

# Microseismic Monitoring Report

## Sulphur Mines Salt Dome – Louisiana (US)

### Borehole and Surface Seismic Arrays

Report Period: October 2025

Reference: 2634299-SUL-MR-251001

Report Review: Michael Reese – Baker Hughes LBPG #1428

LBPG review using results from Baker Hughes and Nanometrics Inc.



This review is based solely on microseismic monitoring results provided in the Baker Hughes October 2025 monthly report from the Baker Hughes microseismic team. The report results were passed through the Baker Hughes QA/QC microseismic processing workflows for accuracy and repeatability. No other information, data or observations from the Sulfur Mines Salt Dome operations were provided to support Baker Hughes report results for this PG review. Interpretation of the events is performed by Sulphur Mines Salt Dome. Details of processing and events are provided in the Baker Hughes October 2025 report (appended to this cover letter).

Seismic monitoring and data processing at Sulphur Mines Salt Dome combines the borehole and surface seismic arrays data for microseismic event processing. This includes the follow:

- Nanometrics operates and performs seismic processing for the surface seismic array using broadband network stations.
- Baker Hughes accesses the real time surface array waveform data and integrates it into the borehole waveform data for processing the microseismic location and magnitude.
- Baker Hughes provides event locations and magnitudes for all seismic events at Sulphur Mines Salt Dome using the combined borehole arrays and surface array waveform data.

#### **Alert Level Status: Low (Green)**

There was no seismic event with a magnitude  $>0.5$  in the AOI and less than 30 MEQ per day in AOI with magnitudes  $> -1$ , thus maintaining the defined alert level status at Low (green).

With the borehole arrays, a slight decrease with 70 detections / 22 located events were observed in October 2025 compared to 70 detections / 26 located events observed in September 2025. There were 10 events reported in the AOI. With 4 events (AOI Cap Rock), 5 events (AOI caverns - PPG-06 (3 events), PPG-02 (1 event), LGS-02 (1 events) and 1 event (AOI Flank). There were 12 events outside the AOI with 10 events in the Flank and 2 events in the caprock. The maximum magnitude of  $-0.80$  was reported outside of the AOI along the flank of the salt dome (4350 ft.). The depths of all observed events from 950 ft to 6150 ft.



# **MICROSEISMIC MONITORING**

## **MONTHLY REPORT: October 2025**

### **Sulphur Mines Salt Dome – Louisiana (US)**

2634299-SUL-MR-251001

<b>Client / Site</b>	Sulphur Mines Salt Dome	
<b>Recipient</b>	Joshua Bradley (Westlake)	
<b>Reference</b>	2634299-SUL-MR-251001	
<b>Period</b>	<b>from</b>	2025/10/01
	<b>to</b>	2025/10/31

## Revision history

Version	Date	Issued by	Verified by	Approved by	Description
1.0	2025/11/17	M. Branellec	E. Fortier	JM. Embry	Monthly report

## Acronyms

Acronym	Signification
N/A	Not Applicable
PGV	Peak Ground Velocity
AOI	Area Of Interest

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## Summary

Network & IT status	<b>System Uptime</b>	100 % - Borehole arrays 100 % - Surface Network
	<b>Digitizers connectivity</b>	Continuous, with no acquisition stops
	<b>Sensors / Noise level</b>	<ul style="list-style-type: none"> <li>• <b>Borehole arrays:</b> 100 %               <ul style="list-style-type: none"> <li>○ <b>PPG-6</b> (6 levels) → noise level: 5 to 20 nm/s (RMS) except sensors PPG-6.1Z with 60 nm/s</li> <li>○ <b>PPG-2</b> (6 levels) → noise level: 8 to 20 nm/s (RMS) except sensors PPG-2.3 [30; 200nm/s] and PPG-2.6 [10; 60 nm/s]</li> </ul> </li> <li>• <b>Surface receivers:</b> 100 % 6 sensors (3-axis) → N/A</li> </ul>
Seismic activity	<b>BOREHOLE ARRAY</b>	
	Detections (of which) Located Max magnitude Max PGV Min depth Max depth	70 22 -0.8 0.0145 mm/s 950 (ft) 6,150 (ft)
	<b>Number of alerts in the month</b>	<b>0 – No alert triggered in October 2025</b>

PGV = Peak Ground Velocity – Maximum vibration measured on the sensors (mm/s)

## Introduction

### I. Alert Level Status

During October 2025 the alert level status was: Low (Green). Alert level criteria are listed in Appendix 1.

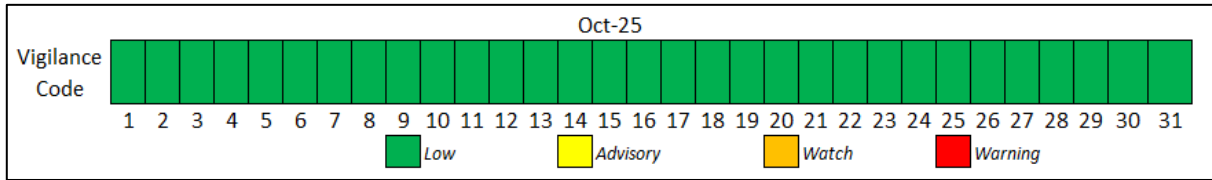


Figure 1: Alert status level during October 2025.

### II. Seismic Network

Microseismic monitoring in Sulphur Mine Salt Dome is executed by:

- **Two borehole arrays**
  - Baker Hughes Microseismic Services group operates and processes data for the borehole seismic arrays located in PPG Well No. 006-X and PPG Well No. 020. The seismic array locations are shown in Figure 2 and the coordinates are listed in the Appendix 2. The borehole arrays were fully functional in October 2025.
- **A surface network, composed by 6 Broadband Trillium**
  - Nanometrics operates the surface broadband array and provide Baker Hughes the data that are incorporated in the final files. The broadband station locations are shown in Figure 2 and listed in Appendix 2.

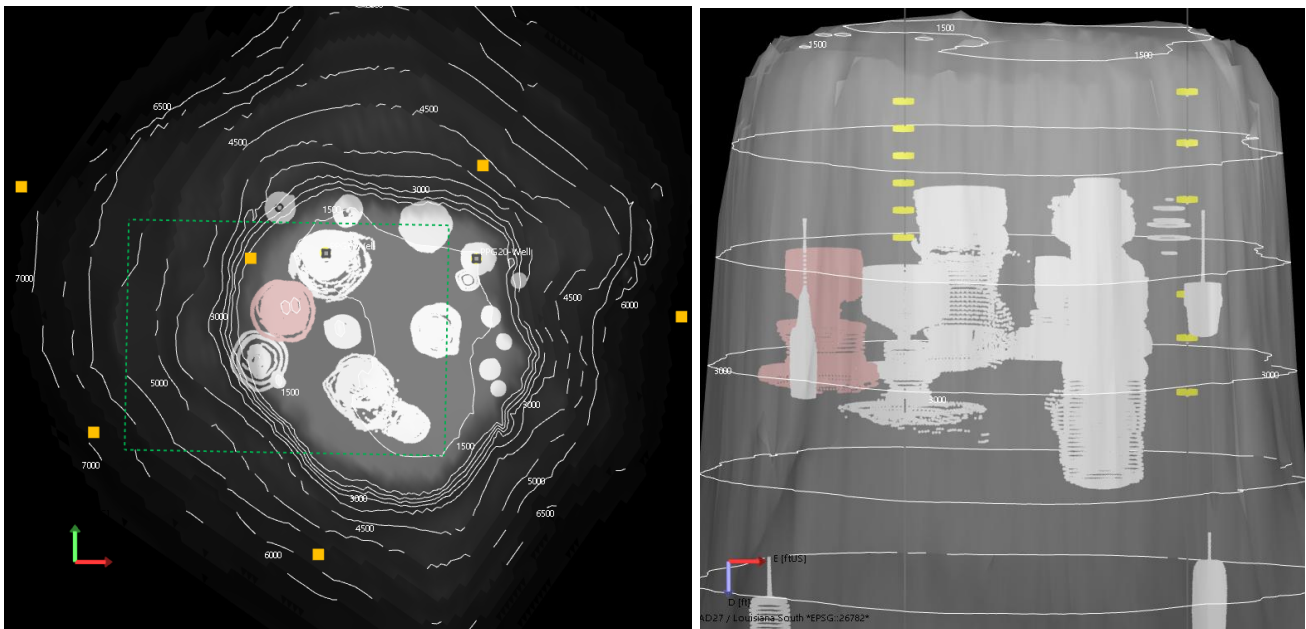


Figure 2: Map (left) and West-East cross section (looking from the South) of the Sulphur Mines Salt Dome. The salt boundary is indicated by gray contour lines. The wellbores with the borehole array sensors are marked by yellow dots for PPG No. 006X and PPG No. 020. Cavern 7 is represented with a red sonar survey. The proposed AOI is indicated on the map view by the green square. The surface network is indicated by the orange squares.

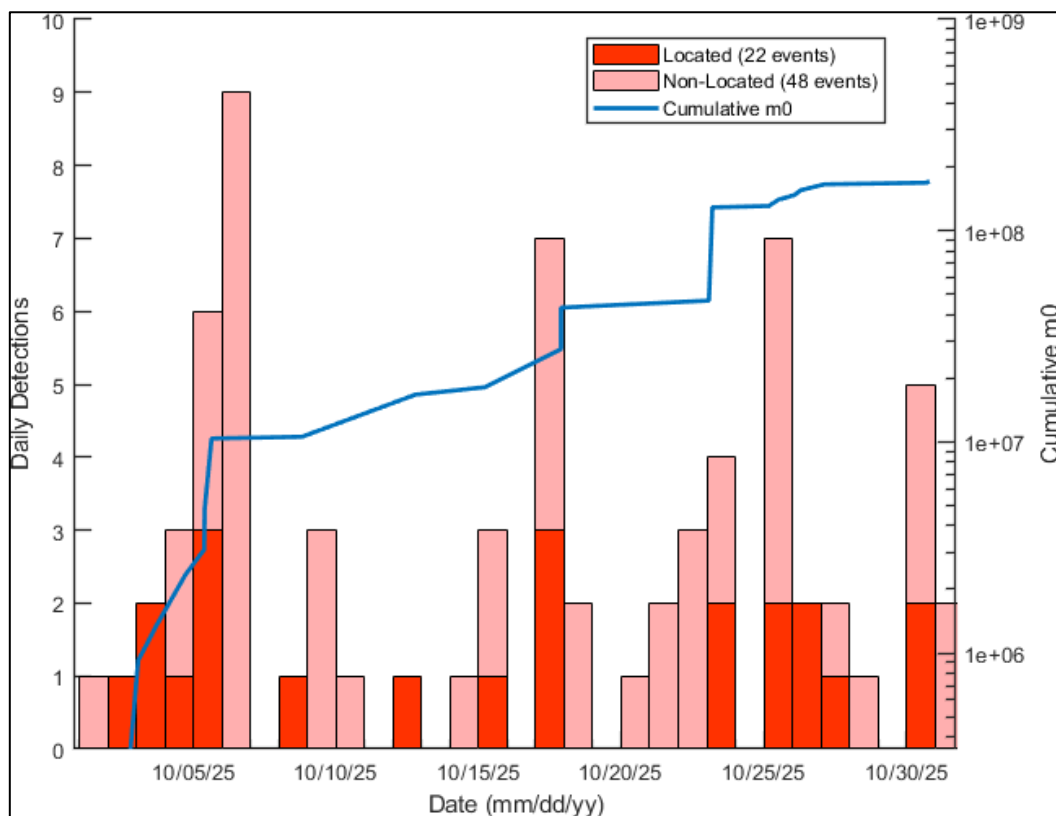
## Microseismic activity during reporting period

- in October 2025, 70 seismic events have been detected by the borehole arrays, **22** events had waveform with sufficient signal to noise ratio to compute their location and magnitude. Amongst the 22 located events,
  - 10 are located inside the AOI (Area of Interest) and distributed as follows (Figure 4):
    - 4 events in the cap-rock,
    - 3 events are associated with cavern PPG-06,
    - 1 event is associated with cavern PPG-02,
    - 1 event is associated with cavern LGS-02,
    - 1 event located on the flank.
  - The other 12 events are located outside the AOI and located:
    - On the flank of the salt dome (10),
    - On the cap-rock (2).
- The maximum magnitude during this period was -0.8 and occurred on 10/23/2025 05:43:50 (CST) along the flank of the salt dome (outside of the AOI).

NB: The catalog of the located events is presented in Appendix 3.

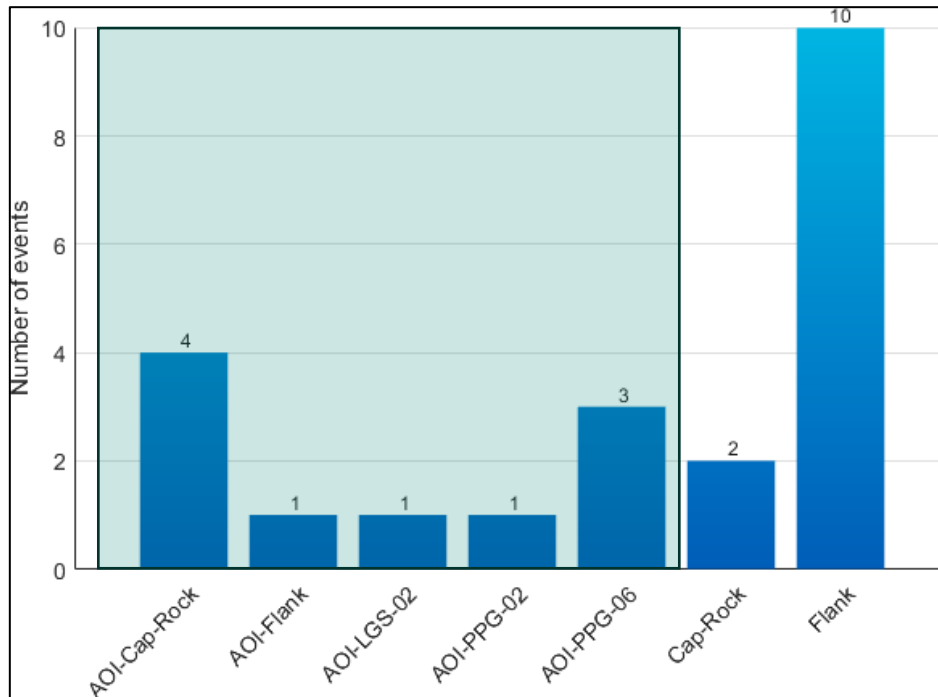
### I. Distribution of the microseismic event

The histogram below shows the number of the locatable and non-locatable events during October 2025.

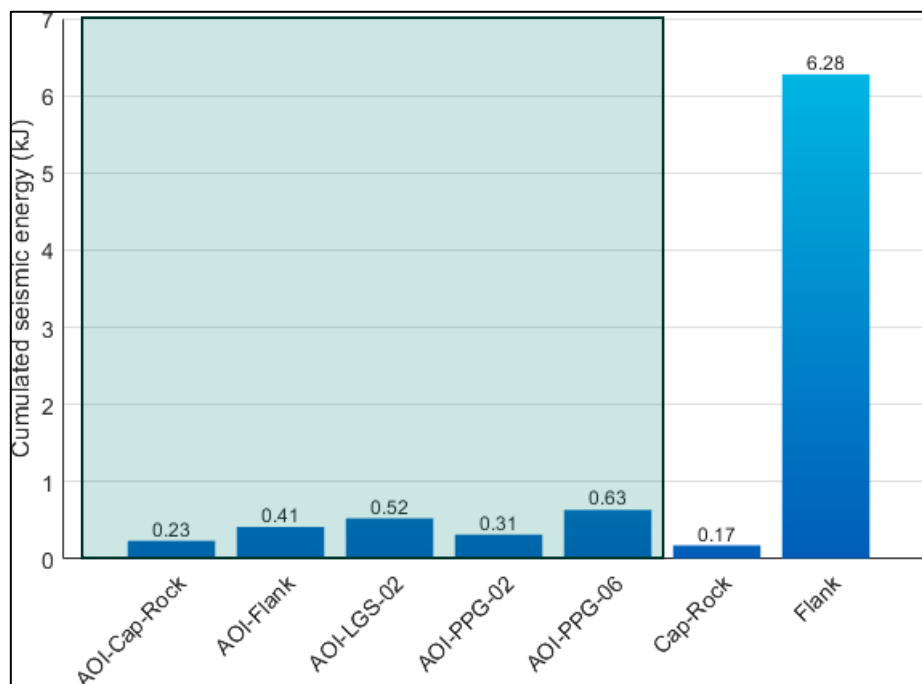


**Figure 3: Daily distribution of all events during October 2025. Dark color represents the located events while light one shows the not located events. Blue line represents the cumulative seismic moment  $M_0$  for the located events.**

Figure 4 shows the distribution of the events by area. In October 2025 the seismicity occurred mainly in the flank (10 events outside of the AOI), on the AOI Cap-Rock (4 events) and around cavern PPG-06 (3 events).



**Figure 4: Events distribution by associated cavern. The green rectangle indicates the events in the AOI.**



**Figure 5: Events energy distribution by cavern. The green rectangle indicates the events in the AOI.**

During October 2025, the greatest amount of seismic energy was released on the flank of the salt dome, outside of the AOI (Figure 5).

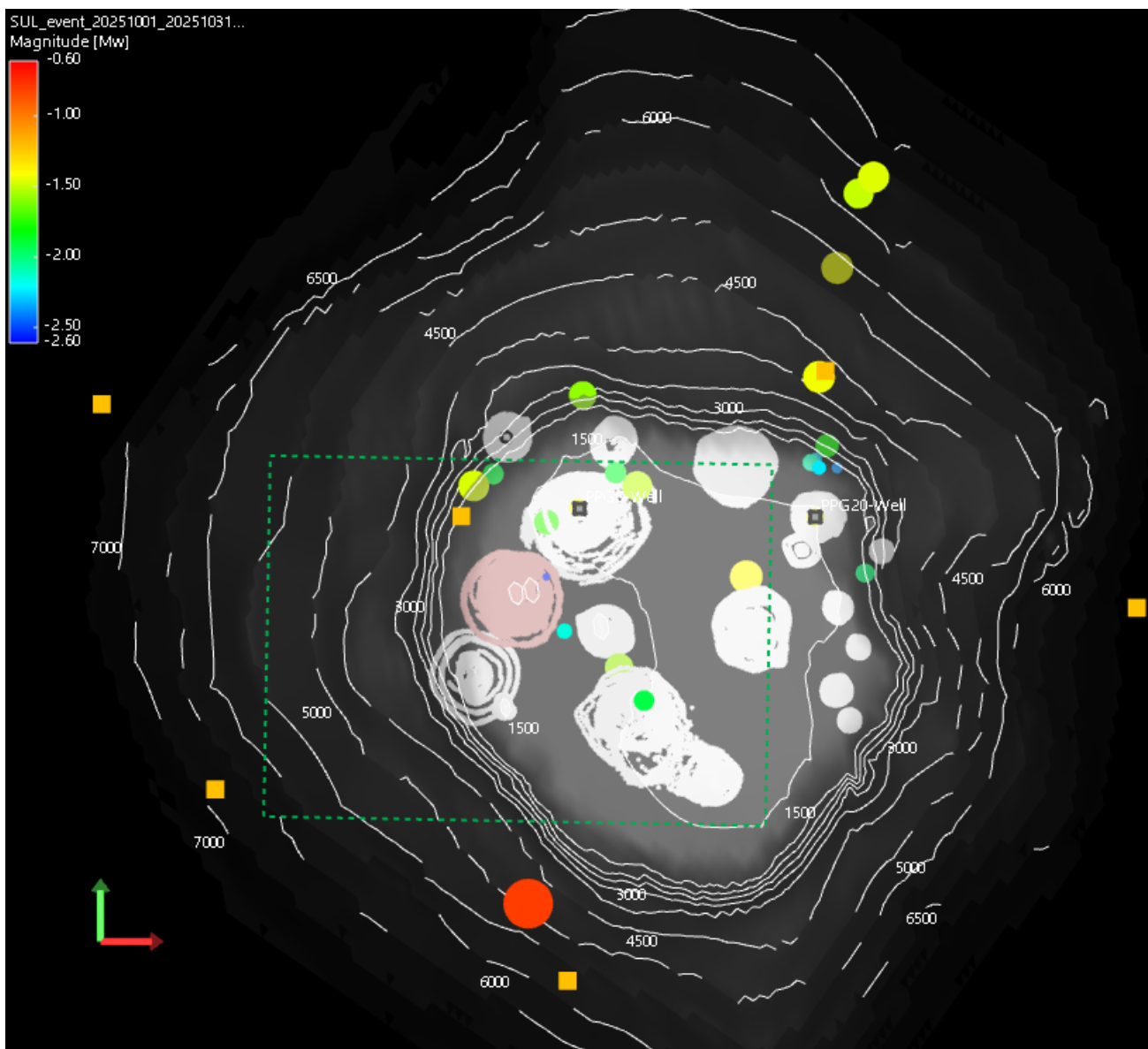
## Event Location

The location maps are presented in the report as:

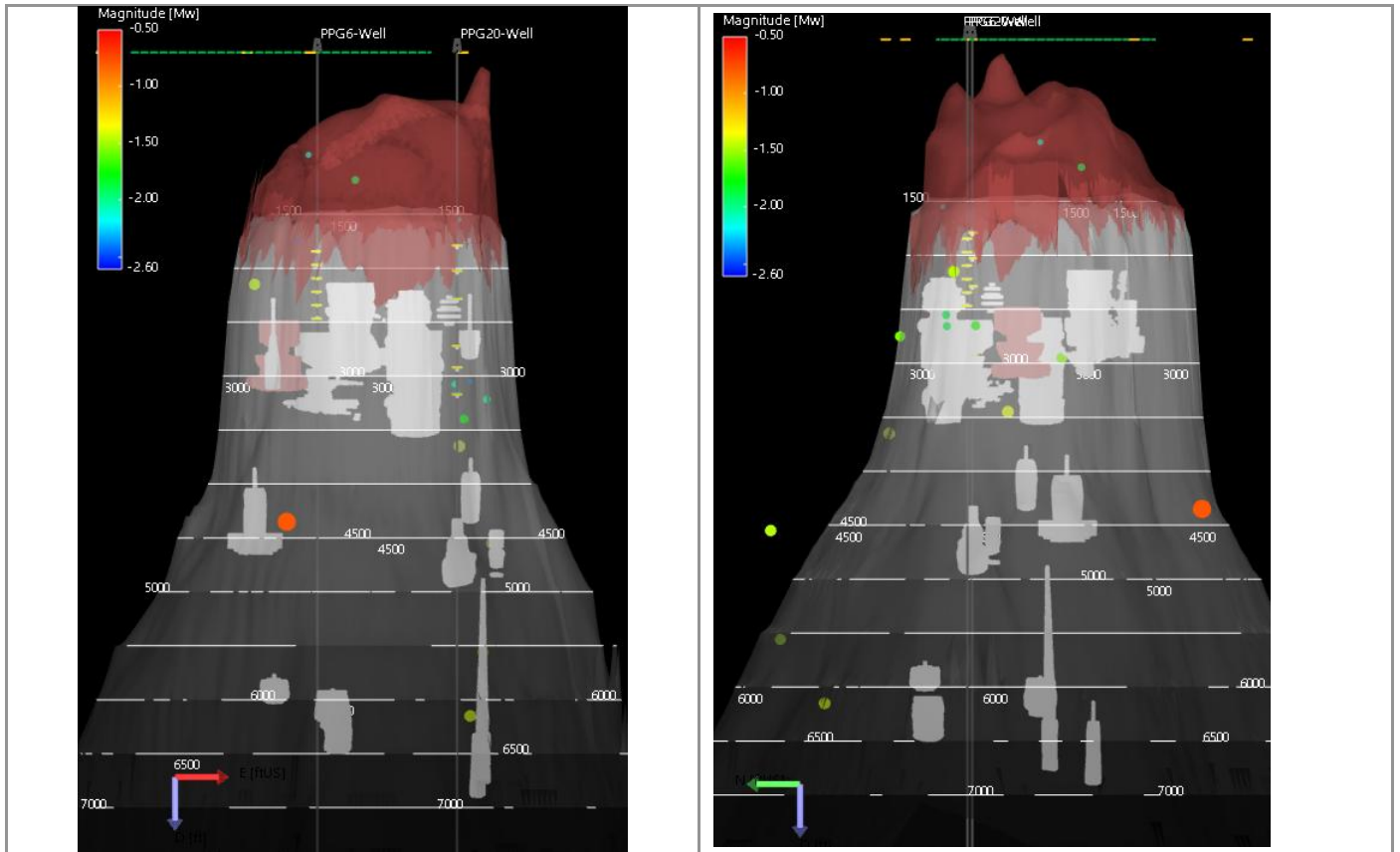
- All events location: inside and outside the AOI (Figure 6 and Figure 7).
- Events located in the AOI (Figure 8, Figure 9, Figure 10).

### I. All event locations (inside and outside AOI)

The figures below show the events location using the borehole arrays.



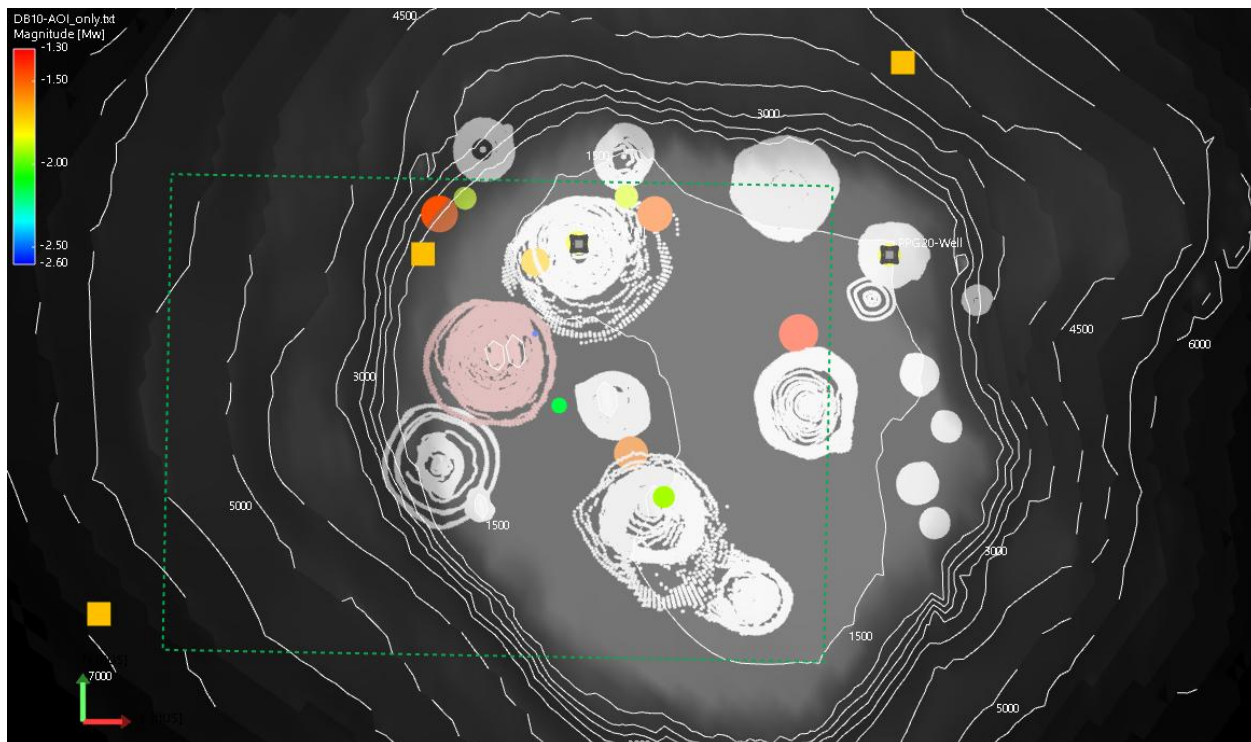
**Figure 6: Map of the located events in October 2025. The events are colored, from blue to red, and sized by magnitude; the green rectangle represents the AOI.**



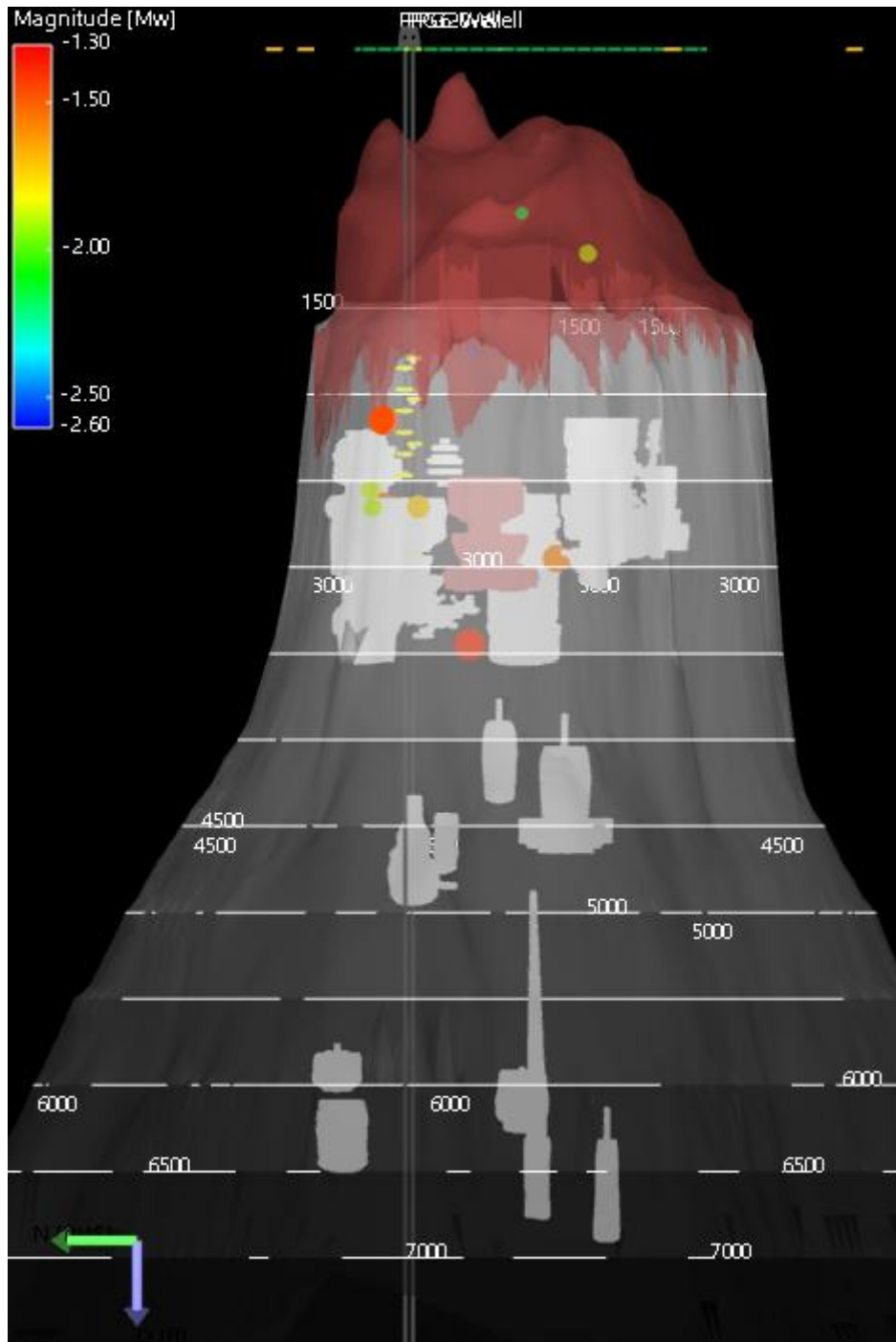
**Figure 7: Cross sections W-E (left) looking from the South, and N-S (right), looking from the West. The events are colored, from blue to red, and sized by magnitude.**

## II. Event Locations in AOI

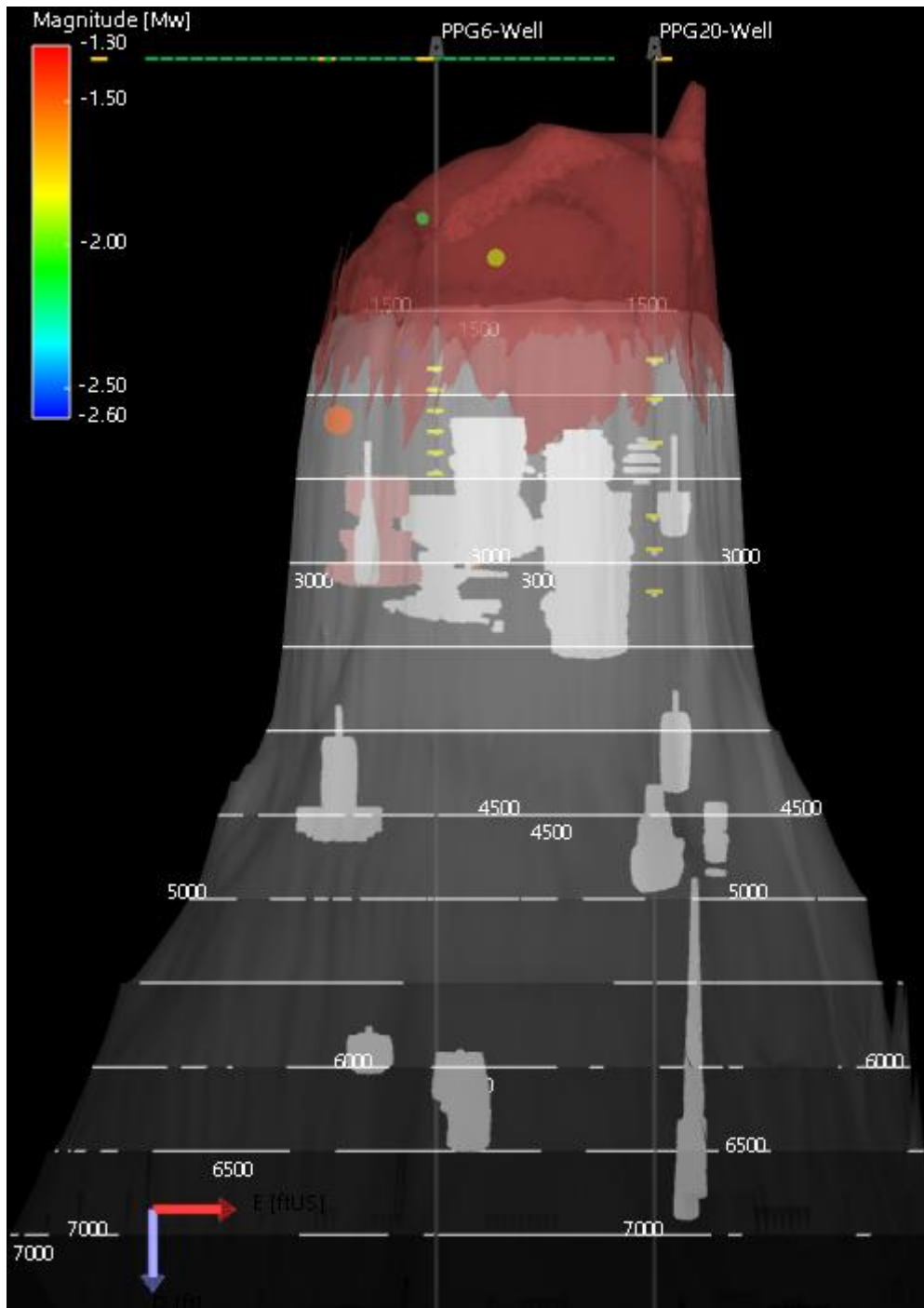
The figures below show the location of the events inside the AOI.



**Figure 8: Map of the located events inside the AOI in October 2025. The events are colored, from blue to red, and sized by magnitude; the green rectangle represents the AOI, the orange squares represent the surface stations.**



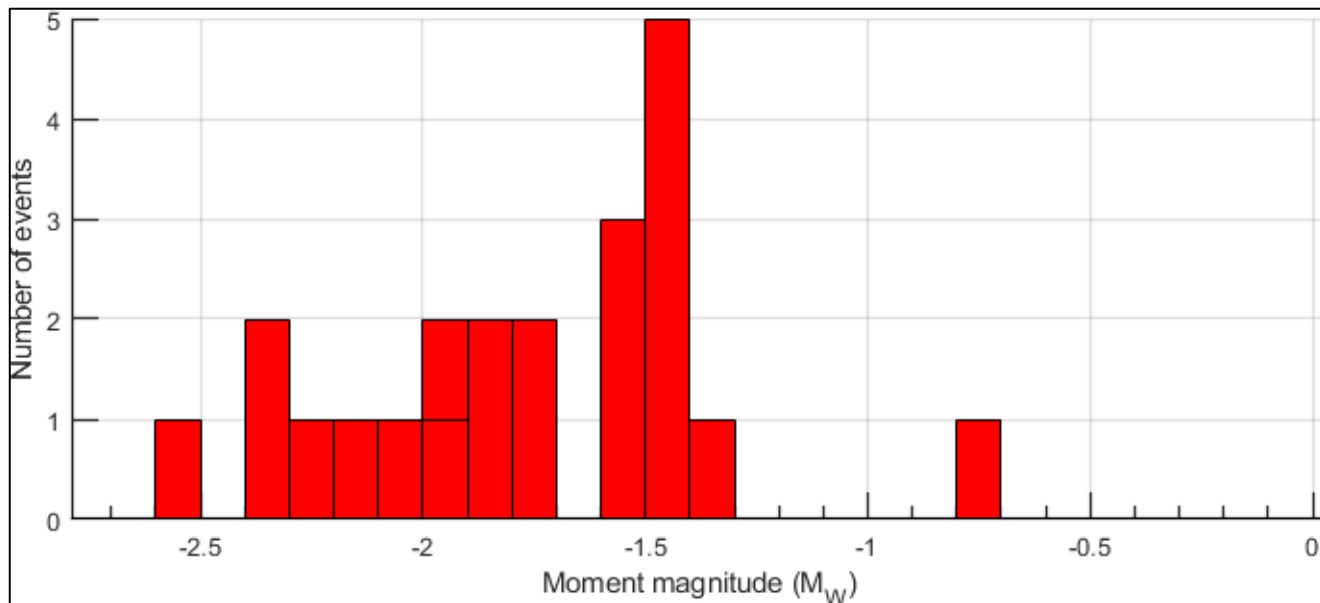
**Figure 9: Cross sections N-S (looking from West) of the located events. The events are colored, from blue to red, and sized by magnitude.**



**Figure 10: Cross sections W-E (looking from south) of the located events. The events are colored, from blue to red, and sized by magnitude.**

## Magnitude and depth distribution

The figure below shows the distribution of the moment magnitudes in October 2025. The values vary between -2.6 and -0.8, median value is -1.7.



**Figure 11: Distribution of magnitudes (M<sub>w</sub>) for events located in October 2025.**

The figure below shows the depth distribution in October 2025 for all the located events.

Events are located between 950 ft and 6150 ft. It is possible to distinguish 3 main groups:

- The first one between 950 ft and 2,150 ft (above the caverns depth and associated with events located in the Cap-Rock),
- A second one between 2,600 ft and 3,750 ft (associated with events located at depth of the caverns and flanks),
- A third composed below 4,000 ft (Max. depth=6150m), associated with flank events.

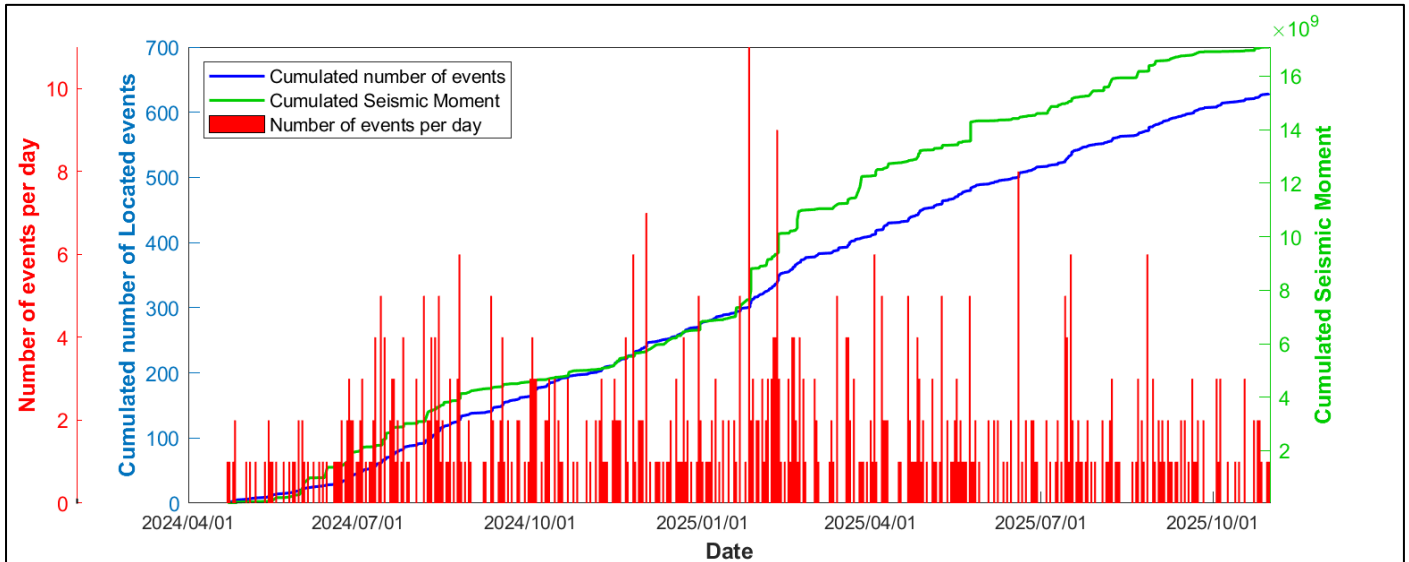


**Figure 12: Distribution of the depths for all the events located in October 2025.**

## Microseismic history from the beginning of the acquisition

### I. History of detections.

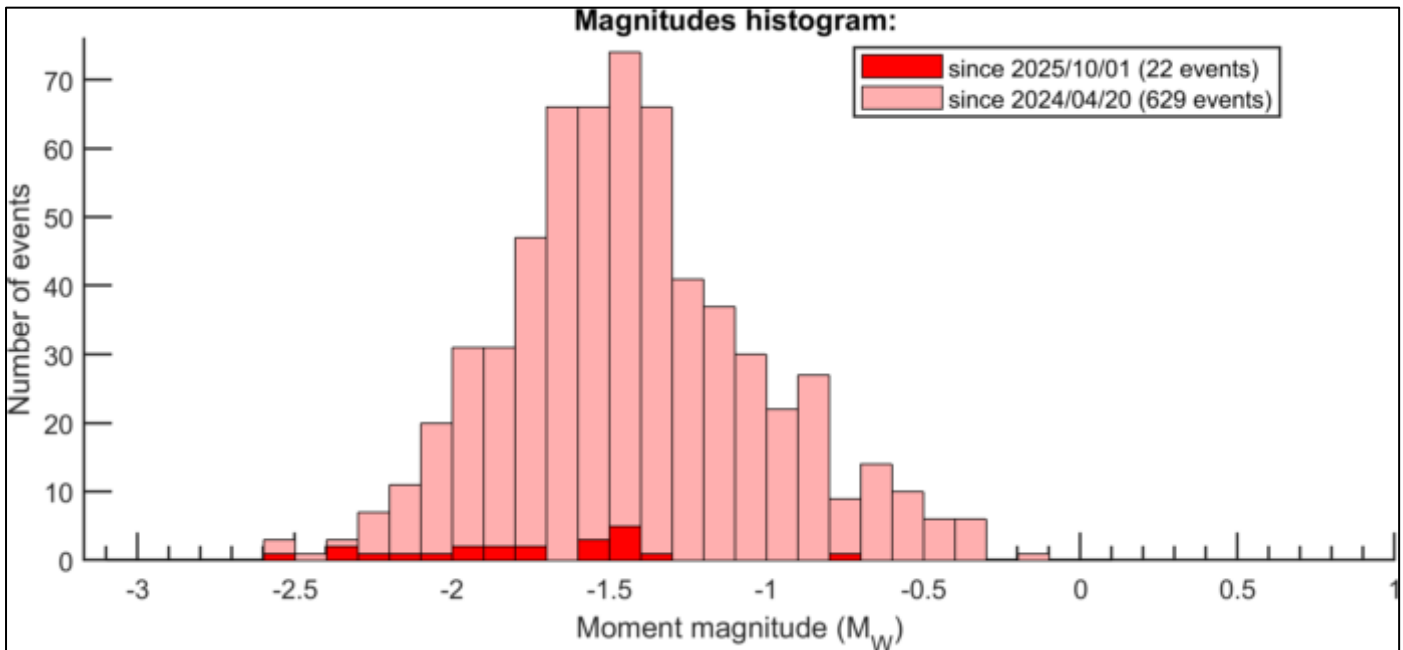
In October 2025, the total number of detections (located and not-located events) is stable with respect to the previous month (same number of detections). The number of located events is slightly lower in October 2025 (22 located events) with respect to September 2025 (26 located events).



**Figure 13: Distribution of the located microseismic events since the beginning of the acquisition on 04/21/2024. Blue line represents the cumulated number of located events. Green line represents the cumulated seismic moment  $M_0$ .**

## II. Historical magnitude distribution.

Figure 14 shows the moment magnitude distribution since the beginning of the acquisition. Dark color bars present the current monthly period and light red color bars present the distribution since the beginning of the acquisition (April 21, 2024). Since the beginning of the acquisition events magnitude are between -2.6 and -0.2 (for 629 located events). The median value of the magnitude since the beginning of the acquisition is -1.5.

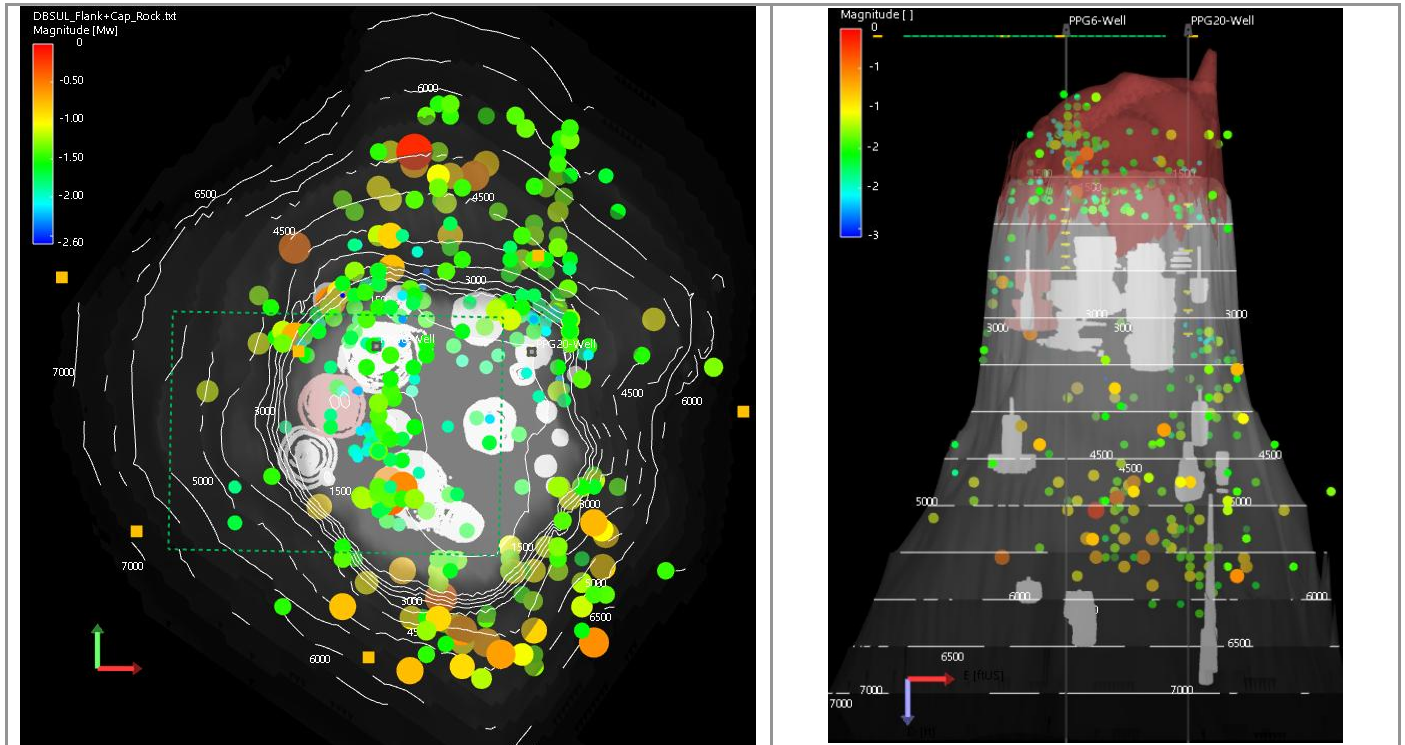


**Figure 14: Distribution of magnitude ( $M_w$ ) for located events. Dark color bars present the current monthly period (October 2025) and light color bars present the distribution since the beginning of the acquisition (from April 21, 2024)**

### III. History of the event locations.

#### History in Cap-Rock and on the Flank

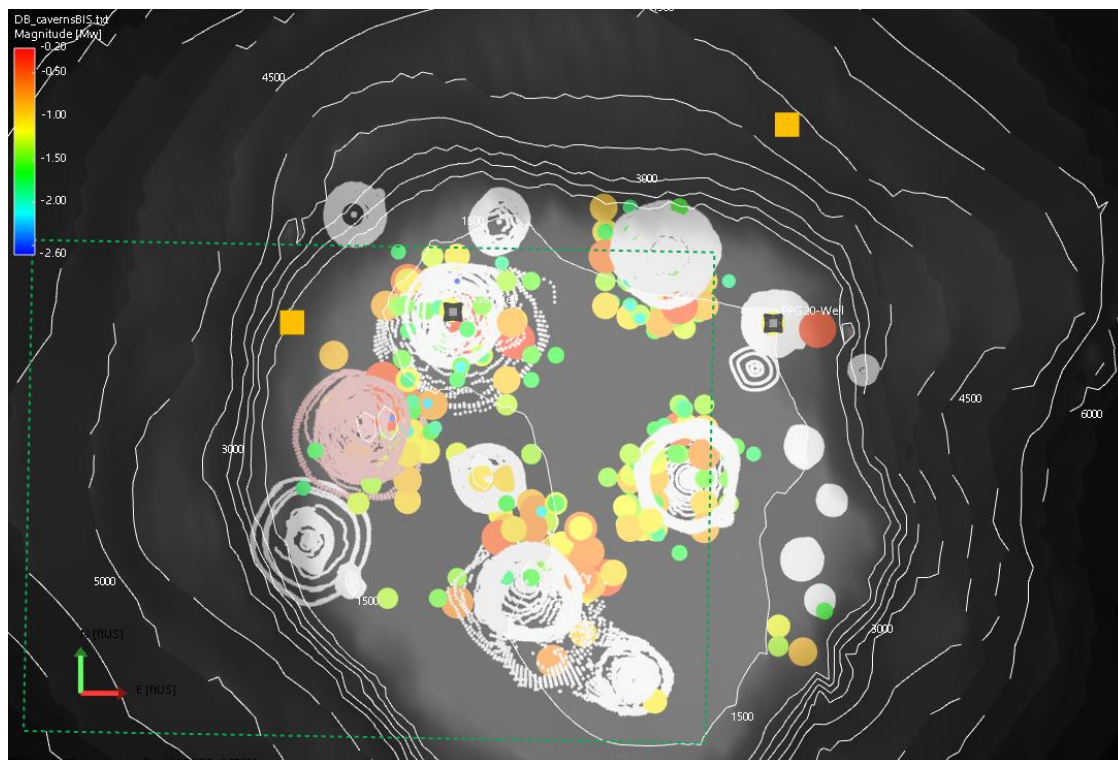
The figure below shows the map and cross section of all the events located in the cap-rock and in the salt flank since April 21, 2024.



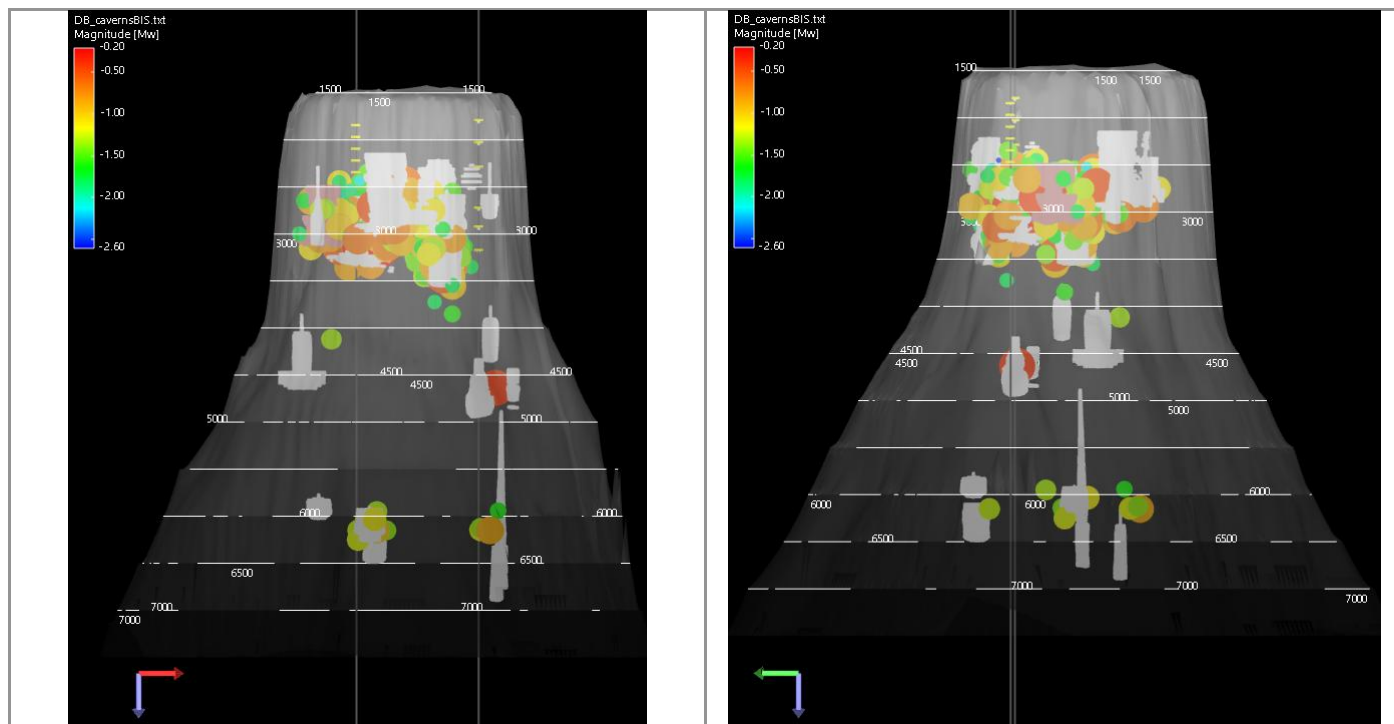
**Figure 15: Map view (left) and W-E side view (right) of the cumulative seismicity recorded since the beginning of the acquisition, located in the Cap Rock (red formation) and on the Flank. Green rectangle represents the AOI area. The events are colored, from blue to red, and sized by magnitude.**

### History around the caverns

The figures below show the history of the events associated with the caverns since the beginning of the acquisition (April 21, 2024).



**Figure 16: Map view of the events located in proximity to the caverns since the beginning of the acquisition (April 21, 2024). The events are colored, from blue to red, and sized by magnitude.**



**Figure 17: Cross sections W-E (left), looking from the South; and N-S (right), looking from the West of the events located close to the caverns since the beginning of the acquisition. The events are colored, from blue to red, and sized by magnitude.**

## APPENDIX 1 – Alert level criteria

Proposed Microseismic Alert Level Criteria and Response for Sulphur Mines Dome.

Alert Status	Criteria	Response
Low (GREEN)	No events with magnitude $\geq 0.5$ in AOI and/or Less than 30 MEQ per day in AOI with magnitudes $\geq -1$	Once per week data processing, with previous monthly microseismic activity summary in the AOI is provided by the 15th of the following month to LDNR IMD.
Advisory (YELLOW)	Event with magnitude $\geq 0.5$ and $< 1.0$ in AOI and/or Count of MEQ per day $\geq 30$ and $< 40$ in AOI with magnitudes $\geq -1$	Daily data processing M-F. Weekly reporting is provided LDNR IMD with activity summary from the previous week. Status remains active until seismic levels within the AOI reach "low"(green) level for 1 day.
Watch (ORANGE)	Event with magnitude $\geq 1$ and $< 1.5$ in AOI and/or Count of MEQ $\geq 40$ and $< 50$ with magnitudes $\geq -1$ in AOI	Seven days per week data processing, 2x week reporting with activity for the previous days is provided via email and text message notifications to IMD. Status remains active until seismic levels within the AOI reach Advisory or Low criteria for 2 consecutive days.
Warning (RED)	Event with magnitude $\geq 1.5$ in the AOI and/or Count of MEQ $\geq 50$ with magnitudes $\geq -1$ in the AOI	Seven days per week data processing, daily reporting with online meetings with stake holders as needed. The warning status level remains active until seismicity levels within the AOI reach a lower status level for 2 consecutive days.

## APPENDIX 2 – Network Coordinates

Borehole arrays coordinates:

Wellbore	Sensor	TVD SS	Easting (ft)	Northing (ft)
PPG 6x	Tool 1	1844	1343141	583425
PPG 6x	Tool 2	1969	1343141	583425
PPG 6x	Tool 3	2094	1343141	583425
PPG 6x	Tool 4	2219	1343141	583425
PPG 6x	Tool 5	2344	1343141	583425
PPG 6x	Tool 6	2469	1343141	583425
PPG 20	Tool 1	1790	1344445	583372
PPG 20	Tool 2	2025	1344445	583372
PPG 20	Tool 3	2285	1344445	583372
PPG 20	Tool 4	2720	1344445	583372
PPG 20	Tool 5	2920	1344445	583372
PPG 20	Tool 6	3170	1344445	583372

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Surface network coordinates:

Station	LAT WGS84	LON WGS84	Date start	Date end
Temp_1a	30.2575	-93.4123	1/30/2023	2/9/2023
Temp_1b	30.2534	-93.4135	2/9/2023	4/3/2023
Temp_2a	30.2570	-93.4097	1/30/2023	2/9/2023
Temp_2b	30.2555	-93.4132	2/9/2023	2/27/2023
Temp_2c	30.2547	-93.4138	2/27/2023	4/5/2023
Temp_3a	30.2533	-93.4091	1/30/2023	2/9/2023
Temp_3b	30.2563	-93.4146	2/9/2023	4/5/2023
Temp_4a	30.2486	-93.4123	1/30/2023	2/27/2023
Temp_4b	30.2507	-93.4121	2/27/2023	3/8/2023
Temp_4c	30.2506	-93.4100	3/8/2023	3/15/2023
Temp_4d	30.2503	-93.4119	3/15/2023	est 4/3/2023
Temp_5a	30.2502	-93.4156	1/30/2023	2/27/2023
Temp_5b	30.2507	-93.4153	2/27/2023	3/15/2023
Temp_5c	30.2504	-93.4140	3/15/2023	est 4/3/2023
Temp_6a	30.2532	-93.4166	1/30/2023	3/15/2023
Temp_6b	30.2529	-93.4161	3/15/2023	4/4/2023
Temp_7a	30.2547	-93.4161	1/30/2023	4/3/2023
Semi Perm S01	30.2453	-93.4073	4/4/2023	
Semi Perm S02	30.2571	-93.4098	4/6/2023	
Semi Perm S03	30.2536	-93.4091	4/6/2023	
Semi Perm S04	30.2470	-93.4213	4/5/2023	5/12/2023
Semi Perm S04_1	30.2506	-93.4204	5/12/2023	
Semi Perm S05	30.2564	-93.4224	4/5/2023	
Semi Perm S06	30.2532	-93.4167	4/5/2023	
Semi Perm S07	30.2547	-93.4162	4/5/2023	
SUL01 trillium	30.2452	-93.4071	9/20/2023	3/12/2024
	<b>LAT NAD 83</b>	<b>LON NAD 83</b>		
SUL02 trillium	30.2570	-93.4098	9/13/2023	
SUL03 trillium	30.2505	-93.4203	9/12/2023	
SUL04 trillium	30.2563	-93.4224	9/12/2023	
SUL05 trillium	30.2547	-93.4161	9/13/2023	
SUL06 trillium	30.2535	-93.4043	3/12/2024	
SUL07 trillium	30.2477	-93.4141	3/12/2024	

**Seismic Station locations and operational dates at Sulphur Mines Dome (to November 1, 2024).**

**Temporary Station locations and start and end dates provided by Westlake.**

**Trillium Station locations provided by Nanometrics and Westlake (Trillium SUL 02-07).**

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## APPENDIX 3 – Catalogue of located events

#	Event origin time CST(UTC-5)	Easting (ft)	Northing (ft)	Depth (ft)	ΔEasting (ft)	ΔNorthing (ft)	ΔDepth (ft)	Mw	Detected by
1	10/02/2025 19:08:06.162	1344566	583644	3050	442	547	417	-2.4	Flank
2	10/03/2025 01:32:10.772	1344466	583644	1550	294	733	392	-2.2	Cap-Rock
3	10/03/2025 17:04:14.267	1344448	583693	3146	393	649	549	-2.3	Flank
4	10/04/2025 17:16:42.355	1344422	583673	3076	378	626	524	-2.1	Flank
5	10/05/2025 09:12:41.172	1343066	582744	950	423	1389	520	-2.1	AOI-Cap-Rock
6	10/05/2025 09:38:34.986	1343503	582362	1183	463	1465	678	-1.9	AOI-Cap-Rock
7	10/05/2025 15:26:16.091	1343166	584044	2750	513	1142	734	-1.6	Flank
8	10/08/2025 19:37:12.503	1342966	583044	1750	403	780	468	-2.5	AOI-Cap-Rock
9	10/12/2025 19:21:56.164	1343366	582544	2950	678	1338	1307	-1.5	AOI-PPG-02
10	10/15/2025 05:34:27.960	1344720	583064	3216	363	687	526	-2.0	Flank
11	10/17/2025 22:06:43.514	1344566	584744	6150	1038	3155	1589	-1.4	Flank
12	10/17/2025 22:06:50.970	1344766	585244	4550	1009	3122	1541	-1.4	Flank
13	10/17/2025 22:06:56.075	1344684	585154	5559	1013	3131	1541	-1.5	Flank
14	10/23/2025 02:50:29.317	1342966	583344	2650	327	645	360	-1.7	AOI-PPG-06
15	10/23/2025 05:43:55.144	1342866	581244	4350	887	3043	1472	-0.8	Flank
16	10/25/2025 05:22:16.176	1343347	583617	2552	246	700	419	-1.9	AOI-PPG-06
17	10/25/2025 13:34:31.316	1344466	584144	3650	584	1322	783	-1.4	Flank

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#	Event origin time CST(UTC-5)	Easting (ft)	Northing (ft)	Depth (ft)	$\Delta$ Easting (ft)	$\Delta$ Northing (ft)	$\Delta$ Depth (ft)	Mw	Detected by
18	10/26/2025 02:47:05.395	1343466	583544	2650	256	722	428	-1.5	AOI-PPG-06
19	10/26/2025 08:13:04.938	1342566	583544	2150	305	667	535	-1.5	AOI-Flank
20	10/27/2025 04:05:50.046	1344066	583044	3450	463	1097	852	-1.4	AOI-LGS-02
21	10/30/2025 17:15:58.437	1344510	583765	3398	447	778	626	-1.8	Cap-Rock
22	10/30/2025 21:07:24.856	1342673	583610	2655	386	705	590	-1.9	AOI-Cap-Rock