

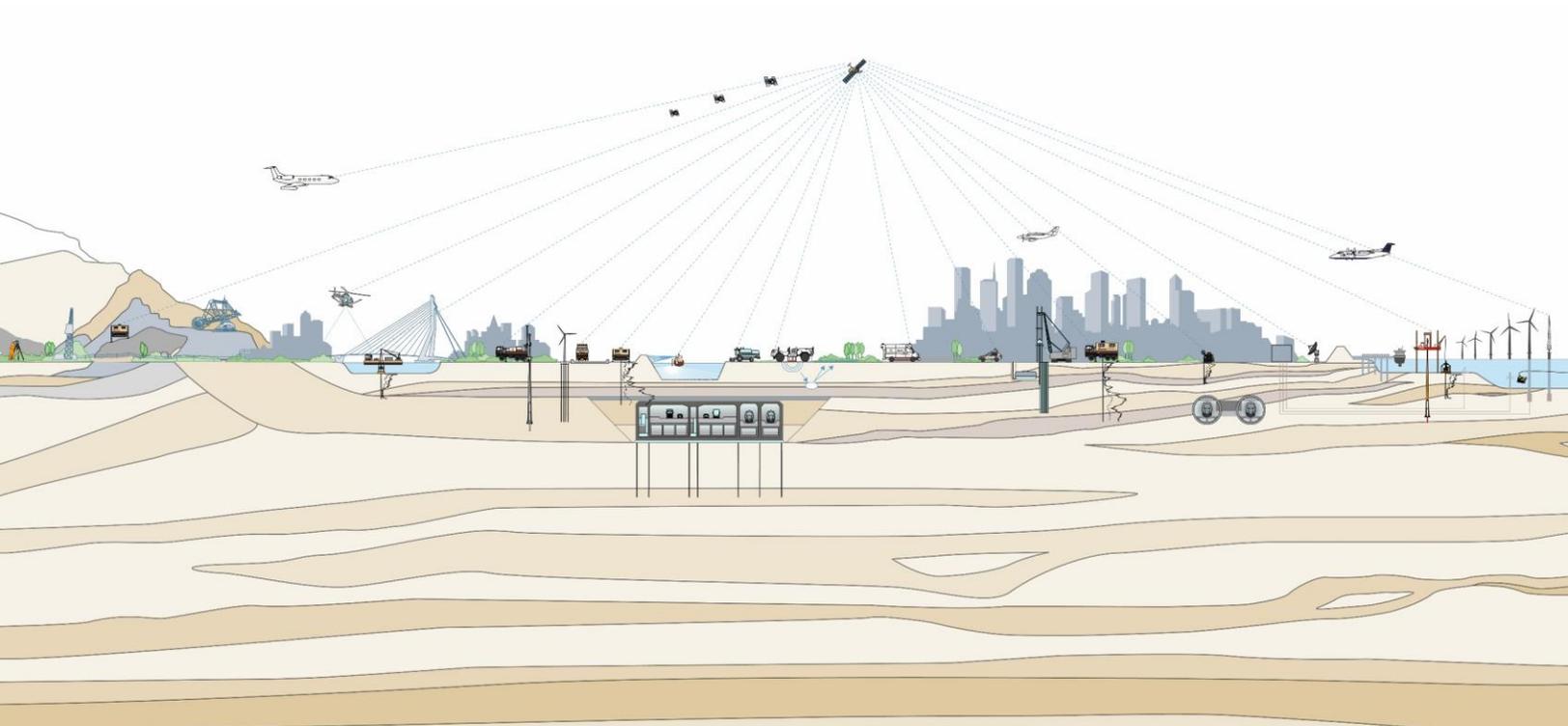
FUGRO

Annual Report July 2019 Through June 2020 Malibu Road Landslide Assessment District Malibu, California

August 2020
Fugro Project No. 04.62160604
Document No. 04.62160604-PR-004(Rev.00)

City of Malibu

Final





FUGRO

Annual Report July 2019 Through June 2020 Malibu Road Landslide Assessment District Malibu, California

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Fugro Project No. 04.62160604
Document No. 04.62160604-PR-004(Rev.00)

Prepared for: City of Malibu
23825 Stuart Ranch Road
Malibu, California 90265

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| 00 | Final | JK | JMM/KMS | KMS | August 21, 2020 |
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| Rev. | Status | Prepared | Reviewed | Approved | Date |



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Fugro Project No. 04.62160604
Document No. 04.62160604-PR-004(Rev.00)
August 21, 2020

City of Malibu
23825 Stuart Ranch Road
Malibu, California 90265

Attention: Mr. Arthur Aladjajian

Annual Report, July 2019 Through June 2020, Malibu Road Landslide Assessment District, Malibu, California

Dear Mr. Aladjajian,

Fugro is pleased to present this annual report for the Malibu Road Landslide Assessment District. This report summarizes the monitoring and maintenance activities completed during the period of July 2019 through June 2020.

Fugro appreciates the opportunity to be of service to the City of Malibu and the District homeowners. Please contact Jason Moore at (858) 337-8273 if you have any questions regarding this report.

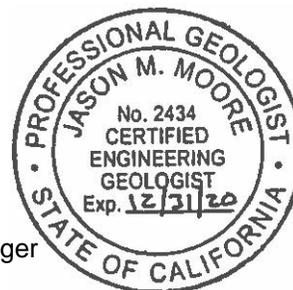
Sincerely,
Fugro USA Land, Inc.


Jason Kim, EIT

Staff Engineer/Lead Technician


Jason Moore, PG, CEG

Associate Geologist/Project Manager



Distribution: (1) Addressee and PDF
(1) City of Malibu - Geotechnical Staff and PDF



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1. INTRODUCTION

1.1 Authorization

Fugro performed the work summarized in this report in accordance with our contract with the City of Malibu (City) and consistent with the cost estimate document "Exhibit A - FY 2019-2020 Maintenance Cost Estimate" presented in the Annual Assessment Report (David Taussig & Associates, 2019).

1.2 Background

The Malibu Road Landslide Assessment District (Assessment District) was established in 1981 by the County of Los Angeles (County) following the activation of a landslide on the west end of Malibu Road in 1978 (Plates 1 and 2). The assessment district provides permanent funding to maintain and monitor dewatering facilities with the purpose of stabilizing the landslide to the extent feasible using dewatering methods only. The County administered the assessment district until 1991 when the City incorporated. The Assessment District was reauthorized in May 1998 under Resolution No. 98-036. 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 within the Malibu Road Assessment District for the period between July 1, 2019, and June 30, 2020 (hereafter, the "monitoring period").

Routine monitoring data collected during the current monitoring period included the following:

- Review of 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 twelve standpipes;
- Periodic groundwater measurements from eight pneumatic piezometers;
- Monthly dewatering production readings from ten dewatering wells owned by the Assessment District and three wells owned by a private homeowner on Bayshore Drive;
- Bi-monthly dewatering production readings from 23 horizontal drains (hydraugers);
- Quarterly and semi-annual ground deformation measurements from 5 slope inclinometers; and
- Periodic maintenance of dewatering and monitoring facilities.

Fugro staff checked the operating condition of the instrumentation and dewatering facilities at each field monitoring/observation location by visual observation and by evaluating preliminary data in the office as information was received. Maintenance was performed as needed based upon the field observations and preliminary data evaluation, and correspondence from concerned homeowners and tenants.

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 July 1, 2019 to June 30, 2020, 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 Appendix A through Appendix C, as indicated in the Table of Contents.

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. MONITORING

2.1 Rainfall Data

A graph of historical monthly rainfall and average annual rainfall from October 1968 through June 30, 2020 is shown on Plate 3 - Rainfall Graph. Monthly rainfall totals from 1968 through 2004 were obtained from County of Los Angeles Department of Public Works (LADPW) Carbon Canyon Rain Station 447C and monthly rainfall totals from 2004 to the present were obtained from LADPW Big Rock Mesa Rain Gauge 1239.

Rainfall data indicate that approximately 16.61 inches of precipitation fell during the monitoring period from July 1, 2019, through June 30, 2020. This approximation is derived from rainfall data that is annually monitored between October 1 through September 30. This year's precipitation is approximately 107 percent of the average annual rainfall from 1968 to 2020 in the "Malibu Area" of approximately 15.57 inches.

Plate 5 – Groundwater Levels, Dewatering, and Rainfall shows the yearly magnitude of deviation of each year's rainfall relative to the mean annual rainfall. The graphic also shows the average annual dewatering output in gallons per day (gpd). The data illustrates that the average annual dewatering output is generally consistent with average rainfall.

2.2 Groundwater Monitoring

The groundwater level data collected during the current monitoring period are summarized in Appendix A and a summary graph of annual mean high groundwater elevation for the Assessment District is included as part of Plate 5. 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, for example, grading, landscaping, storm drains, and rain gutters;
- Accidental water discharges from leaking utilities such as water, irrigation, sewer, and storm drain lines as well as swimming pools; and
- Dewatering activities including pumping dewatering wells and hydraugers.

Typically, groundwater levels rise relatively quickly following significant rainfall events and gradually lower after the wet season ends. Groundwater levels at Malibu Road typically peak around late-March to mid-April and gradually decline through late September to November.

2.2.1 Standpipe Piezometers

Eight standpipe piezometers (W-2A, PZ-A, PZ-B, PZ-C, PZ-D, PZ-E, SI-5, and SI-6) were measured over the monitoring period. Standpipe W-3A cannot be located and is presumed to be buried under soil creeping down the slope on the northern side of Malibu Road. Slope inclinometers/piezometers SI-5 and SI-6 were installed in 1998 along Bayshore Drive. Los Angeles County installed the other piezometers at earlier dates.



Standpipe piezometers are constructed from a length of pipe, usually PVC, inserted into a borehole and then backfilled in place with grout, sand or other approved backfill materials. The pipe contains perforations along selected depth intervals that allow groundwater to enter from the formation and fill the pipe to a height equivalent to the water head at the perforated interval. Some of the standpipes in Malibu Road may be perforated along most of their length and are therefore effective at measuring the average water head at their location, which is typically the equivalent of the water table. Other standpipes are perforated only at the bottom five feet of the casing and measure water head specific to that depth interval. The water level inside piezometers is measured directly by lowering an electric sounder down the standpipe into contact with the water surface. The locations of the standpipe piezometers are depicted on Plate 2 - Assessment District Map, and groundwater elevation data are presented in Appendix A.

2.2.2 Pneumatic Piezometers

Inclinometer casings installed within the Assessment District after 1998 were typically outfitted with one or two pneumatic piezometer sensors, also referred to as 'Tips', nested at varying depths along the length of the inclinometer casing. Each sensor records saturated soil pore water pressure by measuring differential air pressure between the instrument sensor and groundwater surface across a flexible bladder. Differential pressure is converted into water head, which is translated to a relative groundwater elevation. Measuring pore pressures at specific elevations along a vertical profile can be used to measure flow gradients for groundwater migrating through the formation above and within the water table and to infer the presence of perched or confined groundwater zones. Pneumatic water levels were monitored annually during the 2019 - 2020 monitoring year. The locations of the piezometers are depicted on Plate 2, and groundwater elevation data are presented in Appendix A.

2.2.3 Groundwater Level Discussion

General. 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 standpipe piezometer were calculated and compared with those of previous years (Appendix A, Plate A-2).

Malibu Road. Groundwater elevation data for the area along Malibu Road are presented on Plates A-3 and A-4. Groundwater levels for that area are monitored using standpipes PZ-A, -B, -C, -D, -E, W-2A, along with pneumatic piezometers installed in inclinometers SI-1, -1A, -2, -3, and -4. Groundwater levels increased during the 2019 - 2020 monitoring period. The calculated area average water level increased by 0.4 feet when compared to the area average for the 2019 - 2020 monitoring period and is 1.6 feet below the mean area average for this area for the period of record.

No new data are presented for standpipes W-2A or W-3A because W-2A has been dry since July 2014 and W-3A is buried beneath soil creep from the bluff face.



Pneumatic piezometers in inclinometer SI-1A, SI-4, and SI-6 showed slightly increased pore pressures but remain consistent with records from previous monitoring periods. Pneumatic piezometers in inclinometers SI-1 (replaced by SI-1A) and SI-3 are no longer functioning and no new data are presented.

Bayshore Drive. Groundwater elevation data for the area along Bayshore Drive are presented on Plate A-5. Groundwater levels for that area are monitored using standpipes SI-5 and SI-6 along with the two pneumatic piezometers installed with each standpipe. In general, groundwater levels increased during the 2019 - 2020 monitoring period. The calculated area average water-level increased by 7.8 feet when compared to the area average for the 2019 - 2020 monitoring year and is 0.4 feet above the mean area average for this area for the period of record (1991 - 2020). Water levels in standpipe SI-5 increased steadily since the onset of the 2019 Q2 monitoring period. Water levels in standpipe SI-6 remained approximately static over the course of the monitoring year, with fluctuations of less than 0.5 feet. Readings from both the shallow and deep pneumatic piezometers in standpipes SI-5 and SI-6 continue to record water elevation above the standpipe water levels.

The average and highest annual groundwater levels are provided on Plate A-2 and are summarized in Table 1, below.

Table 1. Summary of Average Groundwater Elevations by Area

| Location | Average Groundwater El. 2019-2020 | Change from Prior Year Average | Peak Groundwater El. 2019-2020 | Change from Prior Year Peak |
|------------------------------------|-----------------------------------|--------------------------------|--------------------------------|-----------------------------|
| Malibu Road | 6.4 | +0.4 | 7.3 | 0.0 |
| Bay Shore Drive | 25.6 | +7.8 | 27.7 | +7.5 |
| Note: All units are in feet | | | | |

2.3 Dewatering Production

2.3.1 Total Dewatering Production

A combined graph of the total dewatering rate for the monitored dewatering wells and hydraugers is presented on Plate 4. Total dewatering production data for the measured hydraugers and wells indicates that the average total dewatering rate during the monitoring period was approximately 1555 gpd. This rate stays consistent with the previous monitoring period's average rate of 1553 gpd.

2.3.2 Dewatering Well Production

Graphs showing production rates of individual wells are provided in Appendix B. Production data for the dewatering wells indicate that the average total dewatering well production rate for this monitoring period was approximately 1126 gallons per day (gpd). This represents a decrease of approximately 17 percent from the previous monitoring period production rate of 1352 gpd.



2.3.3 Hydrauger Production

Graphs of individual production rates for individual hydraugers are included in Appendix B. Data for the hydraugers indicate that the average production rate for all hydraugers over the monitoring period is approximately 430 gpd. This represents an increase of 214 percent from the average production rate of 201 gpd for the previous monitoring period.

2.4 Slope Inclinometer Measurements

Fugro monitored five slope inclinometers on a quarterly to semi-annual basis to evaluate subsurface ground deformation. Plots of slope inclinometer measurements (four plots for each monitored slope inclinometer) are presented in Appendix C. The first plot shows the cumulative deflection and incremental deflection for the A-direction and the second plot shows the cumulative deflection and incremental deflection for the B-direction. The plots show approximately one measurement per year from about 2006 through the current monitoring year. The third and fourth plots show displacement versus time for the same period for all recorded measurements during that period.

Some inclinometers show some inconsistent changes (typically <0.1 to 0.2 inch), but the potential movement magnitude and orientation is not clear and is not within the reliable accuracy of the instrument. Although these potential movements are small with respect to the accuracy of the inclinometer, when consistent over a period of several years they may indicate a cumulative trend. If consistent small movements over several years approach or exceed the threshold of the precision of the device, they may indicate movement that is at or near what can be quantified by the monitoring system.

The original 6 inclinometers SI-1 through SI-6 were installed in 1998. SI-1A was installed in August 2006 to replace SI-1 and has a baseline reading from September 2006. SI-2A was installed in September of the 2010 - 2011 monitoring year as a replacement for SI-2 with a baseline reading in November 2010. SI-4A was installed in August 2012 as a replacement for SI-4 and has a baseline reading from September 2012.

Inclinometer SI-3 was installed in April 1998 and is no longer being monitored due to being sheared off in January 2005.

No detectable movement was observed during this monitoring year in any inclinometers within the Malibu Road Assessment District.



3. DEWATERING FACILITY MAINTENANCE

3.1 Facility Maintenance

The operating status of each dewatering well and hydrauger was checked monthly. When necessary, repair work was scheduled and undertaken as expeditiously as possible, typically within a matter of a few hours or days. Generally, repairs and maintenance performed during the current monitoring period consisted of fixing broken hydraugers and conveyance lines. Table 2. Summary of Facility Maintenance provides a description of maintenance activities that were completed during the current monitoring period.

Table 2. Summary of Facility Maintenance and Assessment

| Date | Facility | Description |
|----------|--------------------|---|
| 11/18/19 | Hydraugers | Brush clearing to improve hydrauger access |
| 1/2/20 | W-11 | Non-producing well W-11 inspection. Well casing was sounded, water not detected by sounder. |
| 4/10/20 | Well Control Boxes | Brush clearing & checking well control box conditions |

3.2 Capital Improvement Projects

No capital improvements were performed during the current monitoring period.



4. SUMMARY AND CONCLUSIONS

The status of the Malibu Road Landslide Assessment District can be summarized as follows:

- Measured rainfall during the 2019 - 2020 monitoring year (July 1 through June 30) was 16.61 inches of precipitation. Rainfall during that monitoring period was above the “Malibu Area” historical average of 15.57 inches per monitoring year measured from 1968 through 2020.
- Groundwater levels on Bayshore Drive on average increased during the 2019 - 2020 monitoring period. Though this increase was mainly induced by SI-5’s rise since April 2019, this standpipe has shown higher groundwater elevations in previous monitoring periods. Groundwater levels on Malibu Road on average increased slightly over the 2019 - 2020 monitoring period.
- Average daily dewatering production stayed consistent the previous monitoring year with an approximate 2 gpd difference with dewatering well production decreasing by 226 gpd and hydrauger production increasing by 228 gpd.
- The annual average hydrauger discharge rate of 430 gpd during the 2019 – 2020 monitoring year is above the average hydrauger discharge rate from the past decade (July 2010 – July 2020) of 394 gpd.
- No detectable movement was recorded in inclinometers during the 2019 - 2020 monitoring year.
- Water conservation is encouraged throughout the Malibu Road area 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 the stability of the landslides.
- Groundwater production from existing dewatering wells and hydraugers should be expected to gradually decline over time, in general, as the efficiency of the wells and hydraugers decrease due to mineralization and aging of the facilities. This may contribute to reduced rates of groundwater lowering or localized increases in groundwater levels. Periodic maintenance of the existing facilities and replacement of older, worn-out pumps should improve the efficiency of the dewatering systems throughout the year, especially during and immediately following the rainy months.



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MALIBU, CALIFORNIA**



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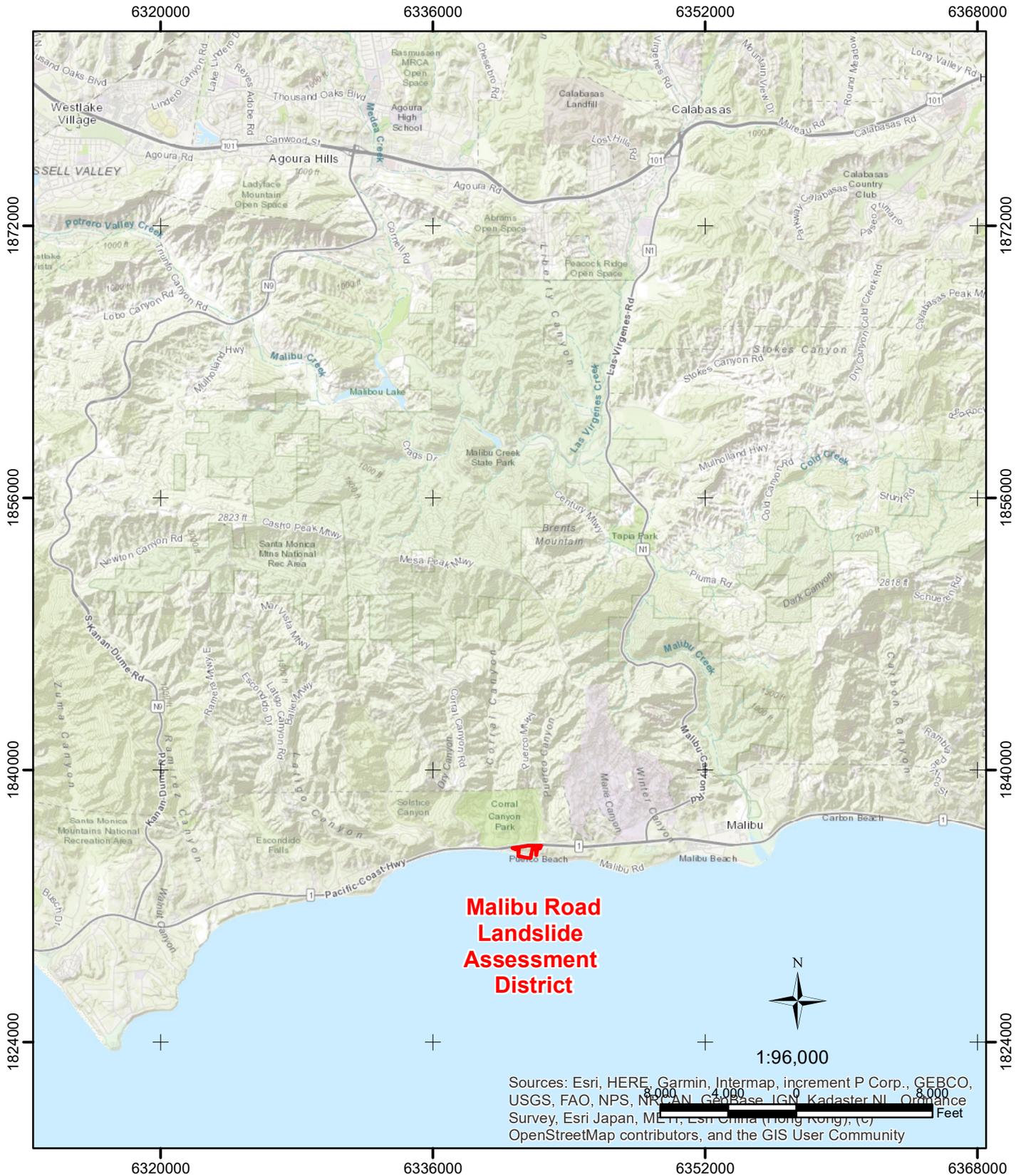
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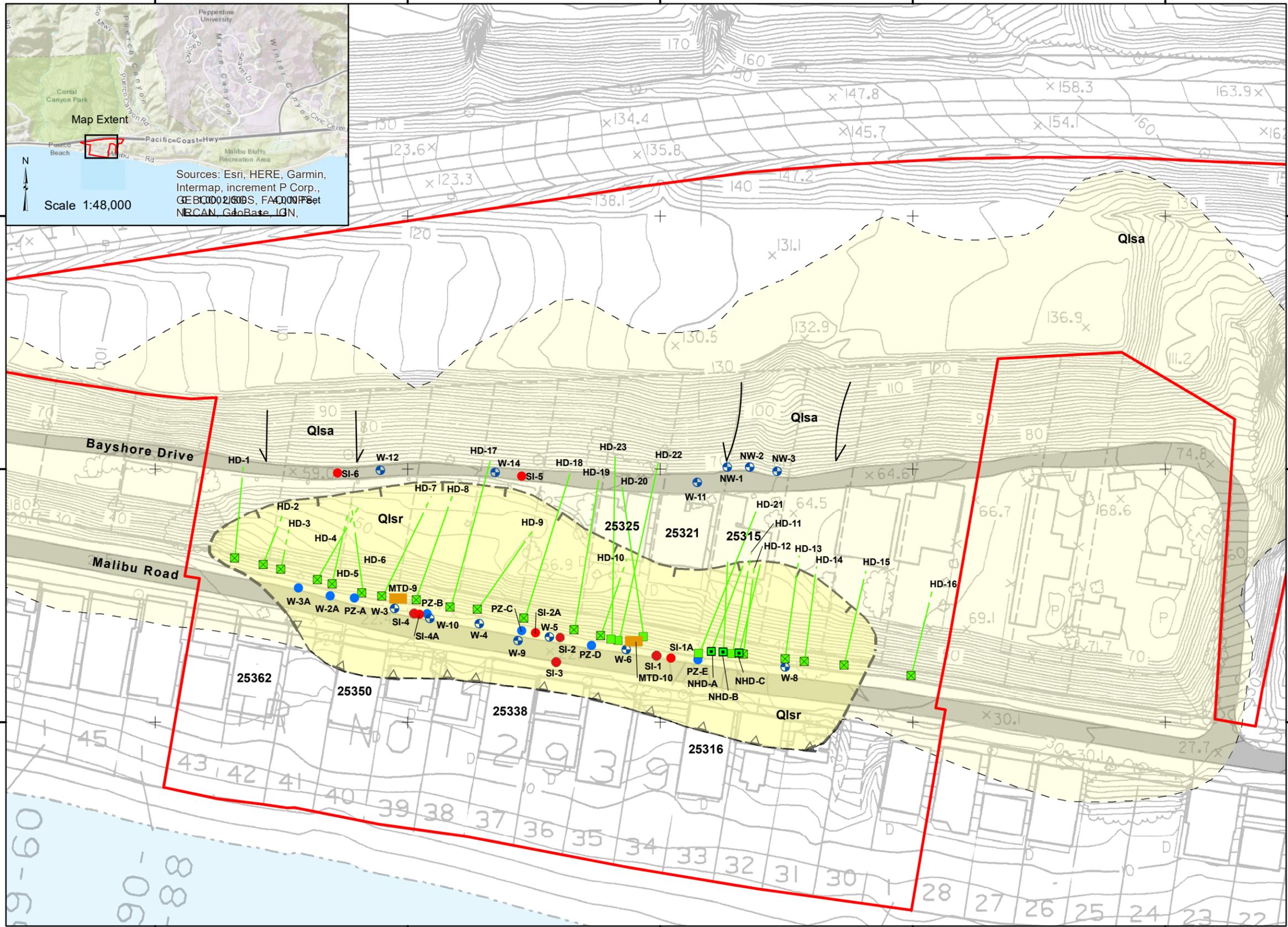
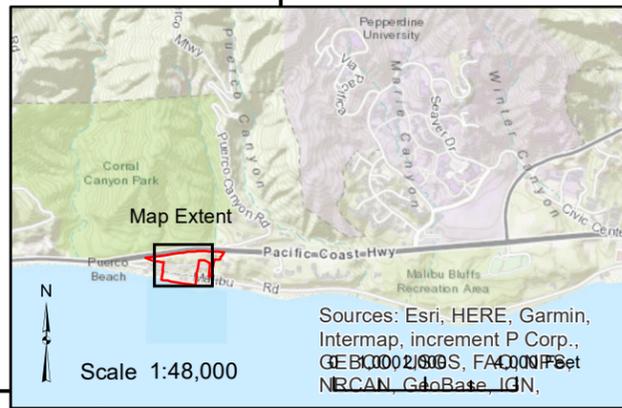
PLATES



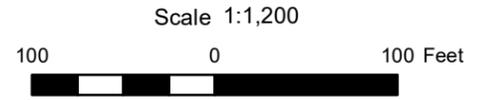
SITE LOCATION MAP
Malibu Road Landslide Assessment District
Malibu, California

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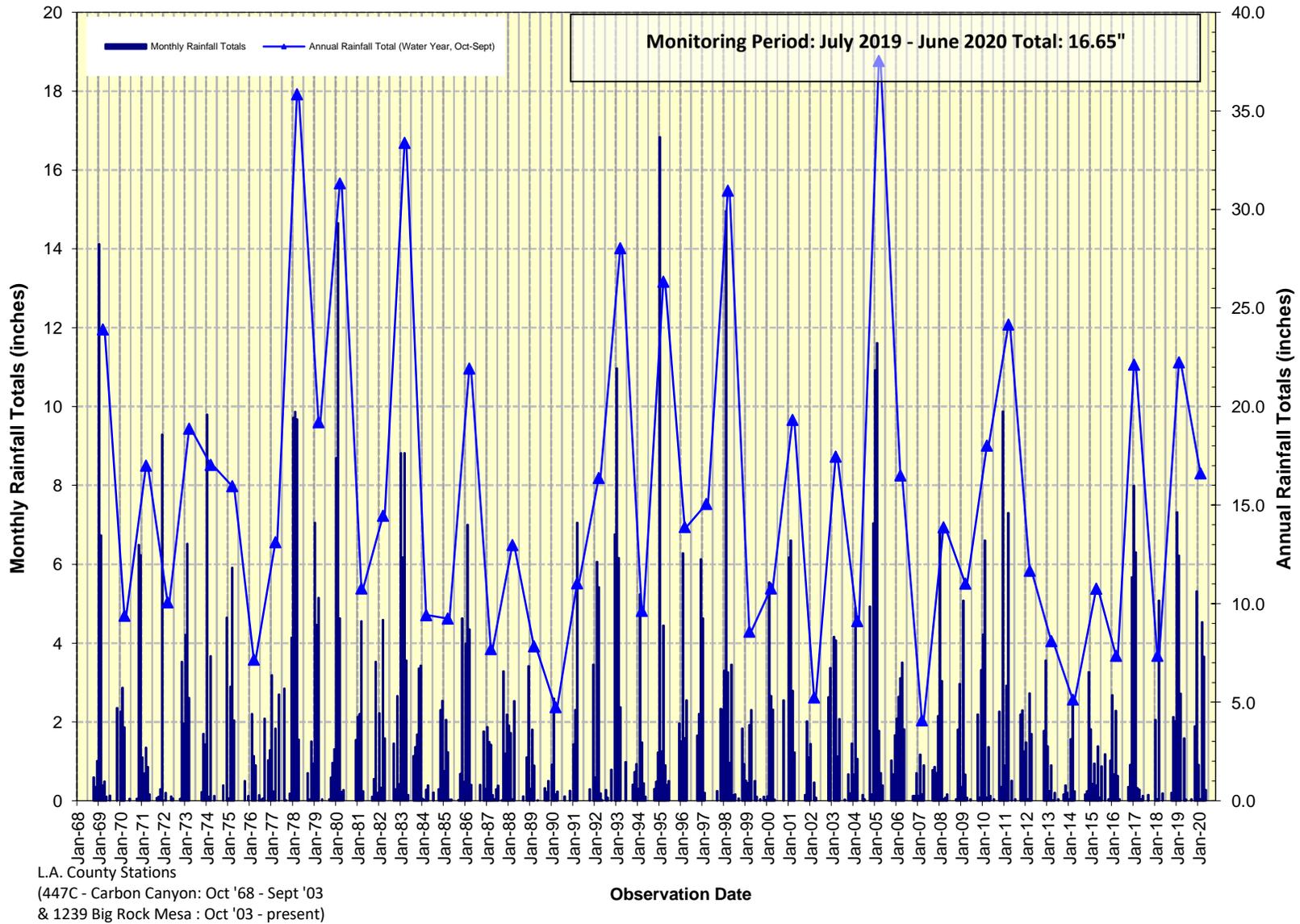
- LEGEND**
- Dewatering Well
 - Slope Inclinometer
 - Destroyed Slope Inclinometer
 - Standpipe Piezometer
 - Storm Drain Outfall
 - Producing Hydrauger (solid line showing unobstructed pipe)
 - Private Hydrauger
 - Nonproducing Hydrauger
 - Coordinate Grid: California State Plane, Zone 5, NAD 83, Feet
 - Assessment District No. 98-3 Boundary
 - Recent Landslide of 1978 (Boundary from Leighton, 1979)
 - Ancient Landslide (Boundary from Leighton, 1979)



ASSESSMENT DISTRICT MAP
 Malibu Road Landslide Assessment District
 Malibu, California

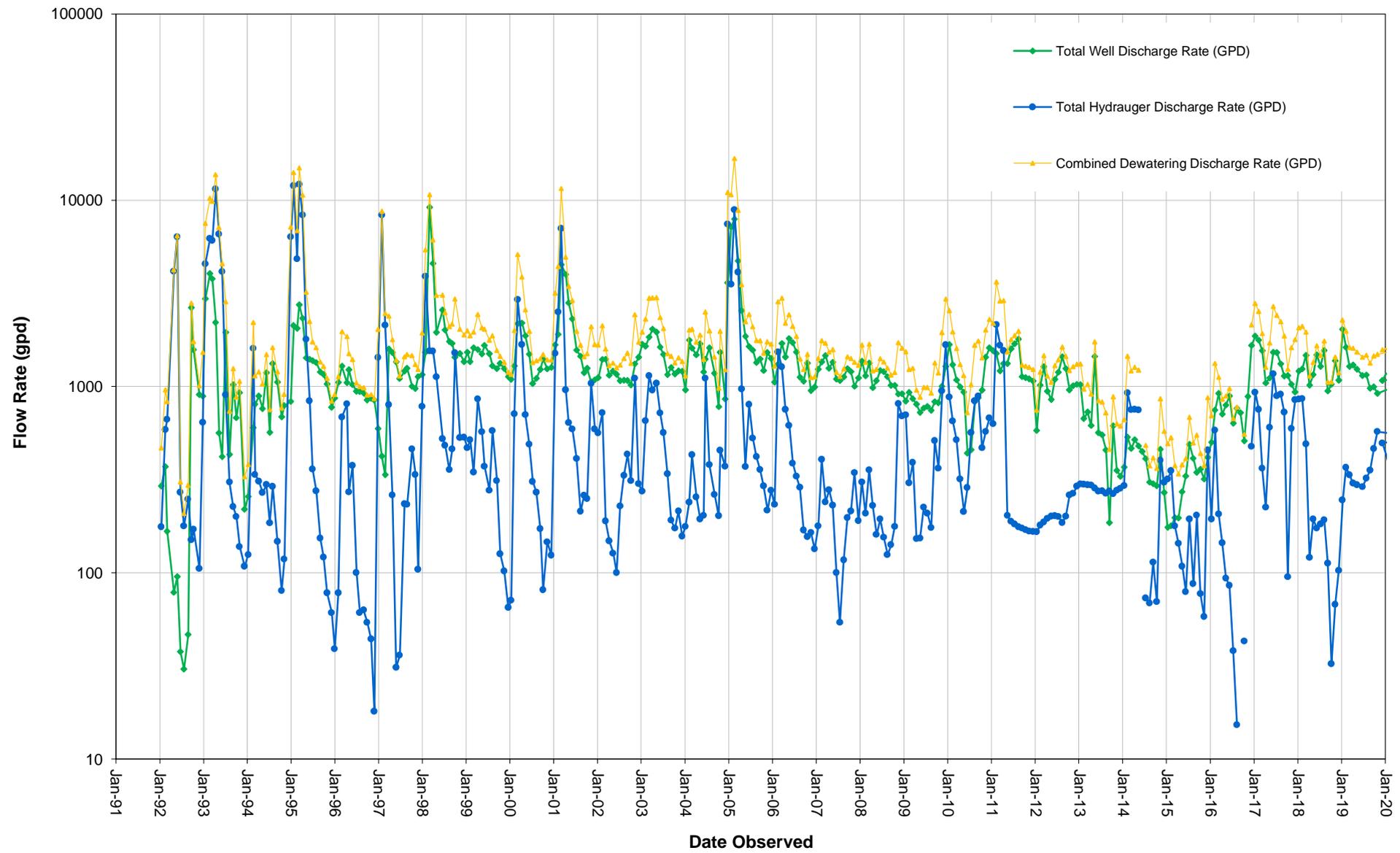
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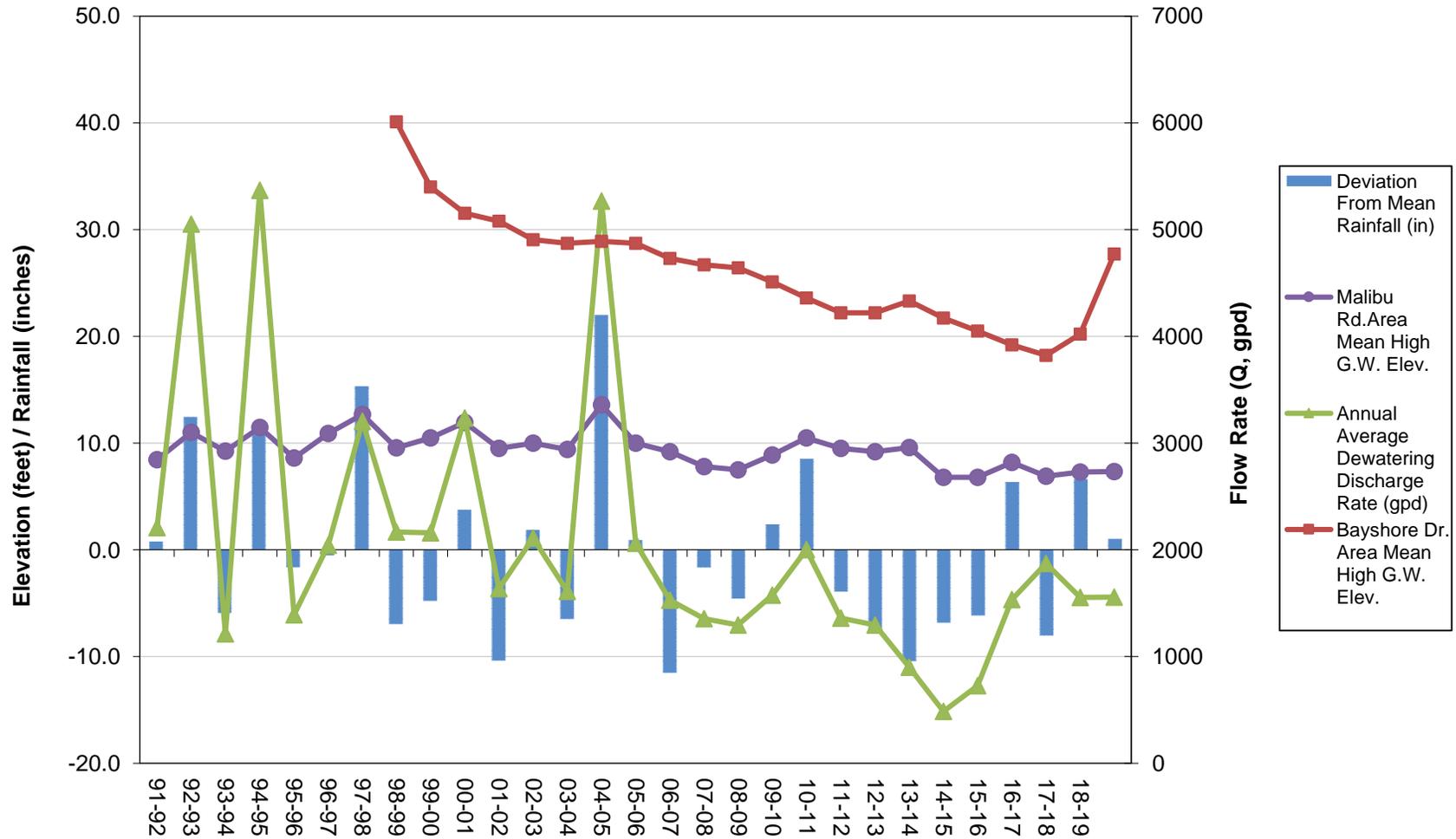
RAINFALL GRAPH
 Malibu Road Landslide Assessment District
 Malibu, California

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MALIBU, CALIFORNIA**



TOTAL DISCHARGE - WELLS AND HYDRAUGERS
Malibu Road Landslide Assessment District
Malibu, California

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 MALIBU, CALIFORNIA**



* Graph shows the mean value of the highest groundwater elevations recorded for each standpipe piezometer during the monitoring year.

GROUNDWATER LEVELS, DEWATERING, AND RAINFALL
 Malibu Road Landslide Assessment District
 Malibu, California



**APPENDIX A
GROUNDWATER DATA**

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**

| MALIBU ROAD LAD - Standpipe Piezometer Information | | | | | | |
|---|--|---|--------------------------|-----------------------------|---------------------|--------------|
| Standpipe ID | Previous Reference Elevation (8/91) | Updated Reference Elevation (4/00) | Casing Depth (ft) | Perforation Interval | Installed By | Notes |
| W-2A | 22.6 | 20.6 | 9.0 | Unknown | LA COUNTY | Dry |
| W-3A | 22.0 | 20.5 | 32.5 | Unknown | LA COUNTY | Buried |
| PZ-A | 20.0 | 19.8 | 17.2 | Unknown | LA COUNTY | |
| PZ-B | 20.0 | 19.1 | 27.9 | Unknown | LA COUNTY | |
| PZ-C | 20.0 | 19.4 | 29.7 | Unknown | LA COUNTY | |
| PZ-D | 20.0 | 19.2 | 24.7 | Unknown | LA COUNTY | |
| PZ-E | 20.0 | 21.4 | 15.8 | Unknown | LA COUNTY | |
| SI-5 ⁺ | 59.0 | 59.3 | 78.0 | -19.0 to -14.0 | BYA | |
| SI-6 ⁺⁺ | 57.0 | 58.0 | 78.0 | -21.0 to -16.0 | BYA | |

Note: + Formerly designated as MR-5

++ Formerly designated as MR-6

| MALIBU ROAD LAD - Pneumatic Piezometer Information | | | | | | |
|---|--|---|------------------------|---------------------|---------------------|--------------|
| Well Identification | Previous Reference Elevation (8/91) | Updated Reference Elevation (4/00) | Tip Depth (ft.) | Tip El. (ft) | Installed By | Notes |
| SI-1* | 20.0 | 20.1 | 34.6 | -14.6 | BYA | leaking |
| SI-2 | 20.0 | 19.7 | 65.1 | -45.1 | BYA | |
| SI-3* | 20.0 | 20.3 | 49.8 | -29.8 | BYA | clogged |
| SI-4 | 22.0 | 18.9 | 43.9 | -21.9 | BYA | |
| SI-5 Tip 1 | 59.0 | 59.3 | 60 | -1 | BYA | |
| SI-5 Tip 2** | 59.0 | 59.3 | 40 | 19 | BYA | |
| SI-6 Tip 1 | 57.0 | 58.0 | 60 | -3 | BYA | |
| SI-6 Tip 2** | 57.0 | 58.0 | 40 | 17 | BYA | |
| SI-1A | 20.0 | 20.0 | 50 | -30 | FUGRO | |

Note: SI-1 thru SI-4 were previously designated MR98-1 thru MR98-4

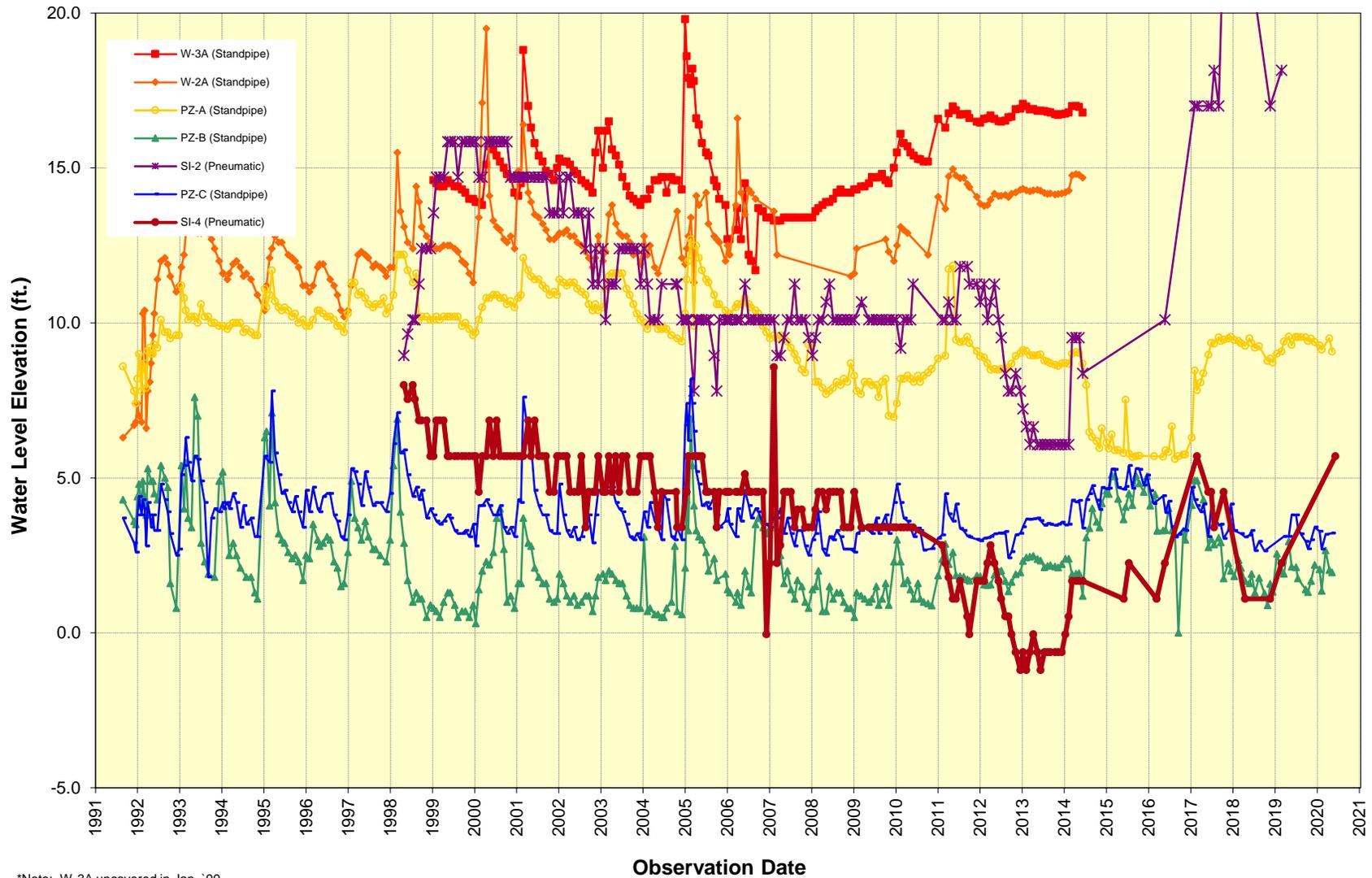
SI-5 and SI-6 were previously designated MR-5 and MR-6

* Piezometer not functioning

MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT - SUMMARY OF GROUNDWATER DATA

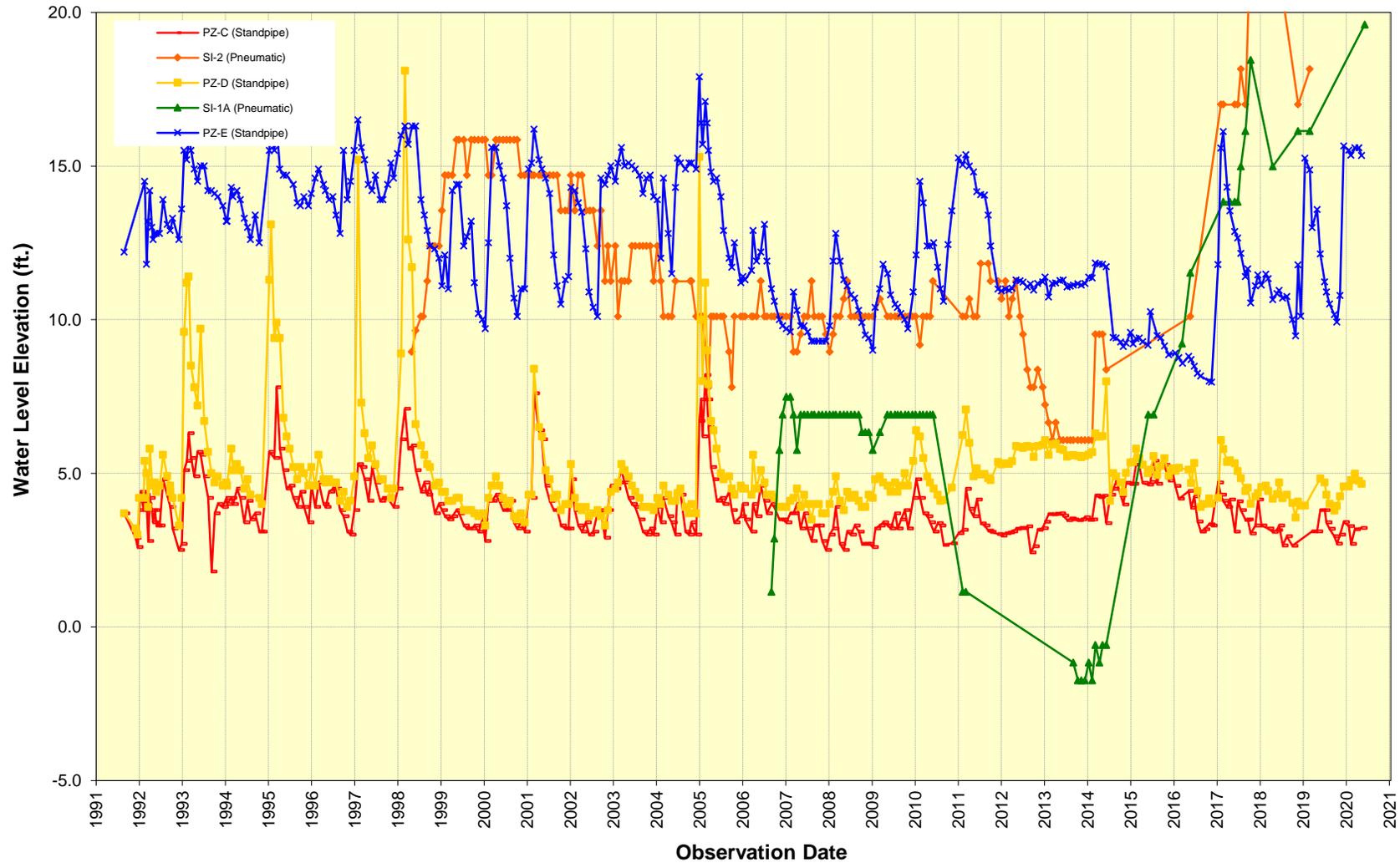
| Standpipe / Piezometer I.D. | | 91-92 | 92-93 | 93-94 | 94-95 | 95-96 | 96-97 | 97-98 | 98-99 | 99-00 | 00-01 | 01-02 | 02-03 | 03-04 | 04-05 | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 | 10-11 | 11-12 | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | 17-18 | 18-19 | 19-20 | Mean '91-20 | Stand Dev. | 19-20 vs. 97-98 | 19-20 vs. mean | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|------------|-----------------|----------------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| MALIBU ROAD - Standpipe Piezometers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W-2A | Mean El. | 8.3 | 12.3 | 12.1 | 11.8 | 11.7 | 11.2 | 12.4 | 12.8 | 13.5 | 13.7 | 12.9 | 12.6 | 12.3 | 12.8 | 13.4 | 13.7 | -- | -- | -- | 14.1 | 14.2 | 14.2 | 14.4 | DRY | DRY | DRY | DRY | DRY | DRY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 11.4 | 13.6 | 13.1 | 12.8 | 12.2 | 12.3 | 15.5 | 14.4 | 19.5 | 16.4 | 13.4 | 13.8 | 12.8 | 14.1 | 16.6 | 14.3 | -- | -- | -- | 15.0 | 14.7 | 14.3 | 14.8 | DRY | DRY | DRY | DRY | DRY | DRY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W-3A | Mean El. | | | | | | | | 14.5 | 14.4 | 15.5 | 15.0 | 15.3 | 14.3 | 16.4 | 13.9 | 13.1 | 13.6 | 14.3 | 15.2 | 16.1 | 16.6 | 16.8 | 16.8 | UTL | UTL | UTL | UTL | UTL | UTL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | 14.6 | 15.7 | 18.8 | 15.4 | 16.5 | 14.7 | 19.8 | 15.5 | 13.7 | 13.9 | 14.7 | 16.1 | 17.0 | 16.7 | 17.1 | 17.0 | UTL | UTL | UTL | UTL | UTL | UTL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PZ-A | Mean El. | 8.6 | 10.1 | 10.0 | 10.4 | 10.2 | 10.5 | 11.1 | 10.4 | 10.2 | 11.1 | 11.2 | 11.0 | 10.3 | 10.8 | 10.7 | 9.9 | 8.5 | 8.1 | 7.9 | 9.2 | 9.0 | 8.9 | 8.8 | 6.3 | 6.0 | 6.9 | 9.4 | 9.1 | 9.4 | 9.4 | 1.4 | -1.7 | 0.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 9.3 | 11.2 | 10.6 | 11.7 | 10.5 | 11.3 | 12.2 | 11.6 | 10.9 | 12.1 | 11.4 | 11.6 | 11.6 | 12.7 | 11.4 | 10.6 | 9.3 | 8.7 | 8.3 | 11.9 | 9.6 | 9.1 | 9.1 | 8.0 | 7.5 | 9.0 | 9.6 | 9.6 | 9.6 | 10.3 | 1.4 | -2.7 | -0.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PZ-B | Mean El. | 4.4 | 4.5 | 2.9 | 3.7 | 2.6 | 2.9 | 3.4 | 1.0 | 1.3 | 2.3 | 1.3 | 1.5 | 1.0 | 2.8 | 1.7 | 2.7 | 1.3 | 1.0 | 1.6 | 1.8 | 1.7 | 2.1 | 2.1 | 4.1 | 4.2 | 3.8 | 2.3 | 1.8 | 1.9 | 2.4 | 1.1 | -1.5 | -0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 5.3 | 7.6 | 5.2 | 7.1 | 3.5 | 4.9 | 6.9 | 1.3 | 2.6 | 4.0 | 1.9 | 2.0 | 3.1 | 6.9 | 2.6 | 3.8 | 2.0 | 1.3 | 3.0 | 2.9 | 2.0 | 2.5 | 2.4 | 5.1 | 5.1 | 4.9 | 3.1 | 3.0 | 2.7 | 3.7 | 1.8 | -4.2 | -1.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PZ-C | Mean El. | 3.6 | 4.6 | 3.9 | 4.7 | 4.2 | 4.2 | 5.1 | 4.0 | 3.6 | 4.5 | 3.6 | 4.1 | 3.4 | 5.2 | 3.9 | 3.7 | 3.0 | 3.0 | 3.7 | 3.4 | 3.1 | 3.3 | 3.7 | 4.6 | 4.8 | 3.7 | 3.5 | 3.1 | 3.2 | 3.9 | 0.6 | -1.9 | -0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 4.4 | 6.3 | 4.9 | 7.8 | 4.7 | 5.3 | 7.1 | 4.7 | 4.3 | 7.6 | 4.8 | 5.1 | 4.2 | 8.2 | 4.6 | 4.1 | 3.9 | 3.4 | 4.8 | 4.5 | 3.4 | 3.7 | 4.3 | 5.3 | 5.4 | 4.7 | 4.2 | 3.8 | 3.8 | 4.9 | 1.3 | -3.3 | -1.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PZ-D | Mean El. | 4.4 | 6.9 | 5.1 | 7.6 | 5.0 | 5.9 | 7.8 | 4.7 | 4.0 | 4.8 | 4.2 | 4.3 | 4.1 | 7.0 | 4.7 | 4.2 | 4.0 | 4.4 | 5.1 | 5.2 | 5.3 | 5.8 | 5.9 | 5.0 | 5.1 | 4.8 | 4.5 | 4.2 | 4.4 | 5.1 | 1.1 | -3.4 | -0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 5.8 | 11.4 | 6.7 | 13.1 | 5.8 | 15.2 | 18.1 | 5.9 | 4.9 | 8.4 | 5.3 | 5.3 | 4.6 | 15.3 | 5.6 | 4.7 | 4.9 | 4.9 | 6.4 | 7.1 | 5.9 | 6.1 | 8.0 | 5.8 | 5.6 | 6.1 | 5.1 | 4.8 | 5.0 | 7.3 | 3.6 | -13.1 | -2.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PZ-E | Mean El. | 13.0 | 14.3 | 13.9 | 14.5 | 14.2 | 14.6 | 15.2 | 12.8 | 12.7 | 13.3 | 12.5 | 14.1 | 13.8 | 15.6 | 12.1 | 10.5 | 10.4 | 10.4 | 11.6 | 13.5 | 11.9 | 11.2 | 11.4 | 9.3 | 9.1 | 11.4 | 11.4 | 11.9 | 13.0 | 12.5 | 1.7 | -2.2 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 14.5 | 16.0 | 15.0 | 16.3 | 14.9 | 16.5 | 16.3 | 14.4 | 15.6 | 16.2 | 14.3 | 15.6 | 14.9 | 17.9 | 14.0 | 13.1 | 12.8 | 11.8 | 14.5 | 15.4 | 14.1 | 11.4 | 11.8 | 9.6 | 10.3 | 16.1 | 12.7 | 15.3 | 15.7 | 14.4 | 2.0 | -0.6 | 1.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Area Average | Mean El. | 7.0 | 8.8 | 8.0 | 8.8 | 8.0 | 8.2 | 9.2 | 8.6 | 8.5 | 9.3 | 8.7 | 9.0 | 8.5 | 10.1 | 8.6 | 8.2 | 6.8 | 6.9 | 7.5 | 9.0 | 8.8 | 8.9 | 9.0 | 5.9 | 5.8 | 6.1 | 6.2 | 6.0 | 6.4 | 8.0 | 1.2 | -2.8 | -1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | 8.5 | 11.0 | 9.3 | 11.5 | 8.6 | 10.9 | 12.7 | 9.6 | 10.5 | 11.9 | 9.5 | 10.0 | 9.4 | 13.6 | 10.0 | 9.2 | 7.8 | 7.5 | 8.9 | 10.5 | 9.5 | 9.2 | 9.6 | 6.8 | 6.8 | 8.2 | 6.9 | 7.3 | 7.3 | 9.4 | 1.7 | -5.4 | -2.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change vs. Prior | Mean El. | | 1.7 | -0.8 | 0.8 | -0.8 | 0.3 | 0.9 | -0.6 | -0.1 | 0.8 | -0.6 | 0.3 | -0.5 | 1.6 | -1.5 | -0.4 | -1.4 | 0.1 | 0.6 | 1.5 | -0.2 | 0.1 | 0.1 | -3.1 | -0.1 | 0.3 | 0.1 | -0.2 | 0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | 2.6 | -1.8 | 2.2 | -2.9 | 2.3 | 1.8 | -3.1 | 0.9 | 1.4 | -2.4 | 0.5 | -0.6 | 4.1 | -3.5 | -0.9 | -1.4 | -0.3 | 1.4 | 1.7 | -1.0 | -0.3 | 0.5 | -2.9 | 0.0 | 1.4 | -1.3 | 0.4 | 0.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bayshore Drive - Standpipe Piezometers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-5 | Mean El. | | | | | | | | 35.5 | 32.2 | 30.7 | 30.1 | 29.3 | 29.0 | 28.6 | 28.2 | 27.8 | 27.3 | 26.3 | 22.6 | 18.8 | 16.5 | 16.4 | 18.0 | 17.4 | 14.3 | 12.2 | 11.2 | 11.1 | 26.5 | 23.2 | 7.5 | | 3.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | 37.8 | 33.4 | 31.2 | 30.4 | 29.7 | 29.2 | 29.0 | 28.4 | 28.0 | 27.5 | 27.0 | 24.3 | 20.5 | 17.6 | 17.2 | 19.4 | 18.3 | 15.6 | 12.9 | 11.5 | 15.6 | 30.4 | 24.3 | 7.3 | | 6.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-6 | Mean El. | | | | | | | | 38.8 | 32.6 | 31.2 | 29.9 | 27.9 | 27.7 | 27.2 | 27.9 | 26.0 | 25.7 | 25.4 | 25.3 | 26.1 | 26.4 | 26.7 | 26.8 | 24.8 | 25.1 | 25.2 | 24.8 | 24.5 | 24.7 | 27.3 | 3.3 | | -2.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | 42.4 | 34.6 | 31.9 | 31.2 | 28.4 | 28.2 | 28.8 | 29.0 | 26.5 | 25.9 | 25.7 | 25.8 | 26.7 | 26.8 | 27.1 | 27.2 | 25.1 | 25.4 | 25.5 | 25.0 | 24.8 | 25.0 | 28.0 | 4.1 | | -3.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Area Average | Mean El. | | | | | | | | 37.2 | 32.4 | 31.0 | 30.0 | 28.6 | 28.3 | 27.9 | 28.0 | 26.9 | 26.5 | 25.8 | 23.9 | 22.4 | 21.5 | 21.6 | 22.4 | 21.1 | 19.7 | 18.7 | 18.0 | 17.8 | 25.6 | 25.2 | 5.0 | | 0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | 40.1 | 34.0 | 31.5 | 30.8 | 29.1 | 28.7 | 28.9 | 28.7 | 27.3 | 26.7 | 26.4 | 25.1 | 23.6 | 22.2 | 22.2 | 23.3 | 21.7 | 20.5 | 19.2 | 18.2 | 20.2 | 27.7 | 26.1 | 5.3 | | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change vs. Prior | Mean El. | | | | | | | | -4.7 | -1.5 | -1.0 | -1.3 | -0.3 | -0.4 | 0.2 | -1.2 | -0.4 | -0.6 | -1.9 | -1.5 | -0.9 | 0.1 | 0.8 | -1.3 | -1.4 | -1.0 | -0.7 | -0.2 | 7.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | -6.1 | -2.5 | -0.7 | -1.8 | -0.4 | 0.2 | -0.2 | -1.5 | -0.6 | -0.3 | -1.3 | -1.5 | -1.4 | 0.0 | 1.1 | -1.6 | -1.2 | -1.3 | -1.0 | 2.0 | 7.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MALIBU ROAD - Pneumatic Piezometers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-1 | Mean El. | Piezometer Not Functioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | Piezometer Not Functioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-1A | Mean El. | | | | | | | | | | | | | | | | 5.8 | 6.9 | 6.5 | 6.9 | Piezometer Not Functioning | | | | | | 8.6 | 13.8 | 15.7 | 16.1 | 19.6 | 11.1 | 5.2 | 19.6 | 8.5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | | | | | | | | | 7.5 | 6.9 | 6.9 | 6.9 | Piezometer Not Functioning | | | | | | 11.5 | 13.8 | 18.4 | 16.1 | 19.6 | 12.0 | 5.2 | 19.6 | 7.6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-2 | Mean El. | | | | | | | 9.3 | 13.2 | 15.6 | 15.1 | 14.1 | 11.9 | 11.5 | 10.1 | 9.9 | 9.9 | 10.1 | 10.2 | 10.1 | 10.2 | 11.0 | 7.4 | 7.1 | | 10.1 | 17.0 | 19.5 | 17.6 | | 11.9 | 3.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | 9.6 | 15.9 | 15.9 | 15.9 | 14.7 | 13.6 | 12.4 | 11.3 | 11.3 | 10.1 | 11.3 | 10.7 | 11.3 | 10.7 | 11.8 | 9.5 | 9.5 | | 10.1 | 17.0 | 22.8 | 18.2 | | 13.0 | 3.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-3 | Mean El. | Piezometer Not Functioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | Piezometer Not Functioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-4 | Mean El. | | | | | | | 7.8 | 6.6 | 5.7 | 6.0 | 5.2 | 4.8 | 5.0 | 4.9 | 4.5 | 4.0 | 4.0 | 3.9 | 3.4 | 1.8 | 1.6 | -0.3 | 0.3 | | 1.7 | 5.1 | 3.4 | 1.7 | 5.7 | 3.9 | 2.1 | -2.1 | 1.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | 8.0 | 8.0 | 6.9 | 6.9 | 5.7 | 5.7 | 5.7 | 5.7 | 5.1 | 8.6 | 4.6 | 4.6 | 3.4 | 2.8 | 2.8 | 1.1 | 1.7 | | 2.3 | 5.7 | 4.6 | 2.3 | 5.7 | 4.9 | 2.1 | -2.3 | 0.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bayshore Drive - Pneumatic Piezometers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-5 Tip 1 | Mean El. | | | | | | | | | | | | | | | | | | | | | | | | | | 20.6 | 27.6 | 26.7 | 23.2 | 24.4 | 28.5 | 6.0 | | -4.1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | | | | | | | | | | | | | | | | | | | 22.1 | 29.0 | 26.7 | 24.4 | 24.4 | 30.8 | 7.4 | | -6.5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-5 Tip 2 | Mean El. | | | | | | | | | | | | | | | | | | | | | | | | | | 24.8 | 30.5 | 29.8 | 27.1 | 23.6 | 30.4 | 5.2 | | -6.8 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | | | | | | | | | | | | | | | | | | | 25.9 | 30.5 | 30.5 | 28.2 | 23.6 | 33.8 | 8.0 | | -10.2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-6 Tip 1 | Mean El. | | | | | | | | | | | | | | | | | | | | | | | | | | 27.1 | 34.8 | 35.6 | 34.9 | 36.1 | 31.1 | 6.4 | | 5.0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | | | | | | | | | | | | | | | | | | | 30.3 | 36.1 | 38.4 | 34.9 | 36.1 | 32.4 | 6.5 | | 3.6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SI-6 Tip 2 | Mean El. | | | | | | | | | | | | | | | | | | | | | | | | | | 34.5 | 52.2 | 42.5 | 41.1 | 41.1 | 41.3 | 4.1 | | -0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highest El. | | | | | | | | | | | | | | | | | | | | | | | | | | 36.5 | 56.1 | 44.5 | 41.1 | 41.1 | 43.5 | 4.9 | | -2.4 | | | | | | | | | | | | | | | | | | | | | | | | | | |

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY 19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**



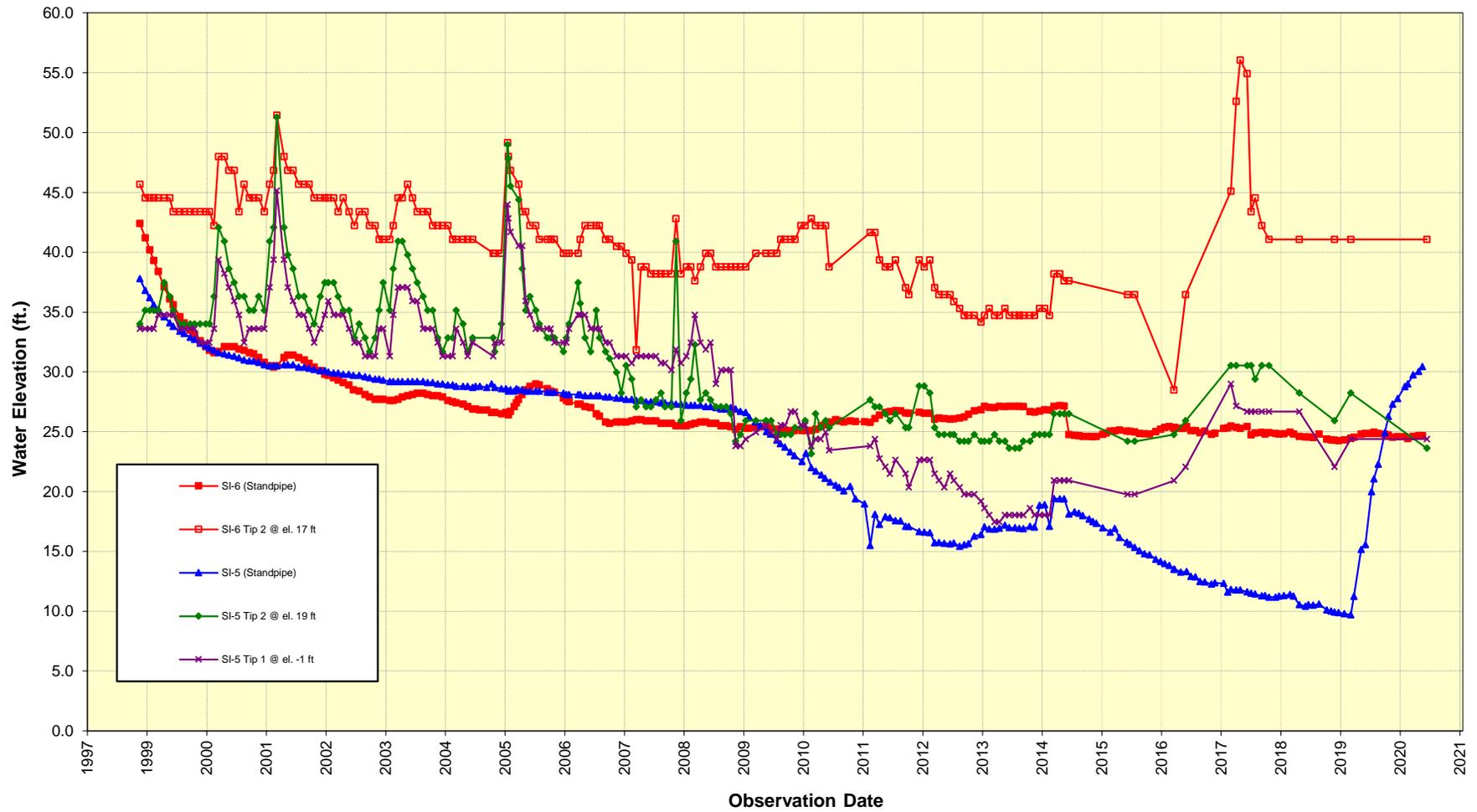
GROUNDWATER HYDROGRAPH
 Malibu Road (West End)
 Malibu Road Landslide Assessment District
 Malibu, California

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
FY 19-20 ANNUAL REPORT
MALIBU, CALIFORNIA**



GROUNDWATER HYDROGRAPH
Malibu Road (East End)
Malibu Road Landslide Assessment District
Malibu, California

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
FY 19-20 ANNUAL REPORT
MALIBU, CALIFORNIA**



GROUNDWATER HYDROGRAPH
Bayshore Drive
Malibu Road Landslide Assessment District
Malibu, California



**APPENDIX B
DEWATERING DATA**

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**

| MALIBU ROAD LAD - Dewatering Well Information | | | | | | | |
|--|-----------------------|------------------------|----------------------|----------------|-----------------------------------|----------------------------|--------------|
| Well ID | Vault Elevation (ft.) | Bottom Elevation (ft.) | Pump Elevation (ft.) | Pump Size (hp) | 2018-2019 Mean Pumping Rate (gpd) | % of Total Well Production | Installed By |
| W-3 | 19.5 | -4.0 | Unknown | 1/2 | 437 | 32% | LA Co. |
| W-4 | 20.0 | -9.0 | Unknown | 1/2 | 141 | 10% | LA Co. |
| W-5 | 19.0 | -9.5 | Unknown | 1/2 | 474 | 35% | LA Co. |
| W-6 | 20.0 | -4.5 | Unknown | 1/2 | 20 | 1% | LA Co. |
| W-8 | 27.5 | 11.0 | Unknown | 1/2 | 19 | 1% | LA Co. |
| W-9 | 20.0 | -40.0 | -35.0 | 1/3 | 10 | 1% | LA Co. |
| W-10 | 19.0 | -40.0 | -35.0 | 1/3 | 13 | 1% | LA Co. |
| W-11 | 61.0 | 1.0 | 13.0 | 1/3 | 149 | 11% | BYA |
| W-12 | 58.0 | -2.0 | 8.0 | 1/3 | 14 | 1% | BYA |
| W-14 | 60.0 | -20.0 | Unknown | 1/3 | 51 | 4% | Fugro |
| NW-1 | Unknown | Unknown | Unknown | Unknown | 16 | 1% | Homeowner |
| NW-2 | Unknown | Unknown | Unknown | Unknown | 20 | 1% | Homeowner |
| NW-3 | Unknown | Unknown | Unknown | Unknown | 9 | 1% | Homeowner |

| MALIBU ROAD LAD- Hydrauger Information | | | | | | |
|---|------------------------|---------|-------------------------|--------------------------------|-----------------------|--------------|
| Hydrauger ID | Installed Length (ft.) | Bearing | Functional Length* (ft) | 2018-2019 Mean Flow Rate (gpd) | % of Total Production | Installed By |
| HD-1** | Unknown | N05E | 74 | 0 | 0% | LA County |
| HD-2** | Unknown | N21E | 34 | 0 | 0% | LA County |
| HD-3** | Unknown | N06E | 13 | 0 | 0% | LA County |
| HD-4 | Unknown | N29E | 53 | 0 | 0% | LA County |
| HD-5 | Unknown | N13E | 41 | 0 | 0% | LA County |
| HD-6 | Unknown | N08W | 55 | 35 | 17% | LA County |
| HD-7 | Unknown | N26E | 87 | 0 | 0% | LA County |
| HD-8 | Unknown | N19E | 92 | 22 | 11% | LA County |
| HD-8A | Unknown | Unknown | Unknown | 57 | 28% | Unknown |
| HD-9 | Unknown | N34E | 76 | 0 | 0% | LA County |
| HD-10 | Unknown | N19E | 55 | 0 | 0% | LA County |
| HD-11 | Unknown | N11E | 78 | 0 | 0% | LA County |
| HD-12 | Unknown | N08E | 70 | 0 | 0% | LA County |
| HD-13 | Unknown | N09E | 79 | 0 | 0% | LA County |
| HD-14 | Unknown | N08E | 80 | 0 | 0% | LA County |
| HD-15 | Unknown | N14E | 82 | 0 | 0% | LA County |
| HD-16 | Unknown | N15E | 69 | 0 | 0% | LA County |
| HD-17** | 150 | N15E | 150 | 0 | 0% | BYA |
| HD-18 | 150 | N18E | 150 | 0 | 0% | BYA |
| HD-19 | 150 | N10E | 150 | 0 | 0% | BYA |
| HD-20 | 150 | N09W | 150 | 19 | 10% | BYA |
| HD-21 | 150 | N22E | 150 | 0 | 0% | BYA |
| HD-22 | 180 | N13E | 180 | 47 | 23% | Fugro West |
| HD-23 | 160 | N01E | 160 | 21 | 10% | Fugro West |

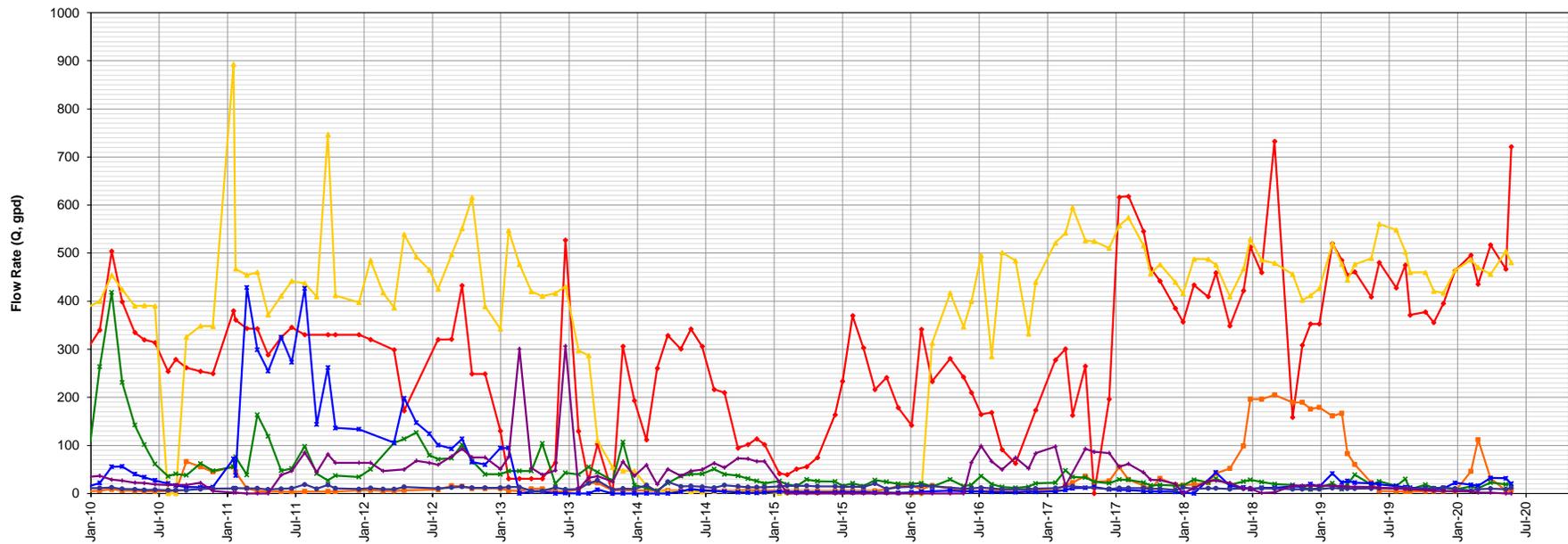
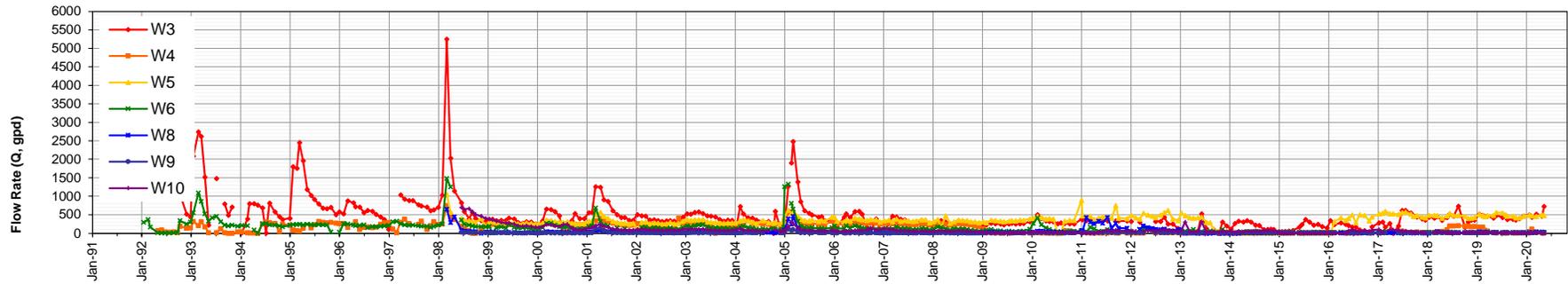
Note: * Measured on 4/1/98 (except HD-22 and HD-23 installed 1/22/05)

** buried/unable to locate

DEWATERING WELL / HYDRAUGER INFORMATION

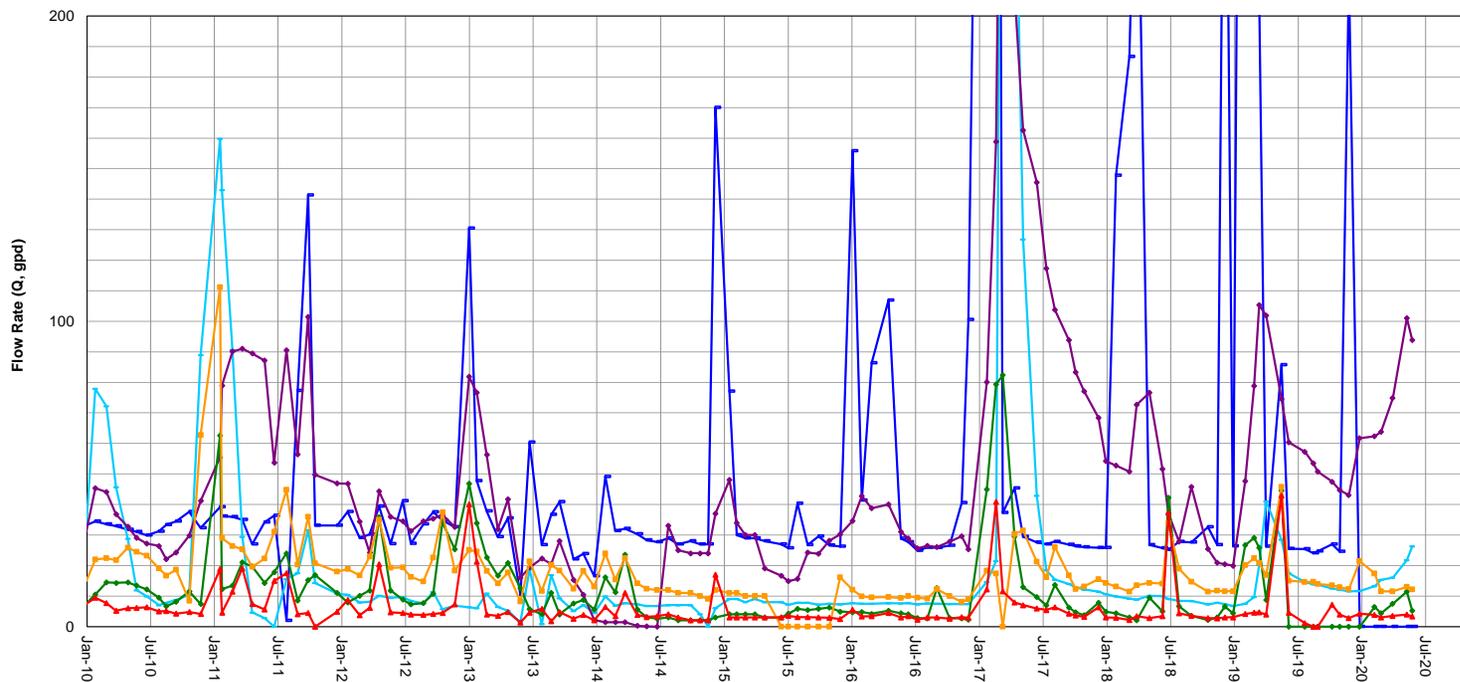
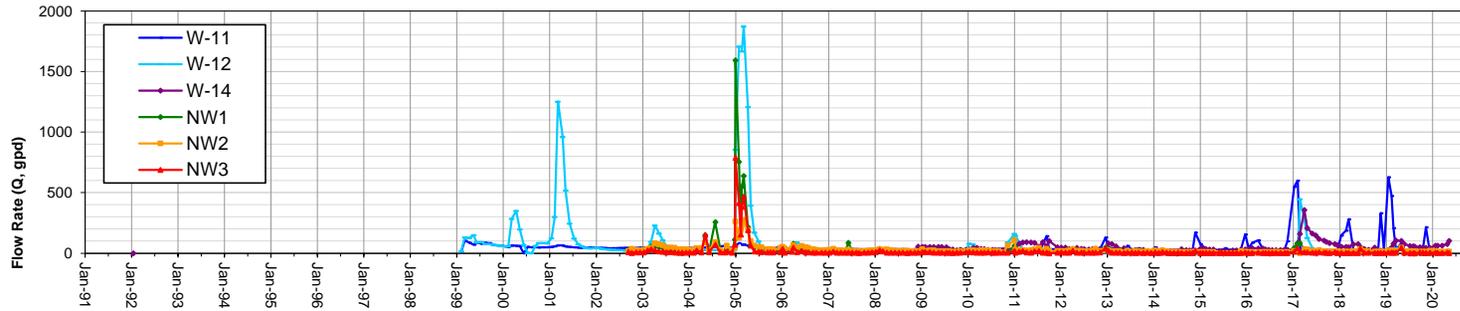
Malibu Road Landslide Assessment District
 Malibu, California

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**



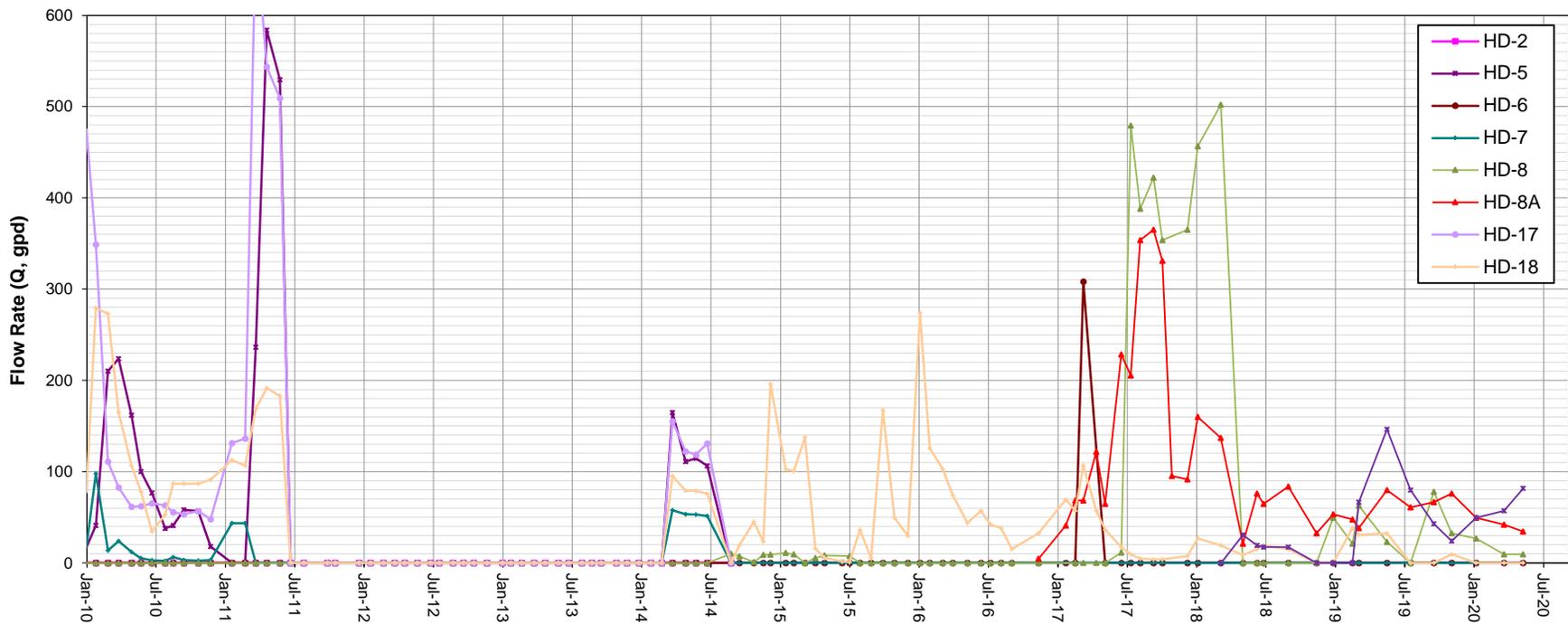
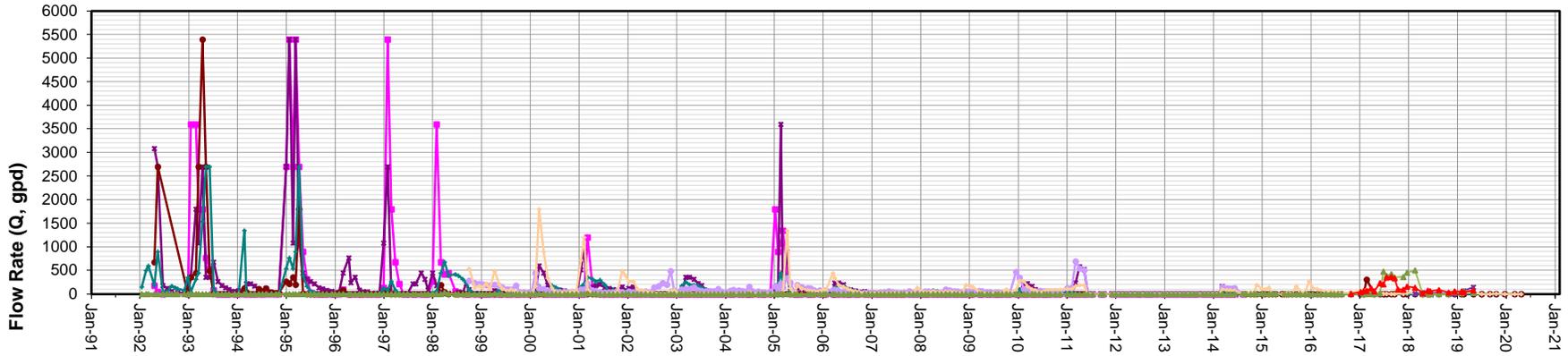
DEWATERING WELL DISCHARGE RATE GRAPH
Malibu Road
 Malibu Road Landslide Assessment District
 Malibu, California

MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
FY19-20 ANNUAL REPORT
MALIBU, CALIFORNIA



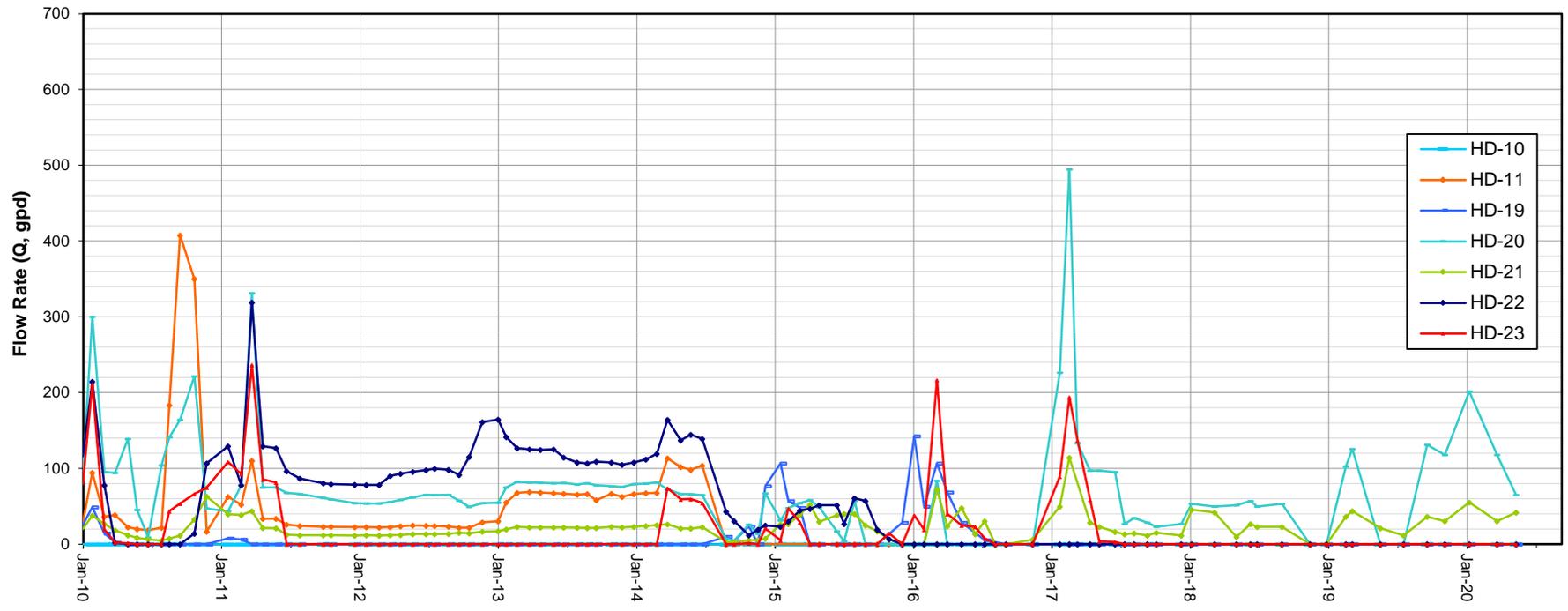
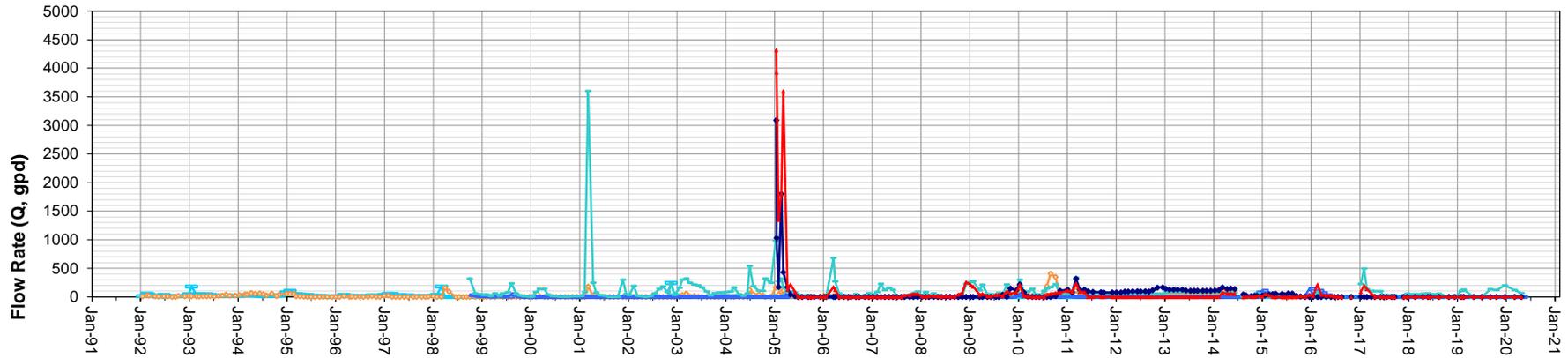
DEWATERING WELL DISCHARGE RATE GRAPH
Bayshore Drive
Malibu Road Landslide Assessment District
Malibu, California

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**



**HYDRAUGER DISCHARGE RATE GRAPH
 Malibu Road (West End)
 Malibu Road Landslide Assessment District
 Malibu, California**

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
 FY19-20 ANNUAL REPORT
 MALIBU, CALIFORNIA**



**HYDRAUGER DISCHARGE RATE GRAPH
 Malibu Road (East End)
 Malibu Road Landslide Assessment District
 Malibu, California**



**APPENDIX C
SLOPE INCLINOMETER DATA**

**MALIBU ROAD LANDSLIDE ASSESSMENT DISTRICT
FY19-20 ANNUAL REPORT
MALIBU, CALIFORNIA**

| MALIBU ROAD LAD - Slope Inclinometer Interpretation Summary | | | | | | | | | |
|--|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------------------|--------------|-------------|-------------|
| | SI-1 (MR98-1) | SI-1A | SI-2 (MR98-2) | SI-2A | SI-3 (MR98-3) | SI-4 (MR98-4) | SI-4A | SI-5 | SI-6 |
| Installation Details | | | | | | | | | |
| Previous Ref.Elev.(8/91) | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 22.0 | N/A | 59.0 | 57.0 |
| Updated Ref.Elev.(4/00) | 20.1 | 20.0 | 19.7 | 19.7 | 20.3 | 18.9 | 18.9 | 59.3 | 58.0 |
| Depth (ft.) | 34 | 50 | 64 | 64 | 49 | 43 | 50 | 78 | 78 |
| Install Date | Apr-98 | Aug-06 | Apr-98 | Sep-10 | Apr-98 | Apr-98 | Aug-12 | Apr-98 | Apr-98 |
| A+ Axis orientation (deg) | 184 | 197 | 201 | 200 | 190 | 204 | 204 | 176 | 186 |
| Casing | RST | SI | RST | RST | RST | RST | SI | SI | SI |
| Installer | BYA | Fugro | BYA | Fugro | BYA | BYA | Fugro | BYA | BYA |
| Interpreted Rupture Depth (ft) | 30-32 | 23-30 | 28-32 | 28-32 | 35-38 | 32-34 | 32-34 | unknown | unknown |
| Status | D | F | D | F | D | D | F | F | F |
| Reading Interval | Quarterly | Quarterly | Quarterly | Quarterly | Quarterly | Quarterly | Semi | Semi | Semi |
| Interpreted Movement (inches) | | | | | | | | | |
| 2019-2020 | NR | -- | NR | -- | NR | NR | -- | -- | -- |
| 2018-2019 | NR | -- | NR | -- | NR | NR | -- | -- | -- |
| 2017-2018 | NR | -- | NR | -- | NR | NR | -- | -- | -- |
| 2016-2017 | NR | 0.1 | NR | 0.15 | NR | NR | 0.15 | -- | -- |
| 2015-2016 | NR | -- | NR | -- | NR | NR | -- | -- | -- |
| 2014-2015 | NR | <0.1 | NR | -- | NR | NR | -- | -- | -- |
| 2013-2014 | NR | 0.1 | NR | -- | NR | NR | -- | -- | -- |
| 2012-2013 | NR | <0.1 | NR | <0.1 | NR | NR | -- | 0.1 | 0.1 |
| 2011-2012 | NR | <0.1 | NR | -- | NR | -- | NR | -- | <0.1 |
| 2010-2011 | NR | <0.1 | NR | -- | NR | 0.6 | NR | -- | <0.1 |
| 2009-2010 | NR | <0.1 | NR | -- | NR | -- | NR | -- | <0.1 |
| 2008-2009 | NR | <0.1 | <0.1 (4) | NR | NR | -- | NR | -- | <0.1 |
| 2007-2008 | NR | <0.1 | -- | NR | NR | -- | NR | -- | <0.1 |
| 2006-2007 | NR | NR | -- | NR | NR | -- | NR | -- | 0.1 |
| 2004-2005 | 0.5 (3) | NR | 0.4 | NR | >1(3) | 0.4 to 0.5 | NR | ~ 0.2 * | -- |
| 2003-2004 (1) | -- | NR | -- | NR | -- | -- | NR | -- | -- |
| 2002-2003 | ~ 0.2 * | NR | ~ 0.1 * | NR | -- | -- | NR | -- | -- |
| 2001-2002 | -- | NR | -- | NR | -- | -- | NR | -- | -- |
| 2000-2001 | 0.5 | NR | 0.4 | NR | 0.3 | 0.6 | NR | -- | -- |
| 1999-2000 | -- | NR | -- | NR | -- | -- | NR | -- | -- |
| 1998-1999 | 3.1 | NR | 1.5 | NR | 4.1 | 1.3 (2) | NR | -- | -- |

NOTES:

D Destroyed

F Functioning

NI No information

(1) Readings only through March 2004

(2) Readings are through 2000, although majority of movement occurred in 1998

(3) Inclinometer sheared off in January, 2005.

(4) Inclinometer sheared off winter of 2009.

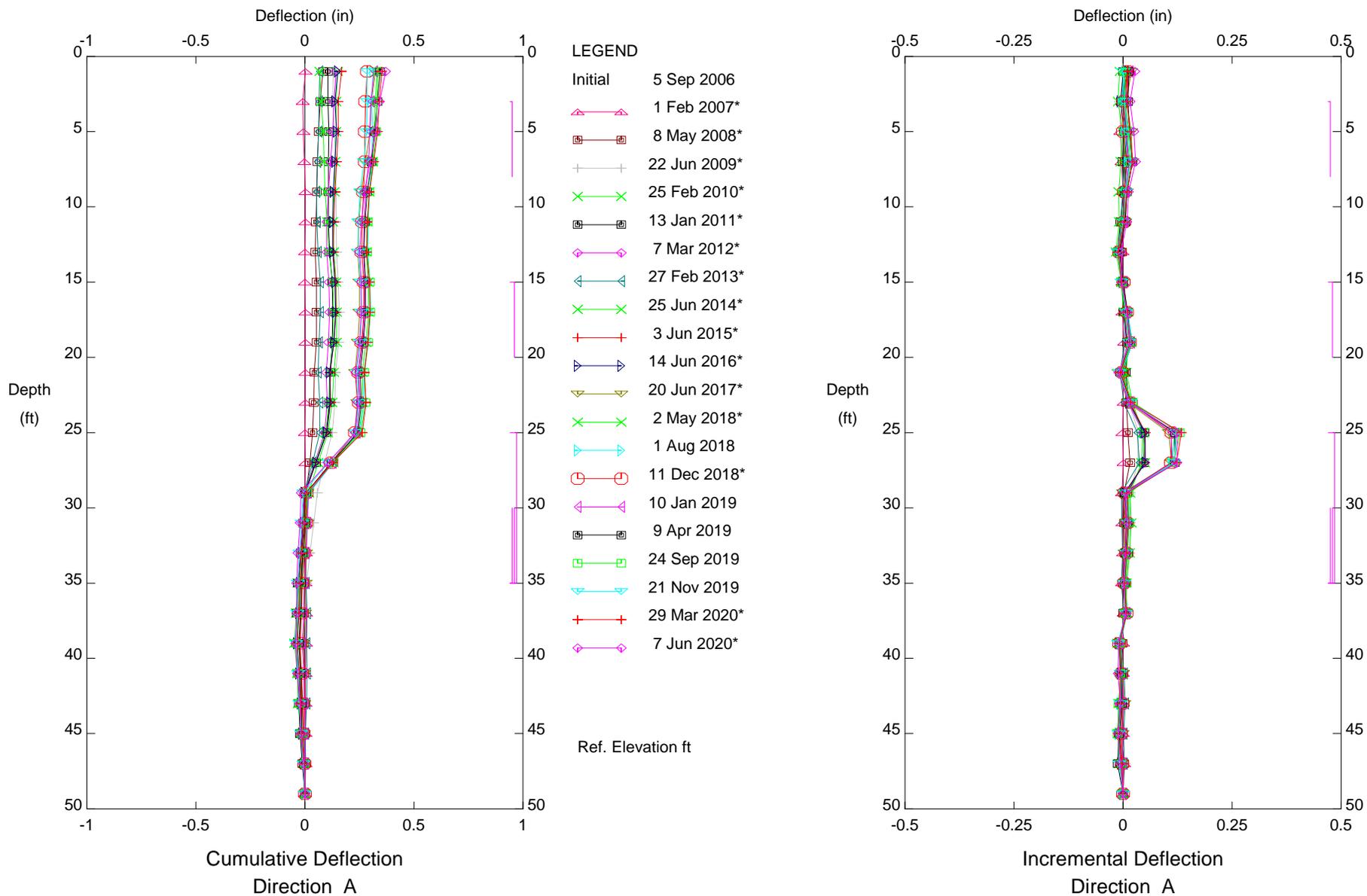
NR No reading

-- No clearly defined interpreted movement.

~ 0.1 * Indicated displacement is less than reliable instrument accuracy. Interpreted movement is theoretical.

SUMMARY OF SLOPE INCLINOMETERS
Malibu Road Landslide Assessment District
Malibu, California

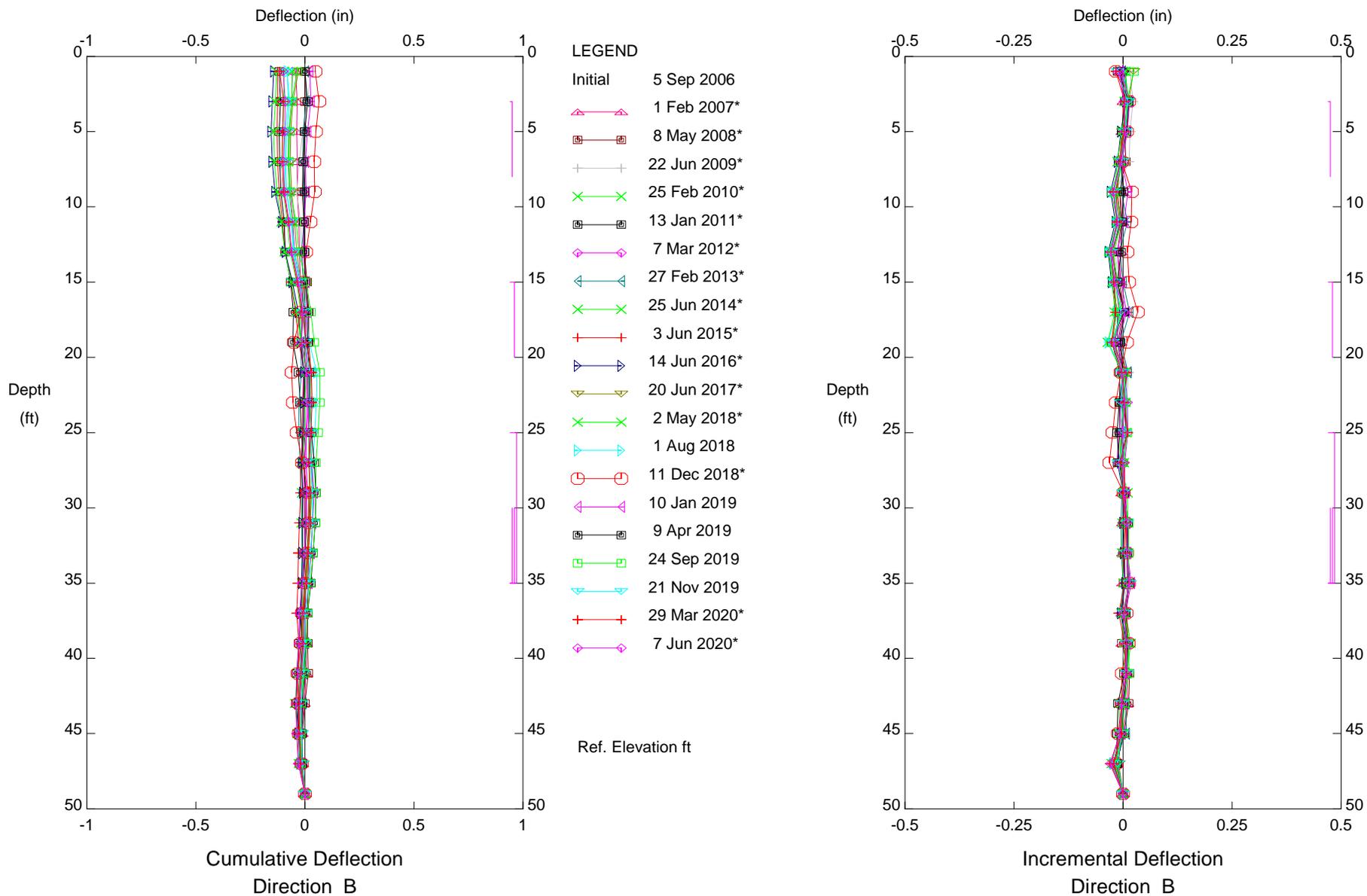
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Assessment District 98-3, Inclinometer SI-1A
City of Malibu

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

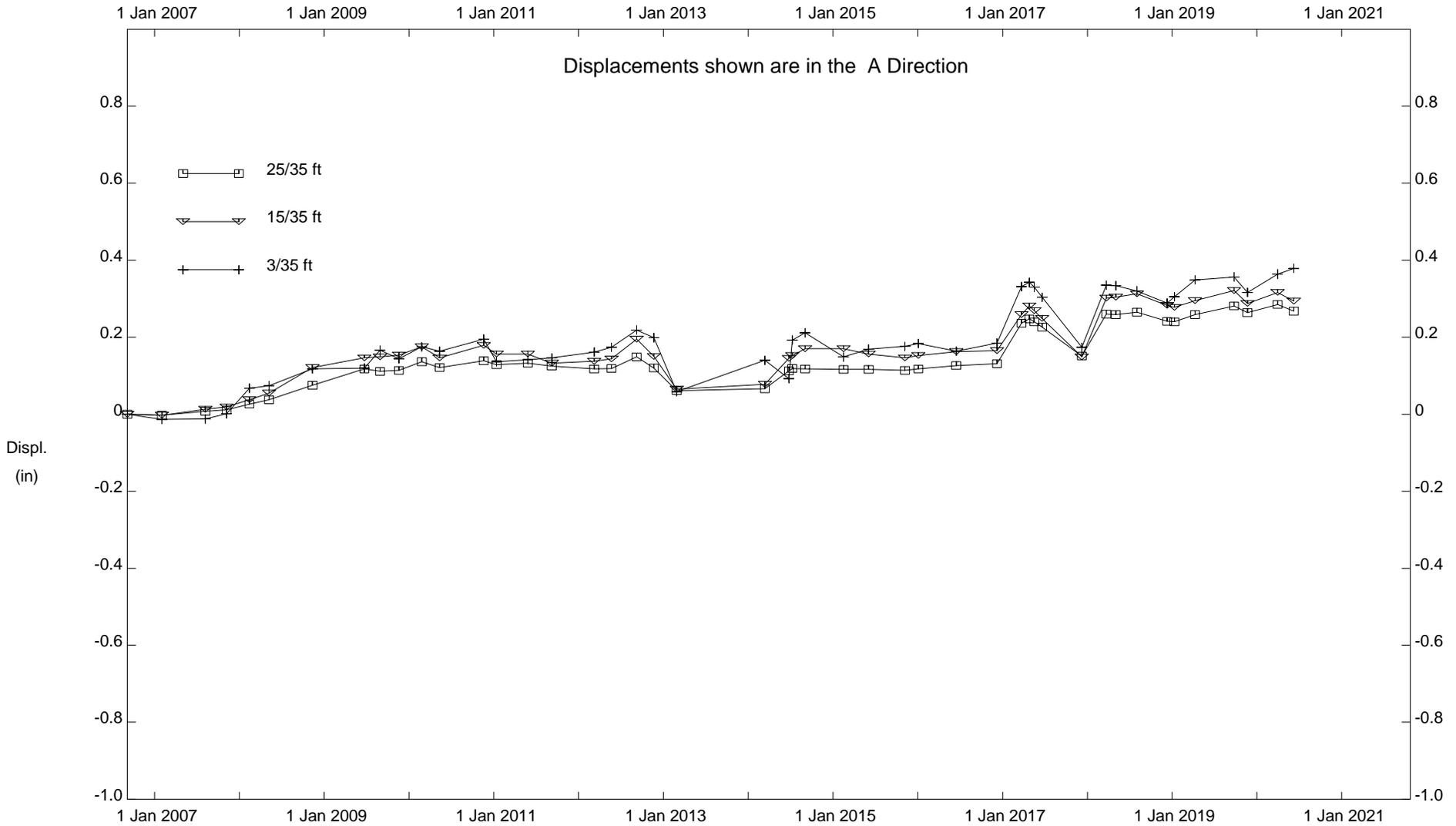
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Assessment District 98-3, Inclinometer SI-1A
City of Malibu

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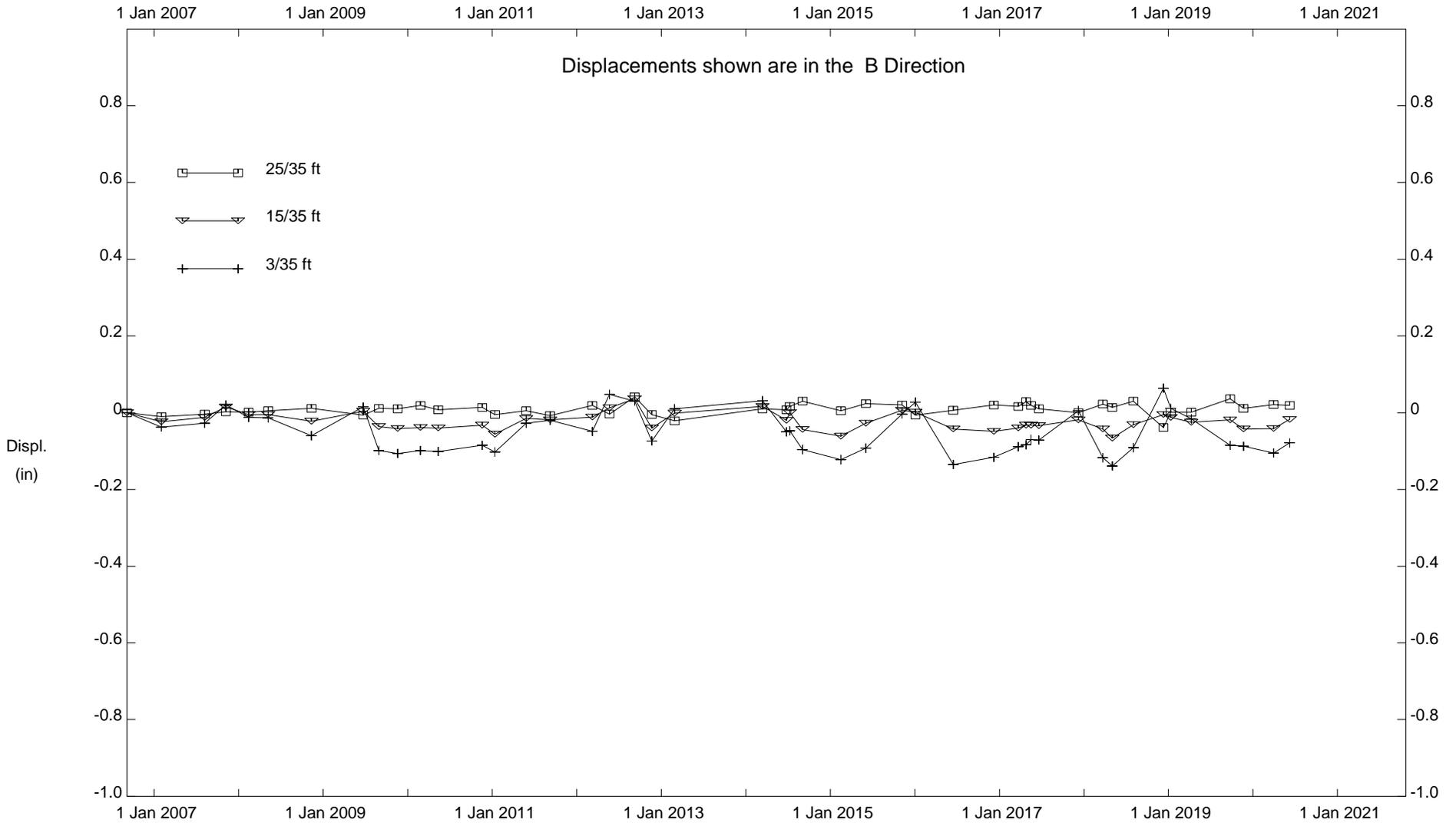
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Assessment District 98-3, Inclinator SI-1A

City of Malibu

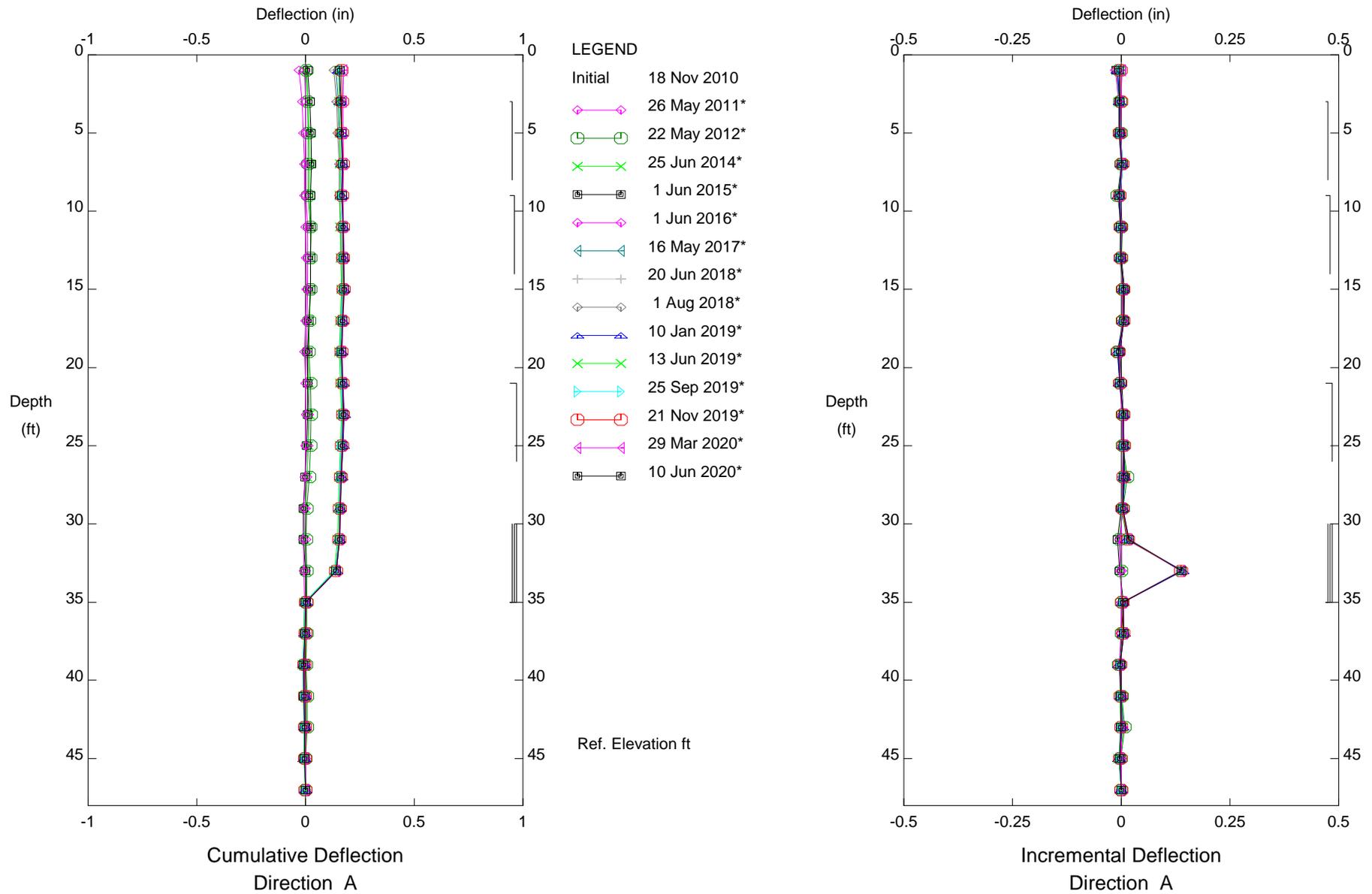
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Assessment District 98-3, Inclinometer SI-1A

City of Malibu

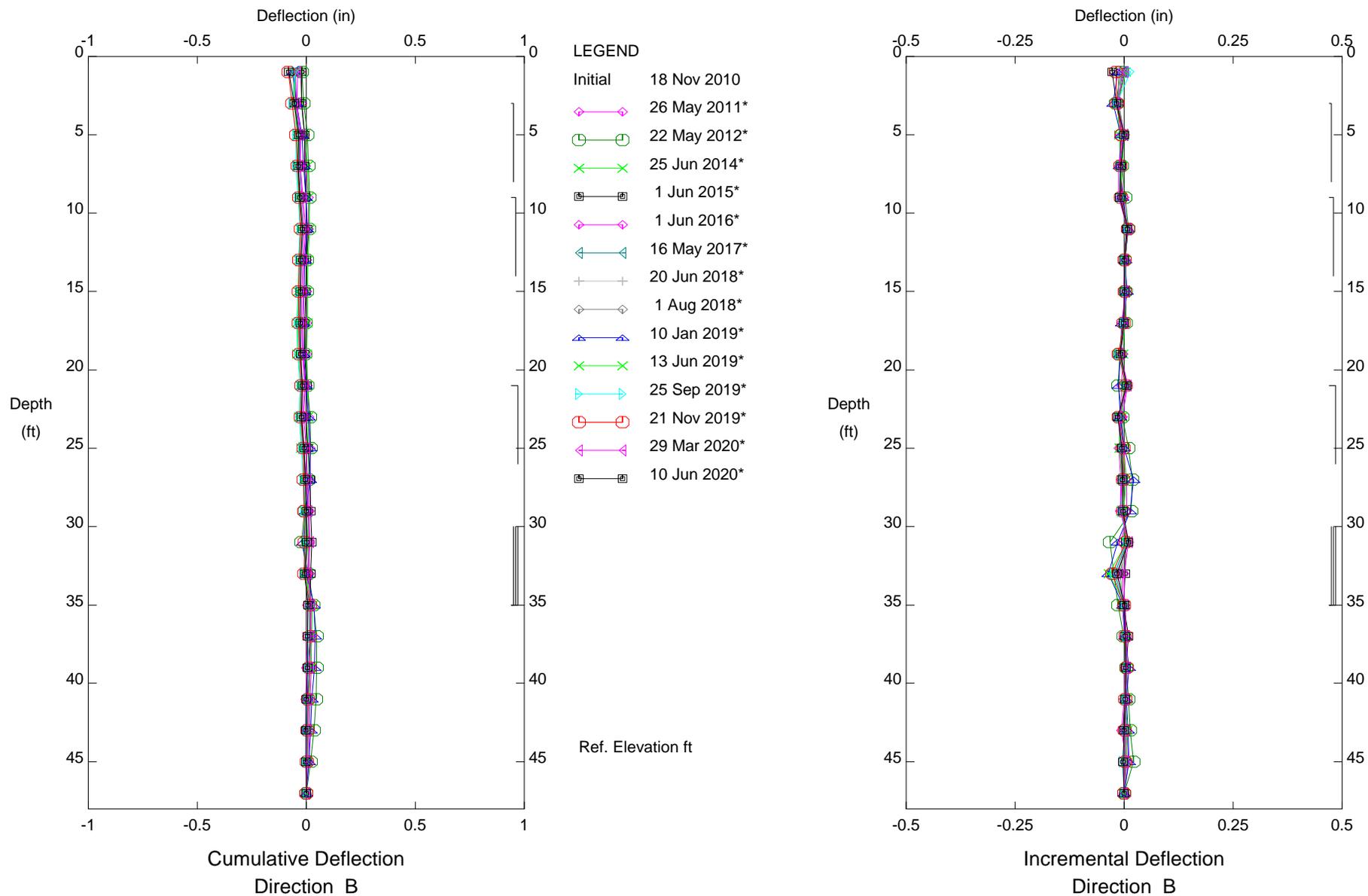
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Assessment District 98-3, Inclinometer SI-2A
City of Malibu

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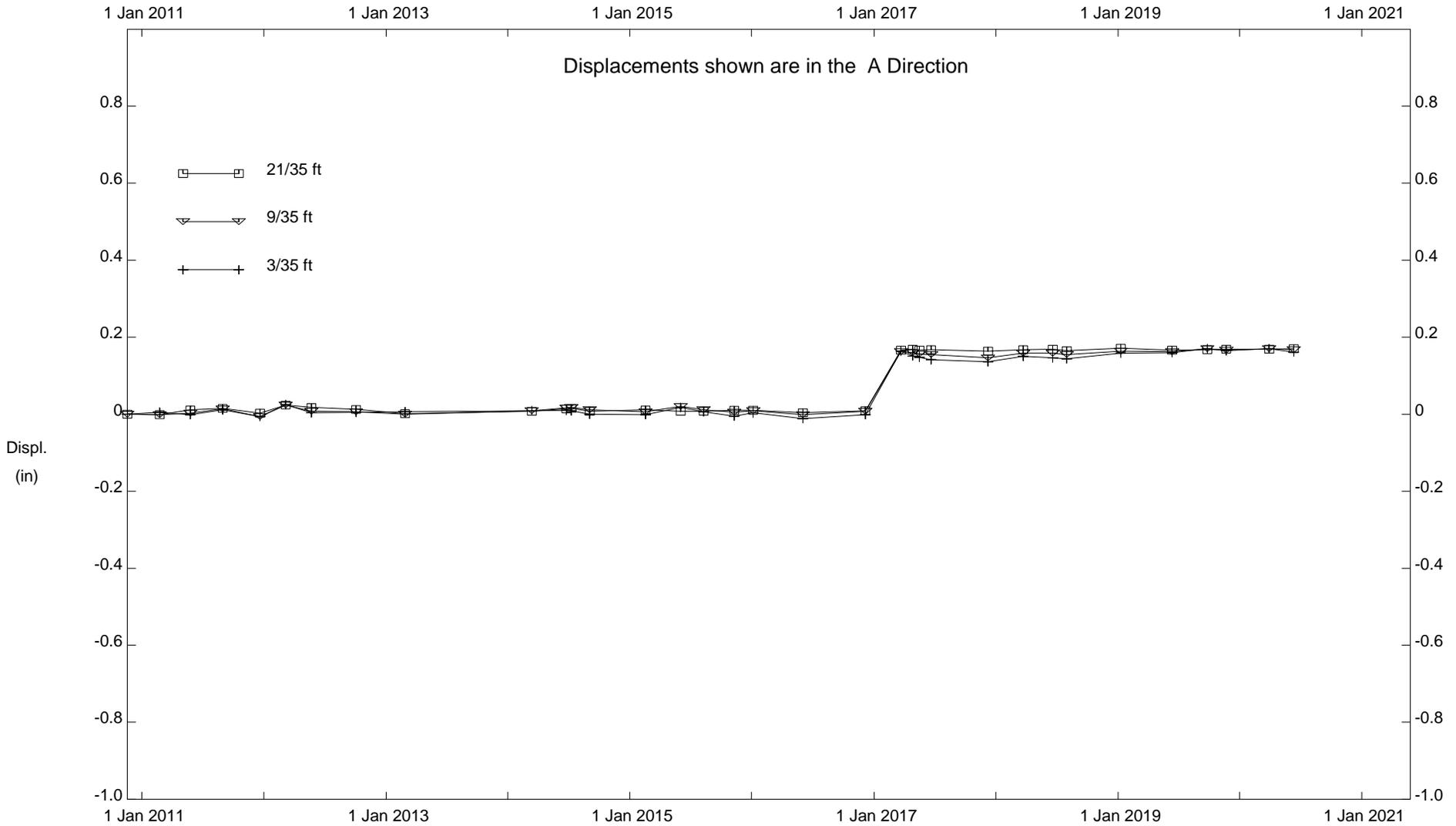
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Assessment District 98-3, Inclinometer SI-2A
City of Malibu

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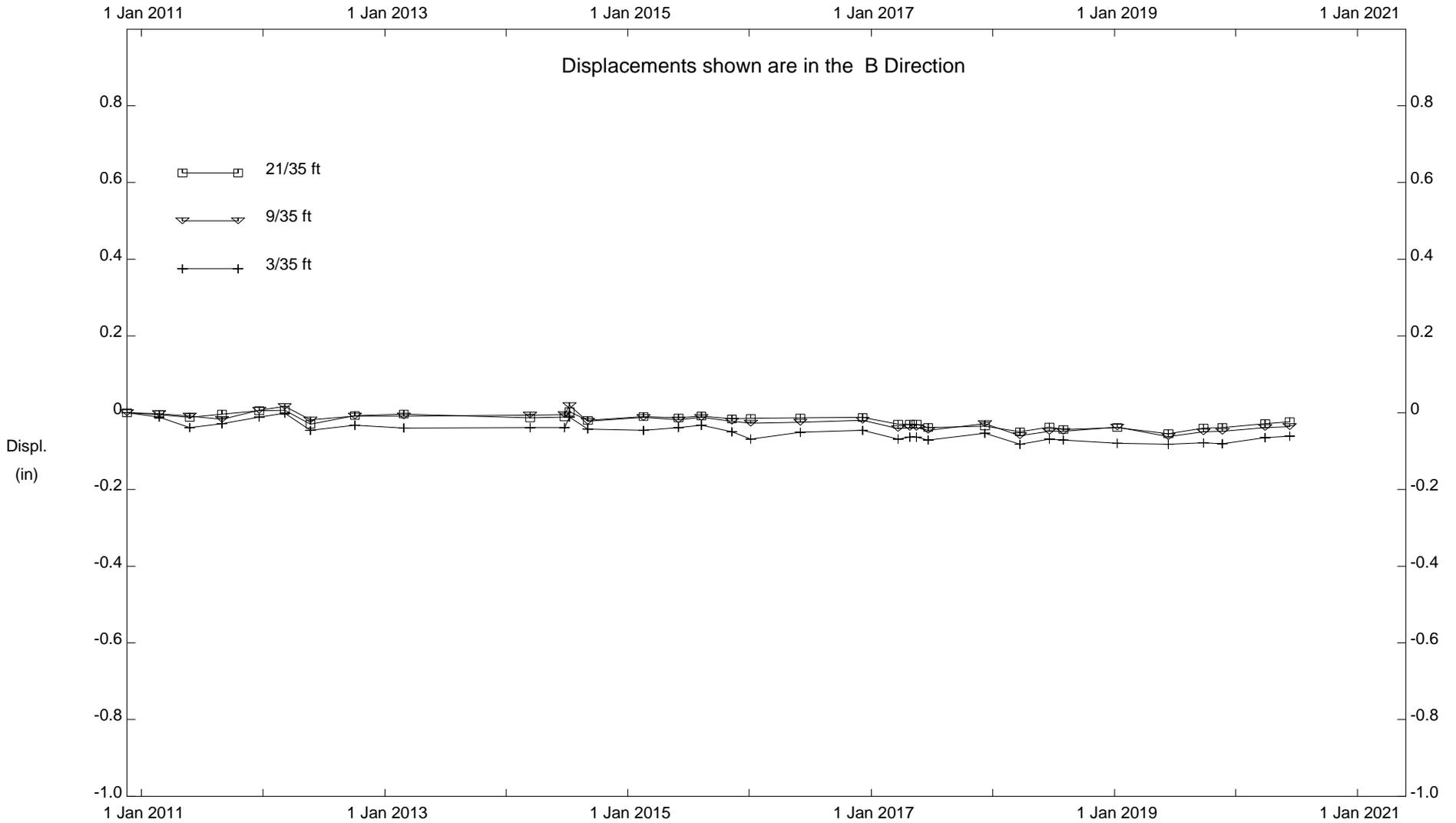
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Assessment District 98-3, Inclinometer SI-2A

City of Malibu

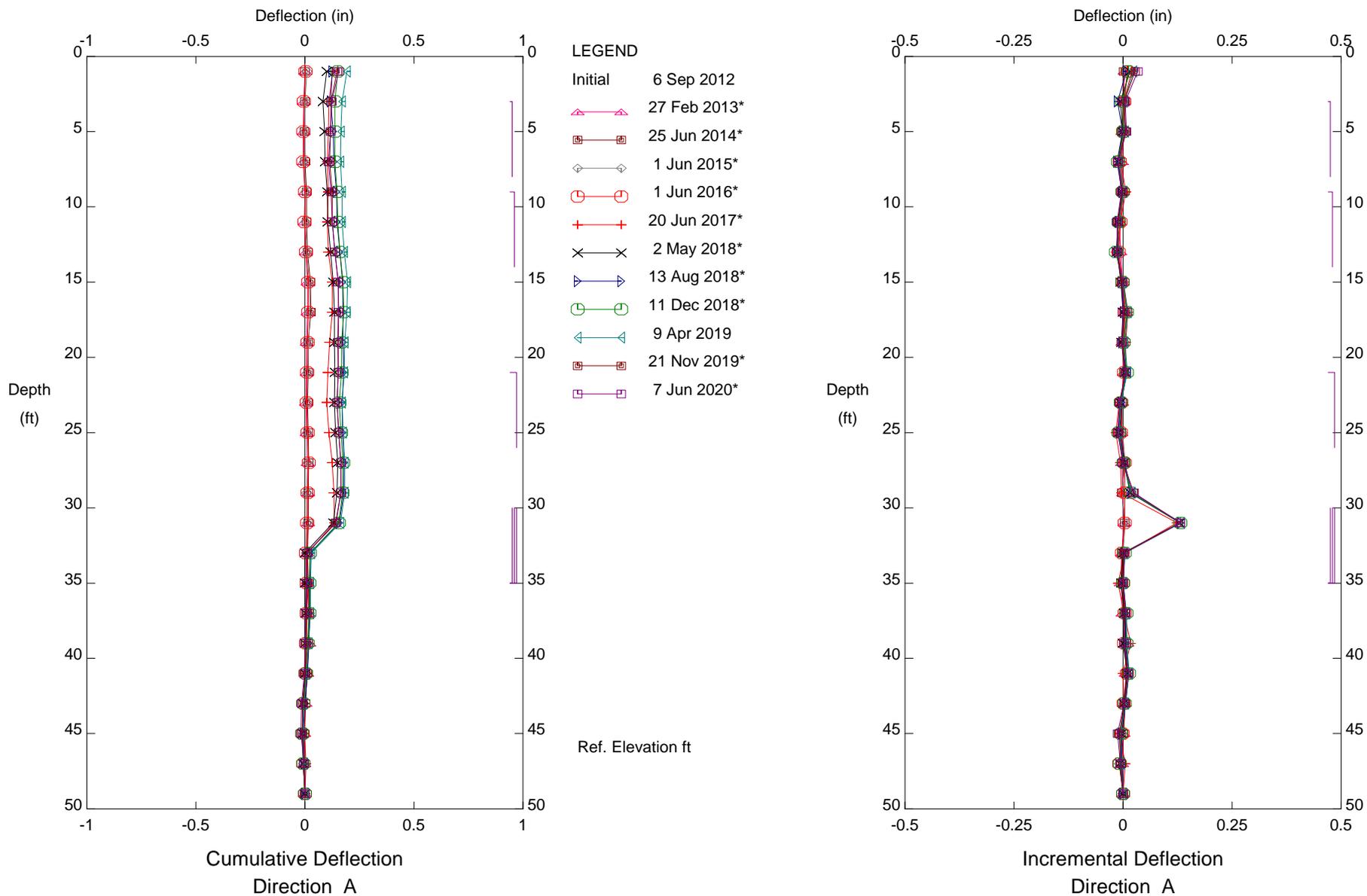
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Assessment District 98-3, Inclinometer SI-2A

City of Malibu

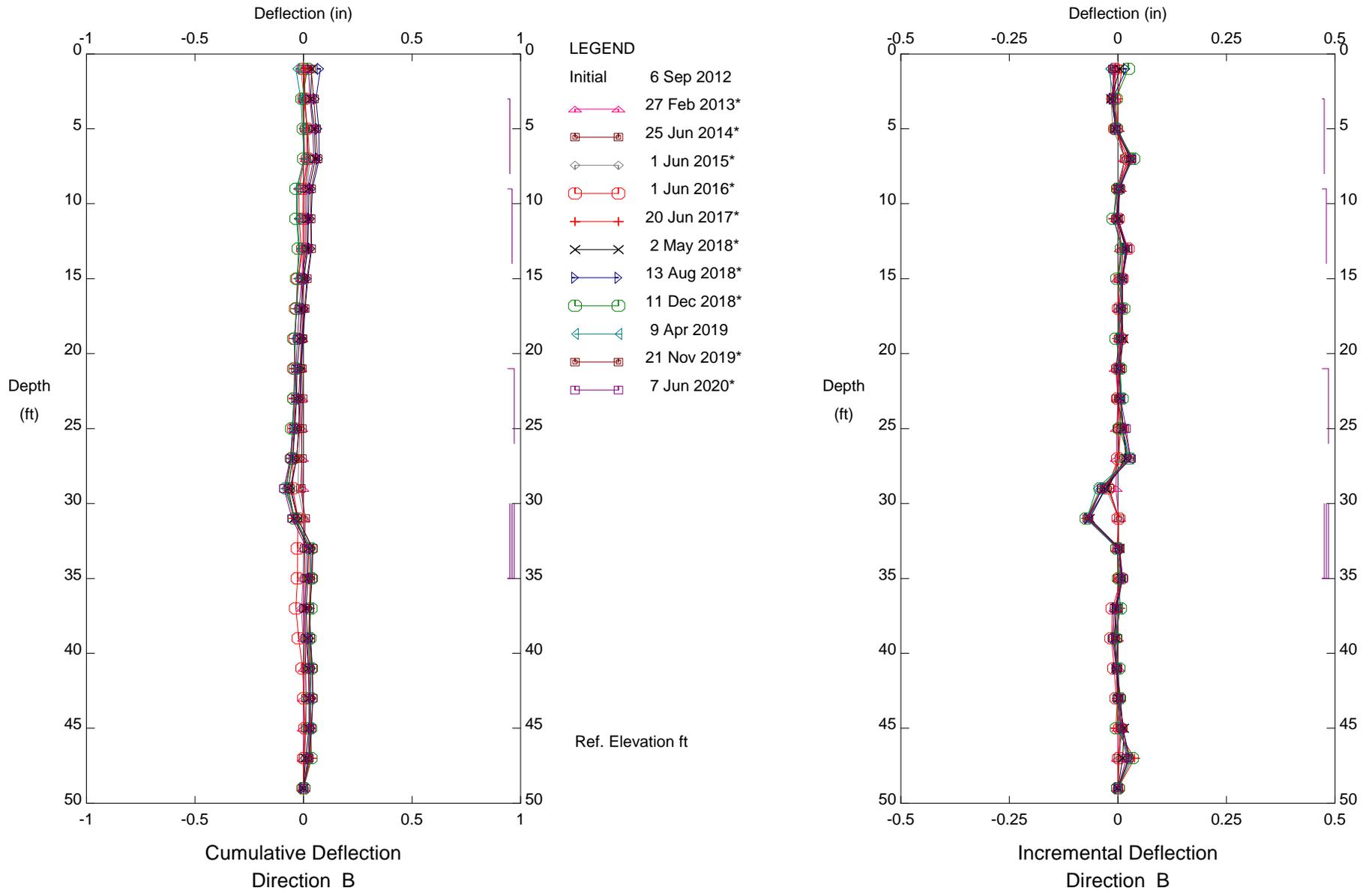
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Assessment District 98-3, Inclinometer SI-4A
City of Malibu

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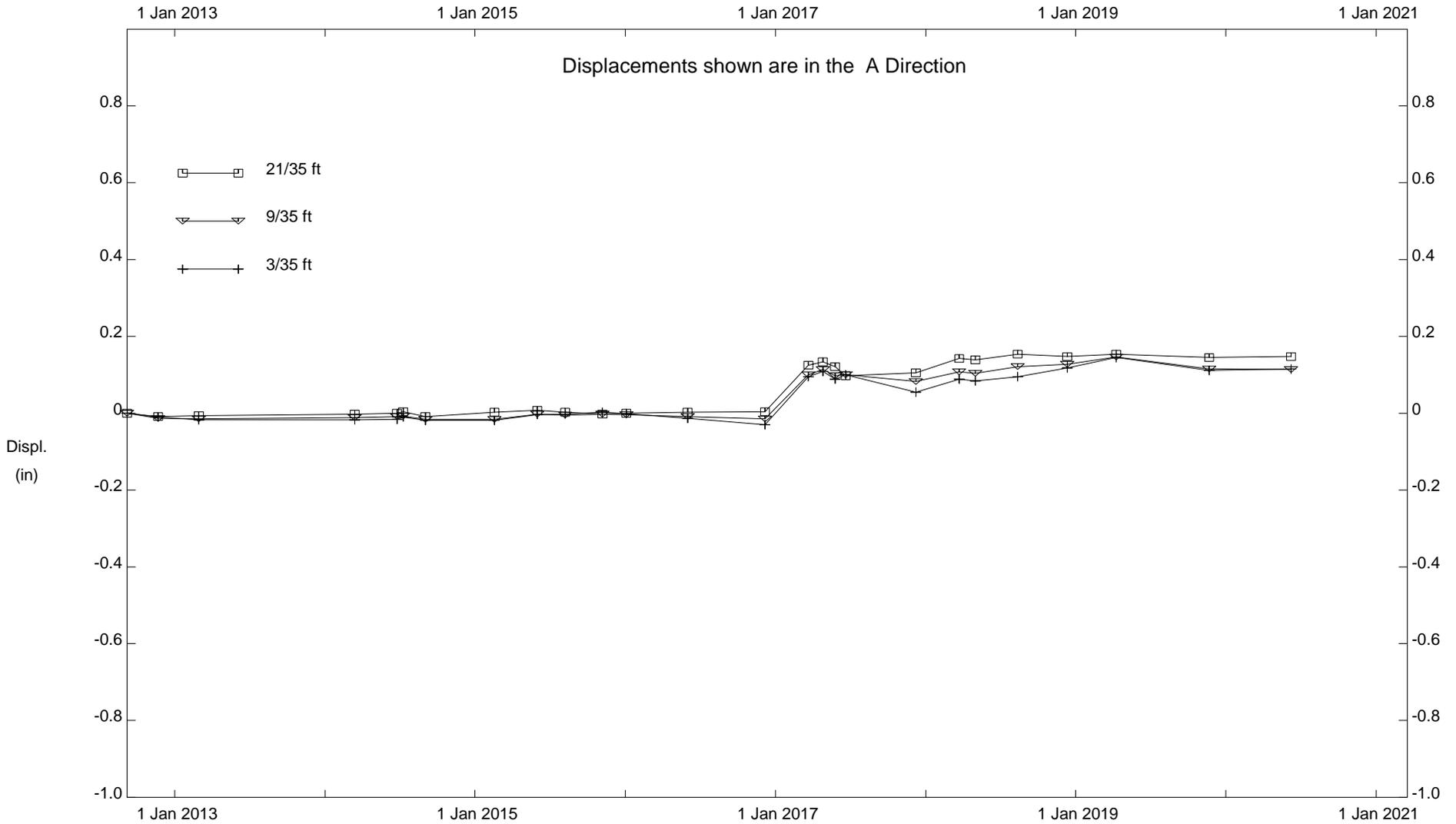
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Assessment District 98-3, Inclinometer SI-4A
City of Malibu

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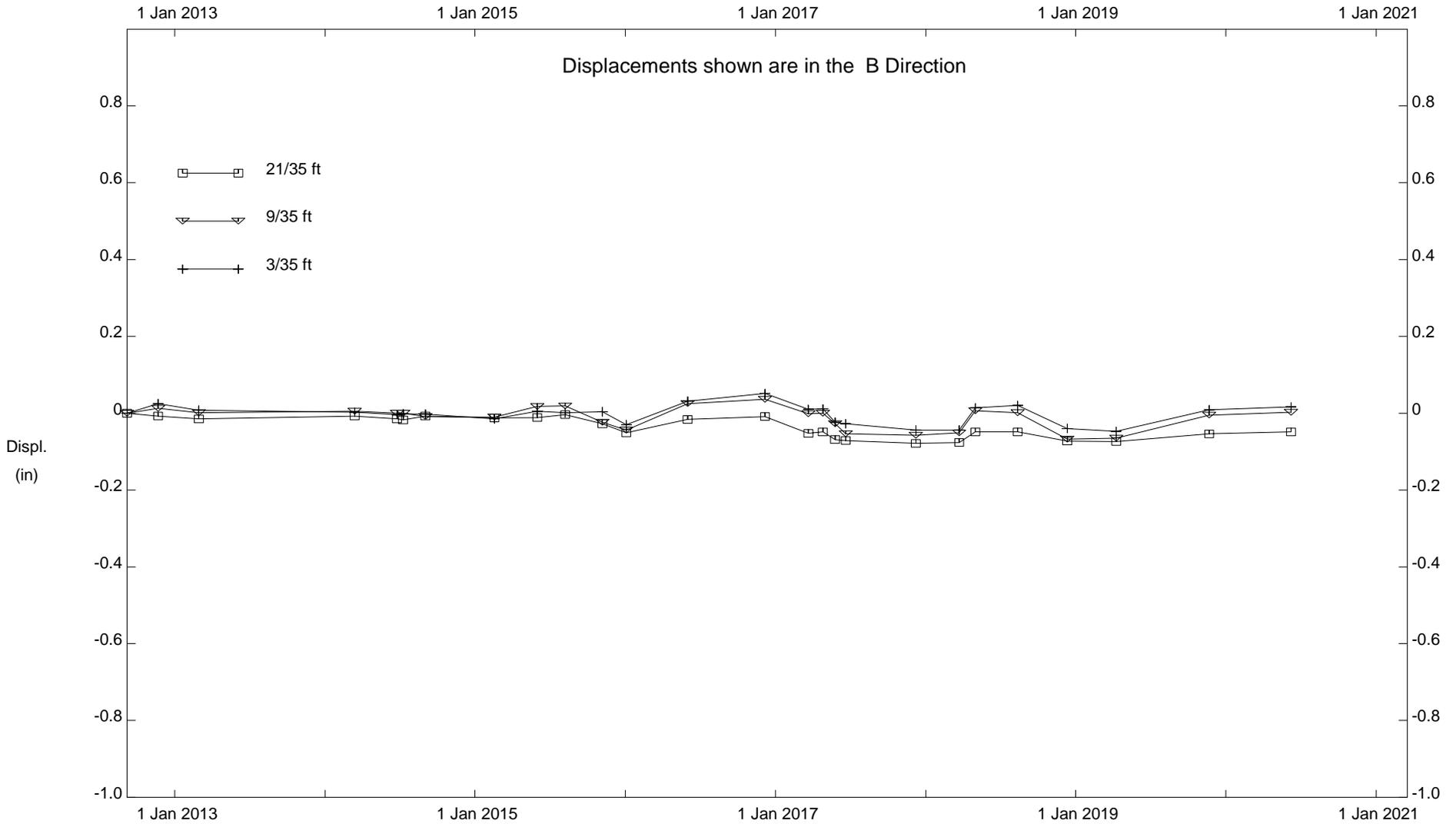
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Assessment District 98-3, Inclinometer SI-4A

City of Malibu

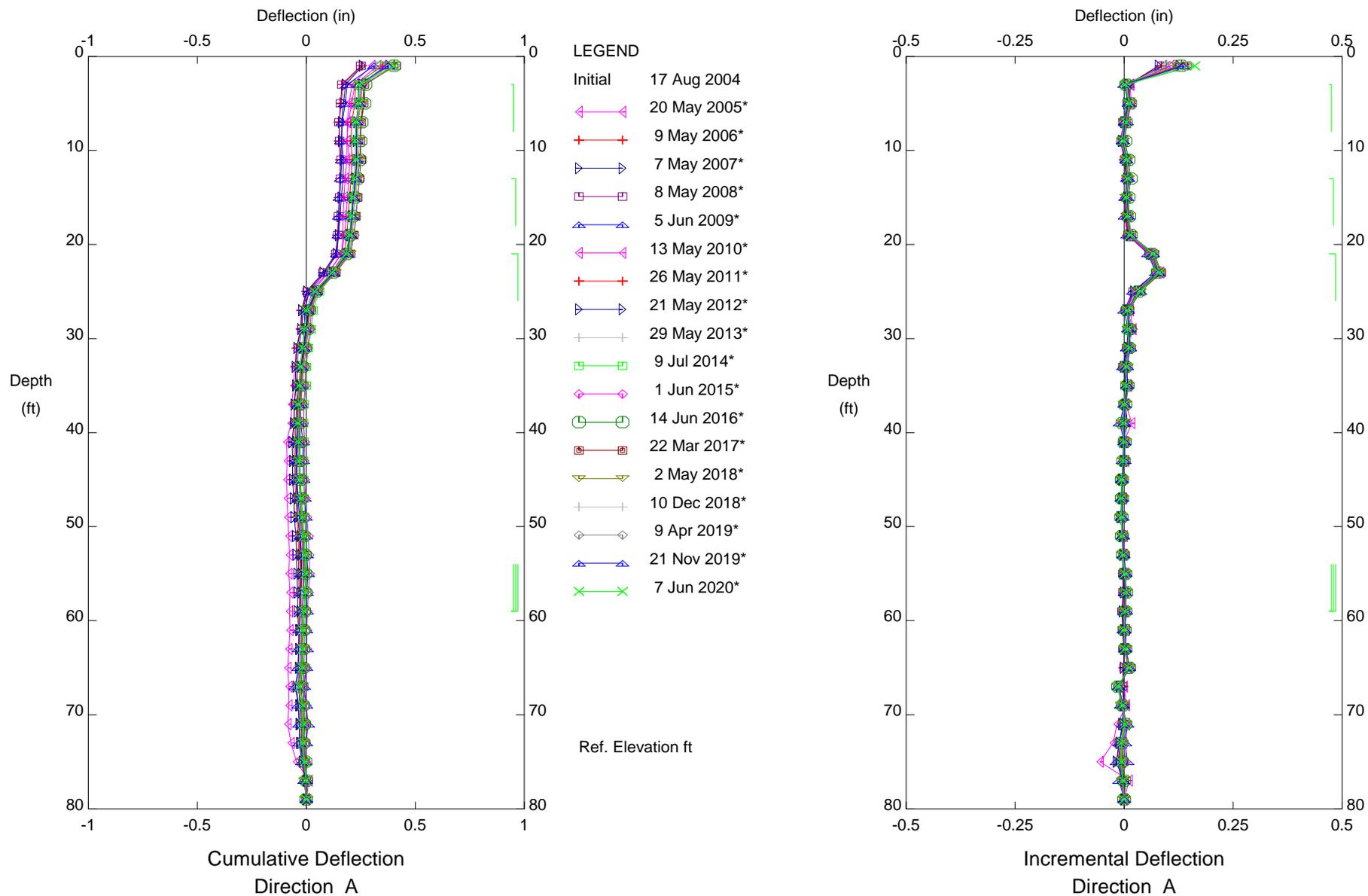
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Assessment District 98-3, Inclinometer SI-4A

City of Malibu

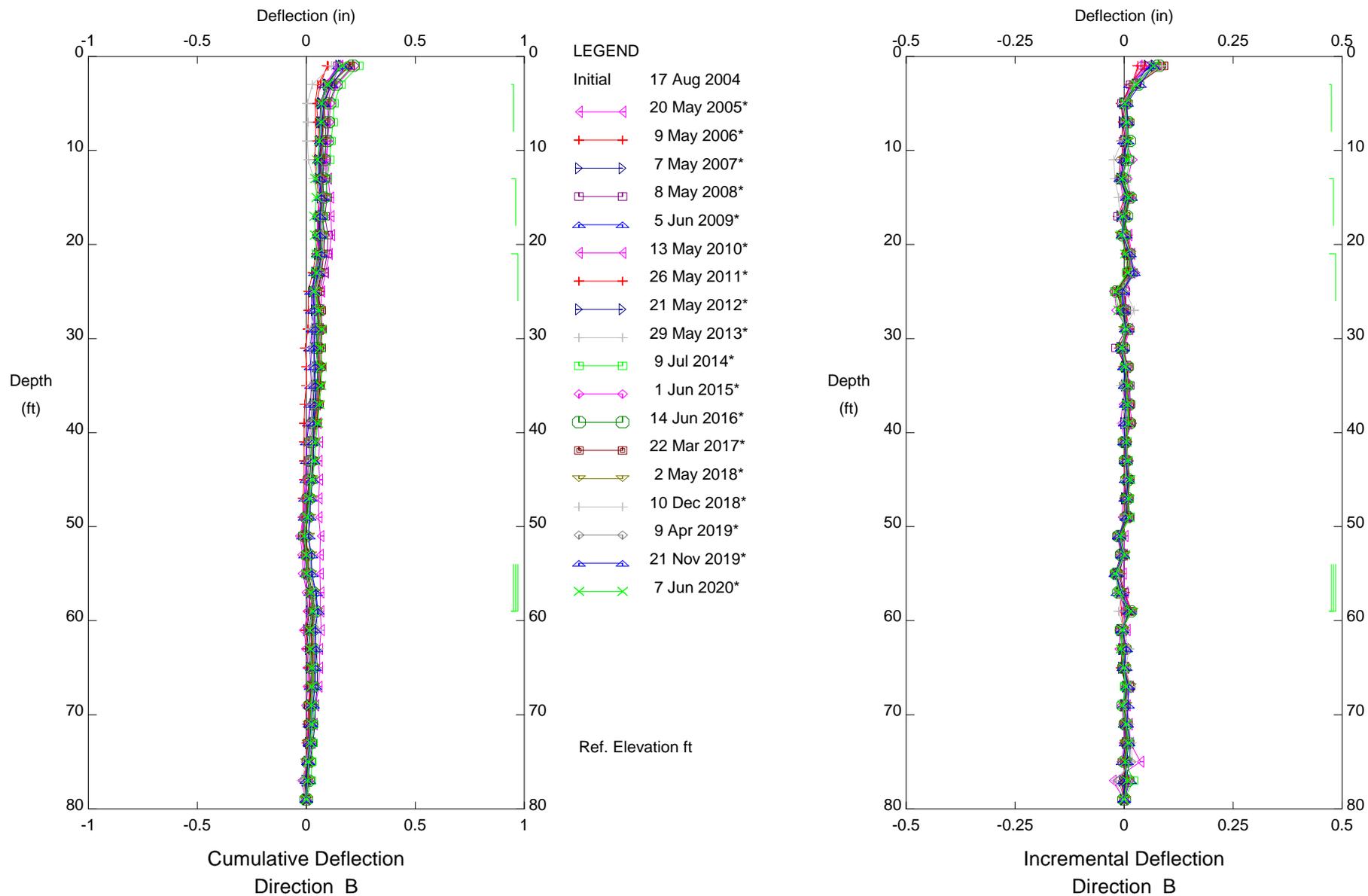
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Assessment District 98-3, Inclinometer SI-5
City of Malibu

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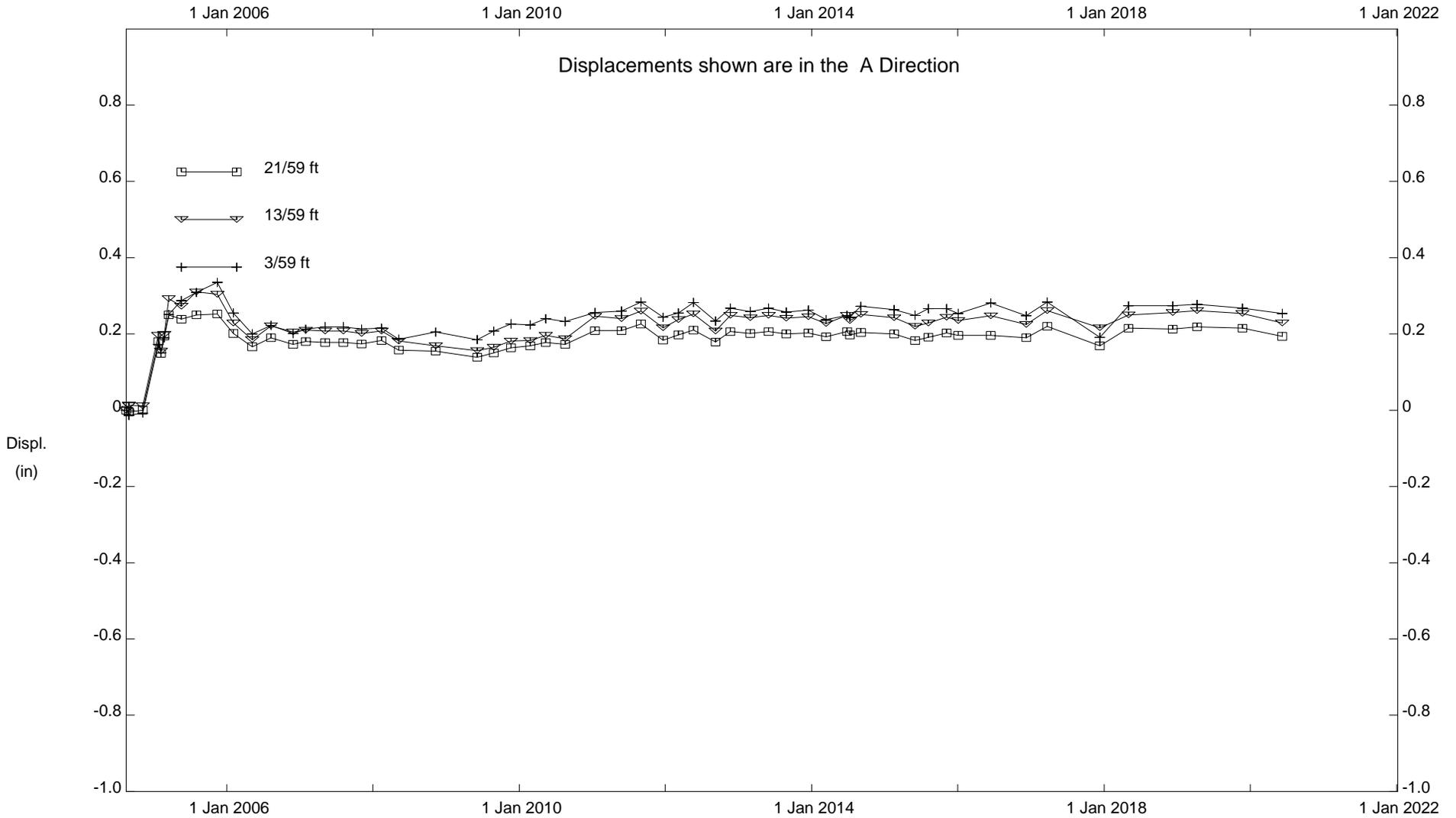


Assessment District 98-3, Inclinometer SI-5

City of Malibu

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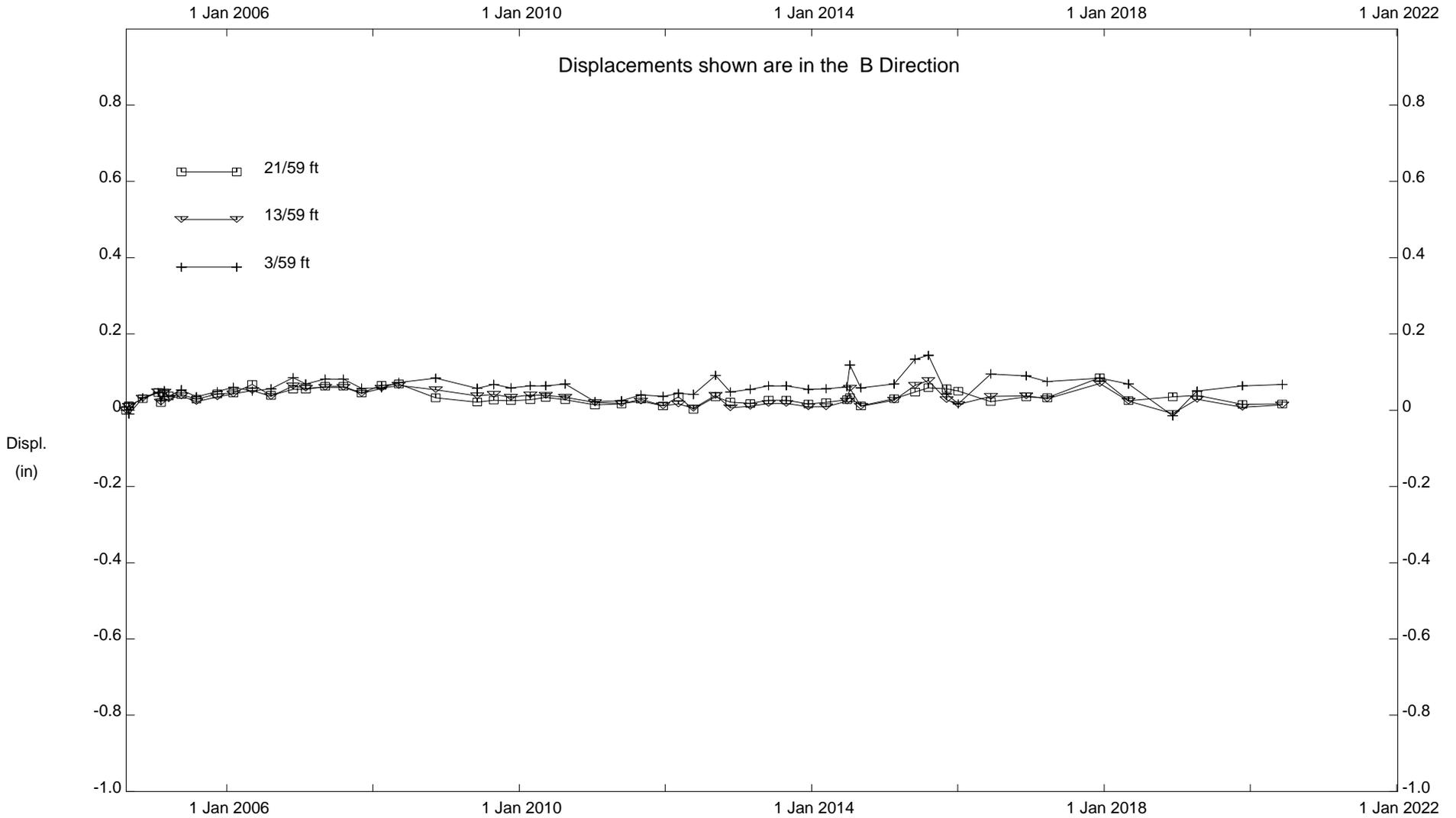
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Assessment District 98-3, Inclinator SI-5

City of Malibu

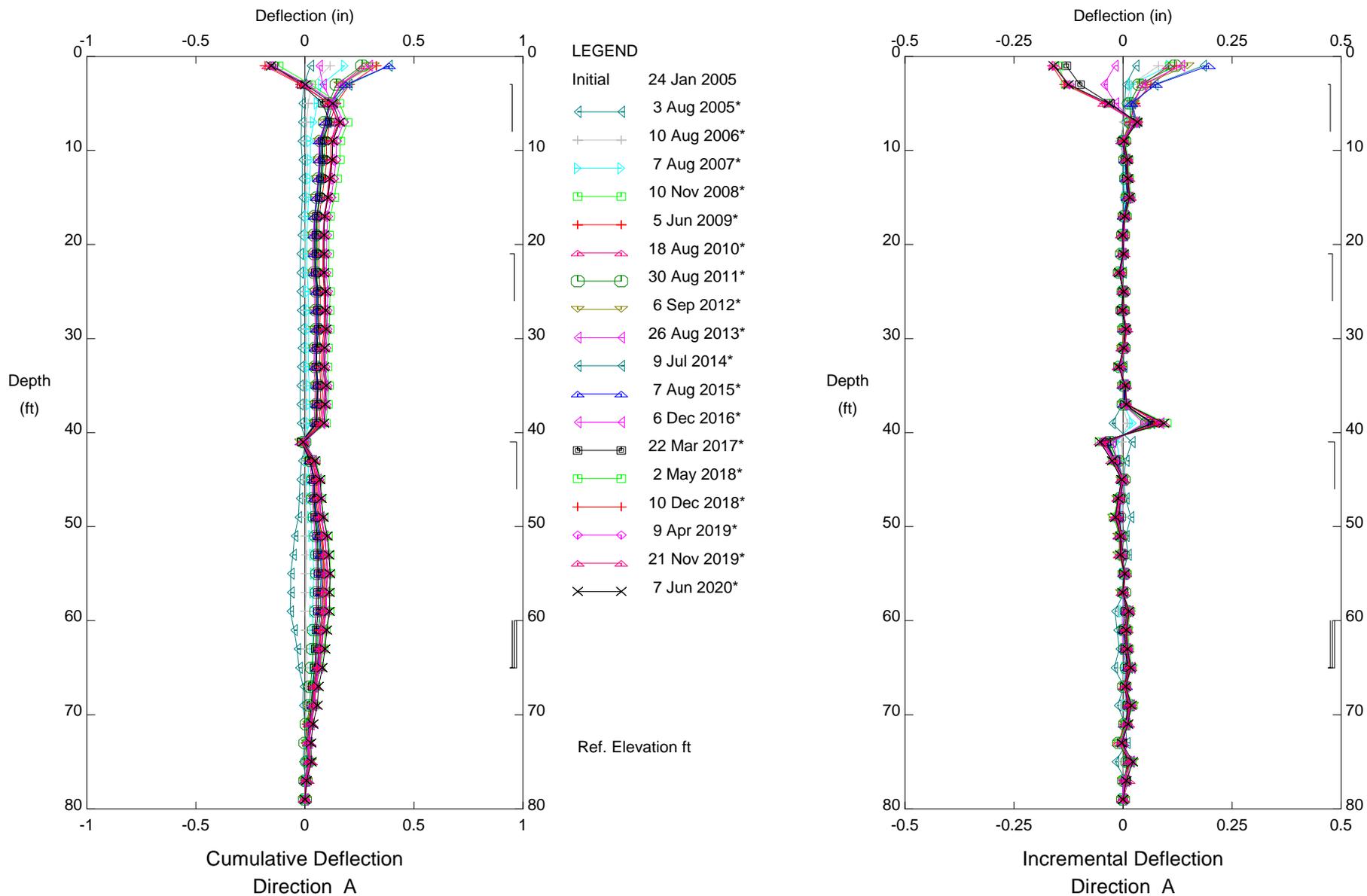
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Assessment District 98-3, Inclinator SI-5

City of Malibu

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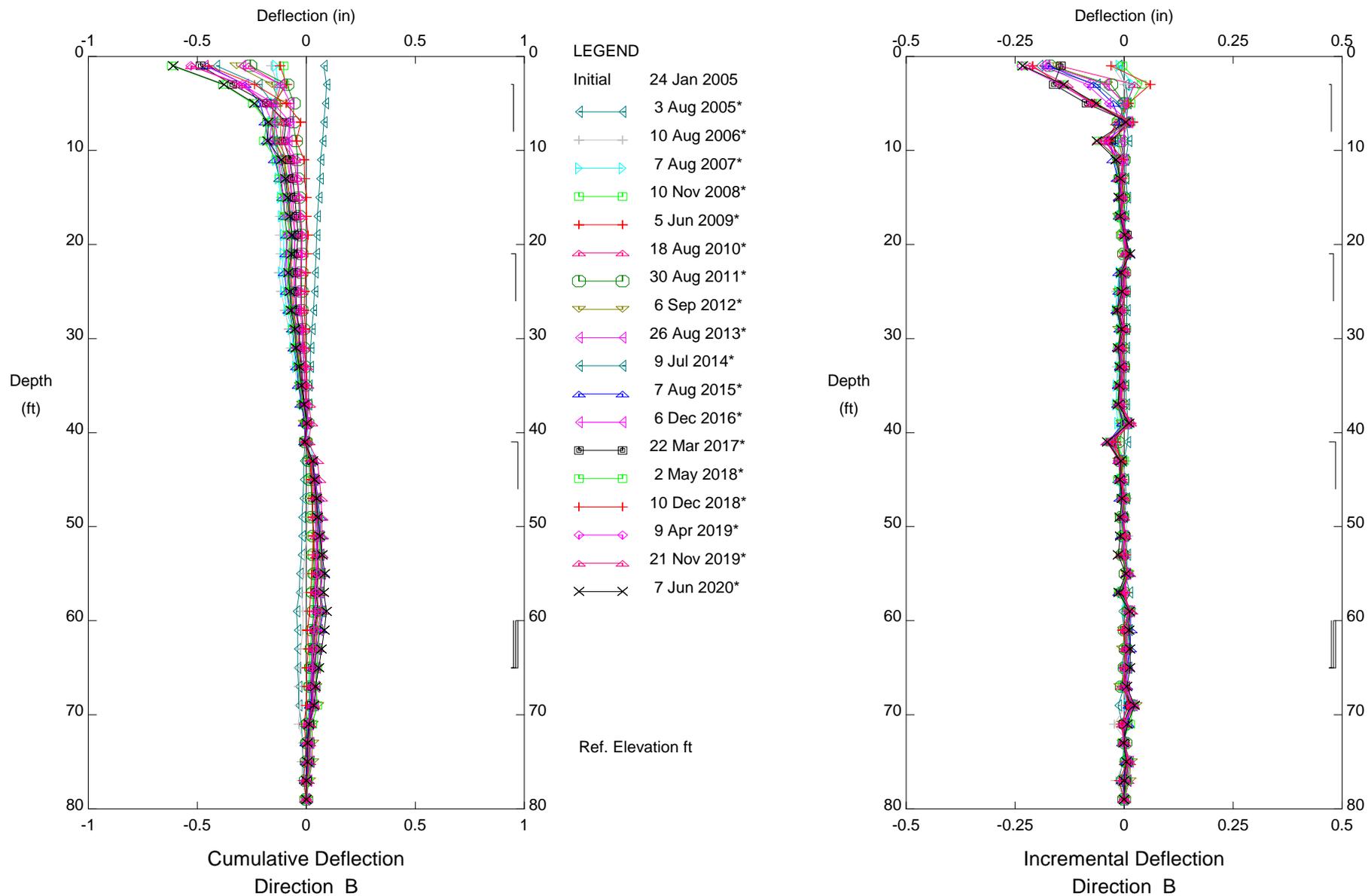


Assessment District 98-3, Inclinator SI-6

City of Malibu

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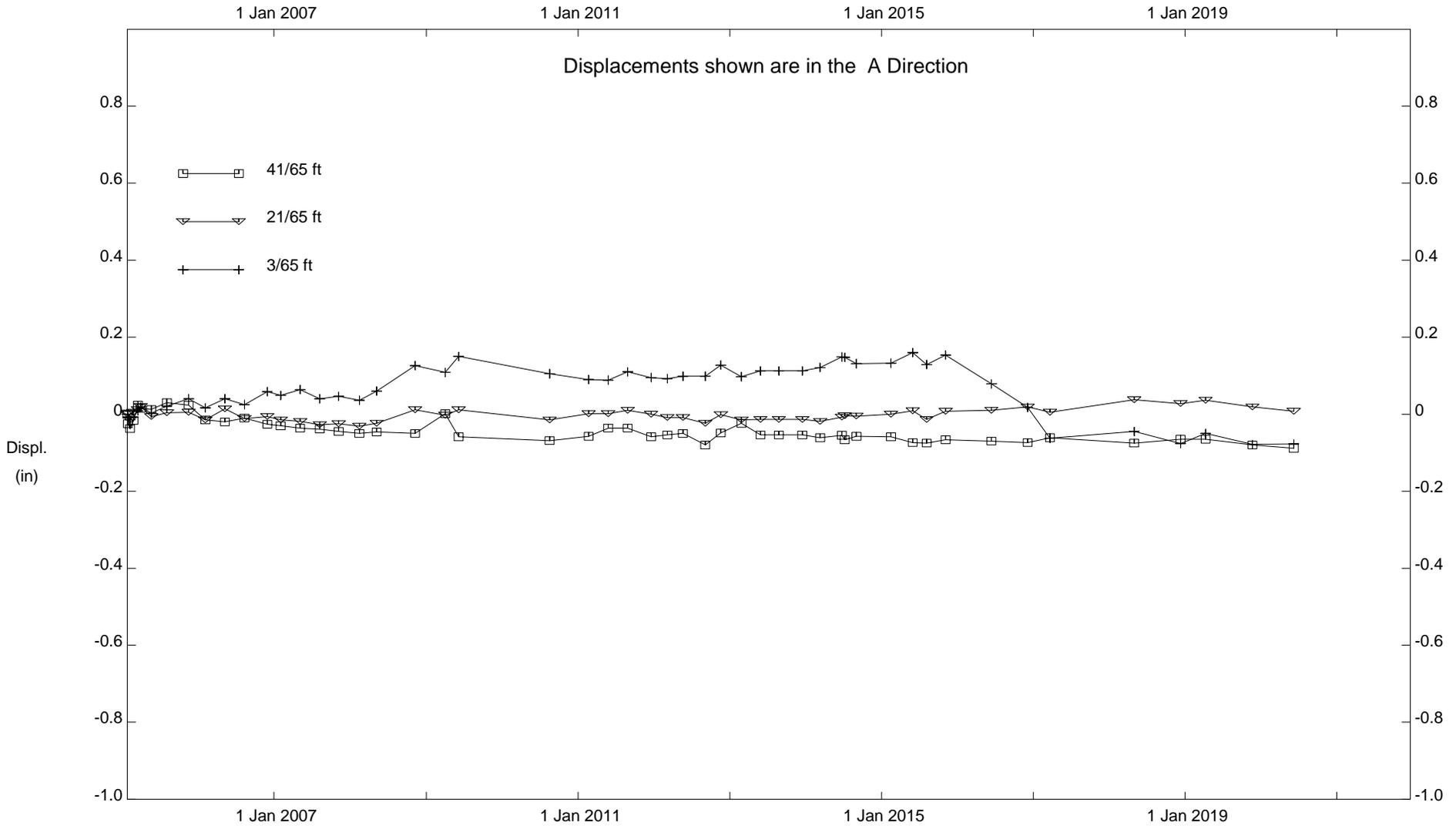


Assessment District 98-3, Inclinometer SI-6

City of Malibu

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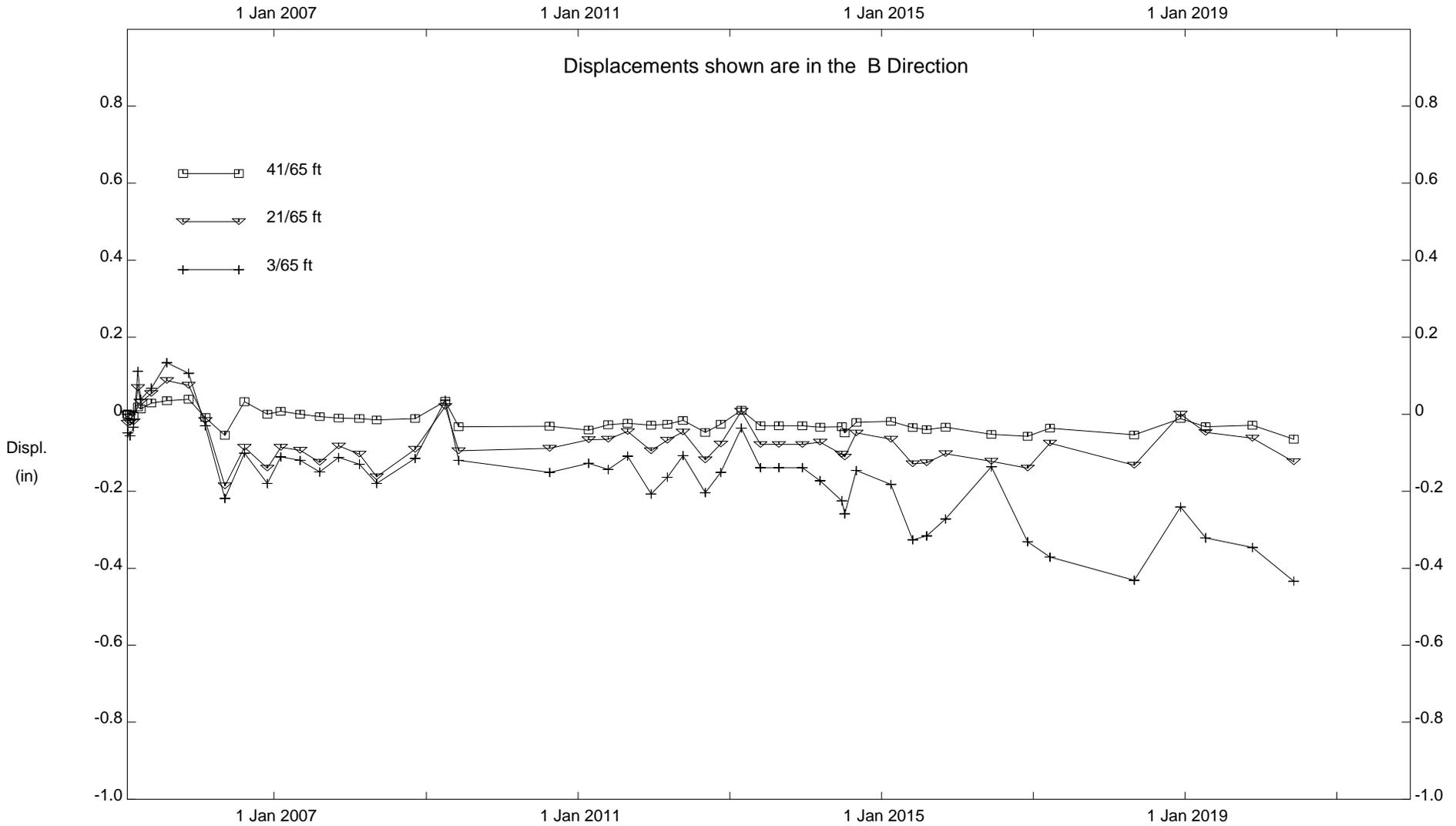
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Assessment District 98-3, Inclinator SI-6

City of Malibu

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Assessment District 98-3, Inclinator SI-6

City of Malibu