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Date: April 20, 2023

Project Number: 19-009

Subject: 301 Mission Retrofit Supplemental Monitoring Report 102: Results as of April 19, 2023

CONTEXT

This supplemental memorandum summarizes results from the monitoring plan implemented at the 301 Mission property following the process established in a letter from Simpson, Gumpertz and Heger (SGH) to the San Francisco Department of Building Inspection (SFDBI) dated March 23, 2022. Instrumentation to temporarily monitor the structure during the excavation and shoring project phases was installed on April 20, 2022, including survey prisms installed at approximately one floor level above grade on the exterior of the building. This supplemental memorandum is for review only. It only contains ongoing monitoring information. This supplemental memorandum does not contain recommendations based upon the ongoing monitoring information.

PRESENTATION OF DATA

Figure S-01 presents the locations of the survey prisms (including both control and target prisms) as referenced in later figures.

Figure S-02 presents the differential horizontal movement toward the excavation at survey prisms installed at approximately one floor level above grade on the exterior of the building, as well as the average in each of the project north-south and east-west direction, since April 26, 2022, through April 19, 2023. Limits established in the aforementioned letter are included for reference.

Figure S-03 presents differential lateral roof deflection data due to shoring wall installation and excavation since April 26, 2022, through April 19, 2023. Limits established in the aforementioned letter are included for reference. Note that differential lateral roof deflection due to shoring wall installation and excavation is calculated following the aforementioned letter as:

$$\Delta_{R,NS} = \Delta_{R-prism,NS} - \Delta_{H,NS} - \alpha_0 T \quad (a)$$

$$\Delta_{R,NS} = \Delta_{R-prism,NS} - \Delta_{H,NS} - \alpha_{1,NS}(T - T_{1,NS}) - \alpha_0 T_{1,NS} \quad (b)$$

$$\Delta_{R,EW} = \Delta_{R-prism,EW} - \Delta_{H,EW} - \alpha_0 T \quad (c)$$

$$\Delta_{R,EW} = \Delta_{R-prism,EW} - \Delta_{H,EW} - \alpha_{1,EW}(T - T_{1,EW}) - \alpha_0 T_{1,EW} \quad (d)$$



where: Δ_R is the computed differential lateral roof deflection due to shoring wall installation and excavation during shoring wall installation (a or c) or during excavation (b or d) for the project north-south (a and b) and project east-west (c and d) directions;
 $\Delta_{R-prism}$ is the differential lateral roof deflection obtained from prism data for the project north-south (a and b) and project east-west (c and d) directions;
 Δ_H is the average differential horizontal movement “at-grade” for the project north-south (a and b) and project east-west (c and d) directions;
 α_0 is the weekly lateral roof deflection rate from the two months of monitoring conducted immediately prior to the shoring wall installation (i.e., monitoring data from February 22, 2022, through April 26, 2022);
 $\alpha_{1,NS}$ is the weekly lateral roof deflection rate from the two months of monitoring conducted immediately prior to starting the Mission Street excavation (i.e., monitoring data from August 15, 2022, through October 16, 2022);
 $\alpha_{1,EW}$ is the weekly lateral roof deflection rate from the two months of monitoring conducted immediately prior to starting the Fremont Street excavation (i.e., monitoring data from December 1, through February 2, 2023);
 T is the number of weeks since initiation of shoring wall installation or excavation;
 $T_{1,NS}$ is the number of weeks between the initiation of shoring wall installation and starting the Mission Street excavation (i.e., between April 26, 2022, and October 18, 2022); and,
 $T_{1,EW}$ is the number of weeks between the initiation of shoring wall installation and starting the Fremont Street excavation (i.e., between December 1, 2022, and February 2, 2023).

Figure S-04 presents rates of differential lateral roof deflection data due to shoring wall installation and excavation since April 26, 2022, through April 19, 2023. Limits established in the aforementioned letter are included for reference. Note that the rates are calculated as:

$$\frac{d\Delta_R}{dT} \approx \frac{\Delta_{R,t} - \Delta_{R,t-1}}{T_t - T_{t-1}}$$

where: t is an index representing the current instance in time; and
 $t - 1$ is an index representing the previous instance in time.

CLOSING

Please contact us if you have any comments or questions, or if you would like to discuss the results presented in this memorandum.

FIGURES

Figure S-01 – Instrument Location Map: Horizontal Survey Control and Target Points at First Level

Figure S-02 – Differential Horizontal Movement Toward Excavation Since 04/26/2022 through 04/19/2023

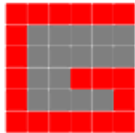
Figure S-03 – Differential Lateral Roof Deflection Data due to Shoring Wall Installation and Excavation since 04/26/2022 through 04/19/2023

Figure S-04 – Rate of Differential Lateral Roof Deflection Data due to Shoring Wall Installation and Excavation since 04/26/2022 through 04/19/2023



DATES

2022/04/26-28: Fremont St. Shoring Pile Test Installation
2022/05/03: Fremont St. Shoring Pile Installation Start
2022/05/26: Fremont St. Shoring Pile Installation on Hold
2022/06/13: Mission St. Shoring Pile Installation Start
2022/08/05: Mission St. Shoring Pile Installation End
2022/09/08: Mission St. Jet Grouting Start
2022/10/05: Mission St. Jet Grouting End
2022/10/08: Fremont St. Shoring Pile Installation Resumed
2022/10/17: Mission St. Excavation Start
2022/11/12: Fremont St. Shoring Pile Installation End
2022/11/16: Mission St. Excavation to Mat Extension Depth
2022/12/07: Fremont St. Jet Grouting Start
2023/01/23-27: Mission St. First Stage Load Transfer
2023/02/03: Fremont St. Excavation Start
2023/03/30: Fremont St. Jet Grouting End



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EXHIBIT MAP

301 MISSION ST
 COUNTY OF SAN FRANCISCO
 STATE OF CALIFORNIA
 APRIL 2022

Project No. 0220-00383 HORIZONTAL TARGET EXHIBIT.dwg

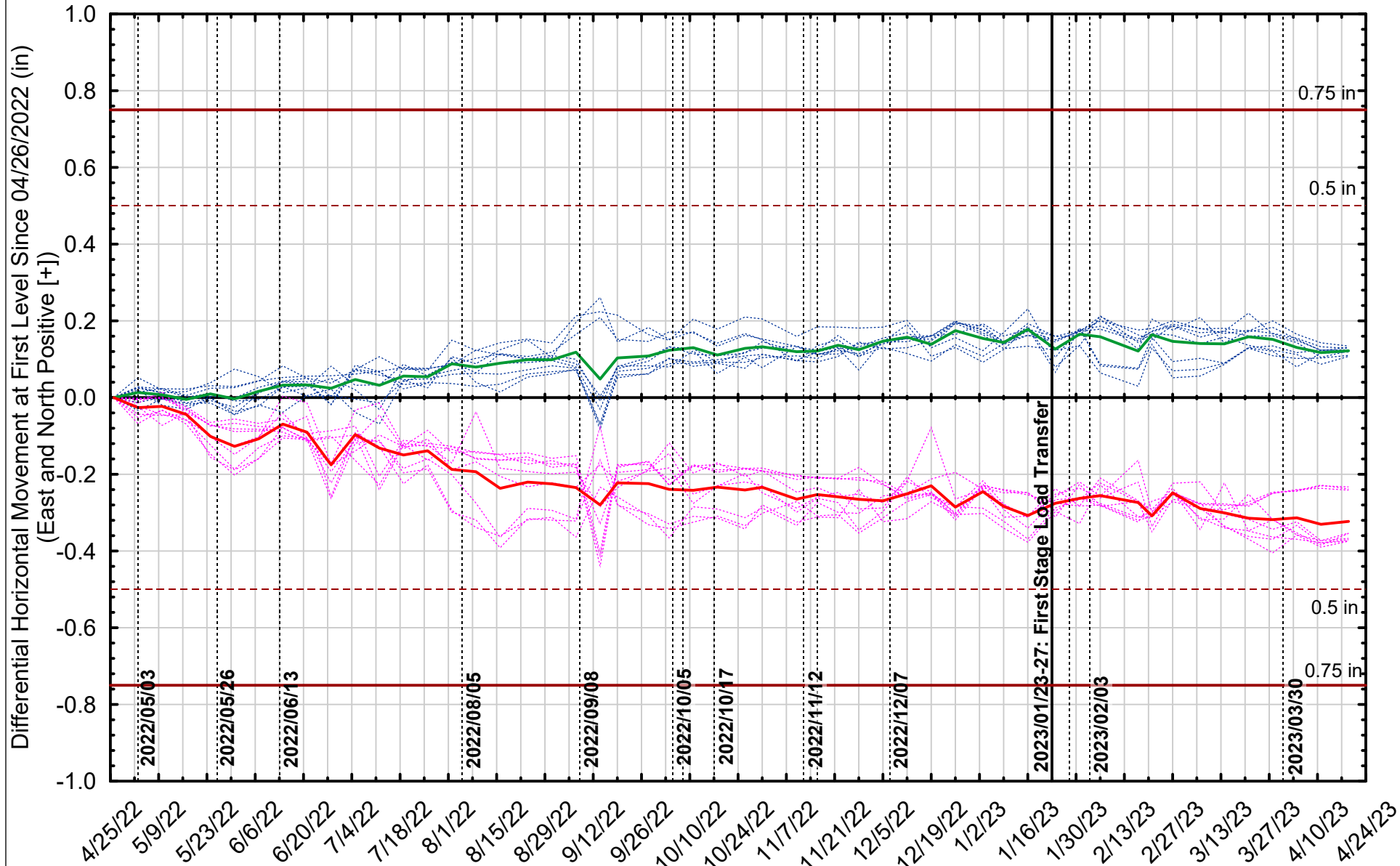
Note: Image provided by Guida
 on 04/26/2022

Project No: 19-009.00	Date: 5/3/2022	Created By: NBW	Checked By: DGM	Figure No: 102S-01
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INSTRUMENT LOCATION MAP
 HORIZONTAL SURVEY CONTROL AND TARGET POINTS AT FIRST LEVEL

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
 City and County of San Francisco, California



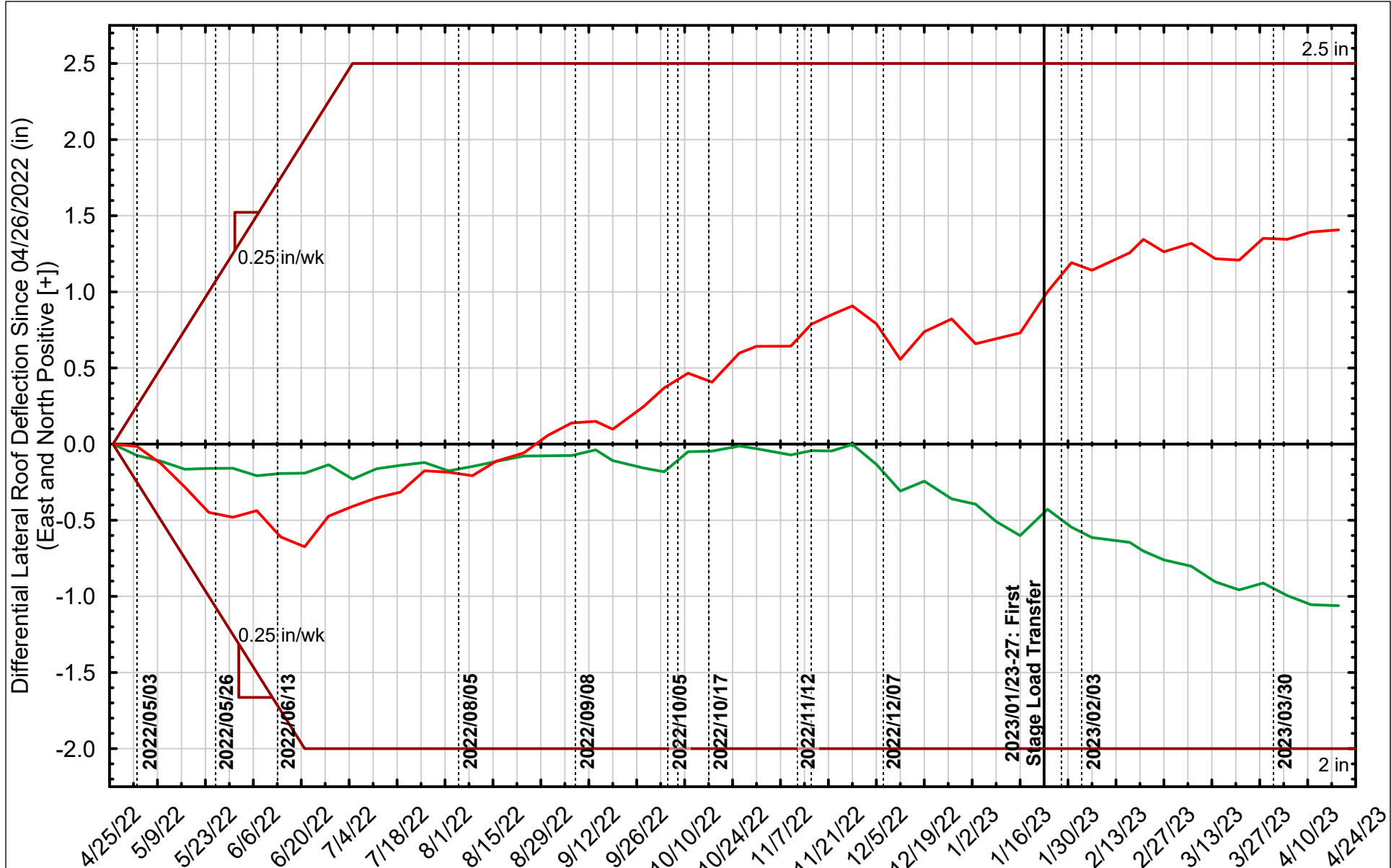
- Horizontal A Limit
- Horizontal B Limit
- Individual N-S
- Average N-S
- Individual E-W
- Average E-W

Project No: 19-009.00	Date: 4/20/2023	Created By: NBW	Checked By: DGM	Figure No: 102S-02
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DIFFERENTIAL HORIZONTAL MOVEMENT TOWARD EXCAVATION
SINCE 04/26/2022 THROUGH 04/19/2023

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

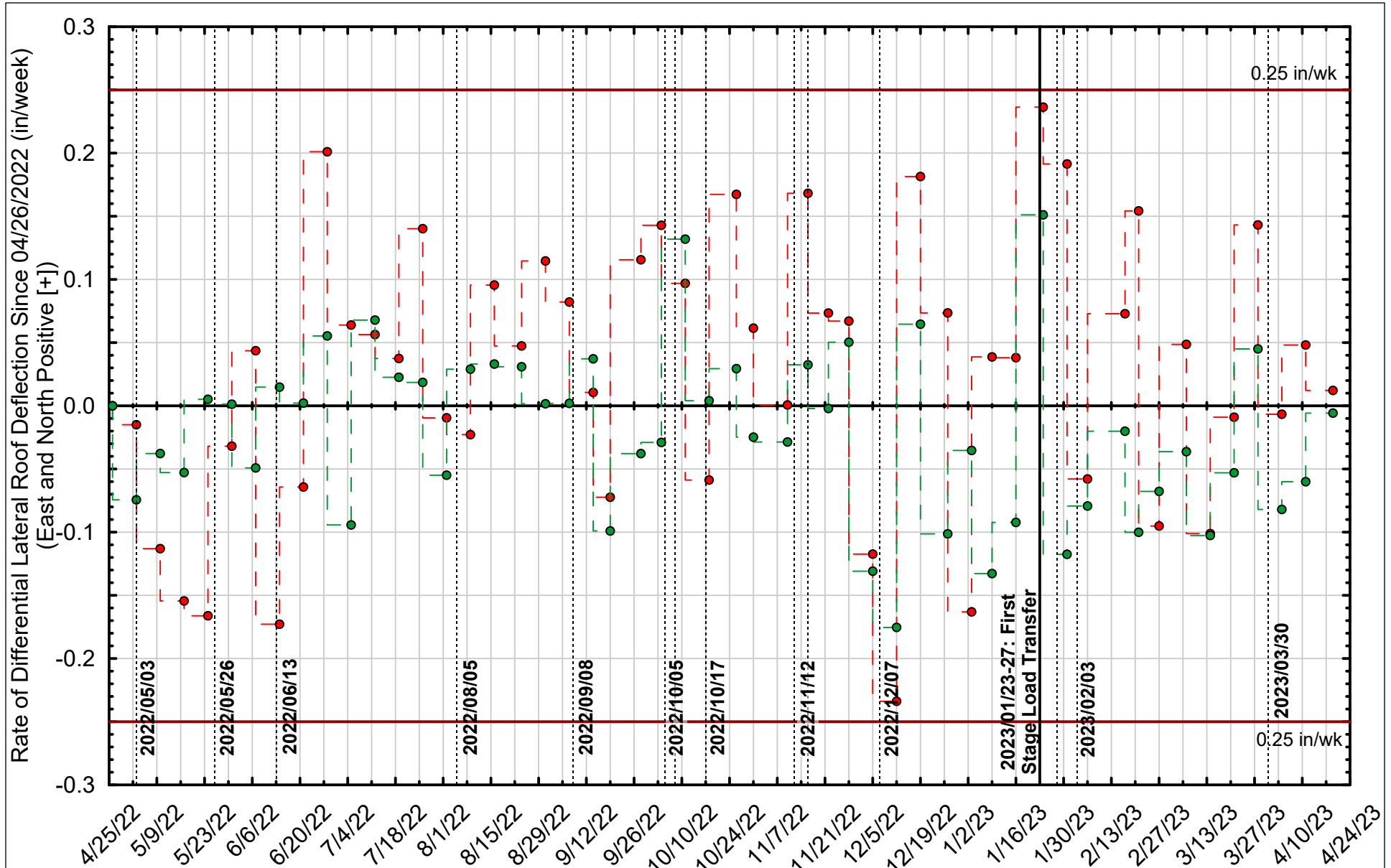


- Δ_R N-S
- Δ_R E-W
- Limit

Project No: 19-009.00	Date: 4/20/2023	Created By: NBW	Checked By: DGM	Figure No: 102S-03
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DIFFERENTIAL LATERAL ROOF DEFLECTION DATA
DUE TO SHORING WALL INSTALLATION AND EXCAVATION
SINCE 04/26/2022 THROUGH 04/19/2023
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California



- Rate of Δ_R E-W
- Rate of Δ_R N-S
- Limit

Project No: 19-009.00	Date: 4/20/2023	Created By: NBW	Checked By: DGM	Figure No: 102S-04
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**RATE OF DIFFERENTIAL LATERAL ROOF DEFLECTION DATA
 DUE TO SHORING WALL INSTALLATION AND EXCAVATION
 SINCE 04/26/2022 THROUGH 04/19/2023**
 Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
 City and County of San Francisco, California