

To: Jerald Schnabel  
Continental Materials Corp.  
File: August 2021 Monitoring Summary

From: Paul Kos  
Denver, CO 80222  
Date: September 30, 2021

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**Reference: August 2021 Geotechnical Monitoring Summary Pikeview Quarry**

## 1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this August 2021 Geotechnical Monitoring Summary for the Pikeview Quarry. The Pikeview Quarry is situated along the foothills of the Rocky Mountains, northwest of Colorado Springs, Colorado. Continental Materials Corp. operates the quarry, which is currently closed, pending reclamation. A geotechnical monitoring program was established to monitor reclamation activities which will affect the geotechnical performance of the existing and reclaimed slopes during and following reclamation grading. This report presents the geotechnical monitoring results for the slope reclamation activities at the site through the month of August 2021.

It is important to note that activities at the Pikeview Quarry are focused on preparation for reclamation construction. This includes coordinating with contractors, importing fill, preparing growth medium, preparing riprap, and site maintenance; no fill is being placed on the slopes. Continuous monitoring by the robotic survey system began in 2010 and has continued through the month of August 2021 uninterrupted. Visual inspections of the slopes were performed by Stantec engineers.

### 1.1 PURPOSE

The purpose of this report is to summarize the August 2021 geotechnical monitoring results and verify the geotechnical performance of the existing and reclaimed slopes with respect to the historical performance record. The goals of the geotechnical instrumentation monitoring program can be described as:

- Meet corporate risk management requirements,
- Provide ongoing slope monitoring and advance warning of any changed conditions that could pose a hazard to workers or to the public,
- Document the geotechnical performance of the slope, and
- Document monthly site grading activities and construction quality assurance.

### 1.2 MONITORING SUMMARY

Major components of the instrumentation monitoring program are listed in Table 1 and shown on Figure 1.

**Table 1 Monitoring Frequency**

Monitoring Type	Frequency
Visual inspection	Daily/Monthly
Robotic theodolite/prism	Continuous
Drone inspection	Monthly



Compaction testing	Every 5,000 yd <sup>3</sup> (min.)
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## 2.0 VISUAL INSPECTIONS

Inspections are completed daily by site personnel and monthly by Stantec personnel to document visual observations of slope conditions, including conditions of instability (i.e., cracking, slumping, over-steepened slopes, seeps, perched boulders, rock falls, erosion, and areas undercut by construction or maintenance activities). Certain areas of the landslide have been designated as safety exclusion zones, and these areas are inspected from adjacent locations.

When present, site operators inspect their work areas for signs of instability on a daily basis before starting work per site safety rules and regulations. The limited work performed in August 2021 resulted in the operator visual inspections being limited to stockpiles.

Stantec conducted visual inspections of the Pikeview Quarry slopes on August 26, 2021. The engineering inspections were conducted by traversing each area of the mine and observing the uphill slope and the downhill slope for signs of instability, and areas in need of maintenance. Slopes that have been graded and are 2 horizontal (H):1 vertical (V) or shallower are also traversed on foot. The findings are listed below, and photographs of notable observations are included on Figure 2 in Appendix A.

- Healed Cracks: Older cracks and recent cracks are being monitored for changes. Currently the cracks are not growing in any of the areas of concern on the slopes of the site.
- Crack Free: No cracking was observed on the native granite slopes above the extents of the disturbed area. The hummocky field in the area immediately above the southern extent of the slide shows evidence of cracking but they are not fresh or active. No new or open cracks were found immediately inside or next to the slide area.
- Previously Observed Cracks: Previously observed tension cracks remain on the production floor and at the crest of fill slopes. These cracks were observed following the period of heavy rain. The cracks are not believed to be a problem, they are likely due to the recent heavy rain saturating the area (Photo 2).
- The Pond below the Middle Peak remains partially filled and there are plans for a notch to be added to the pond's berm to keep the water level from exceeding a specific level .
- The culvert remains cleared but mostly blocked inside. CMC has partially cleared the culvert, but access constraints, support columns inside the culvert, and the volume of sediment in the culvert have limited the sediment removal. CMC inspects the culvert for ponded water following rain events, and should any water be observed, it will be removed using pumps. To date, no ponding has been observed .
- Prisms: Several prisms were passed along the walking route and appeared to be in their original position and operating normally. Control points and most of the monitoring points are permanently cemented into the ground while some of the monitoring points are cemented into 5-gal buckets to be portable as needed (Photo 4).
- Fill: Material is being imported and temporarily placed on the "production floor". During the visit, different types of material including mulch and general fill were being deposited here for future placement.
- Survey stakes were placed across a historic crack on the slope above and south of the landslide area to track any changes over the coming months.
- Eroded material has collected below the culvert. CMC has partially cleared the debris, but access limitations and supports within the culvert inhibit clearing all the debris. CMC has procured a pump and will begin pumping operations if any water collects behind the culvert.



Visual inspections of the Pikeview Quarry did not reveal any evidence of large-scale instability outside of the landslide areas previously identified. No bulging, rippling, over-steepening, depressions, slumps, or dry slip-offs were observed in areas that have been graded and/or reclaimed.

The site has experienced a wet Winter and Spring, and the additional moisture is likely contributing to the settling and cracking. According to the National Weather Service, Colorado Springs has received 145% of normal precipitation in Spring, and 184% of the normal snowfall in Winter 2020-2021. Colorado Springs received 21.7 inches of snow though Spring, which is 9.9 inches above normal. Colorado Springs received 6.13 inches of precipitation though Spring, which is 1.90 inches above normal.  
<https://www.weather.gov/pub/climate2021SpringReviewSummerPreview>

### 3.0 PRISM SURVEY

A Leica Robotic station is used to continuously survey the prisms onsite to document slope movements. The station records the location of each prism every four hours. There are currently 20 prisms; 3 prisms are control points located outside the slope movement area, 13 prisms are located on the slopes surrounding the landslide area, and 4 prisms are located at the toe of the landslide. As the slope is backfilled and graded, additional prisms will be installed. The existing prism locations are shown on the current topography in Figure 3, and the proposed prism locations are shown on the reclamation topography in Figure 4. Both figures are included in Appendix B.

The monitoring software, GeoMos, has been programed to provide automatic alarms if there is a movement recorded that is greater than 0.35 feet or if a prism cannot be located. The alarm notes and actions taken are logged, and the alarms are summarized in Table 2. Following each alarm, CMC clears the area of concern until the data can be reviewed and the slope can be inspected. CMC made sure that there were no workers in the area before inspecting the slope. No prism data was collected from August 1 to 7 when Colorado Springs Utilities cut power to the site. During this time the system was down, and it took several days to restore power and get the system running again. No work was performed at the quarry during this time. On August 13, Prism P69 tipped over due to erosion around the base of the bucket. The erosion was repaired, and the bucket was replaced as close to the original position as possible. Prisms TOE1 and TOE3 were moved by sheep during the period of August 15 to 18. These prisms were placed back in their original positions and are operating normally. All other alarms were determined to be caused by rain.

**Table 2 Alarm Summary**

<b>Date(s)</b>	<b>Alarm</b>	<b>Cause/Actions taken</b>	<b>Issue Resolved</b>
08/01/2021-08/07/2021	No readings on all prism on multiple scans	Power cut to the site. Power restored later.	08/07/2021
08/11/2021-08/13/2021	Prism P69 could not be found on multiple scans	Prism eroded and then replaced	08/13/2021
08/13/2021	All prisms could not be found on multiple scans	Heavy rain	08/13/2021
08/15/2021 to 08/16/2021	Prism TOE 1 could not be found	Prism moved by sheep	08/16/2021
08/17/2021-08/18/2021	Prism TOE3 could not be found	Prism moved by sheep	08/17/2021



The prism monitoring results for transverse and height displacements, monthly change, and cumulative change are summarized in Table 3 below. The transverse displacement measures the change in the horizontal distance from the robotic station to the prism; positive displacements indicate less distance between the station and prism (movement towards the total station). The height displacement measures the change in the vertical distance from the robotic station to the prism; positive displacements indicate upward movement. The values for the last reading in the month are included in Table 3. The monthly delta is the most recent reading cumulative delta displacement (horizontal, lateral, and vertical) subtracted from the last reading from the previous month. The cumulative delta values are a total displacement and are not associated with a direction. The transverse, height, and cumulative delta displacements are the total displacement over the life of the monitoring, which has been several years for all the prisms except P69. Prism P69 was moved on June 20, 2020, and the displacements included in Table 3 are the displacements since that date. According to Leica documentation, the survey accuracy is  $\pm 4 \text{ mm} + 1.5 \text{ ppm}$  for prisms located greater than 500m from the station; these equates to an accuracy of  $\pm 0.016 \text{ ft}$ .

The data show stable conditions with no movement for 16 of 20 prisms with recorded displacements limited to data scatter and not actual movements. Prisms P63, TOE2, and TOE3 are located at the toe of the landslide, and these locations showed slope creep movements at slow velocities (approximately 0.001 feet per day or less). Prism NP66 is located above the landslide, and this prism also recorded slope creep movements at slow velocity. This settlement is likely related to the increased moisture causing the landslide material to consolidate. Plots of the transverse and height displacements for each prism are included in Appendix B.



**Table 3 Prism Summary**

Prism ID	Cumulative Transverse Displacement (ft)	Cumulative Height Displacement (ft)	Monthly Delta (ft)	Cumulative Delta (ft)	Notes / Recommendations
CP1	0.004	-0.009	-0.0020	0.0250	
CP2	-0.053	0.001	0.0017	0.4223	
CP3	0.285	-0.219	0.0043	0.3656	
NP1	0.270	-0.284	0.0116	0.3925	
NP2	0.077	-0.091	0.0035	0.1335	
NP66	0.478	-0.560	0.0716	0.8608	Slope creep at slow velocity.
P1	0.357	-0.048	0.0058	0.3650	
P2	0.165	-0.027	0.0051	0.2435	
P25	0.009	0.038	0.0116	0.1531	
P32	-0.049	-0.078	-0.0039	0.2533	
P33	-0.080	-0.053	0.0058	0.2075	
P35	0.050	-0.180	0.0002	0.4661	
P4	0.390	-0.117	0.0056	0.5087	
P5	0.412	-0.148	0.0048	0.6467	
P63	15.505	-6.325	0.0580	16.7457	Slope creep at slow velocity.
P69	0.026	-0.036	0.0832	2.1035	Prism knocked over by weather and erosion.
P70	0.372	-0.301	0.0010	0.6167	
TOE1	0.160	0.041	0.0015	0.1849	Prism moved by wildlife.
TOE2	0.623	-0.608	0.0000	0.8643	Slope creep at slow velocity.
TOE3	1.904	-0.860	0.0823	2.2198	Prism moved by wildlife. Slope creep at slow velocity.

## 4.0 DRONE SURVEY

The site was flown for aerial imagery using an unmanned aircraft system (UAS or 'drone') on, August 16, 2021. The imagery was inspected for signs of instability and used to supplement the onsite visual inspections.



Features noted in the aerial imagery review were inspected during Stantec’s engineering inspection and are summarized in Section 2 above. The imagery was also used to create site topography.

The July topography was also compared to the August topography to identify changes in the site topography. Comparison of the two surveys showed that approximately 3,120 yd<sup>3</sup> of fill had been imported and temporarily placed. No slope movements or other changes in topography were identified. The current imagery and topography are included in Figures 1 and 3, and the comparison surface is included as Figure 5 in Appendix C.

As previously reported in the September 2020 monitoring report, there are limitations with the method of comparing drone surveys from different months. The drone data indicate changes in the slopes along each of the reclamation benches, buildings, and areas with trees or shrubs. These areas are stable, and the changes are the result of survey limitations on or near vertical slopes.

## 5.0 COMPACTION TESTING

No fill was permanently placed at the quarry in August. Once fill placement starts, the fill will be placed in one-foot lifts, moisture conditioned as necessary, and compacted. Compaction testing will commence at the rate of at least one test per 5,000 yd<sup>3</sup> placed.

Per CMC, imported material is being stockpiled onsite for placement at a later date. The material will be tested for compaction level and areas failing compaction testing will either be further compacted until the specification is met or removed and replaced in a compacted manner.

## 6.0 RECLAMATION PROGRESS

CMC is actively working towards reclaiming the Pikeview Quarry and has contracted with Stantec to provide EPCM services through completion. As an updated feature of our monthly report, we will provide progress of activities, anticipated milestone schedule and a one month look ahead to better communicate project objectives. A phased or “gated” approach will be used to complete the reclamation process going forward (See milestone schedule below)

Phase 1 - Value Engineering and issue RFP to qualified Contractors

Phase 2 - Commercial negotiations with successful contractor

Phase 3 - Execution planning and Contractor readiness review

Phase 4 - Site Construction execution

Phase 5 - Final revegetation (season 2)

Task/Milestone	Estimated Dates
Phase 1 – Issue RFP to Bidders	Completed June 2021
Phase 1 – RFP Evaluation & Recommendation	Completed July 2021
Phase 2 – Constructor Contract Award	October 2021
Phase 3 – Project Kick-off with successful Contractor	November 2021
Phase 4 – Contractor Mobilization to Site	November 2021
Phase 4 – Contractor Demobilize from Site	End 2022
Phase 5 – Final Revegetation season 2 Begins	2022 until acceptance



Progress of activities this month:

- City approval of the Grading and Erosion Control Plan and Construction Stormwater Plan
- Continue negotiations with preferred contractors
- Received construction proposals and began negotiations with the preferred contractors
- Importing fill material continued
- Geotechnical monitoring continued
- Processing of Growth Medium for use as topsoil continued
- Removal of site debris continued. Materials, equipment, and debris onsite are being removed to prepare the site for the reclamation contractor.
- Procured pump for culvert operations.

Work planned for next month includes:

- Ongoing negotiations with preferred contractors
- Continue importing fill material
- Continue geotechnical monitoring
- Continue processing of Growth Medium
- Begin processing of riprap
- Continue to remove site debris

## 7.0 CONCLUSIONS

None of the data collected in August 2021 indicate evidence of any large-scale movements that increase risk to workers or to the public. The landslide area continues to show slope creep movements with slow velocities. Movements attributed to heavy rain were recorded at the toe of the slope, but these movements were not repeated. Shallow surface erosion continues to occur requiring ongoing maintenance and cleanup.

- Increased precipitation results in slight increases in settlement, cracking, and movements, which is consistent with the understanding of site conditions.
- Restricted access to the ungraded landslide slopes should continue.
- All monitoring should continue at current frequencies.
- All alarms shall continue to be taken seriously even if data errors are suspected.



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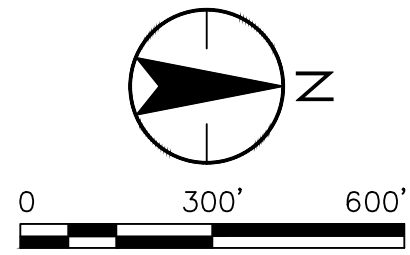


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- LEGEND**
- Permit/Affected Lands Boundary
  - Proposed Disturbance Limit
  - Landslide Extent
  - Buttress Fill Extent
  - Existing Prism
  - Proposed Prism



Client/Project  
**CONTINENTAL MATERIALS  
 CORP.  
 PIKEVIEW QUARRY SLOPE  
 MONITORING**

Project No.  
 227419041

Title <b>SITE MAP</b>	
Revision #	Date 2021.09.30
Drawn By PK	Figure No. 1



# Appendix A

Visual Inspections



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6. HUMMOCKS AREA ON SOUTH END OF SITE



5. VIEW TO THE NORTH OF PRODUCTION AREA



4. PRISM NEAR ROCK FALL AREA



3. LANDSLIDE SLOPE LOOKING SOUTH

NOTE 1:  
NO CRACKS

NOTE 1:  
NO CRACKS

NOTE 1:  
NO CRACKS



7. VIEW OF LARGE BREAKAWAY SECTION



2. CRACKING NEAR PRODUCTION FLOOR



8. VIEW OF RECLAMATION BENCHES



1. PRODUCTION FLOOR



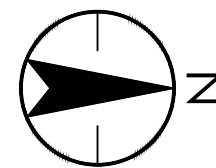
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LEGEND

- Permit/Affected Lands Boundary
- Proposed Disturbance Limit
- Landslide Extent
- Buttress Fill Extent
- Observed Crack

NOTES

1. NO CRACKS OBSERVED IN THIS AREA.
2. ALL PHOTOS TAKEN AUGUST 26, 2021.



Client/Project  
CONTINENTAL MATERIALS  
CORP.  
PIKEVIEW QUARRY SLOPE  
MONITORING

Project No.  
227419041

Title  
OBSERVATIONS FROM  
SEPTEMBER INSPECTION

Revision #	Date
	2021.09.30
Drawn By PK	Figure No. 2

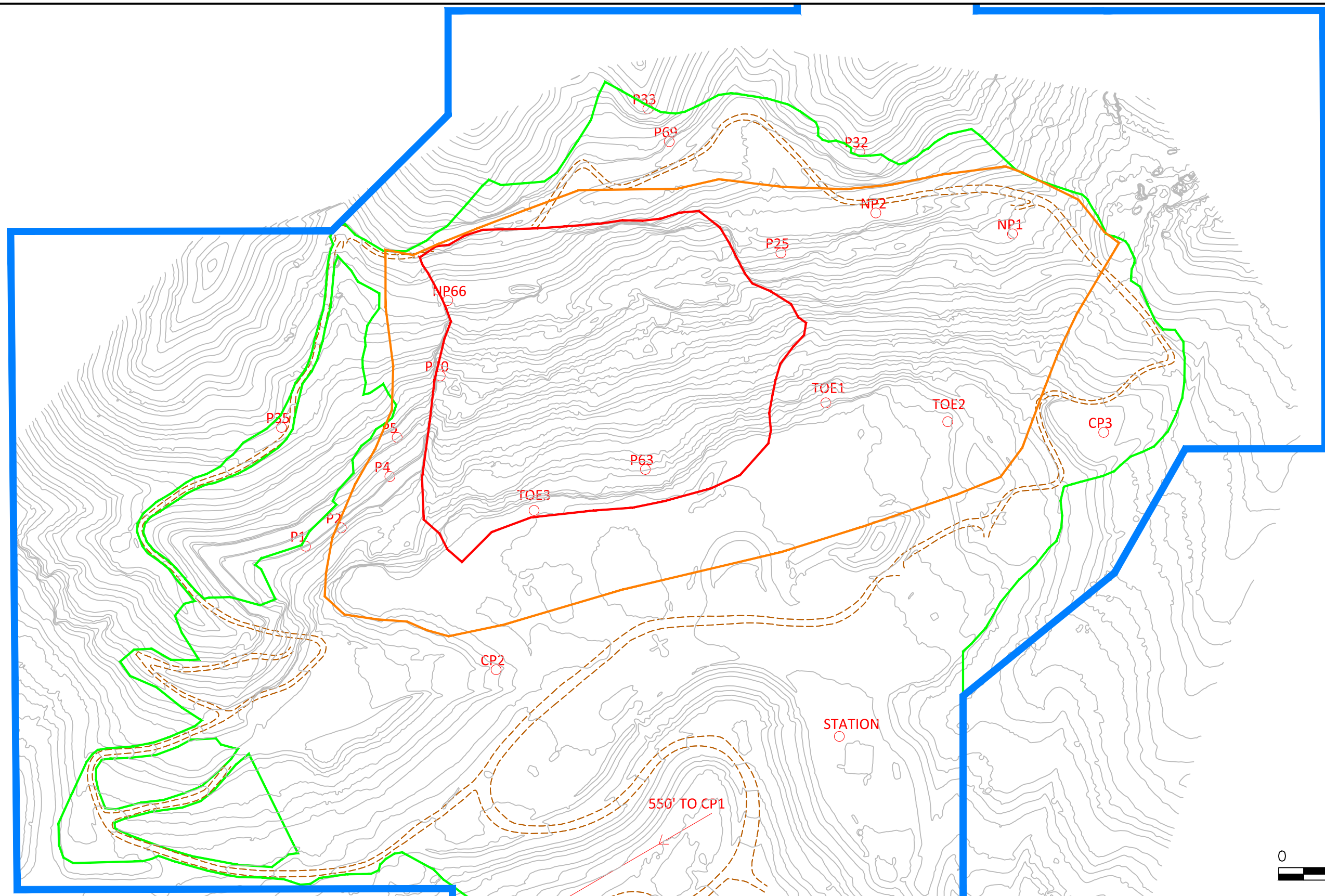
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# Appendix B

Prism Survey



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LEGEND

- Permit/Affected Lands Boundary
- Proposed Disturbance Limit
- Landslide Extent
- Buttress Fill Extent
- Existing Prism
- Proposed Prism

1. GRADING AND MOVEMENT OF STATION WILL BE EXTENDED AS LONG AS POSSIBLE.
2. PRISMS WILL BE INSTALLED AS EACH BENCH IS FINISHED.
3. ALL PRISMS WILL BE RETAINED AS LONG AS POSSIBLE.
4. TOPOGRAPHY FROM AUGUST 16, 2021 DRONE SURVEY.
5. CONTOUR INTERVAL IS 10 FEET

Client/Project

CONTINENTAL MATERIALS  
 CORP.  
 PIKEVIEW QUARRY SLOPE  
 MONITORING

Project No.  
 227419041

Title

EXISTING PRISMS WITH  
 CURRENT SURFACE

Revision  
 #

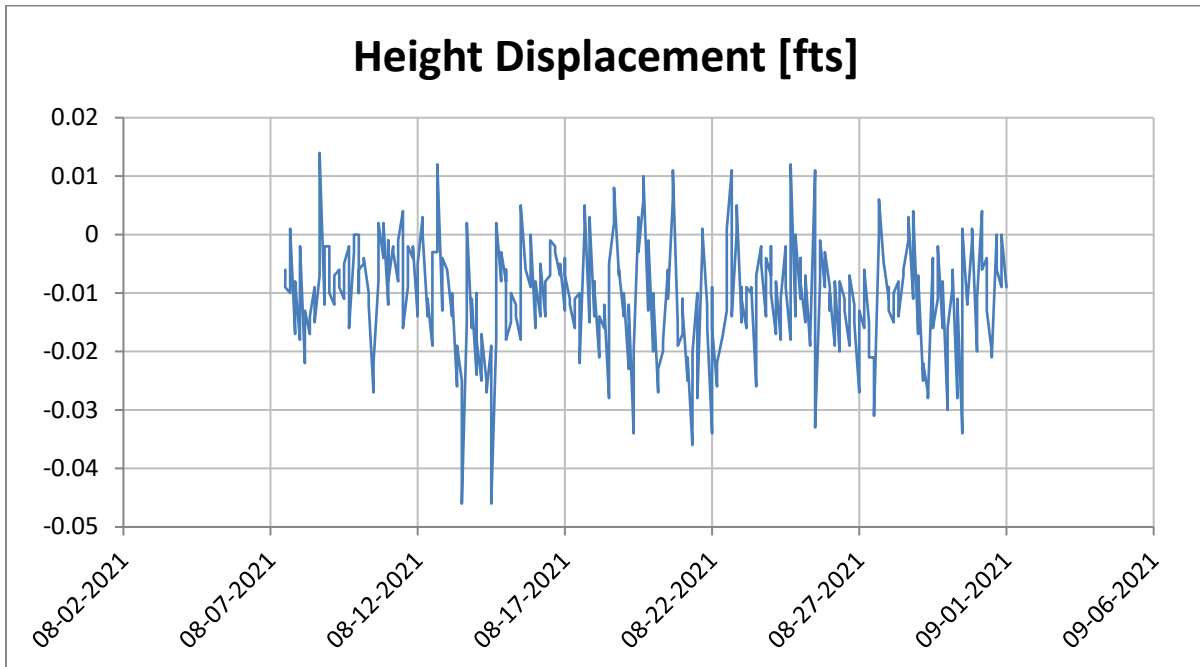
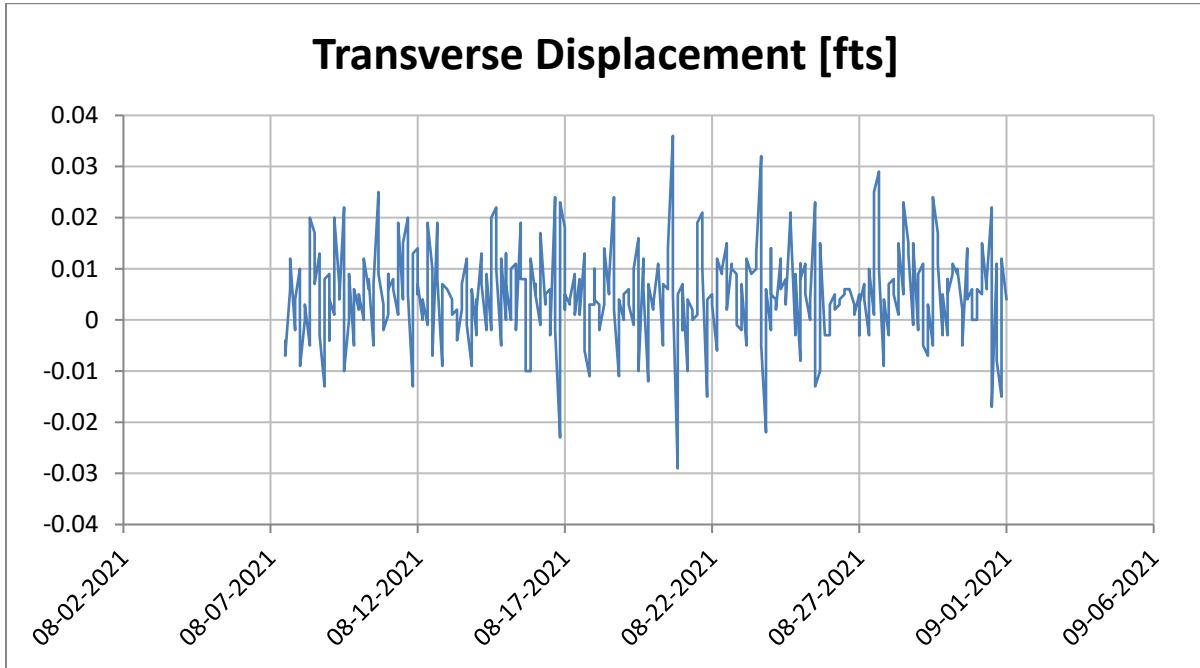
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 PK

Date  
 2021.09.30

Figure No.  
 3



# Prism CP1

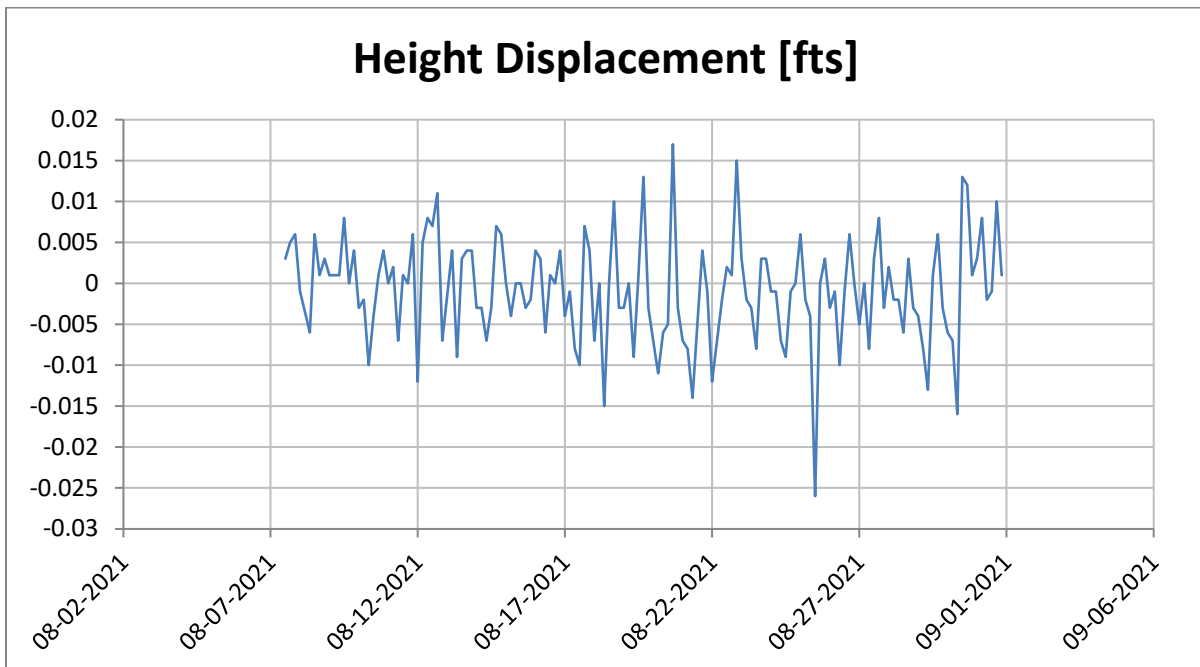
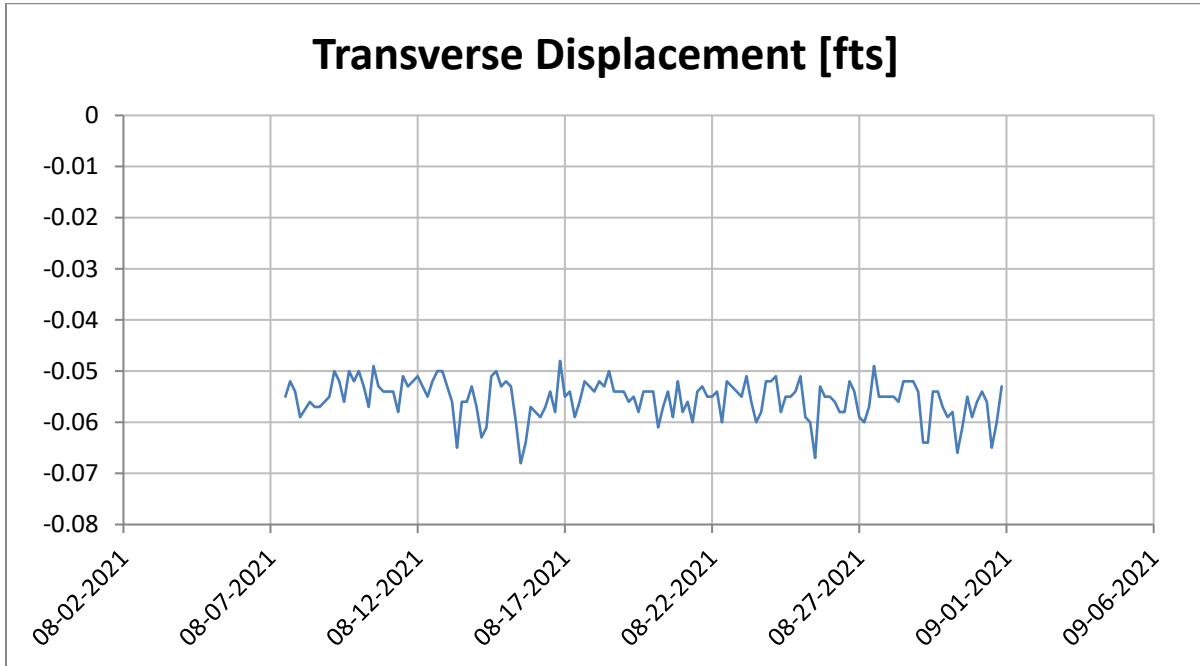


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism CP2

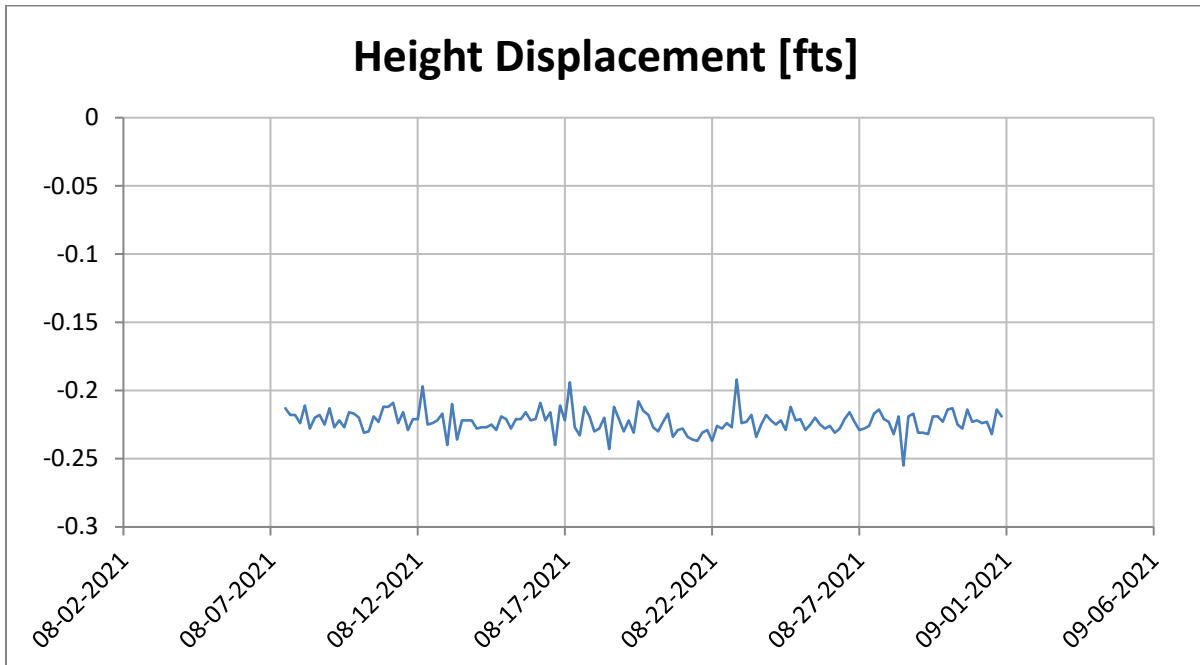
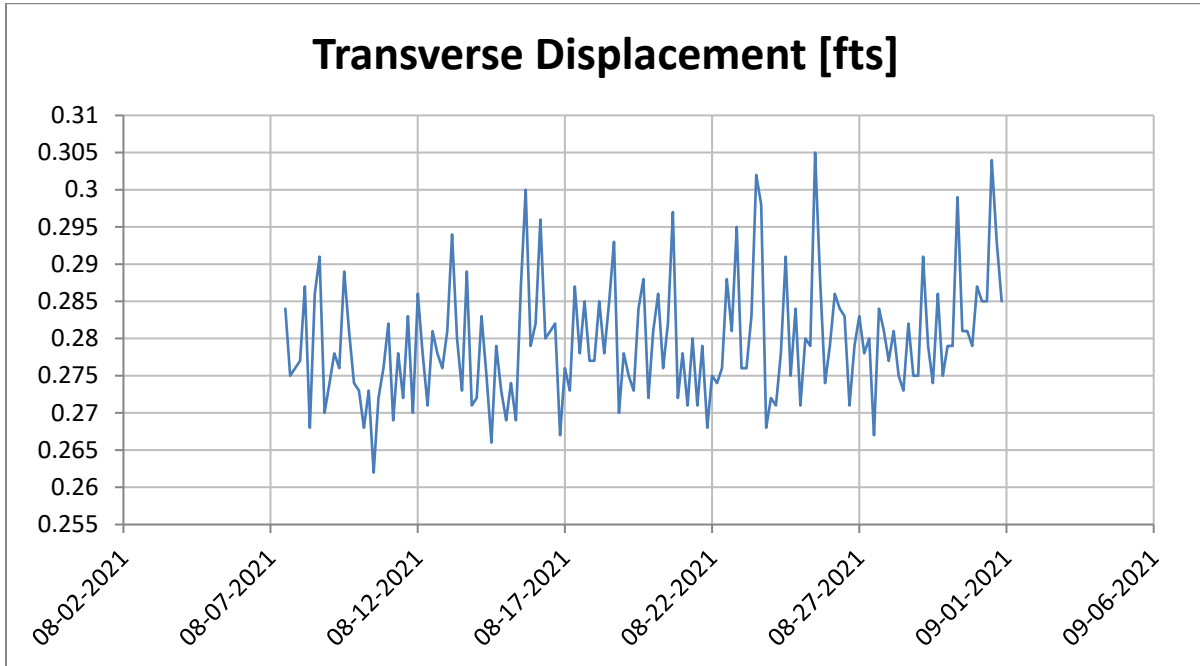


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## Prism CP3



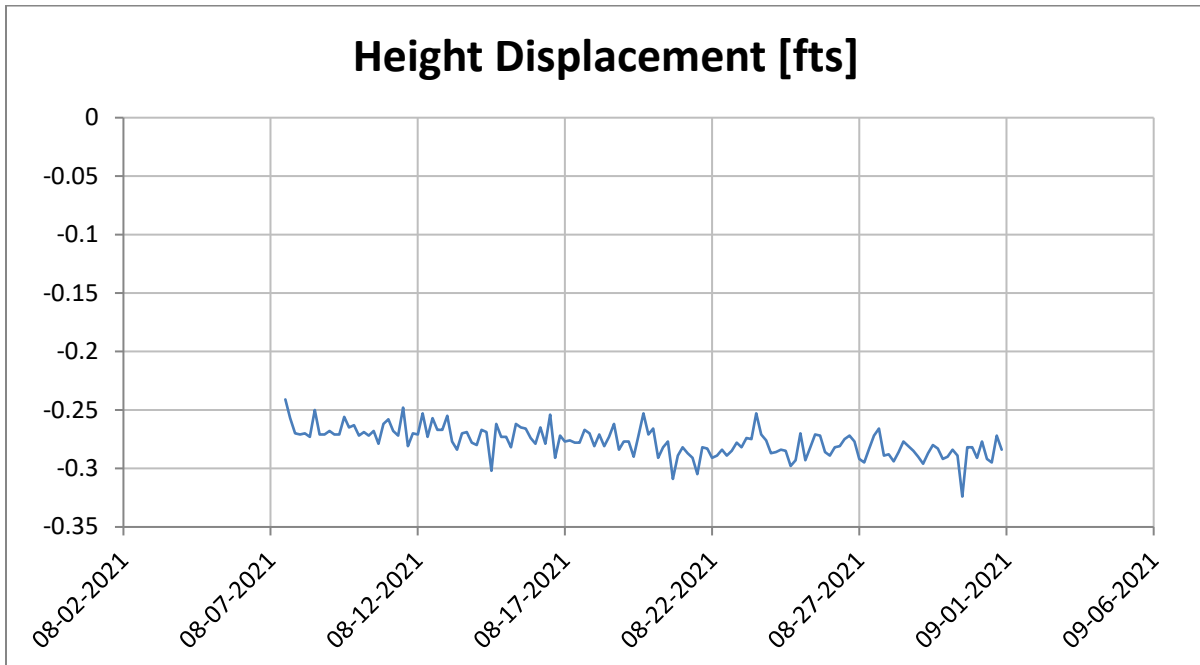
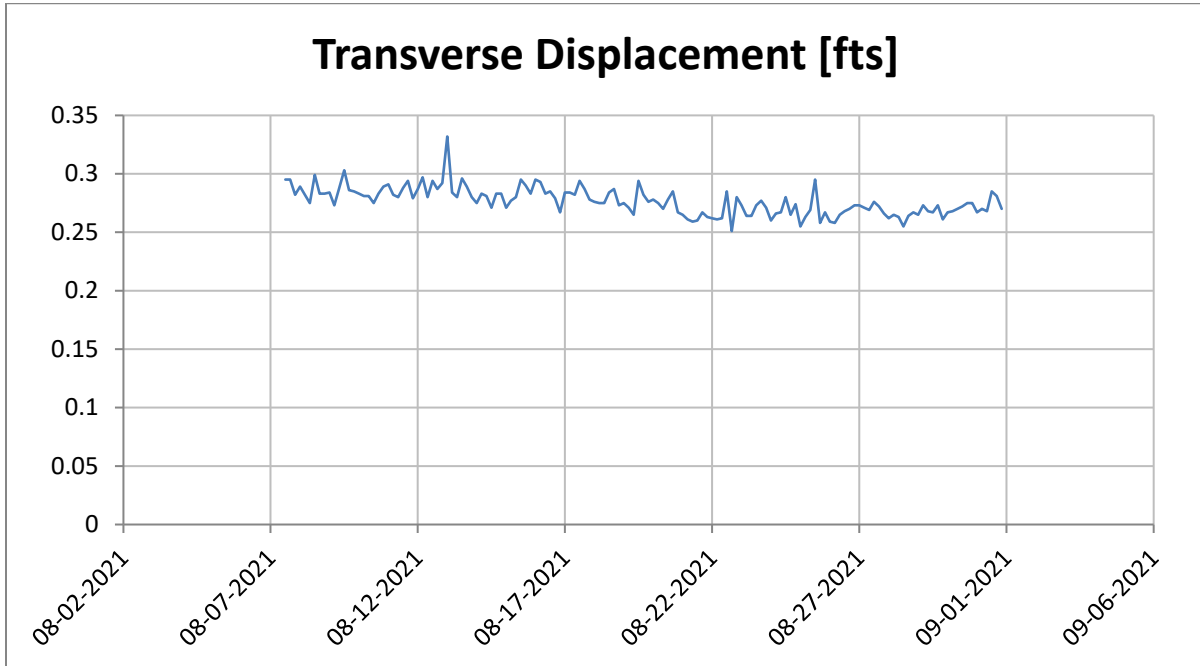
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# Prism NP1

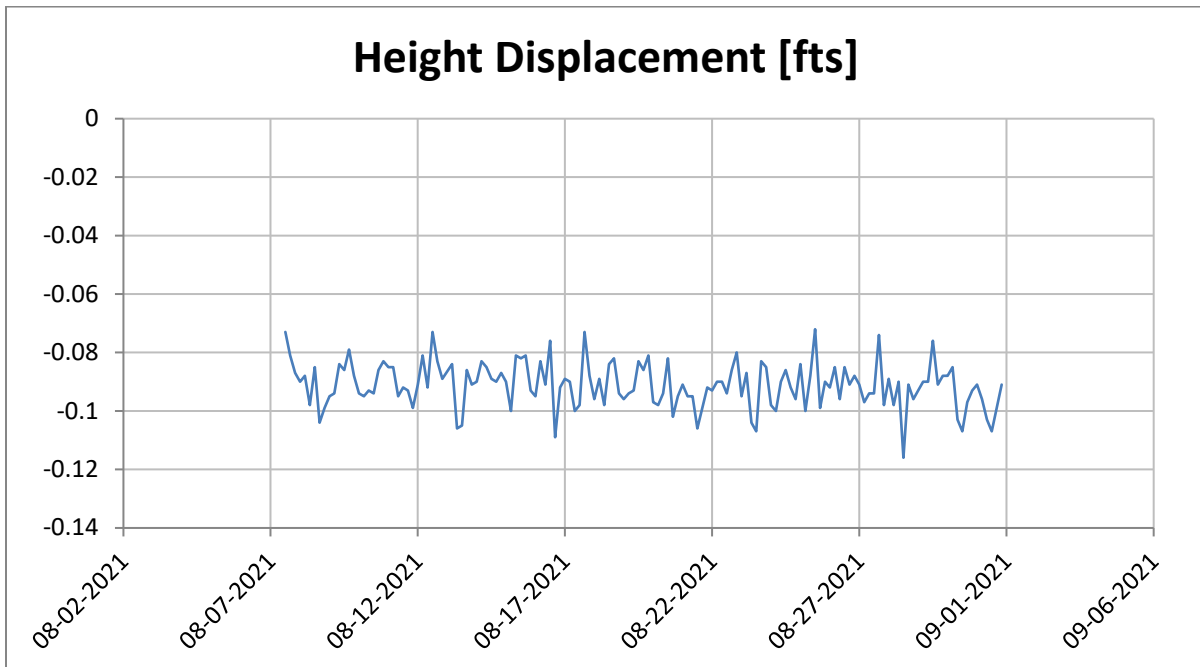
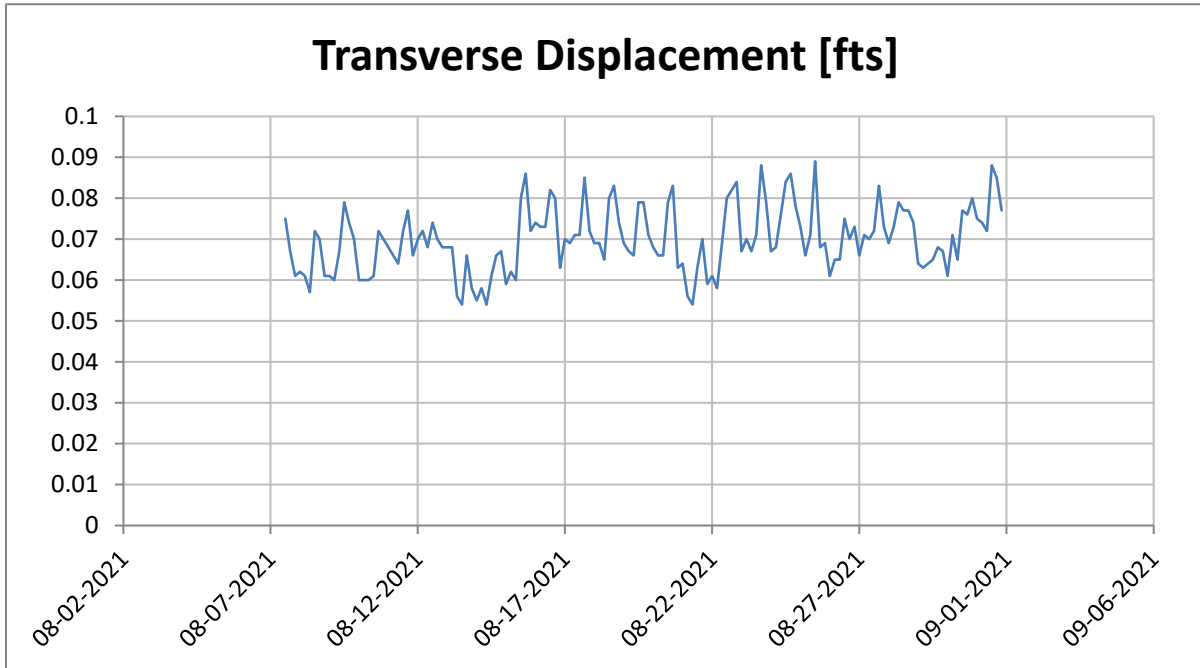


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## Prism NP2

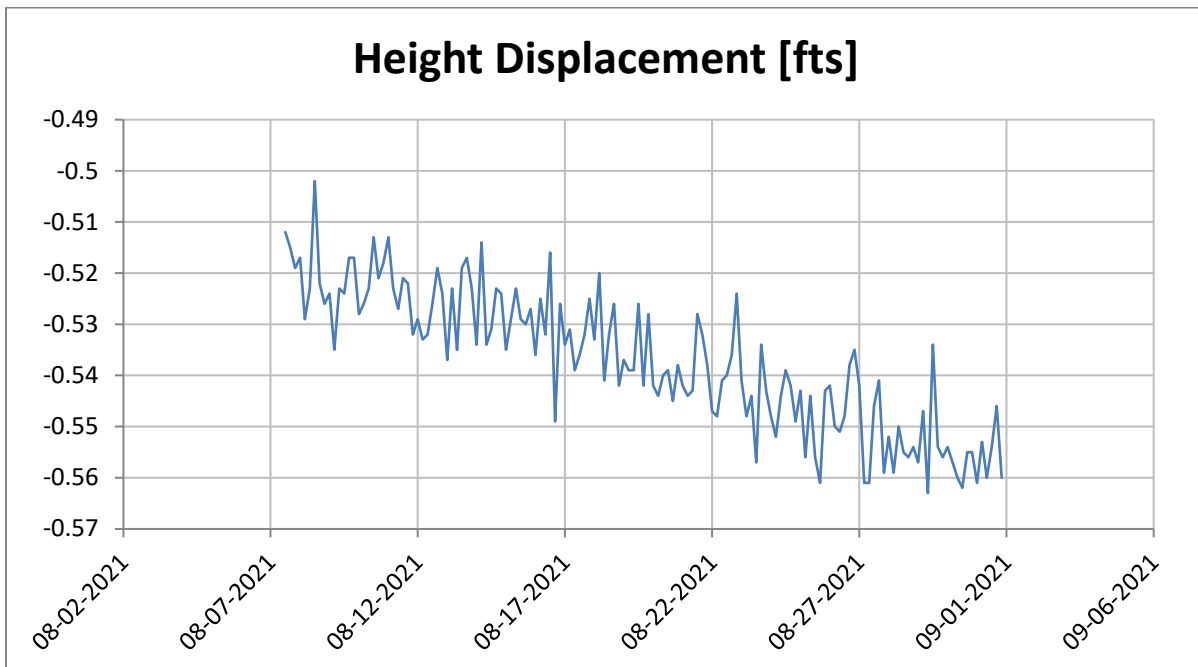
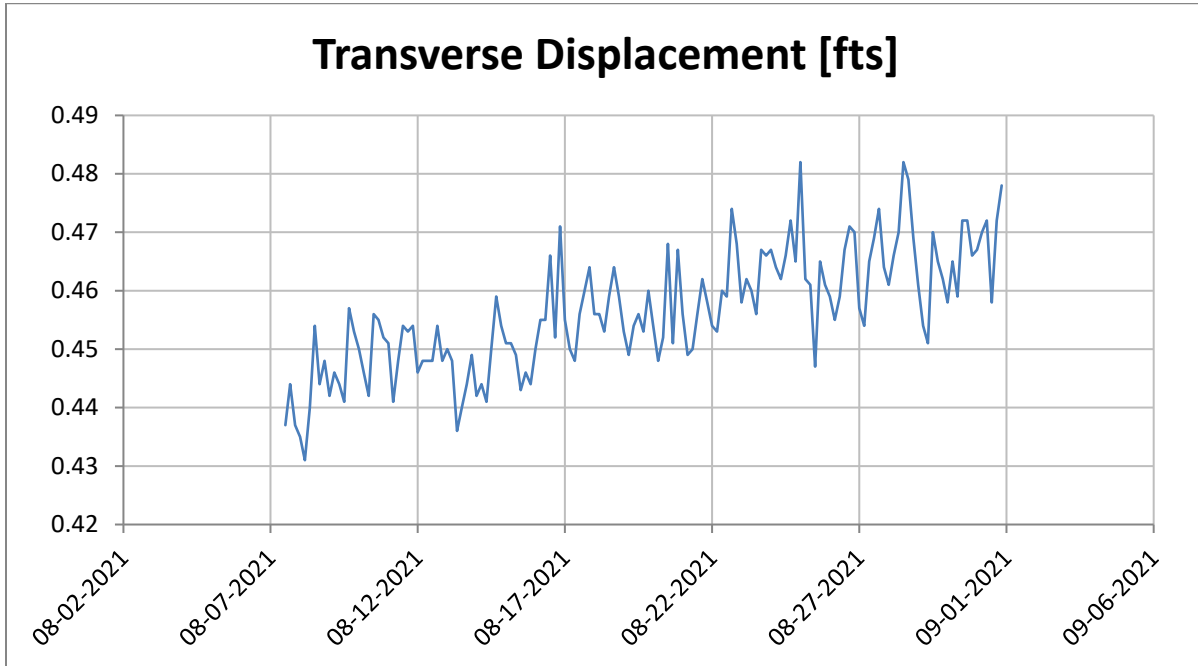


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# Prism NP66

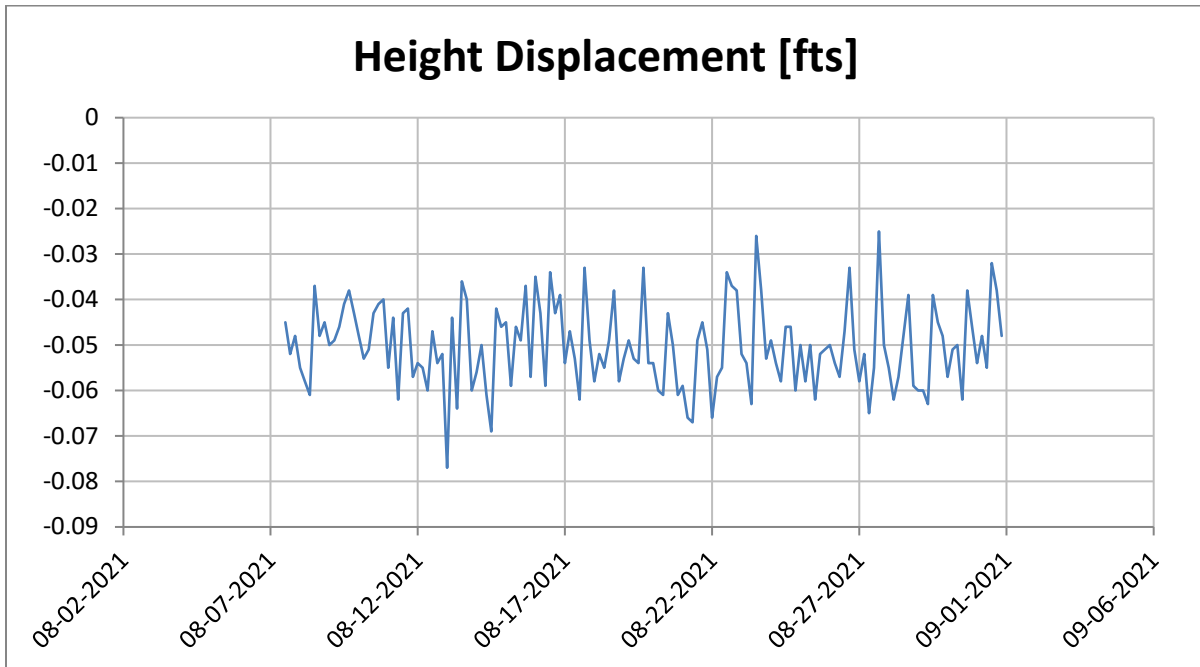
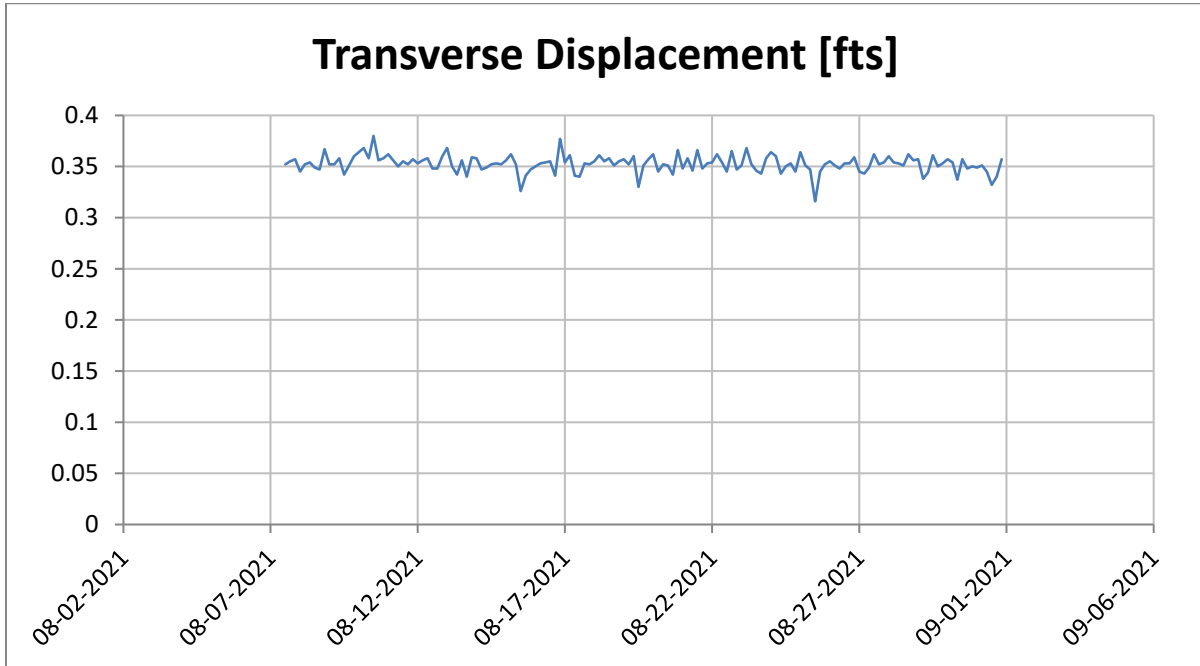


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# Prism P1

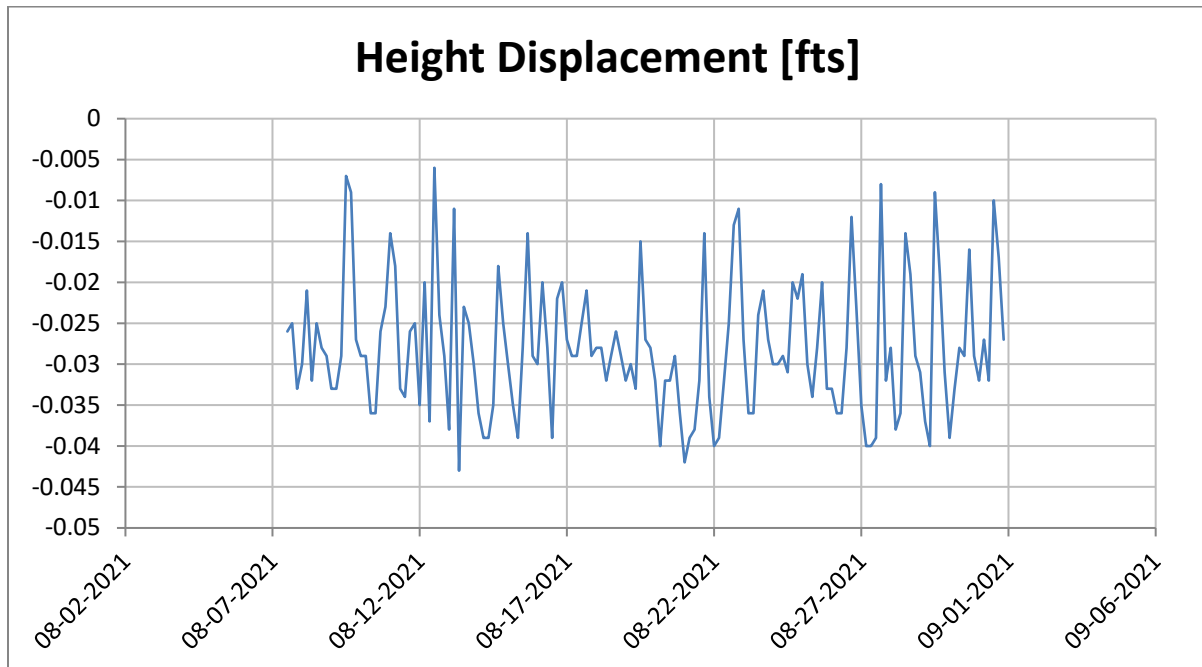
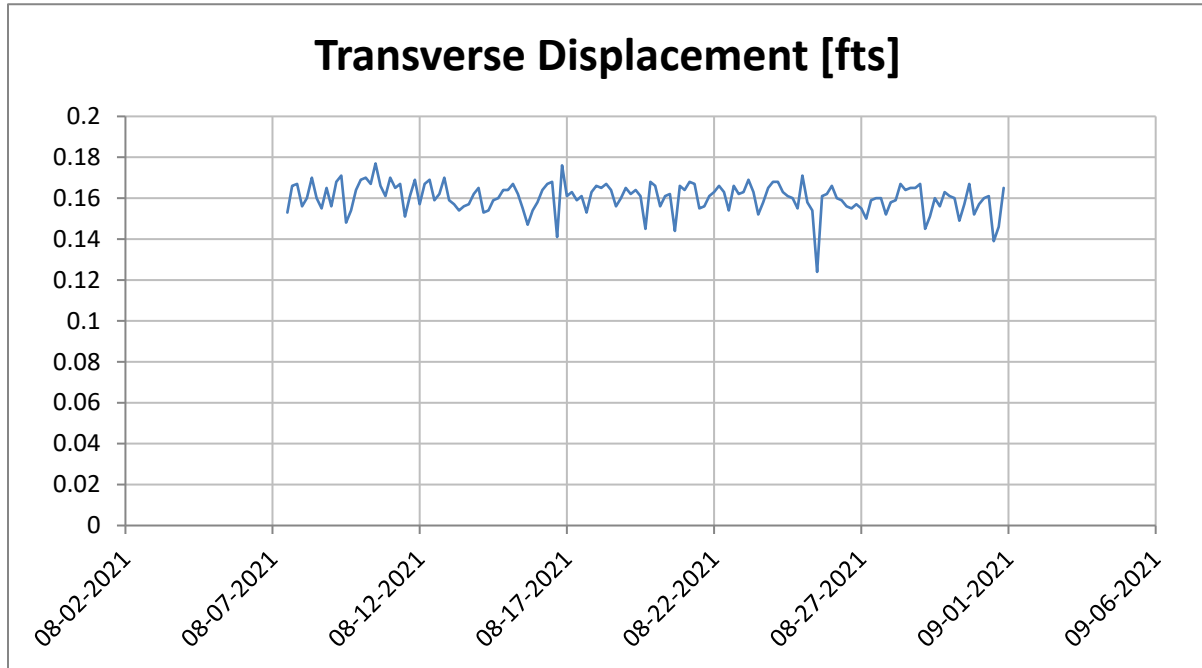


#### Notes:

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## Prism P2

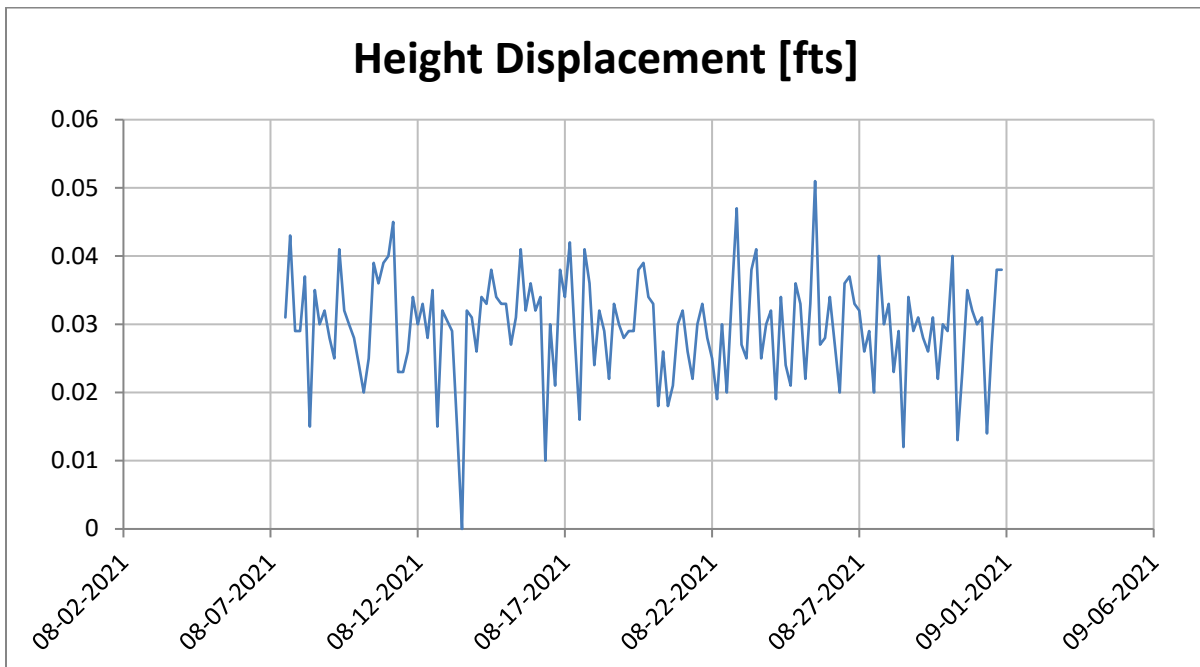
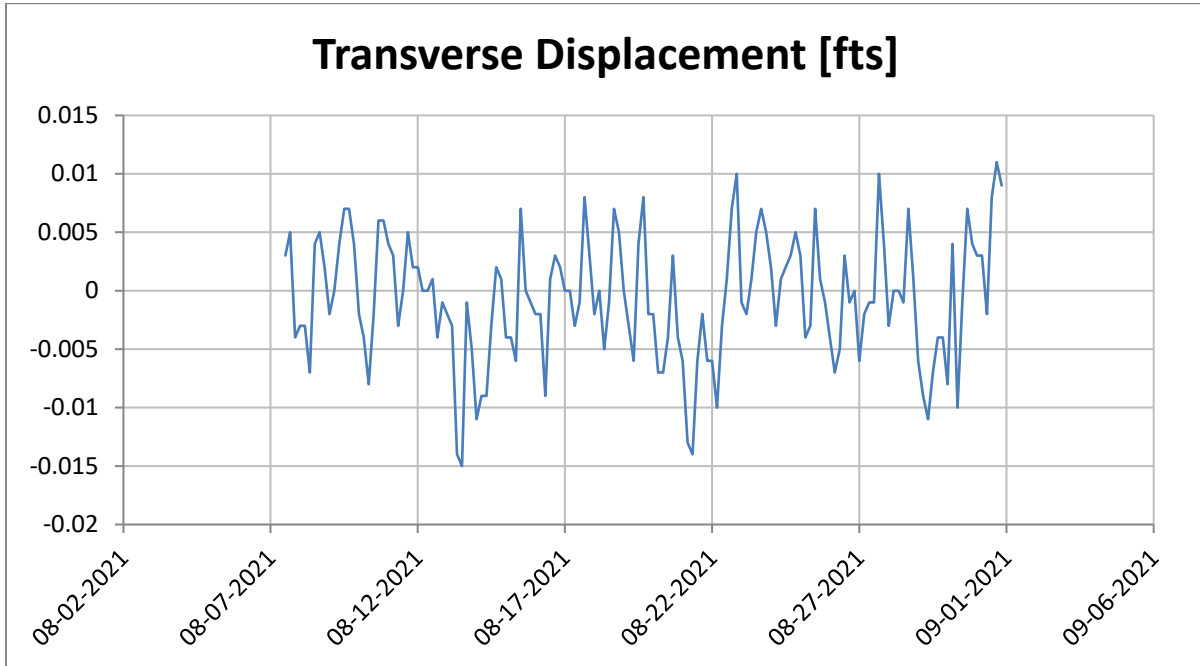


#### Notes:

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4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P25

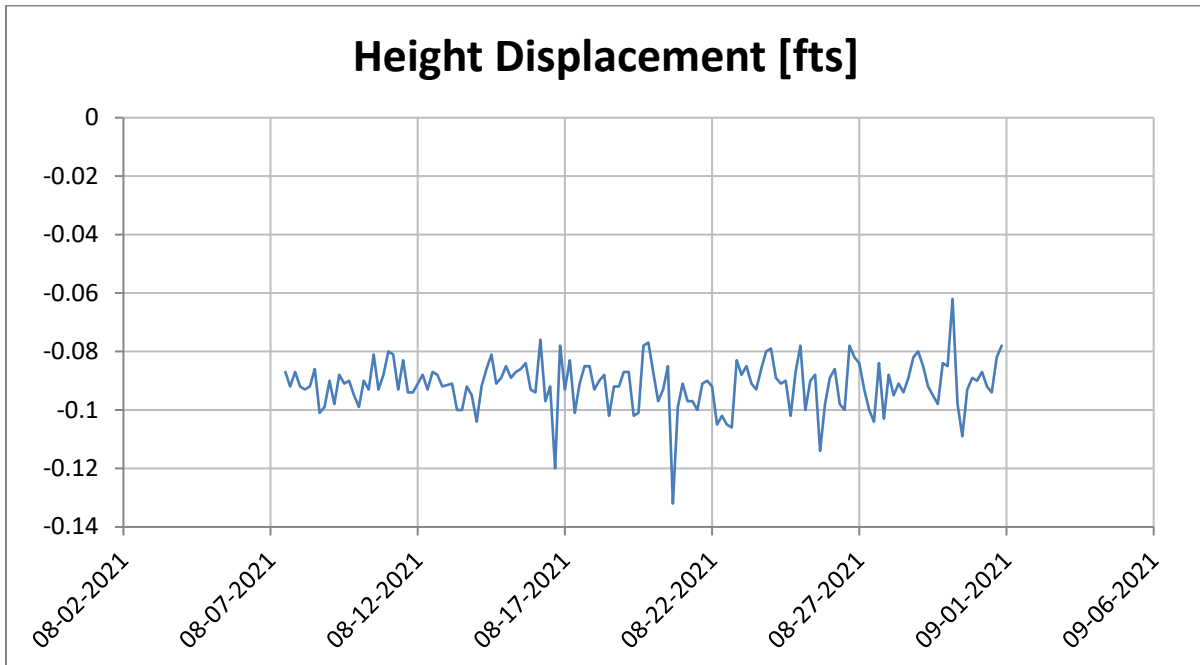
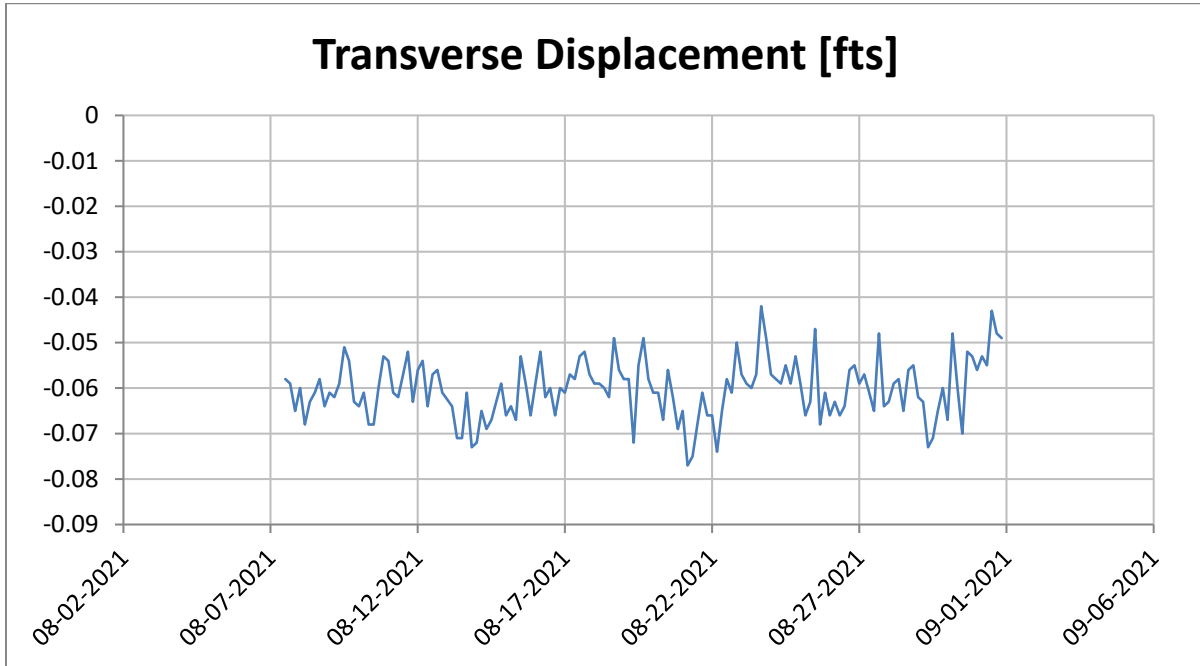


#### Notes:

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2. Alarm threshold is  $\pm 0.35$  feet.
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4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P32

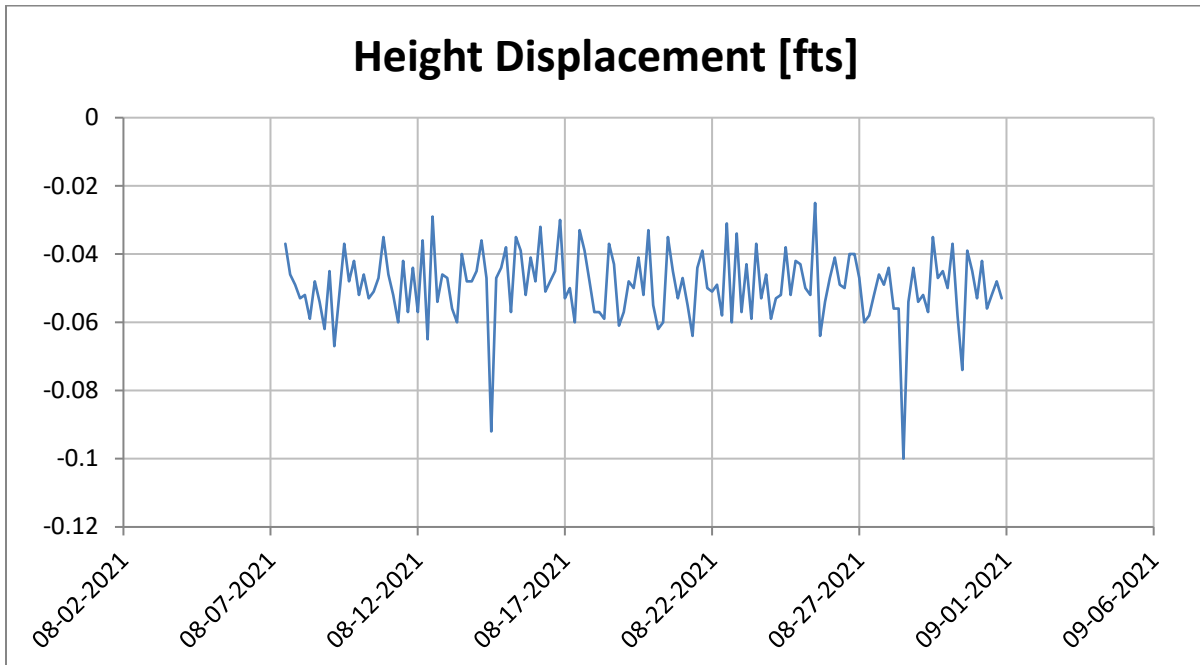
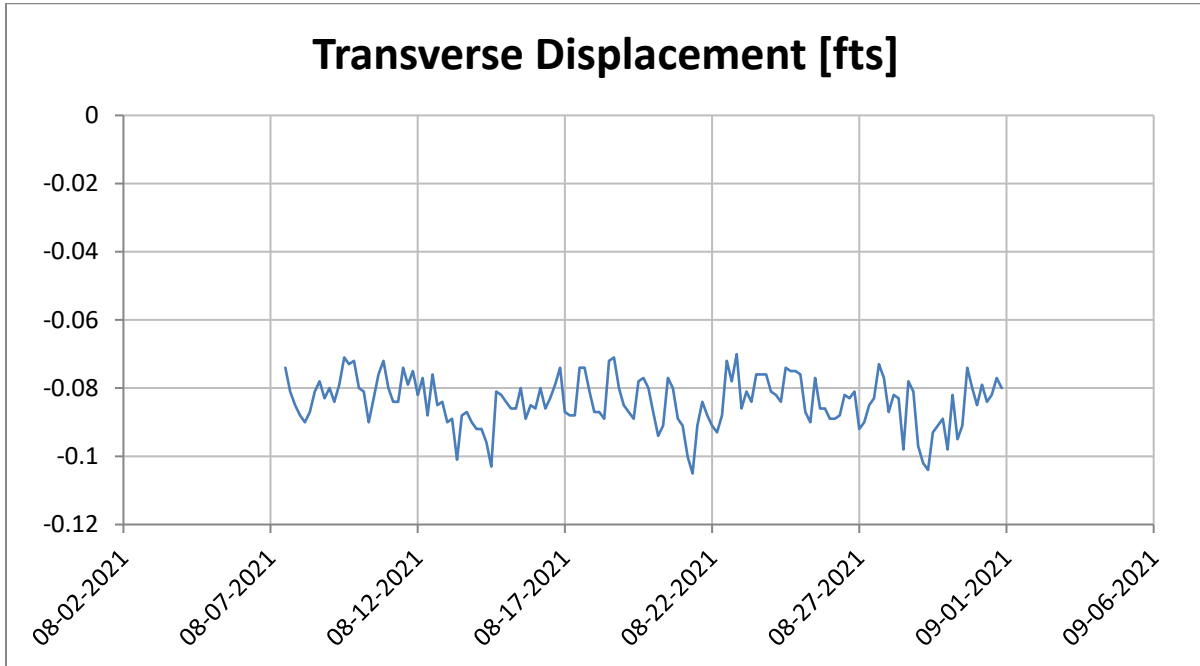


#### Notes:

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4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P33



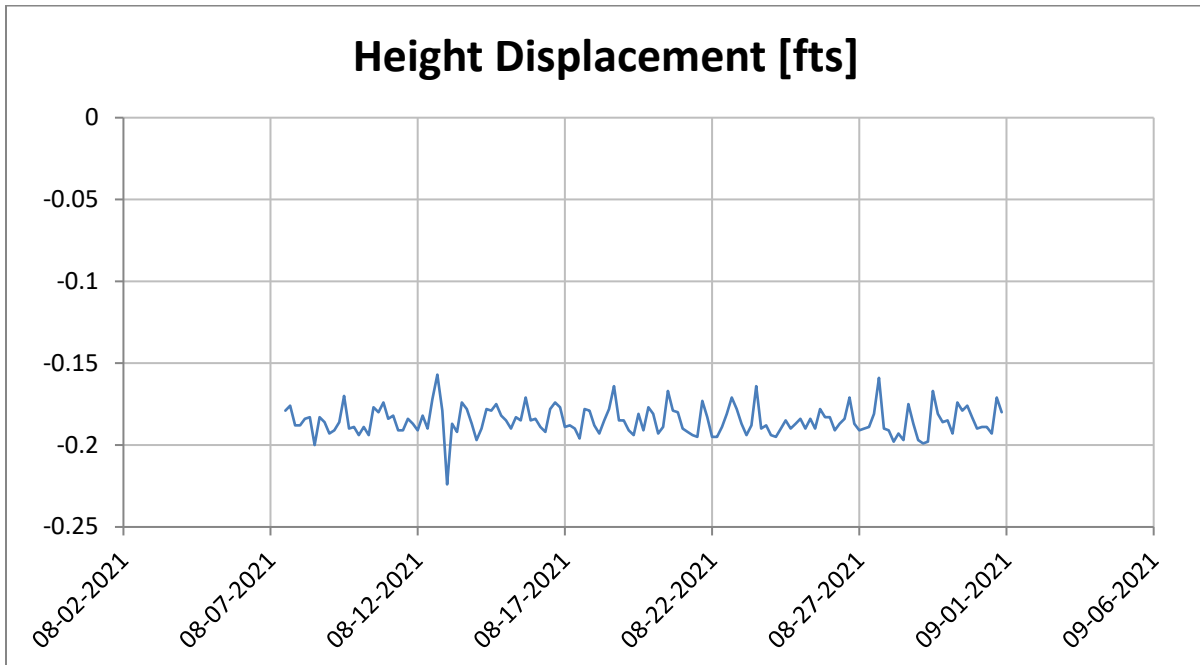
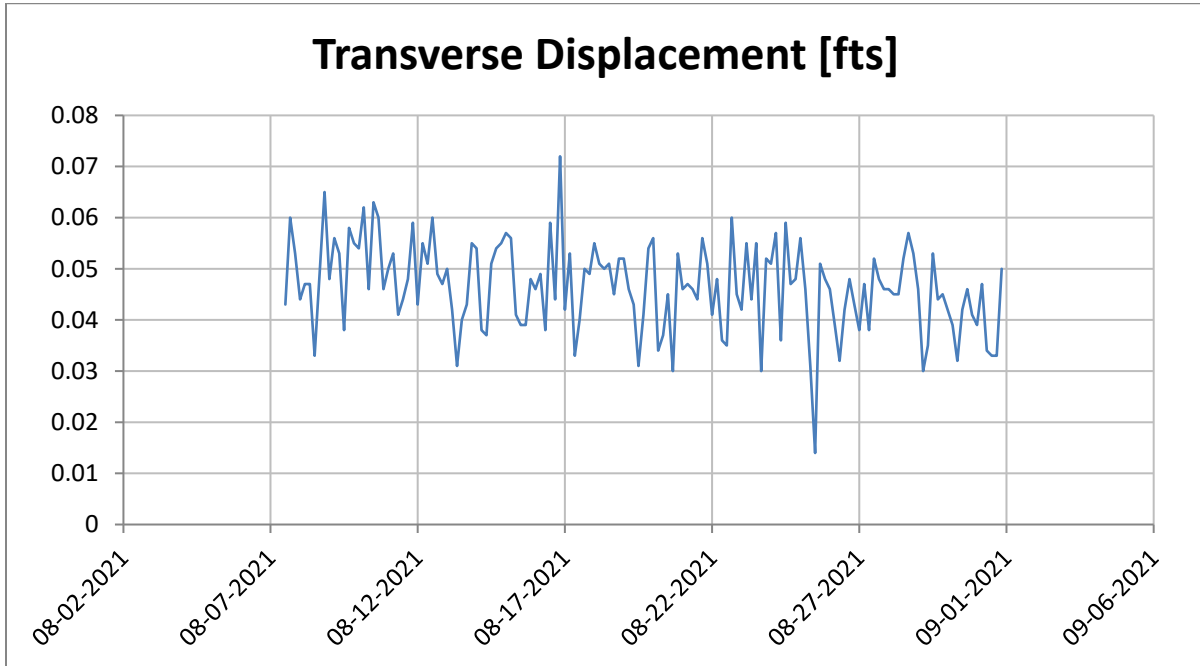
#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.





## Prism P35

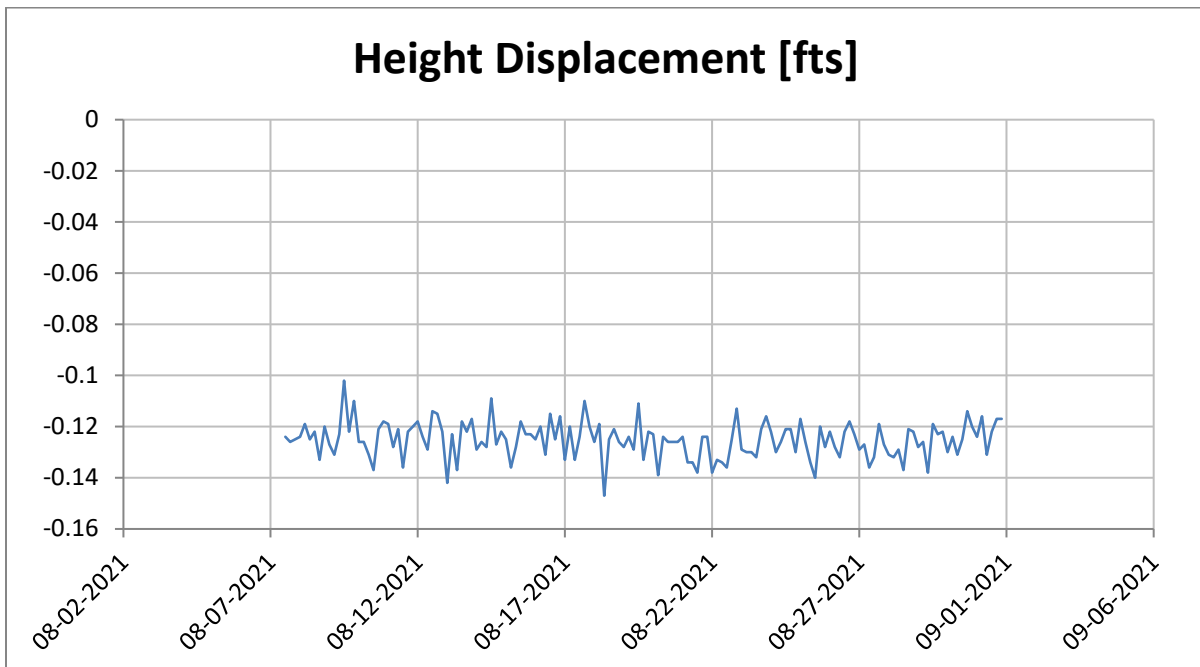
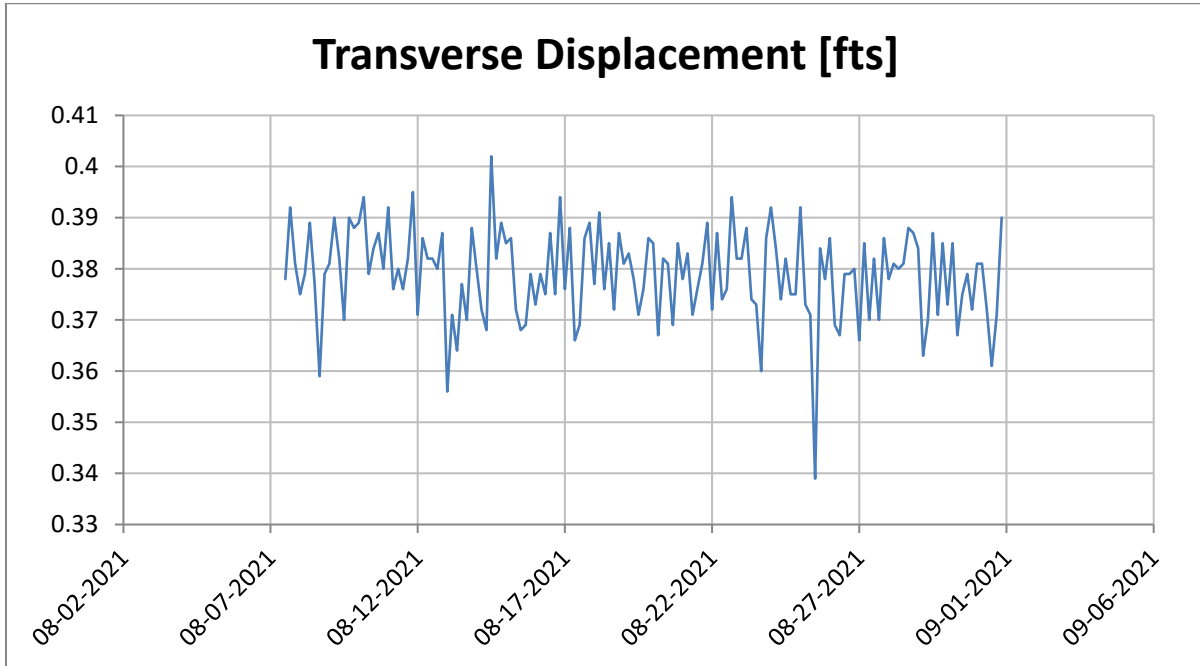


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P4

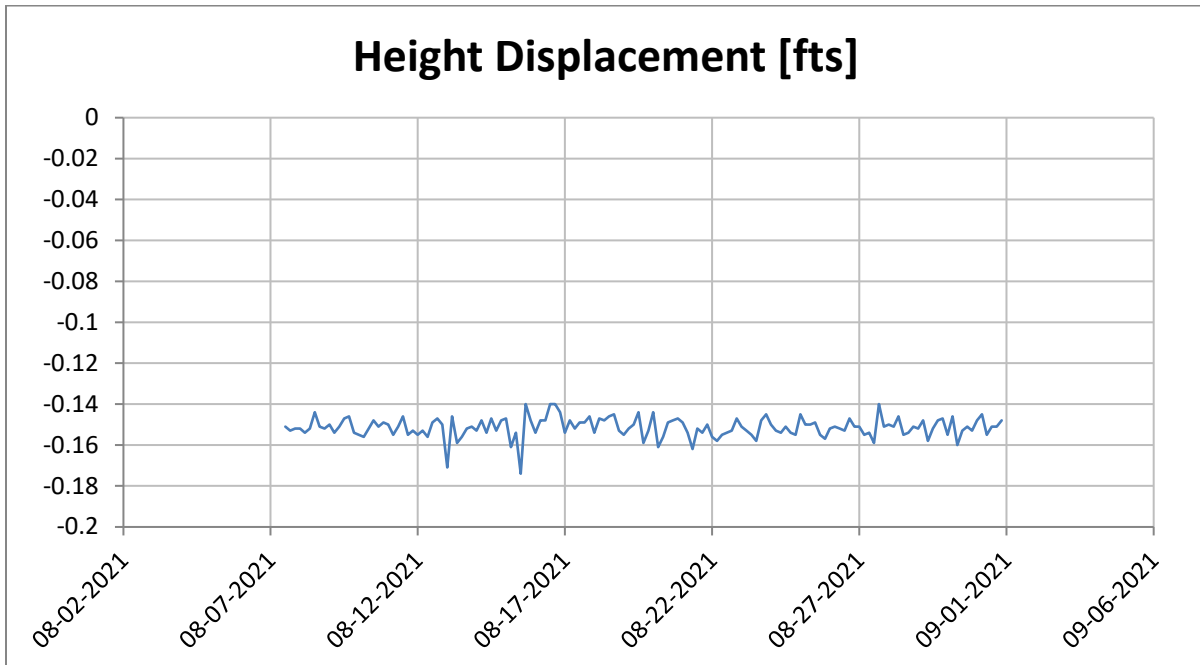
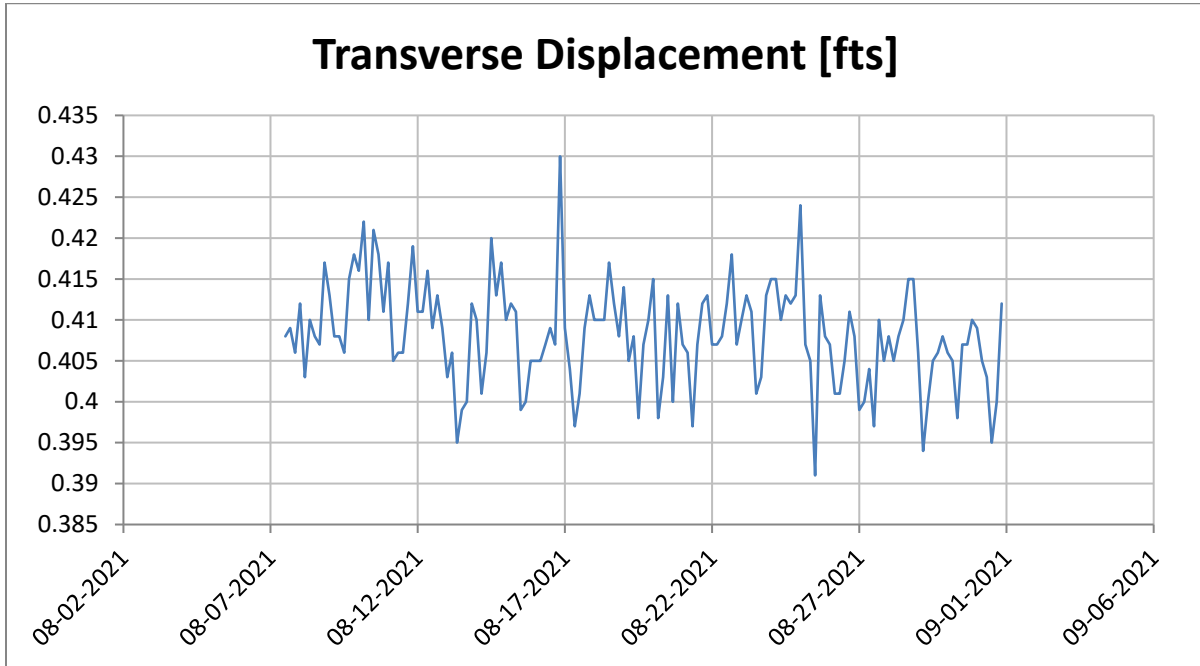


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P5

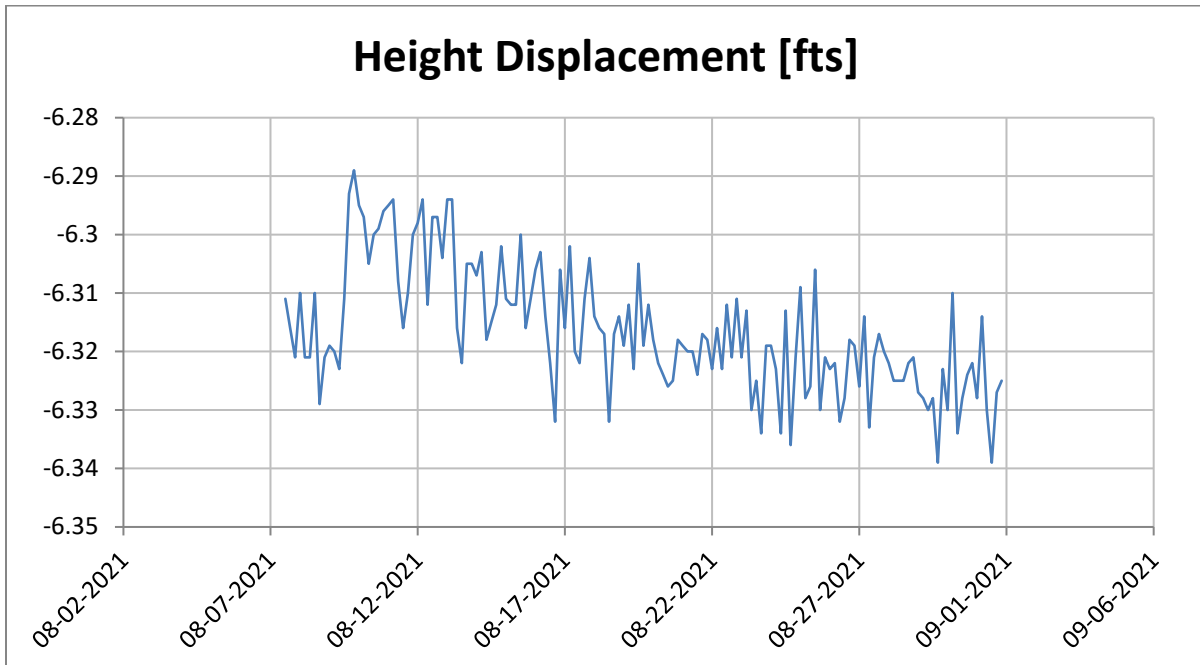
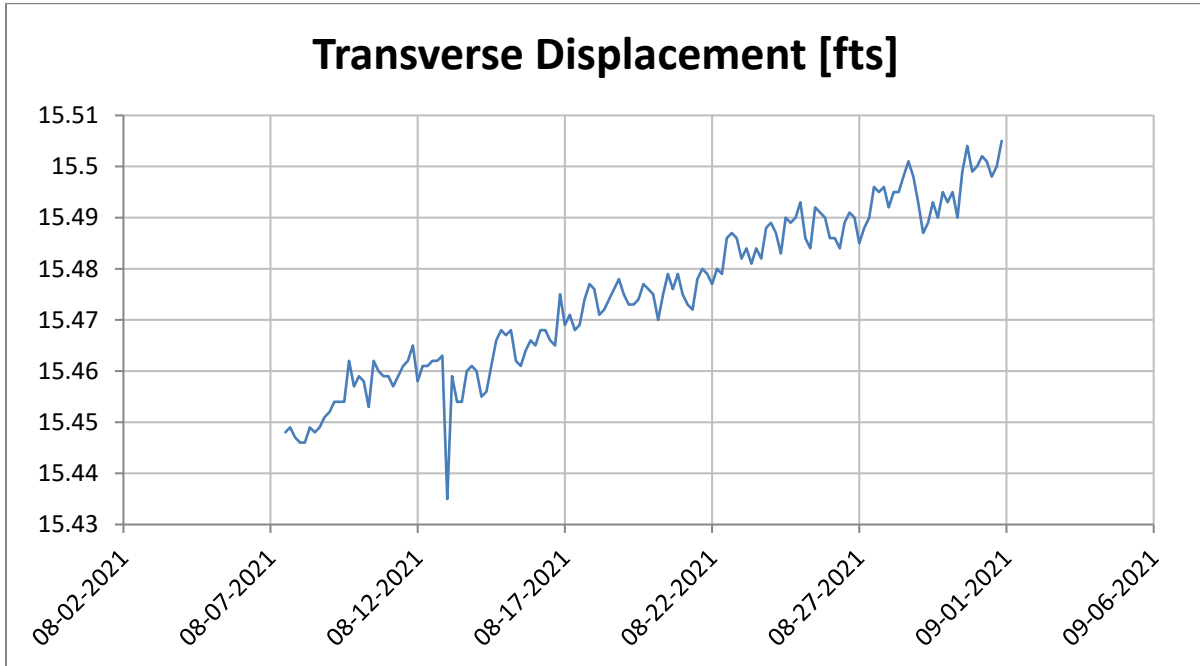


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P63

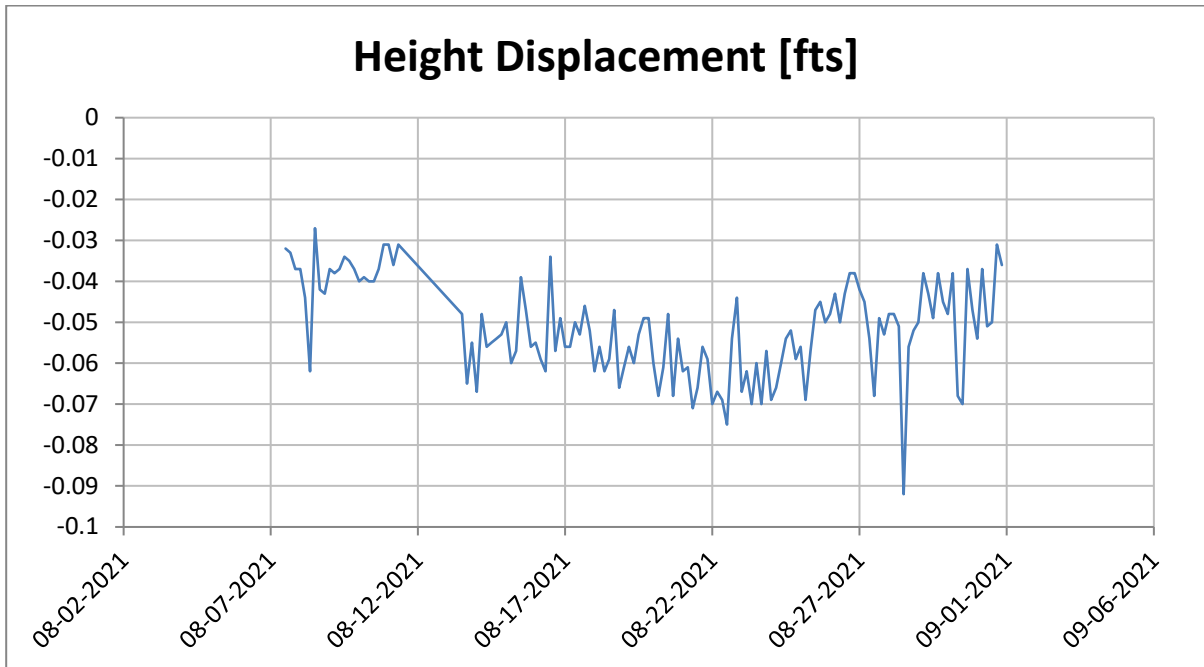
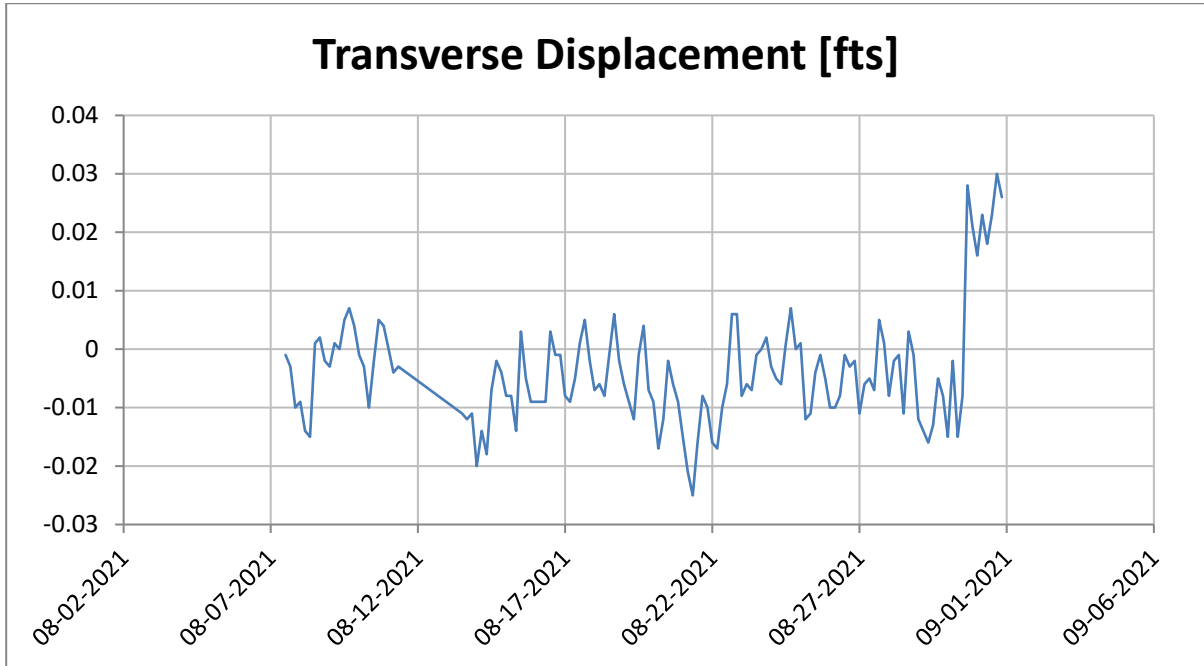


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



## Prism P69

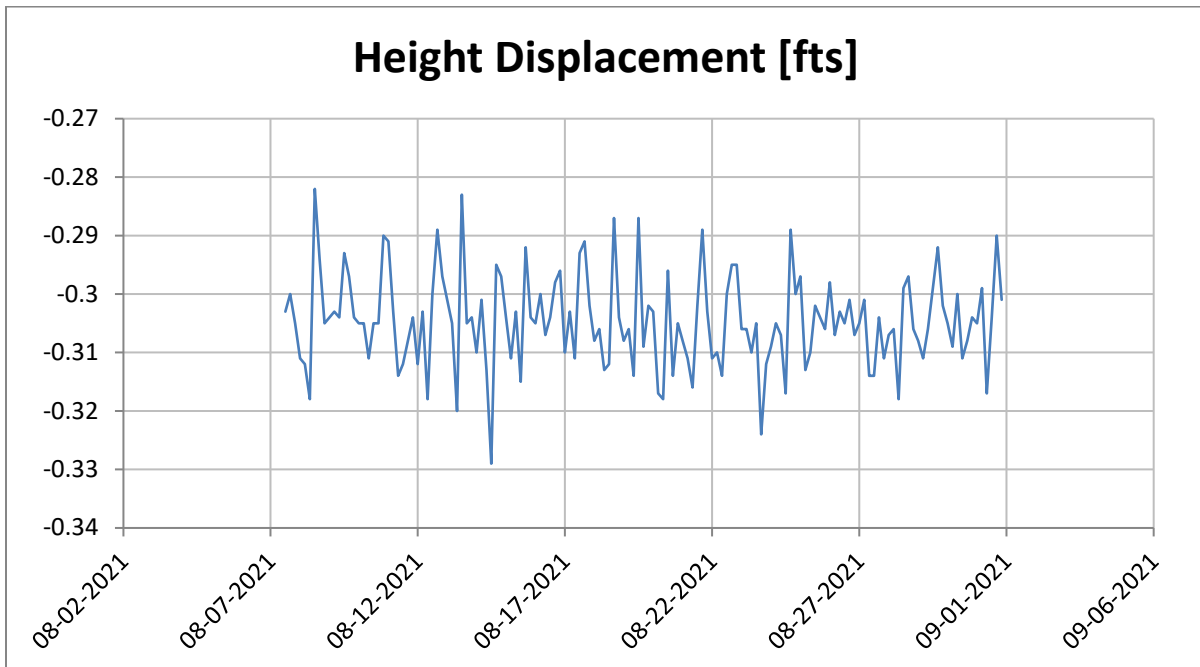
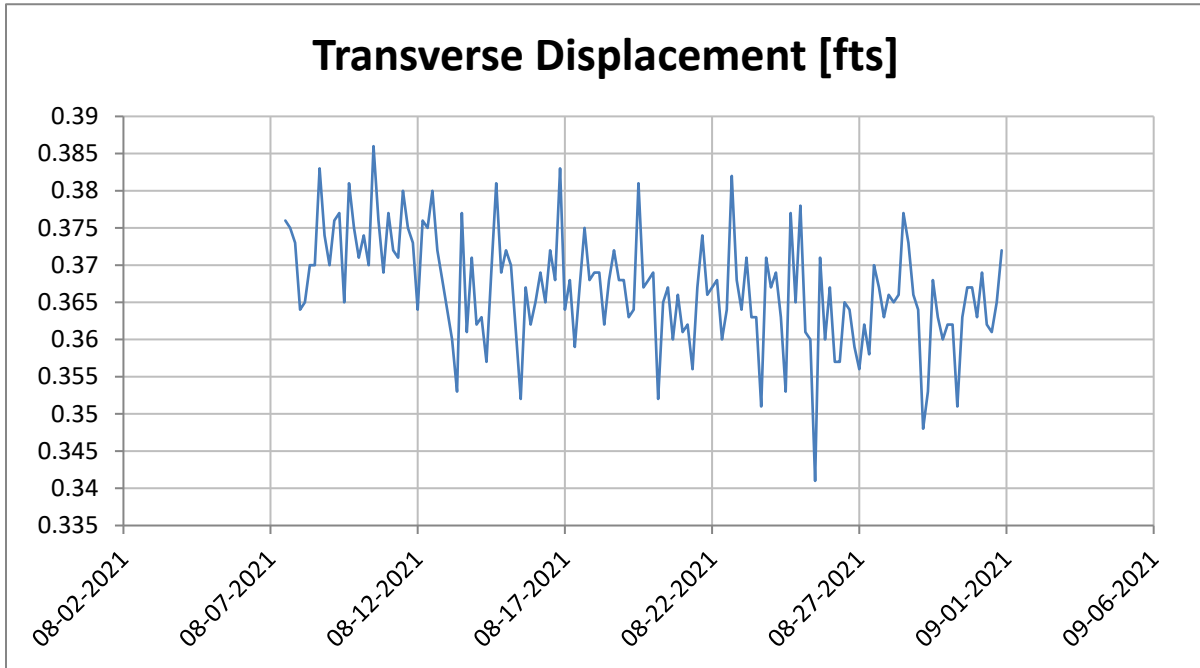


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.
5. Prism P69 was moved due to erosion and placed approximately in its original position.



## Prism P70

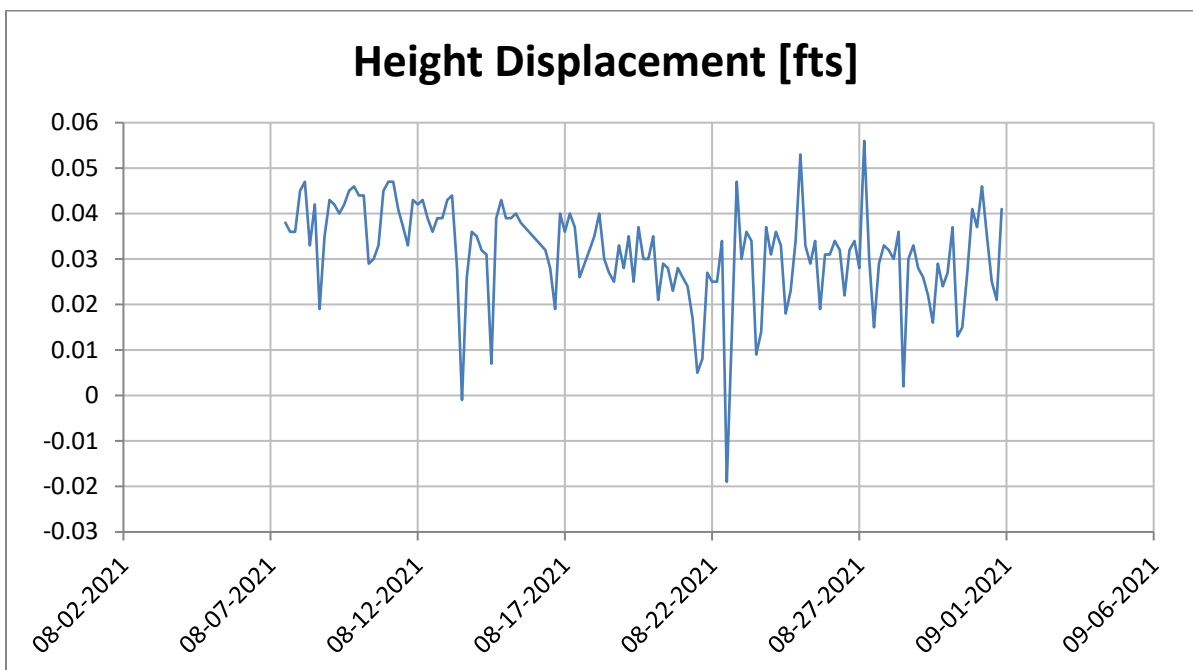
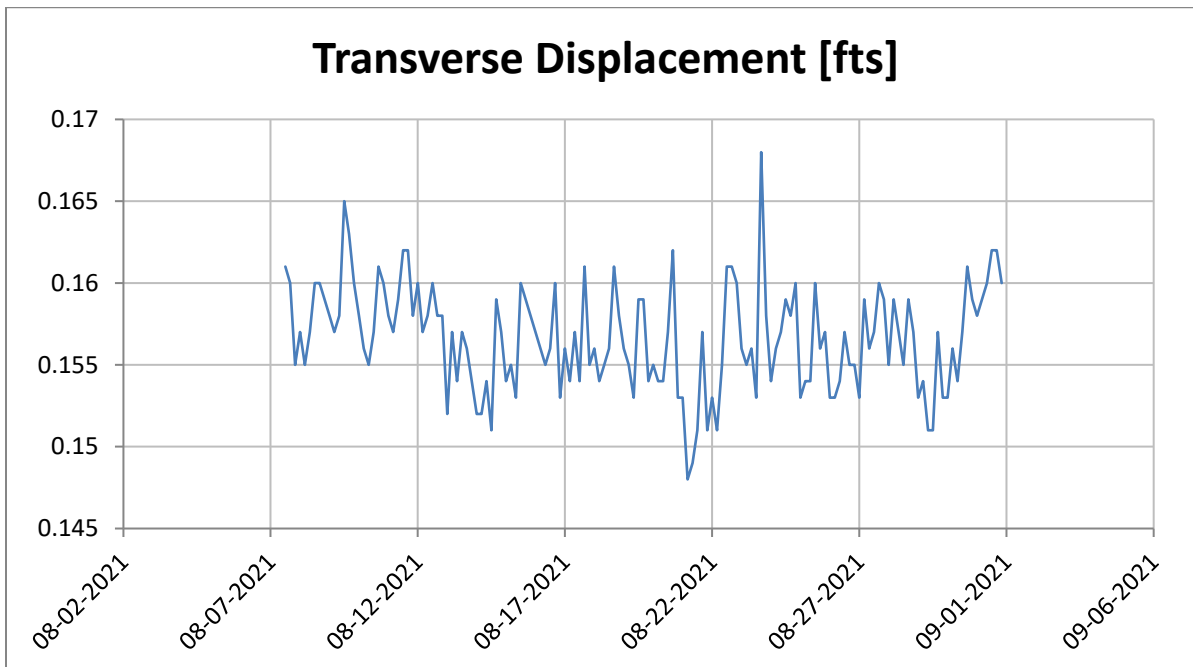


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.



# Prism TOE1

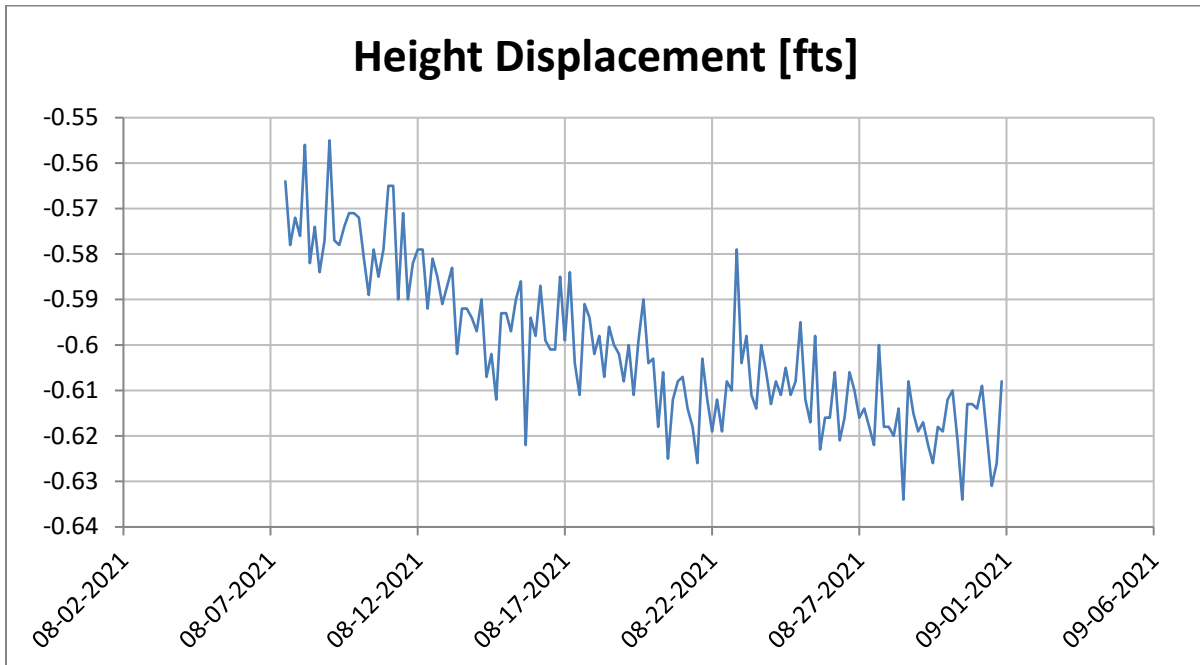
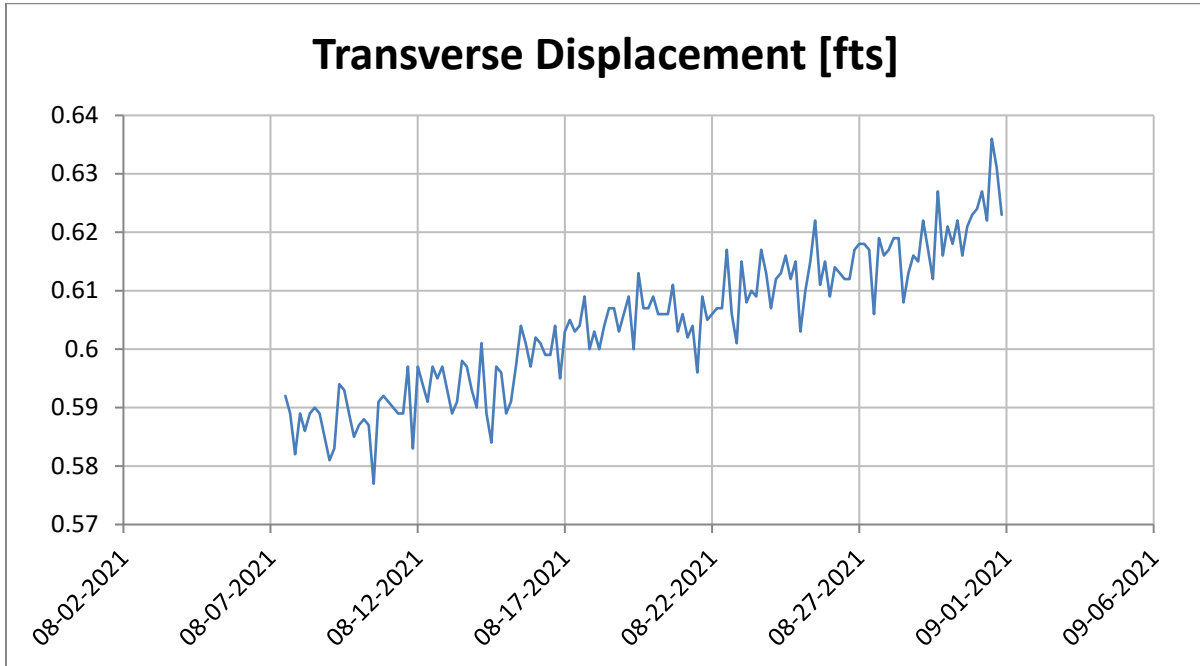


#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.
5. Prism TOE1 was moved by wildlife on 8/15.



## Prism TOE2



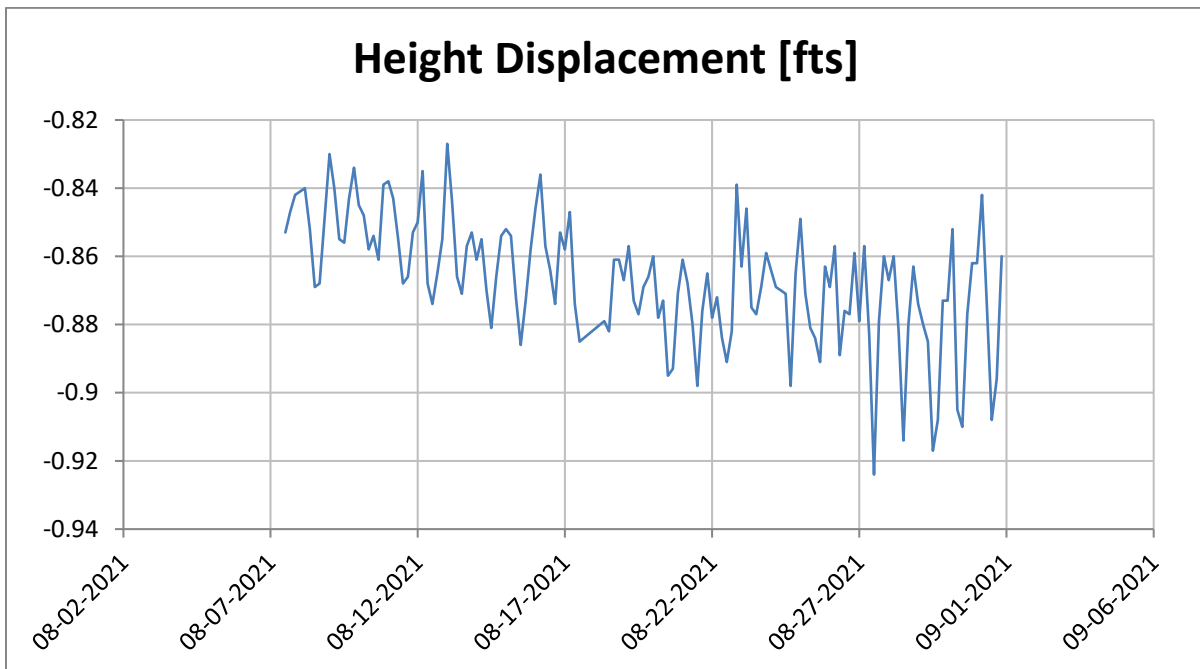
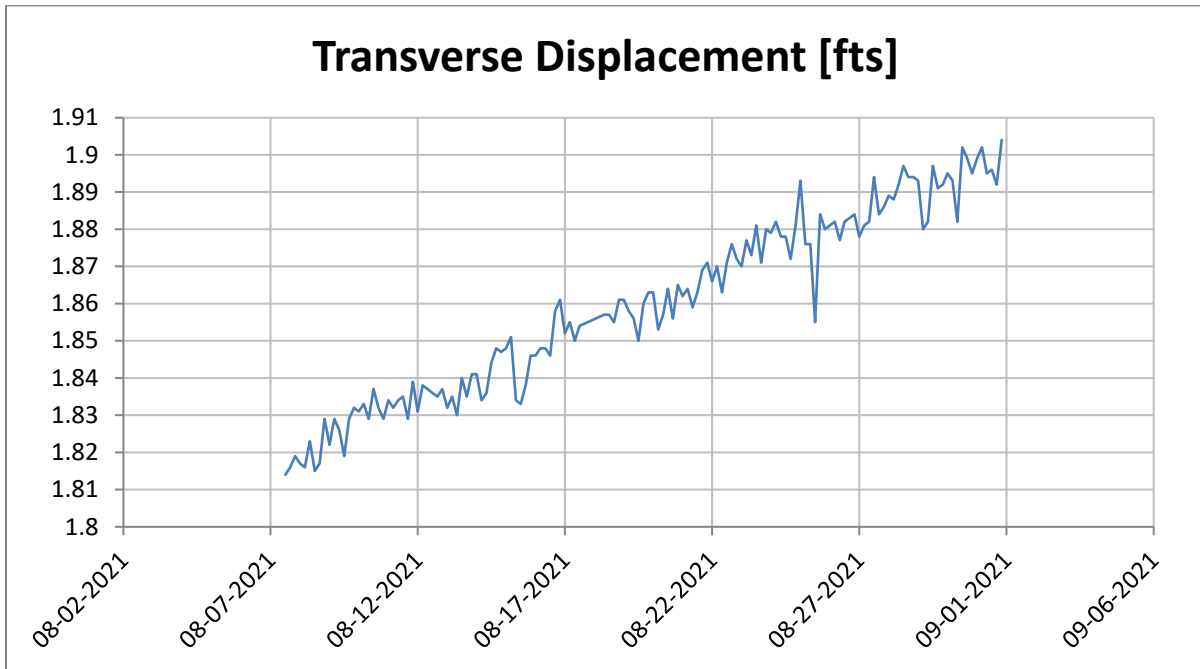
#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.
5. Prism TOE2 is located at the toe of the landslide. This location showed slope creep movements at slow velocities.





## Prism TOE3



#### Notes:

1. Survey accuracy is +/-0.016 feet.
2. Alarm threshold is +/-0.35 feet.
3. Transverse displacement is in the horizontal direction. Positive direction means closer to the robotic station.
4. Height displacement is in the vertical direction. Positive direction means higher in elevation.
5. Prism TOE3 was moved by wildlife on 8/17.



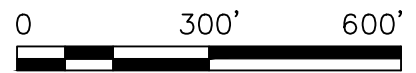
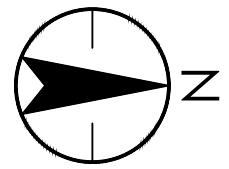
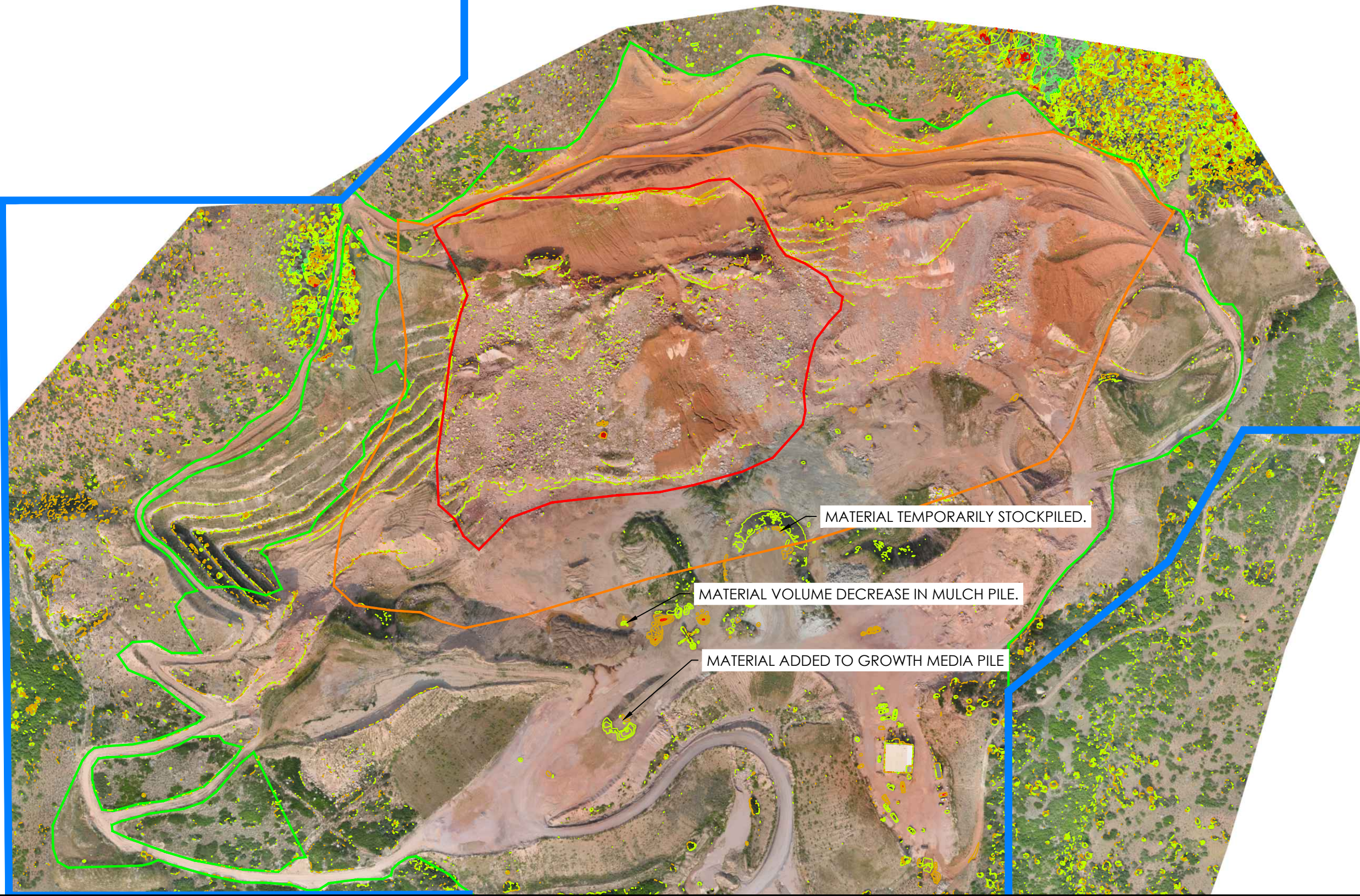
# Appendix C

Drone Survey



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**LEGEND**

- Permit/Affected Lands Boundary
- Proposed Disturbance Limit
- Landslide Extent
- Buttress Fill Extent
- Comparison Contour. Increase in elevation. (CI=2')
- Comparison Contour. Decrease in elevation. (CI=2')

1. COMPARISON OF DRONE FLIGHTS FROM 07/15/21 and 08/16/2021.

Client/Project  
**CONTINENTAL MATERIALS CORP.  
 PIKEVIEW QUARRY SLOPE MONITORING**

Project No.  
 227419041

Title  
**EXISTING PRISMS WITH CURRENT SURFACE**

Revision #	Date
	2021.09.30
Drawn By PK	Figure No. 5