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Date: April 3, 2023

Project Number: 19-009

Subject: 301 Mission Retrofit Supplemental Monitoring Report 099: Results as of March 28, 2023

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## 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 March 28, 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 March 28, 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:  $\Delta_R$  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;  
 $\Delta_H$  is the average differential horizontal movement “at-grade” for the project north-south (a and b) and project east-west (c and d) directions;  
 $\alpha_0$  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 March 28, 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

Note that the survey of only the Fremont Street prisms was performed on March 28, 2023, due to a street closure on Mission Street, and the survey of only the Mission Street prisms was performed on March 31, 2023, due to equipment blocking the line of sight on Fremont Street. The data is presented as if all measurements occurred on March 28, 2023. 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 03/28/2023

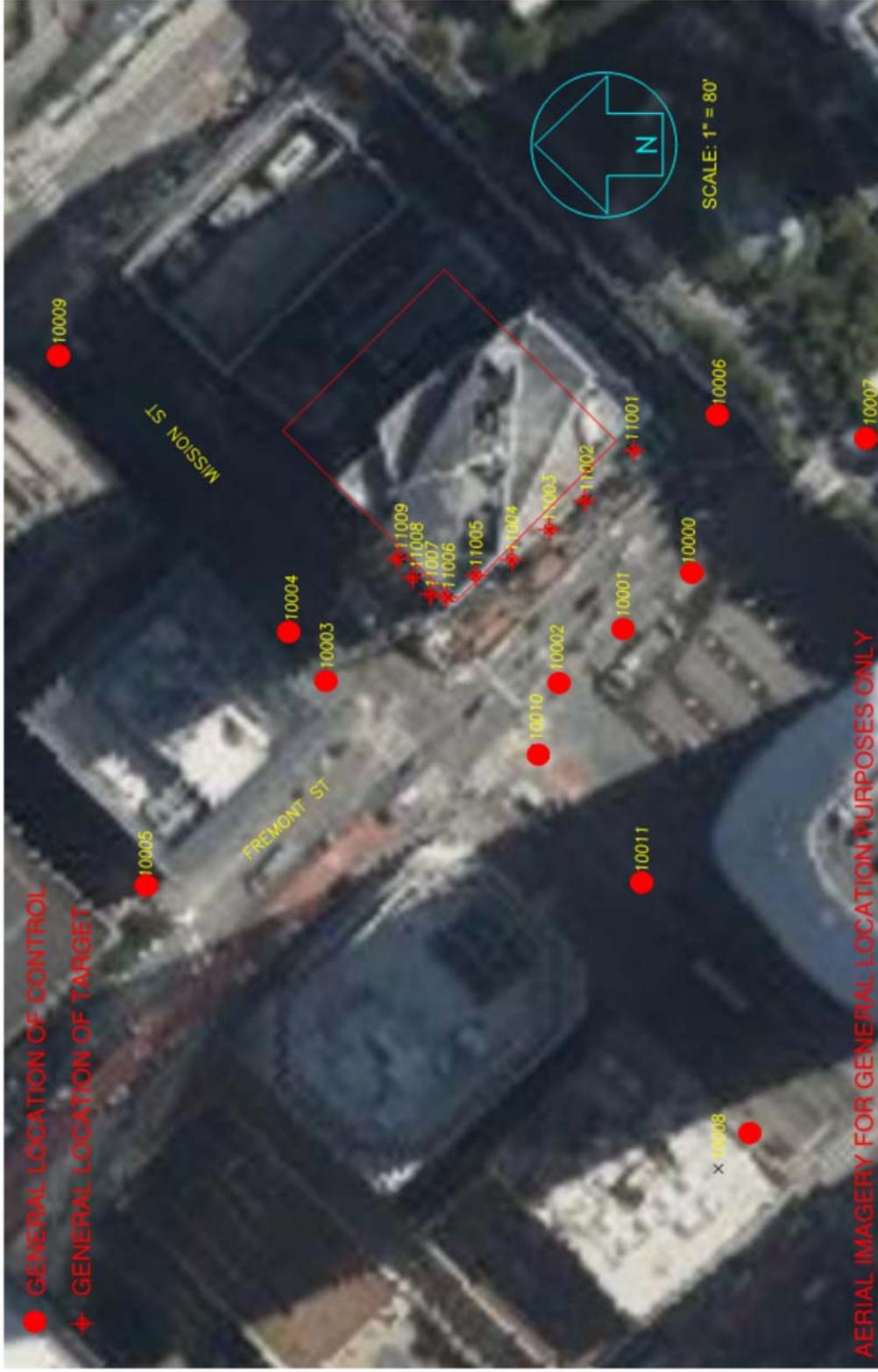
Figure S-03 – Differential Lateral Roof Deflection Data due to Shoring Wall Installation and Excavation since 04/26/2022 through 03/28/2023

Figure S-04 – Rate of Differential Lateral Roof Deflection Data due to Shoring Wall Installation and Excavation since 04/26/2022 through 03/28/2023



## **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



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

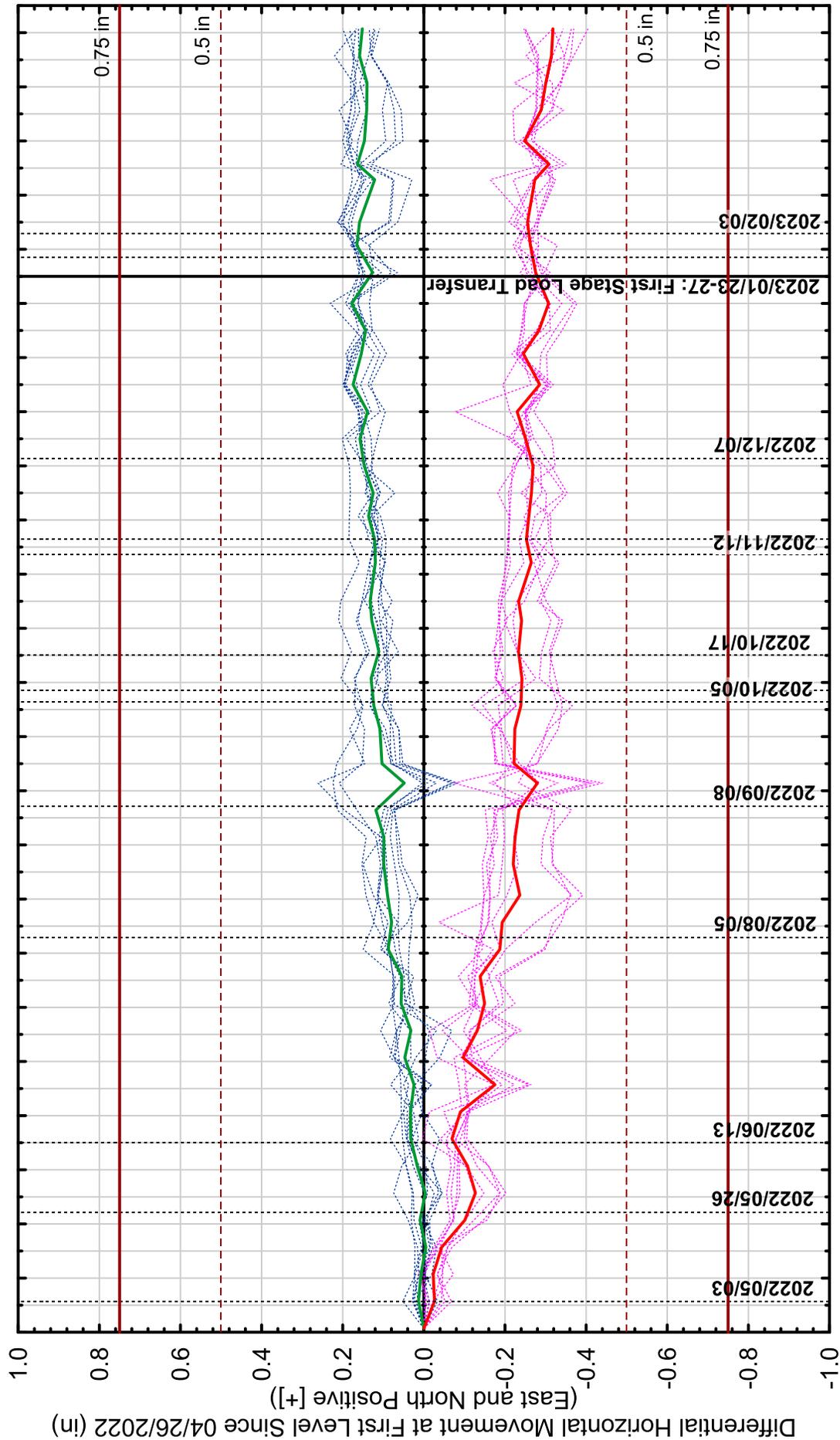
Checked By: DGM

Figure No: 099S-01



INSTRUMENT LOCATION MAP  
 HORIZONTAL SURVEY CONTROL AND TARGET POINTS AT FIRST LEVEL

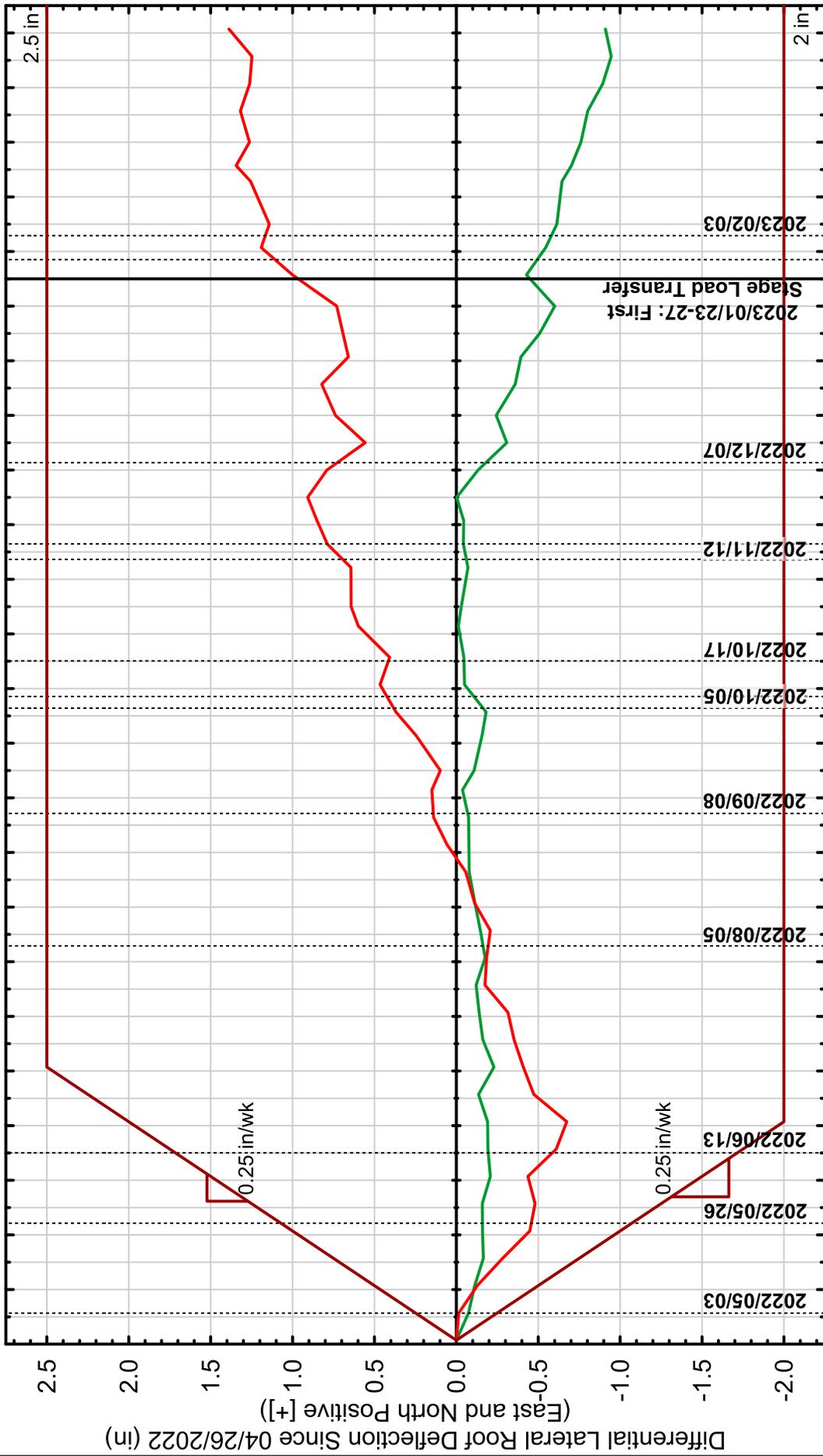
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data  
 City and County of San Francisco, California



4/25/22 5/9/22 5/23/22 6/6/22 6/20/22 7/4/22 7/18/22 8/1/22 8/15/22 8/29/22 9/12/22 9/26/22 10/10/22 10/24/22 11/7/22 11/21/22 12/5/22 12/19/22 1/2/23 1/16/23 1/30/23 2/13/23 2/27/23 3/13/23 3/27/23

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

Project No: 19-009.00	Date: 4/3/2023	Created By: NBW	Checked By: DGM	Figure No: 099S-02
<b>SLATE</b> GEOTECHNICAL CONSULTANTS				
DIFFERENTIAL HORIZONTAL MOVEMENT TOWARD EXCAVATION SINCE 04/26/2022 THROUGH 03/28/2023				
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data City and County of San Francisco, California				



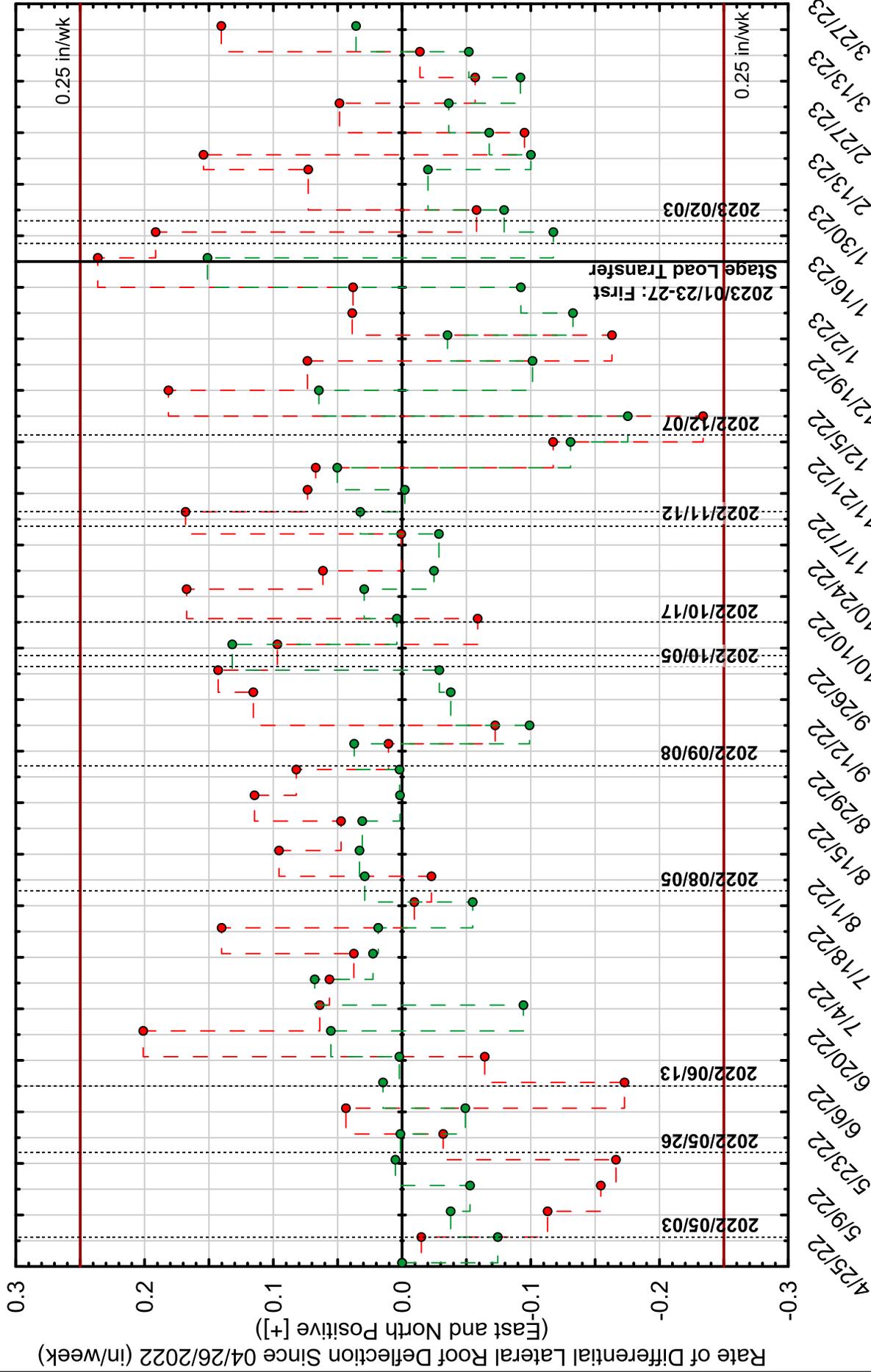
$\Delta_R$  N-S  
 $\Delta_R$  E-W  
 Limit

Project No: 19-009.00 Date: 4/3/2023 Created By: NBW Checked By: DGM Figure No: 099S-03



DIFFERENTIAL LATERAL ROOF DEFLECTION DATA  
 DUE TO SHORING WALL INSTALLATION AND EXCAVATION  
 SINCE 04/26/2022 THROUGH 03/28/2023

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



Project No: 19-009.00 Date: 4/3/2023 Created By: NBW Checked By: DGM Figure No: 099S-04

**SLATE**  
 GEOTECHNICAL CONSULTANTS

RATE OF DIFFERENTIAL LATERAL ROOF DEFLECTION DATA  
 DUE TO SHORING WALL INSTALLATION AND EXCAVATION  
 SINCE 04/26/2022 THROUGH 03/28/2023

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