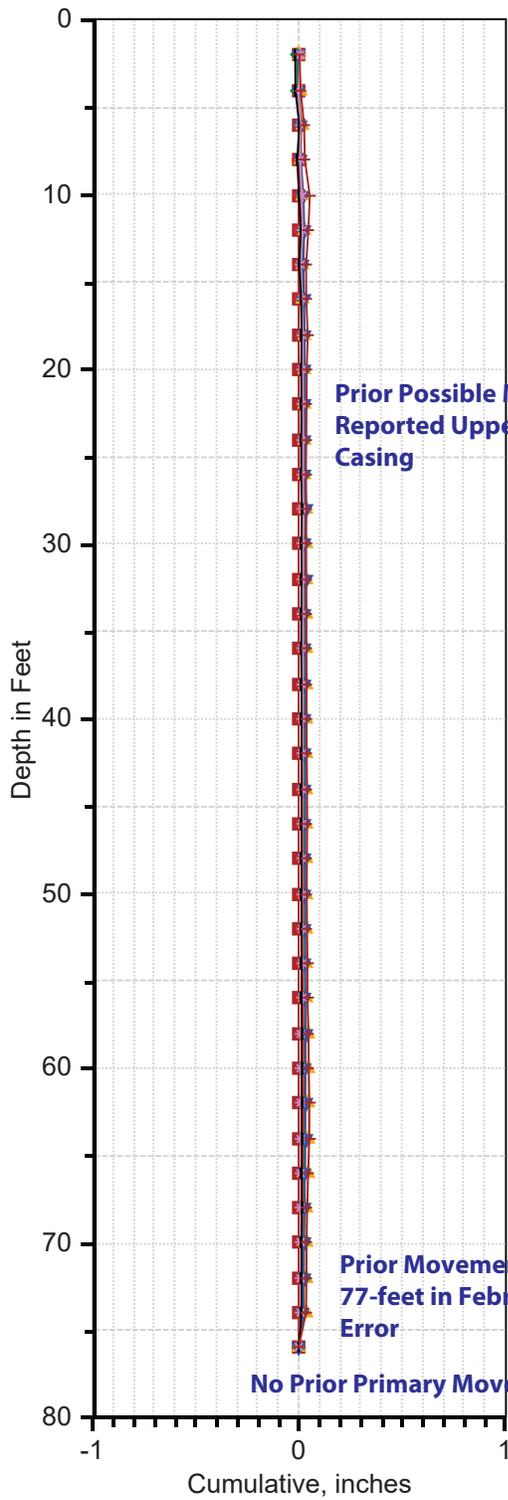
- 8/9/2021
- 12/15/2021
- ▲ 3/25/2022
- ◆ 5/18/2022
- ▼ 11/1/2022
- ✦ 1/18/2023
- 6/7/2023

Plot of Slope Inclinometer <h2 style="margin: 0;">SI-14</h2>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft): 76	Baseline Date: 8/9/21	
	Install Date: 9/1998	Installed Depth (ft): 78	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0	

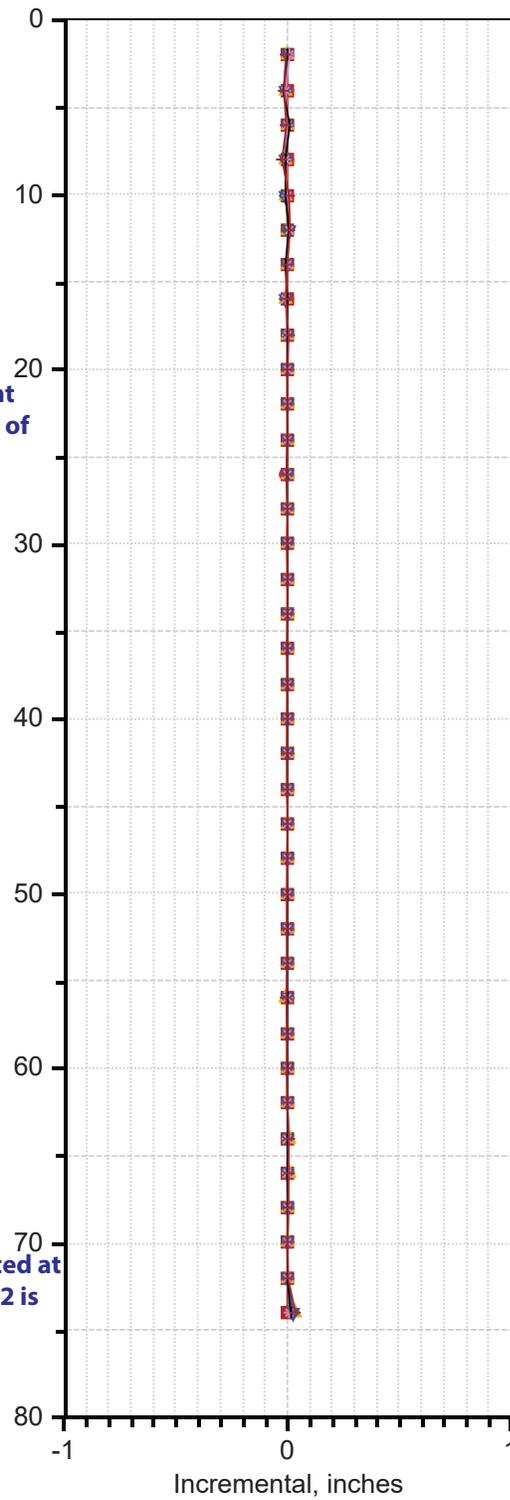
Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

PROJECT: Calle del Barco LAD Malibu, CA	PROJECT NUMBER: 220-277
REVISION DATE: 8/7/2023	

A-
10°



A+
190°



- 5/3/2021
- 8/3/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ◇ 11/1/2022
- ⊕ 1/18/2023
- 6/7/2023

- 5/3/2021
- 8/3/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ◇ 11/1/2022
- ⊕ 1/18/2023
- 6/7/2023

Plot of Slope Inclinometer

SI-15

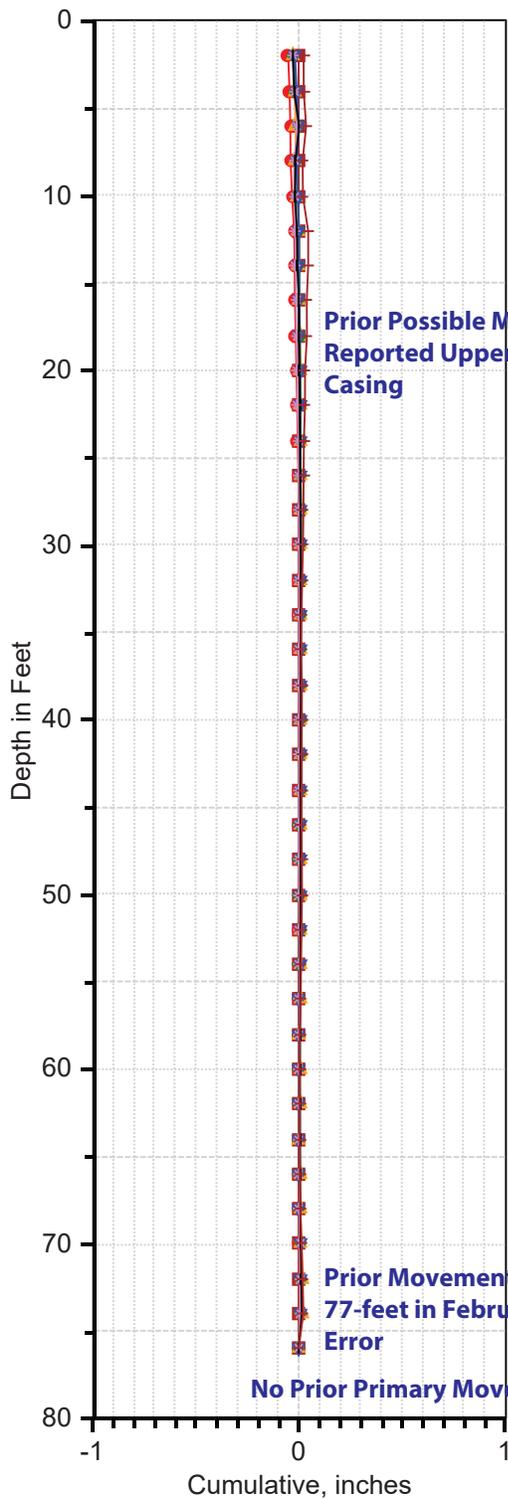
Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
Depth of Survey (ft): 74	Baseline Date: 5/3/21	Corrections: None
Install Date: 9/1998	Installed Depth (ft): 80	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0



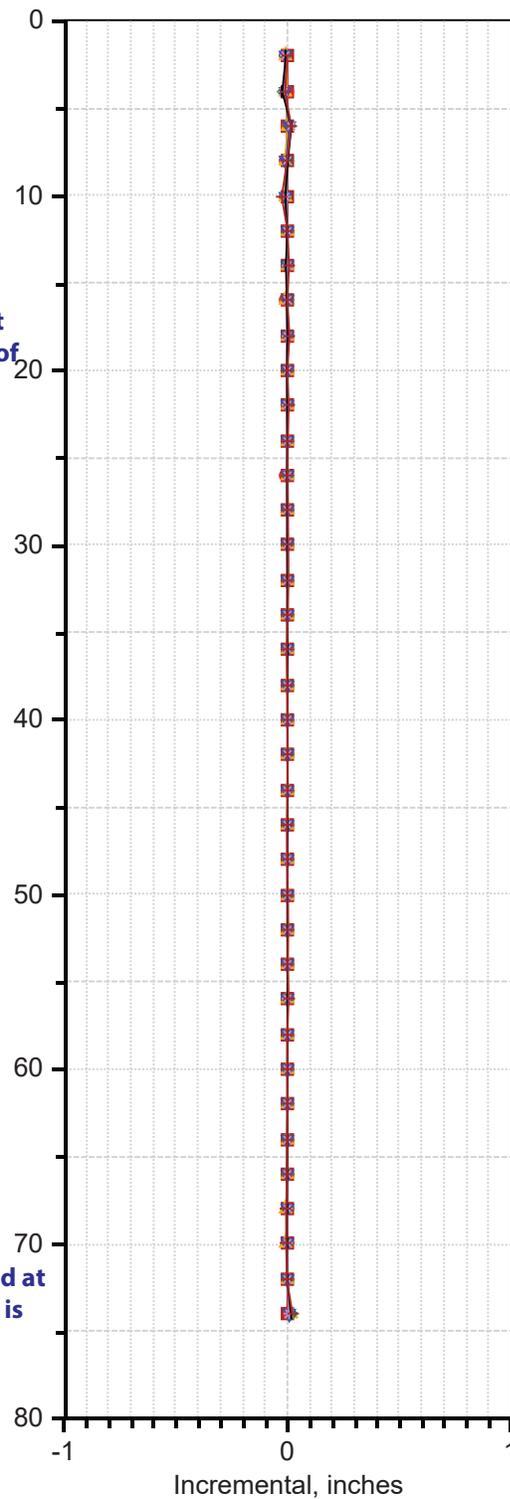
Yeh and Associates, Inc.
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PROJECT: Calle del Barco LAD Malibu, CA	PROJECT NUMBER: 220-277
REVISION DATE: 8/7/2023	

**B-
100°**



**B+
280°**



- 5/3/2021
- 8/3/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ◇ 11/1/2022
- ⊕ 1/18/2023
- ⊖ 6/7/2023

- 5/3/2021
- 8/3/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ◇ 11/1/2022
- ⊕ 1/18/2023
- ⊖ 6/7/2023

Plot of Slope Inclinerometer

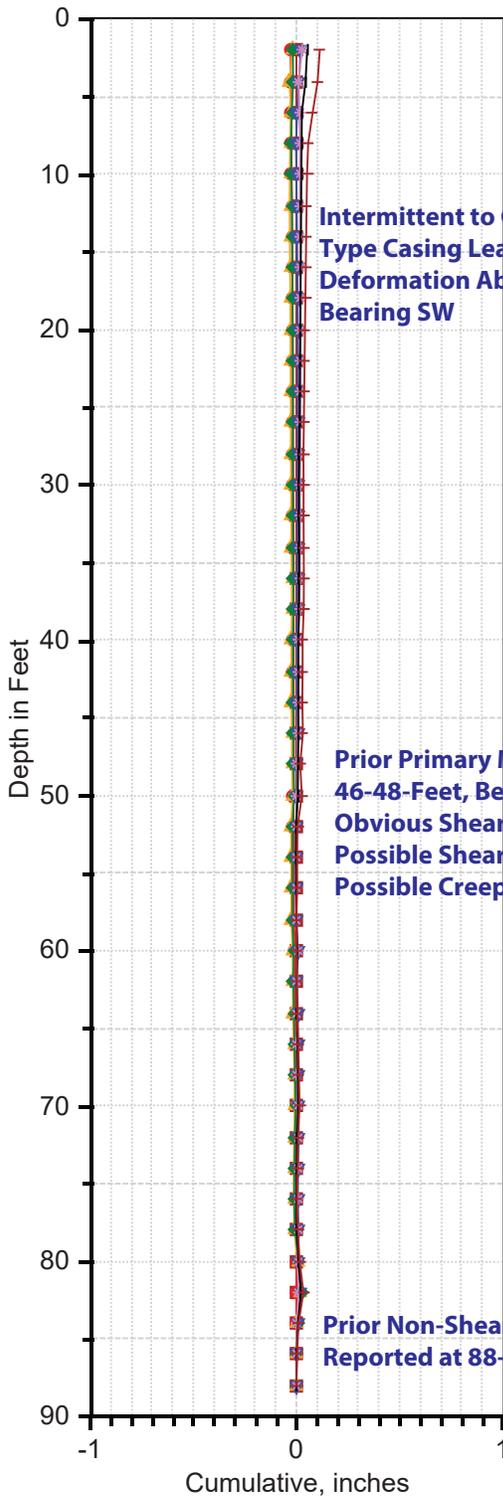
SI-15

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 74		Baseline Date: 5/3/21	
Install Date: 9/1998		Corrections: None	
Installed Depth (ft): 80	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	

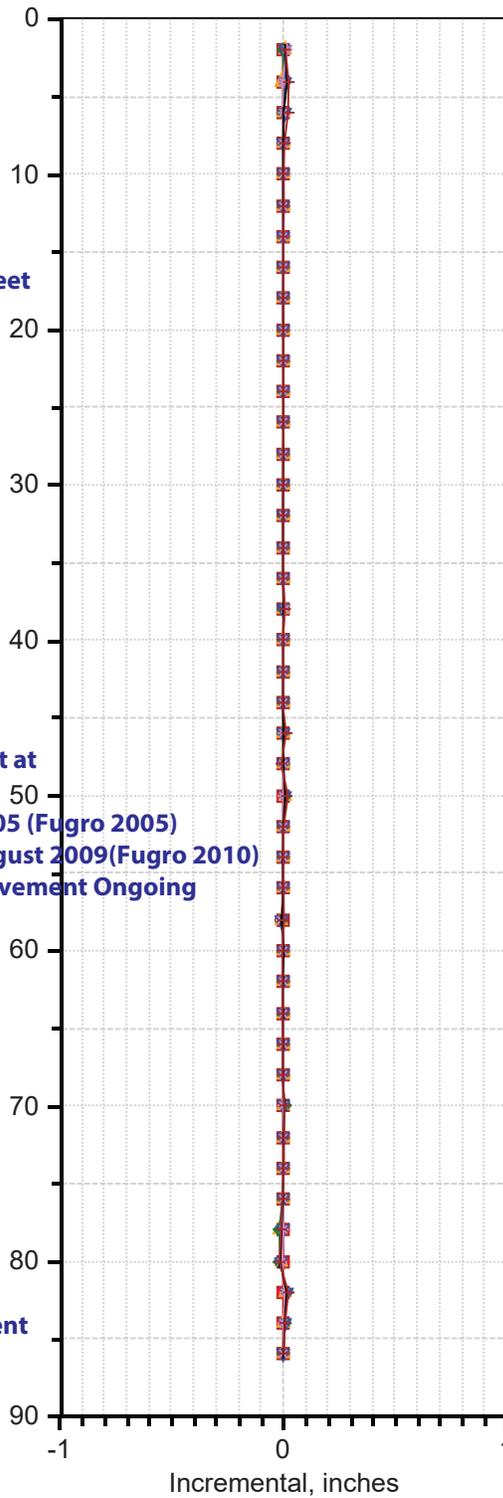


PROJECT:	Calle del Barco LAD Malibu, CA	PROJECT NUMBER: 220-277
REVISION DATE:	8/7/2023	

A-30°



A+210°



- 5/3/2021
- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊠ 1/19/2023
- 6/7/2023

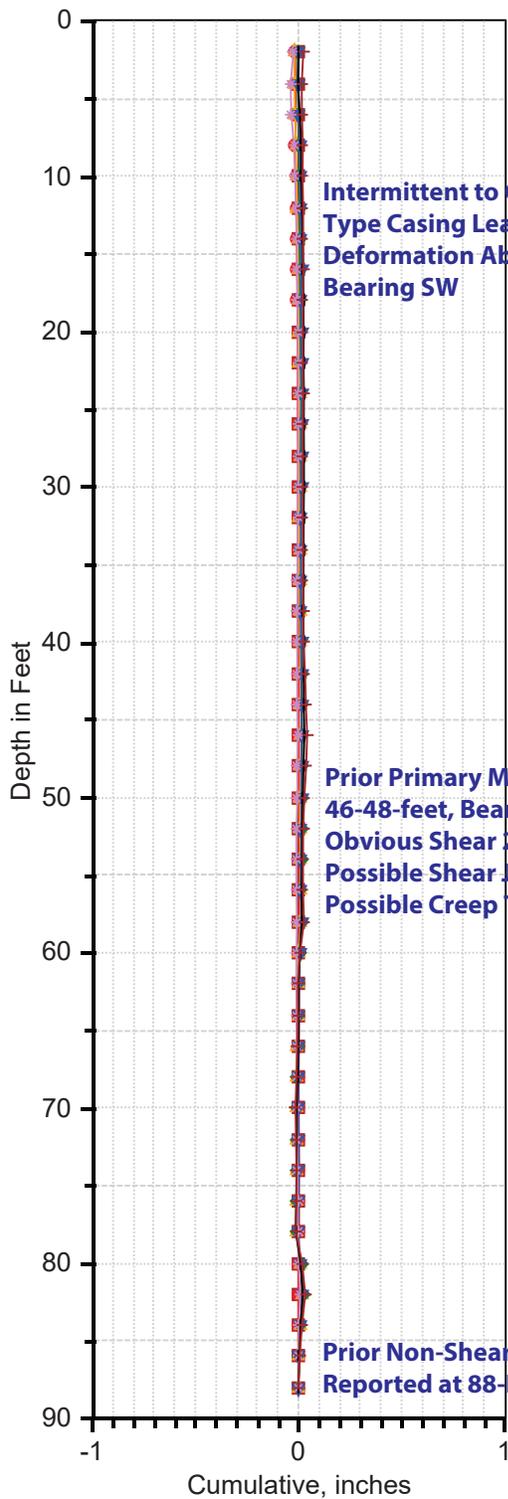
- 5/3/2021
- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- ⊠ 1/19/2023
- 6/7/2023

Plot of Slope Inclinometer

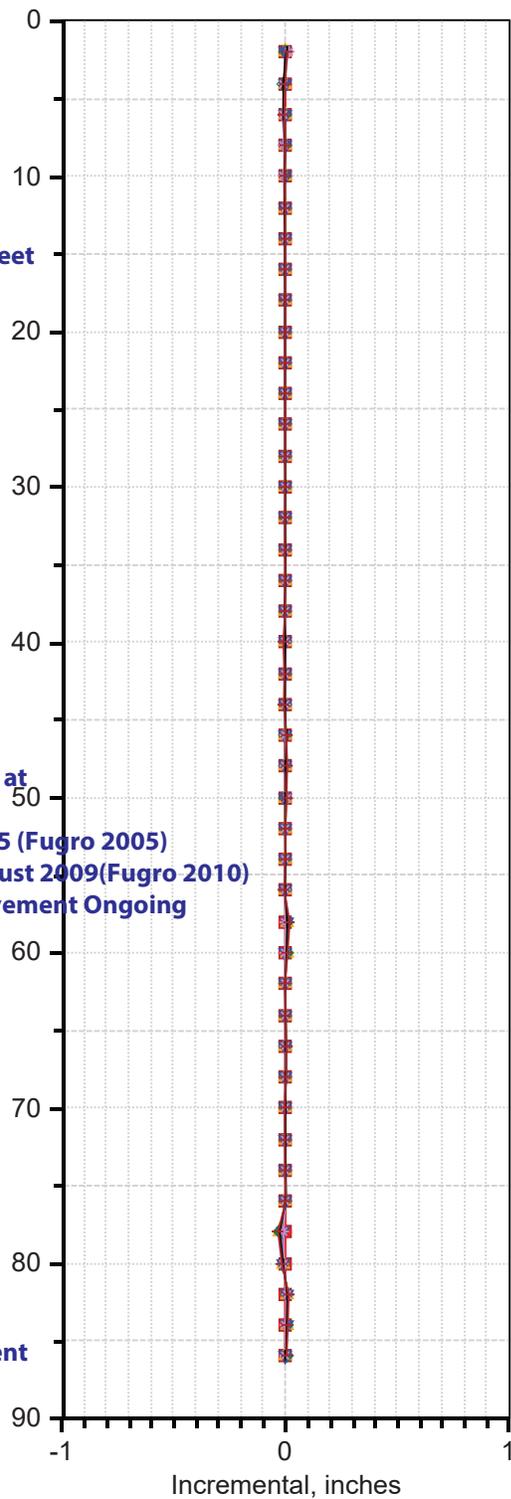
SI-16

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 86		Baseline Date: 5/3/21	
Install Date: 8/2003		Corrections: None	
Installed Depth (ft): 88	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	

B-120°



B+300°



- 5/3/2021
- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- 1/19/2023
- 6/7/2023

- 5/3/2021
- 8/4/2021
- ▲ 12/9/2021
- ◆ 3/25/2022
- ▼ 5/18/2022
- ✦ 11/1/2022
- 1/19/2023
- 6/7/2023

Plot of Slope Inclinometer

SI-16

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 86		Baseline Date: 5/3/21	
Install Date: 8/2003		Interpreted Movement Since Baseline (in): 0	
Installed Depth (ft): 88		Interpreted Movement Monitoring Year (in): 0	

APPENDIX C - DEWATERING

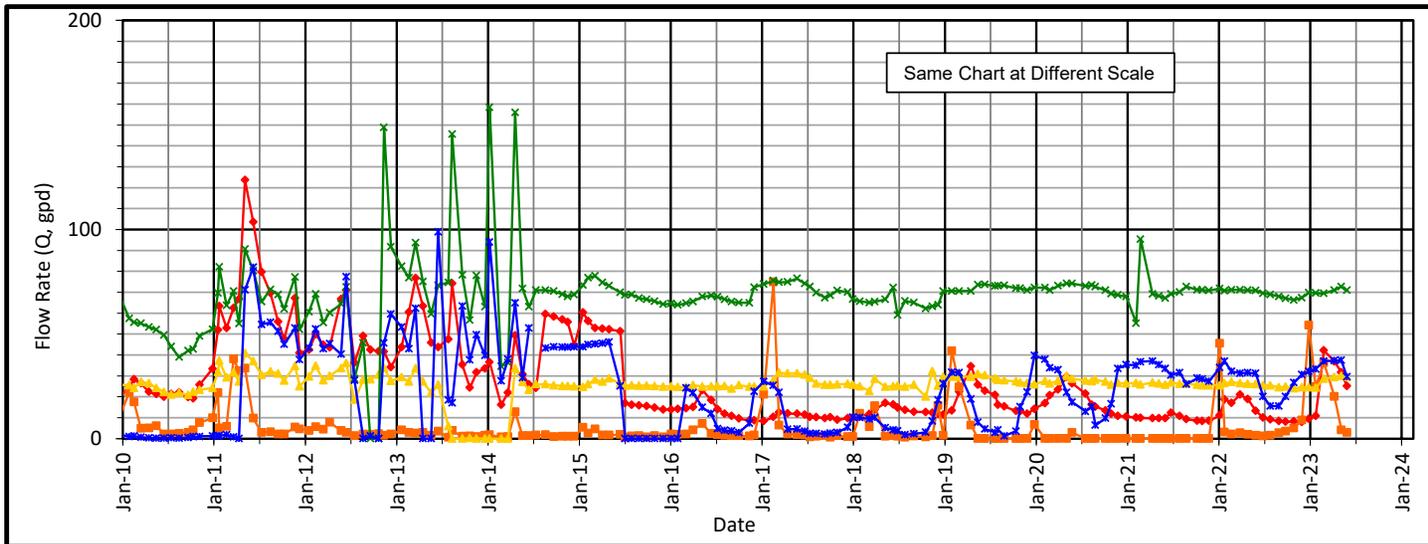
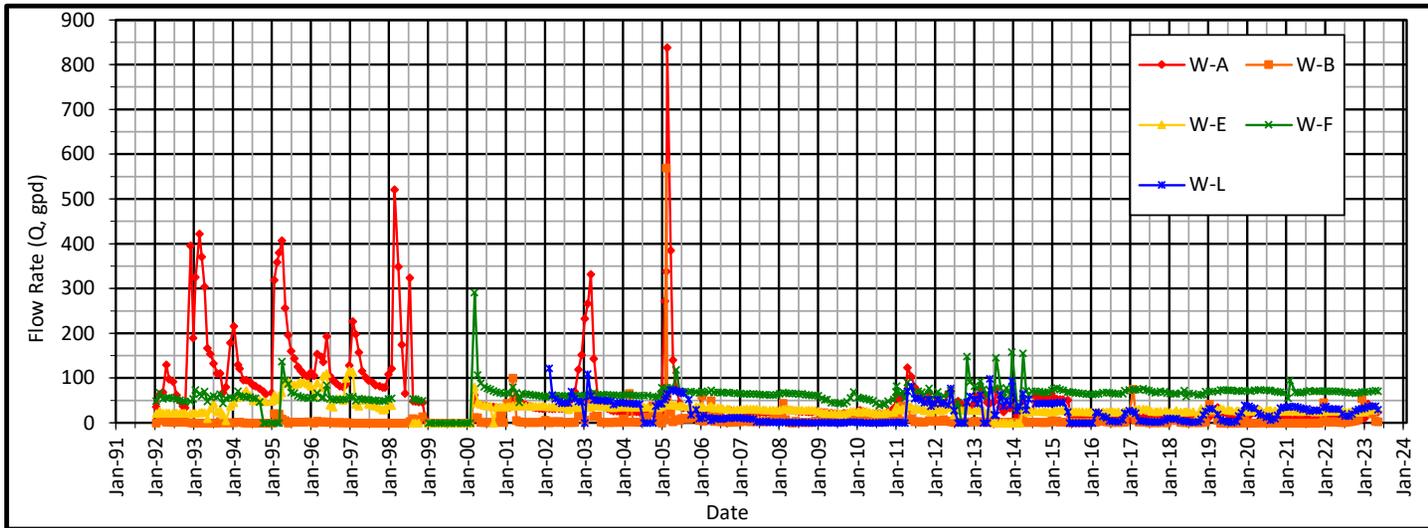
Dewatering Well Information							
Well ID	Vault Elevation (ft.)	Bottom Elevation (ft.)	Pump Elevation (ft.)	Pump Size (hp)	2022-2023 Pumping Rate (gpd)	% of Total Well Production	Comment
W-A	196.0	Unknown	45.0	1/2	17.3	4%	
W-B	204.0	169.7	173.7	1/2	13.8	4%	
W-C	295.0	233.5	237.5	1/2	73.7	19%	
W-D*	297.0	Unknown	Unknown	none	0.0	0%	Destroyed '98
W-E	215.0	Unknown	116.5	1/2	26.3	7%	
W-F	210.0	109.0	112.0	1/2	69.2	18%	
W-G*	292.0	222.0	none	none	0.0	0%	No Pump, Dry
W-H	299.5	234.5	242.5	1/3	10.3	3%	
W-I	298.0	238.0	248.0	1/3	3.4	1%	
W-J	304.0	244.0	250.0	1/3	82.6	21%	
W-K	430.0	370.0	380.0	1/3	0.0	0%	Dry
W-L	258.0	189.0	192.5	1/2	28.0	7%	
W-M	302.0	242.4	245.0	1/2	68.8	17%	

Note: * Non-functioning Dewatering Wells

Hydrauger Information						
Hydrauger ID	Installed Length (ft)	Functional Length (ft)	2022-2023 Flow Rate (gpd)	% of Total Production	Installed By	Comment
HD-1	93	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-2	127	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-3	155	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-4	80	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-5	65	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-6	97	unknown	0.0	0%	BYA	Destroyed per BYA (2000)
HD-7	227	unknown	0.0	0%	BYA	no production '21-'23
HD-8	290	unknown	0.0	0%	BYA	no production '21-'23
HD-9	230	unknown	0.0	0%	BYA	no production '21-'23
HD-10	330	unknown	0.0	0%	BYA	no production '21-'23
HD-11	230	unknown	0.0	0%	BYA	no production '21-'23
HD-12	330	unknown	0.0	0%	BYA	no production '21-'23
HD-13	210	unknown	60.8	33%	BYA	
H-1	240	unknown	55.8	30%	LA County	
H-2	180	unknown	0.0	0%	LA County	No outlet to monitor
ROWH-1	--	unknown	0.0	0%	BYA	discharge diverted from H-2
H-3	235	unknown	0.0	0%	LA County	Destroyed 1998
H-4	140	unknown	0.0	0%	LA County	Destroyed 1998
H-5	260	unknown	0.0	0%	LA County	Destroyed 1998
H-6	140	unknown	0.0	0%	LA County	Destroyed 1998
H-7	205	unknown	0.0	0%	LA County	Destroyed 1998
H-1A	100	92	0.0	0%	Fugro	no production '21-'23
H-2A	130	125	66.6	36%	Fugro	Flowing after January 2023, First time since 2014

DEWATERING WELL / HYDRAUGER INFORMATION

Calle del Barco Landslide Assessment District
 Malibu, California

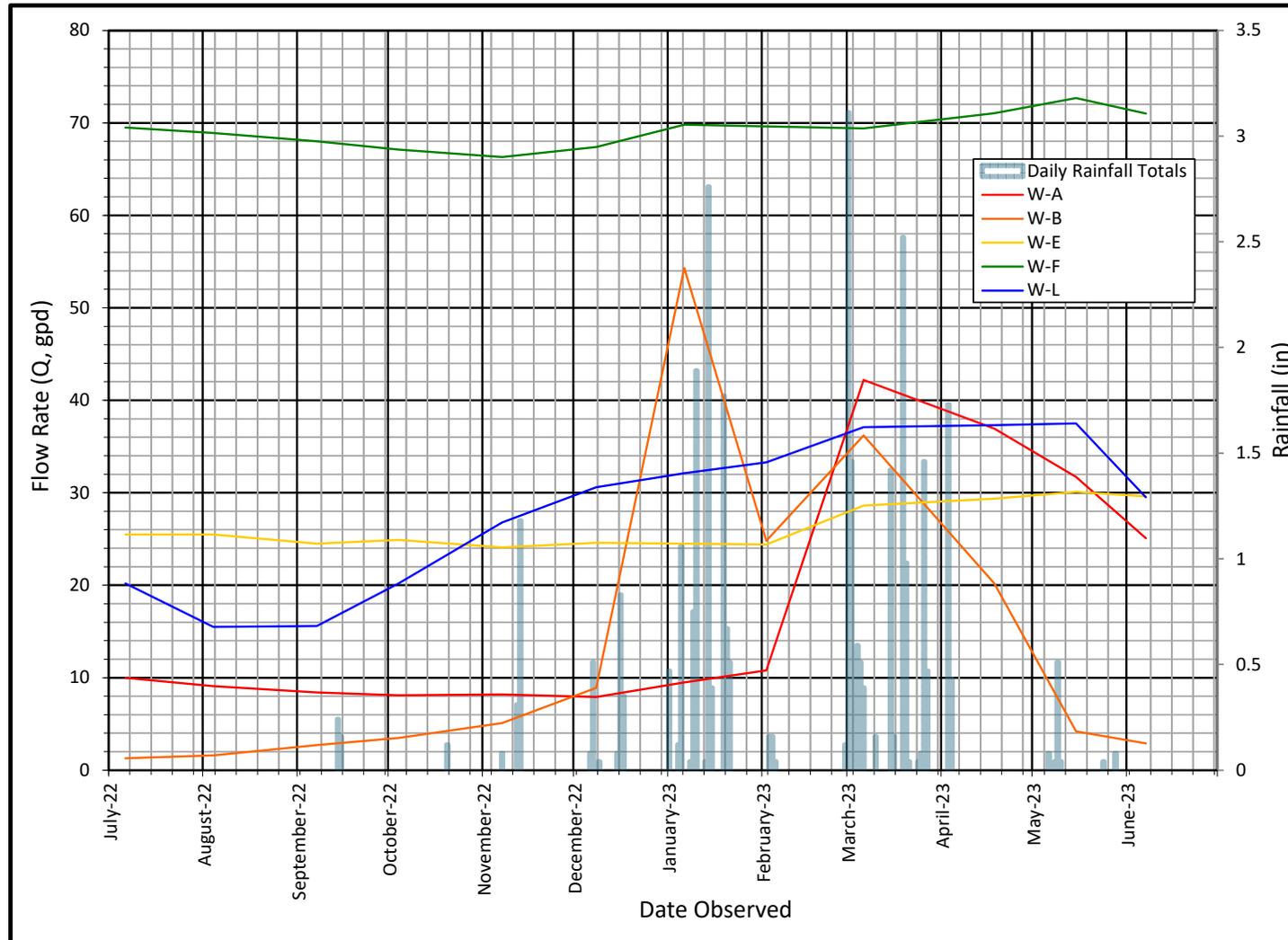


DEWATERING WELL DISCHARGE RATE GRAPH (HISTORIC)

Rambla Orienta and Slope

Calle del Barco Landslide Assessment District

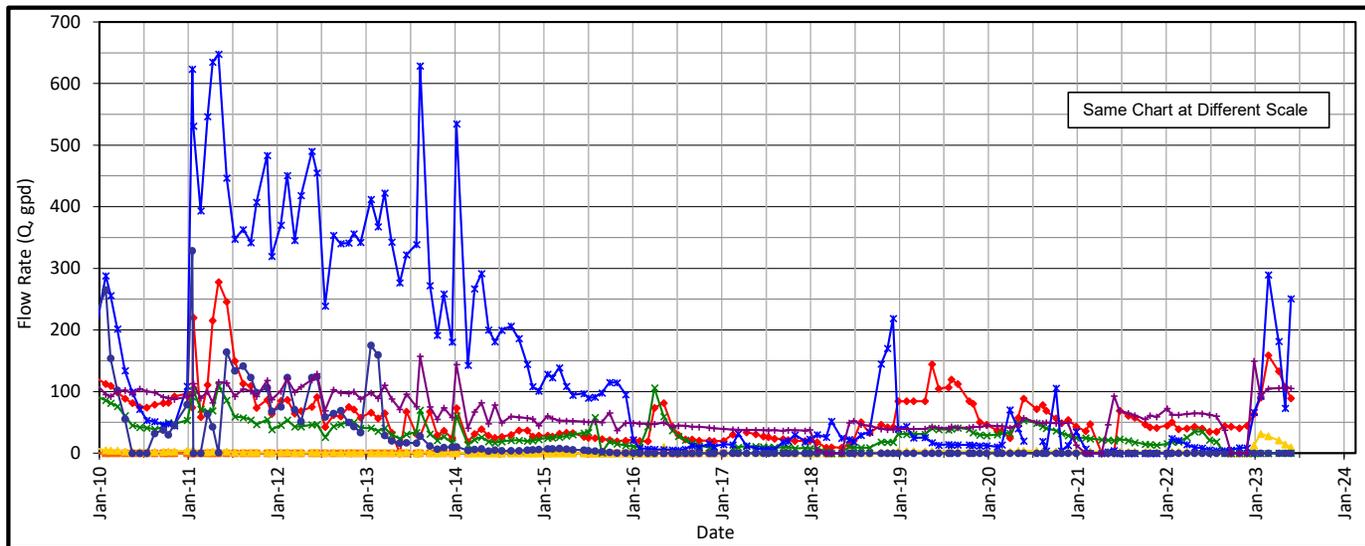
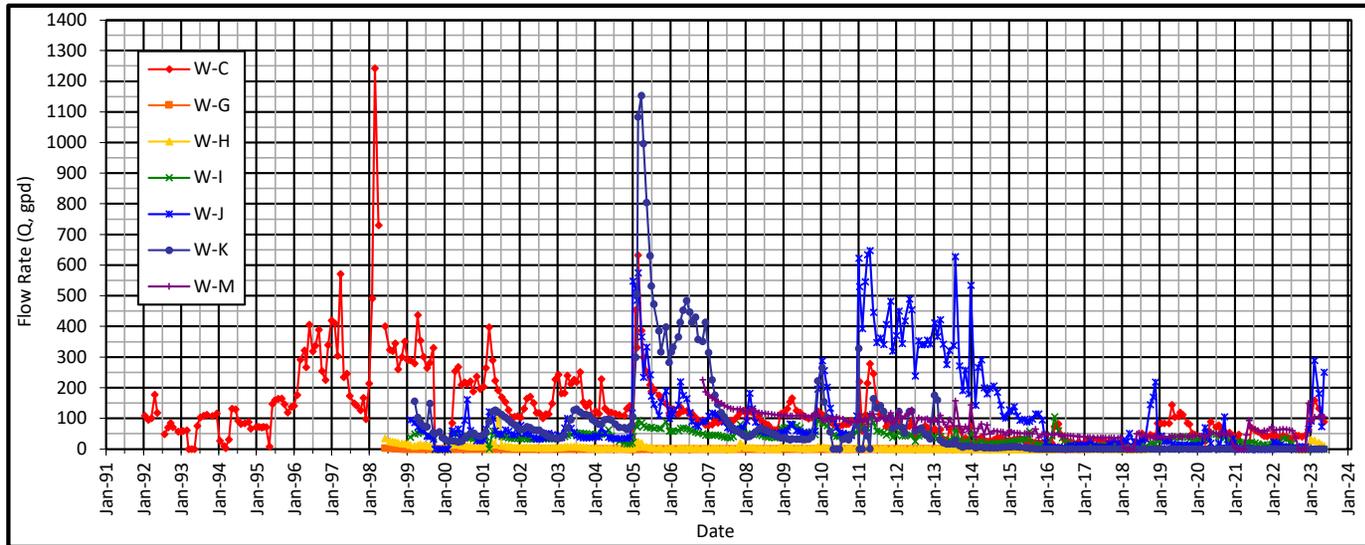
Malibu, California



DEWATERING WELL DISCHARGE RATE GRAPH (MONITORING YEAR)

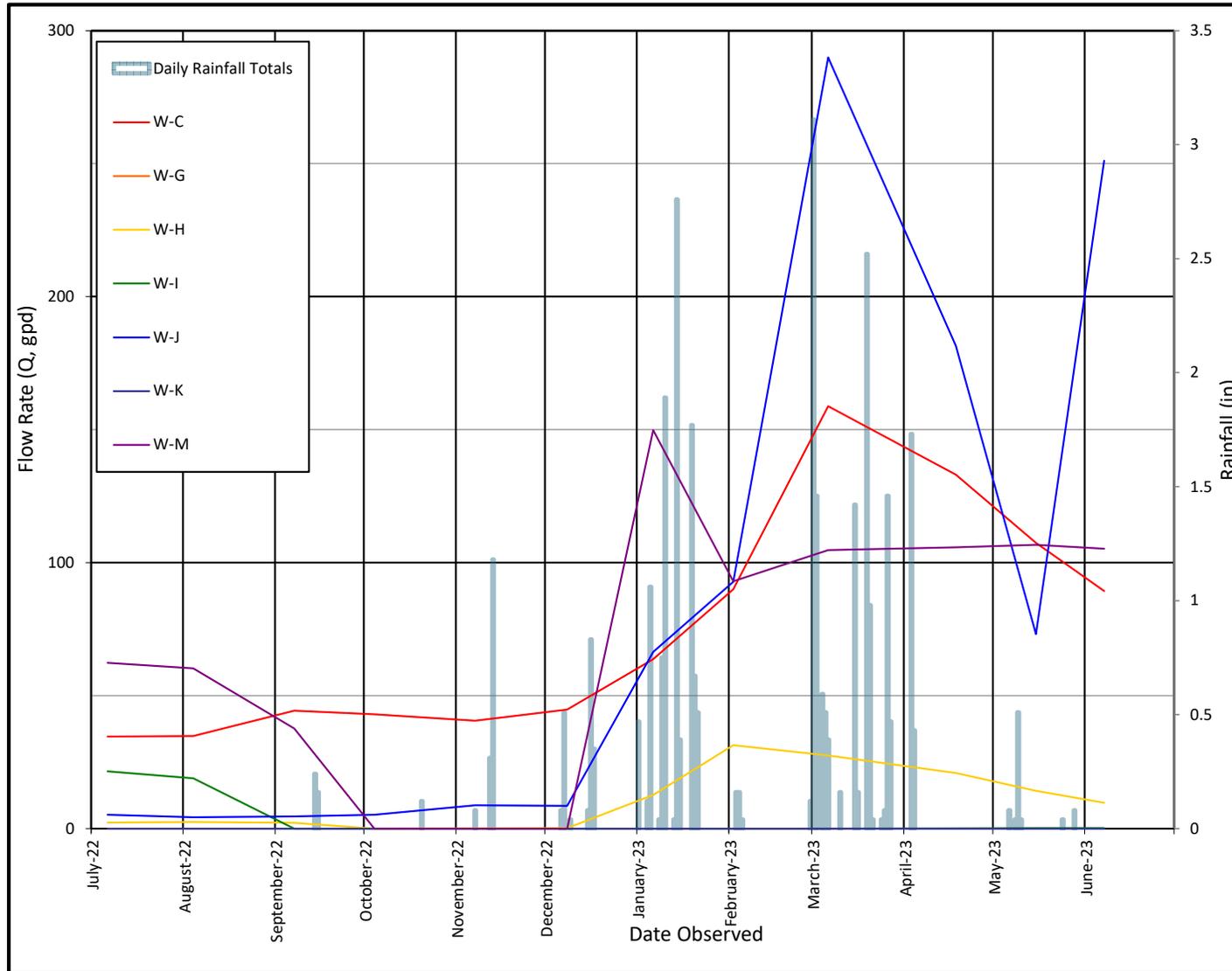
Rambla Orienta and Slope

Calle del Barco Landslide Assessment District
 Malibu, California



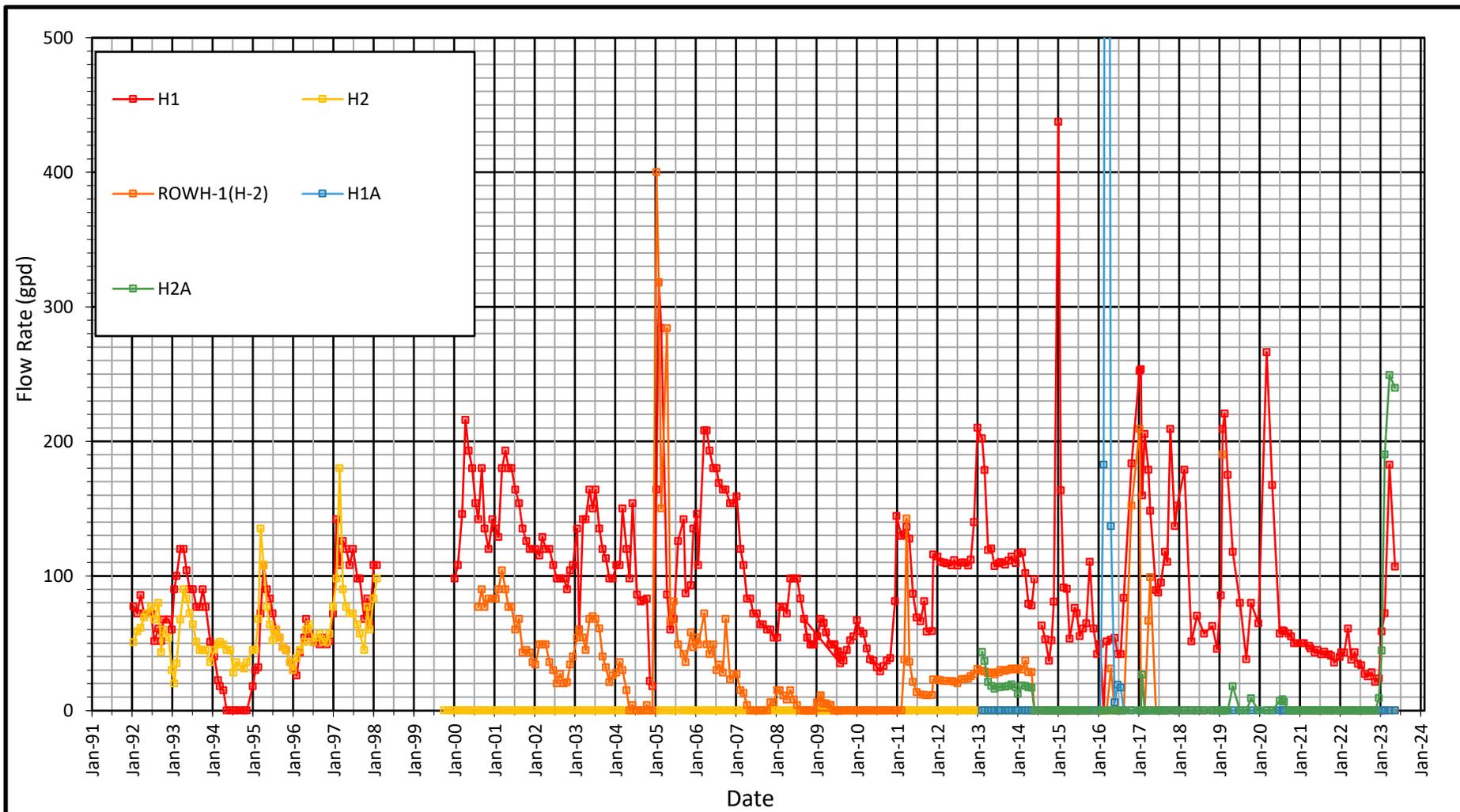
DEWATERING WELL DISCHARGE RATE GRAPH (HISTORIC)

Calle del Barco and Rambla Pacifico
 Calle del Barco Landslide Assessment District
 Malibu, California



DEWATERING WELL DISCHARGE RATE GRAPH (MONITORING YEAR)

Calle del Barco and Rambla Pacifico
 Calle del Barco Landslide Assessment District
 Malibu, California

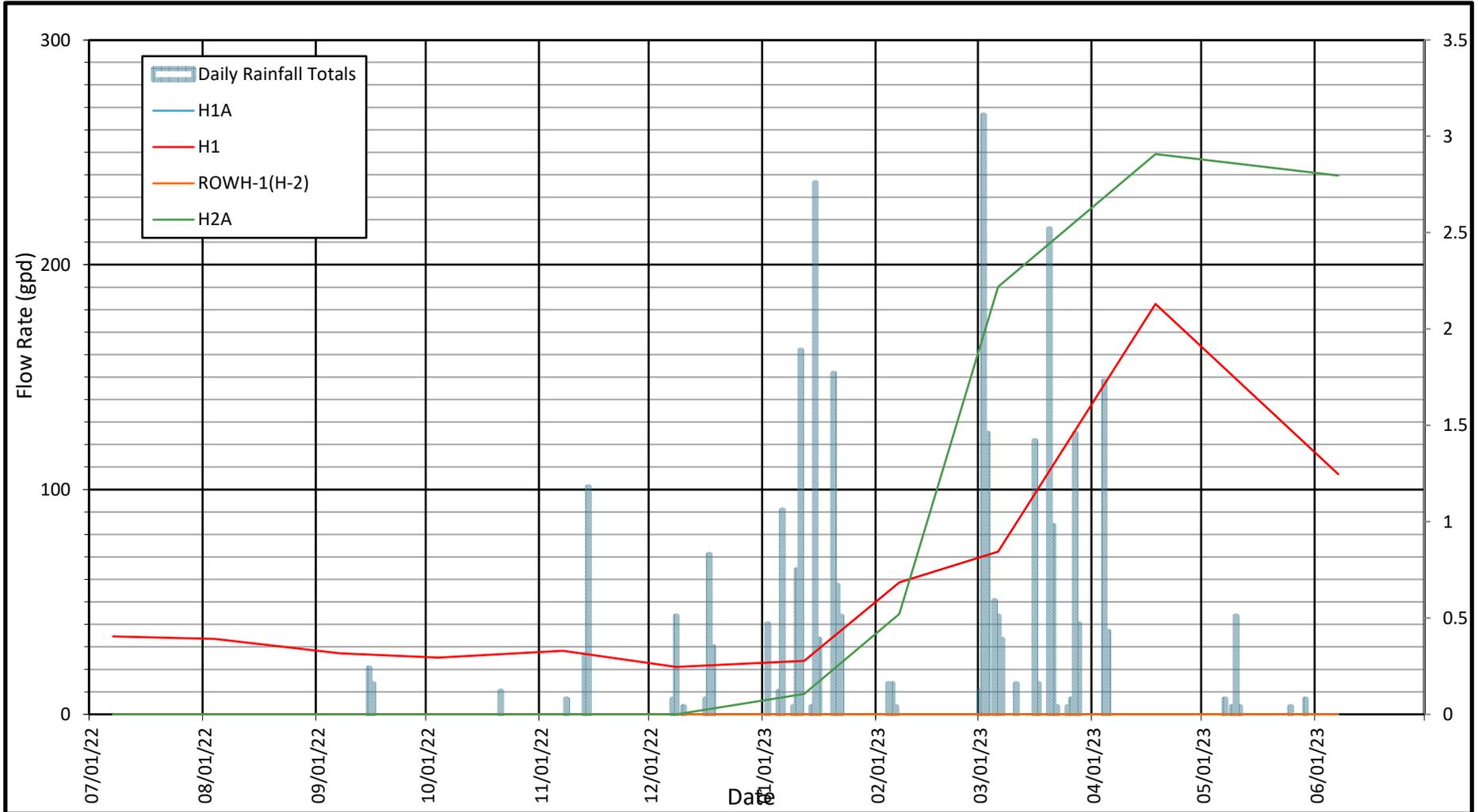


HYDRAUGER DISCHARGE RATE GRAPH (HISTORIC)

Rambla Orienta

Calle del Barco Landslide Assessment District

Malibu, California

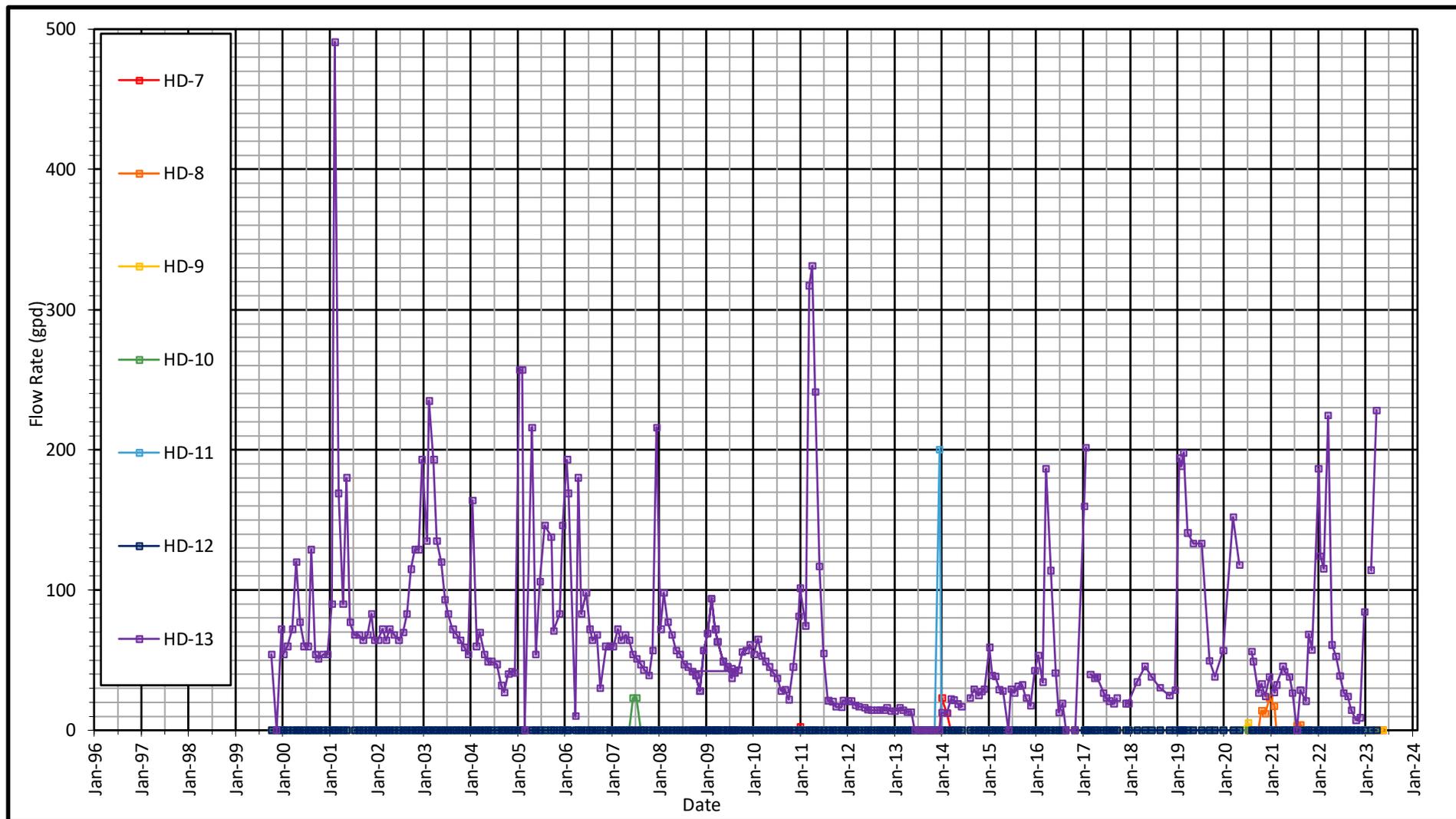


HYDRAUGER DISCHARGE RATE GRAPH (MONITORING YEAR)

Rambla Orienta

Calle del Barco Landslide Assessment District

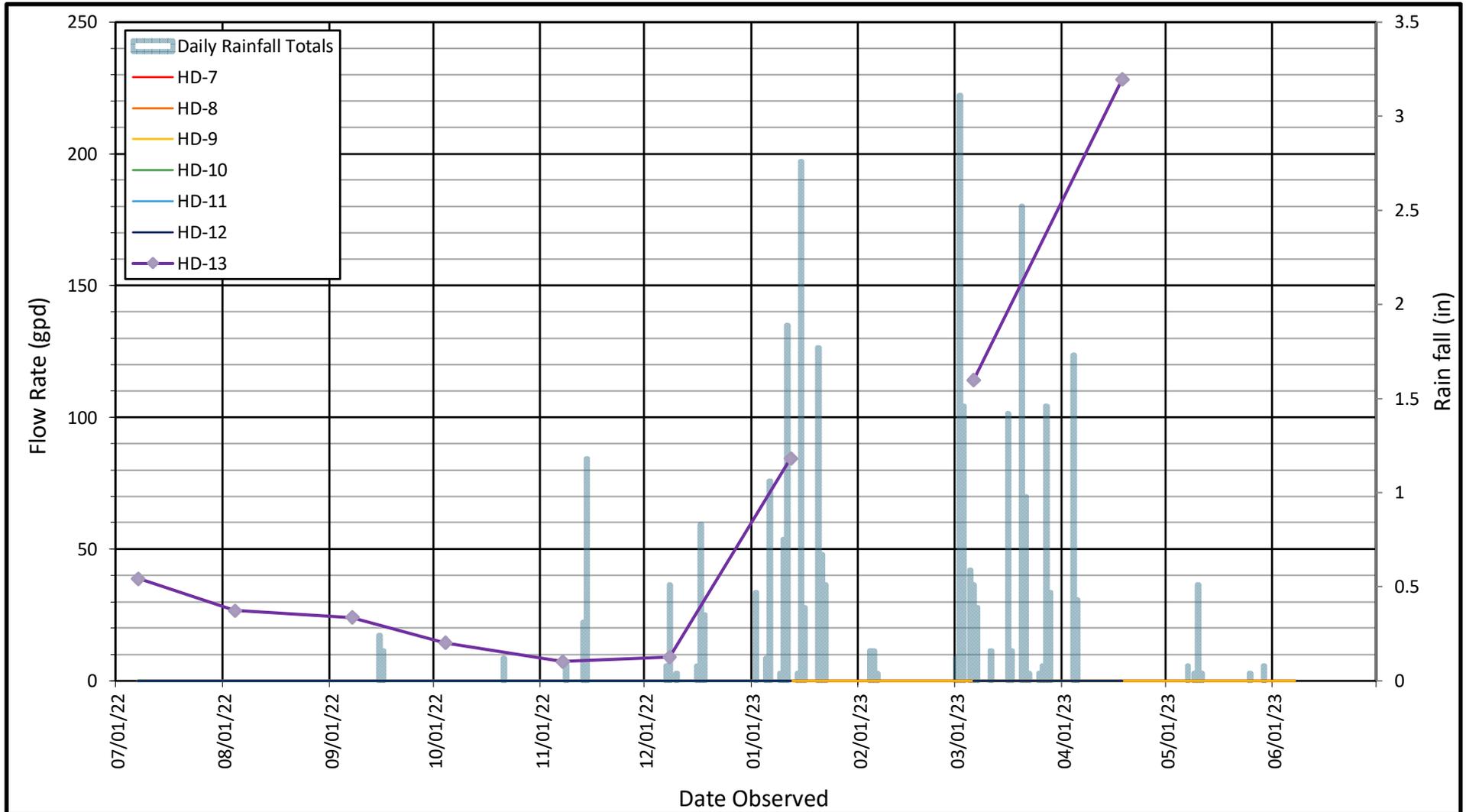
Malibu, California



HYDRAUGER DISCHARGE RATE GRAPH (HISTORIC)

Landslide Toe

Calle del Barco Landslide Assessment District
Malibu, California



HYDRAUGER DISCHARGE RATE GRAPH (MONITORING YEAR)

Landslide Toe

Calle del Barco Landslide Assessment District
 Malibu, California