TSX/PAZ Satellite Update
InSAR Subsidence
November 15, 2023

<u>Lonquist comment:</u>

The PAZ satellite from the TSX/PAZ constellation (4 & 7-day revisit) passed by Sulphur on Friday November 10. We received the dataset Monday and verified that none of the datapoint areas around the dome and caverns near the western flank are showing deviation from their respective trends. The attached time series plots have been prepared for reference.

Submitted by: Nathaniel Byars (Lonquist)

TSX/PAZ Satellite Update

Continuous InSAR Monitoring of
Ground Displacement
Near Western Caverns and Dome Flank

Sulphur Mines Salt Dome

Prepared for:
Westlake Chemical

Prepared by:
Lonquist & Co., LLC
8591 United Plaza Blvd.
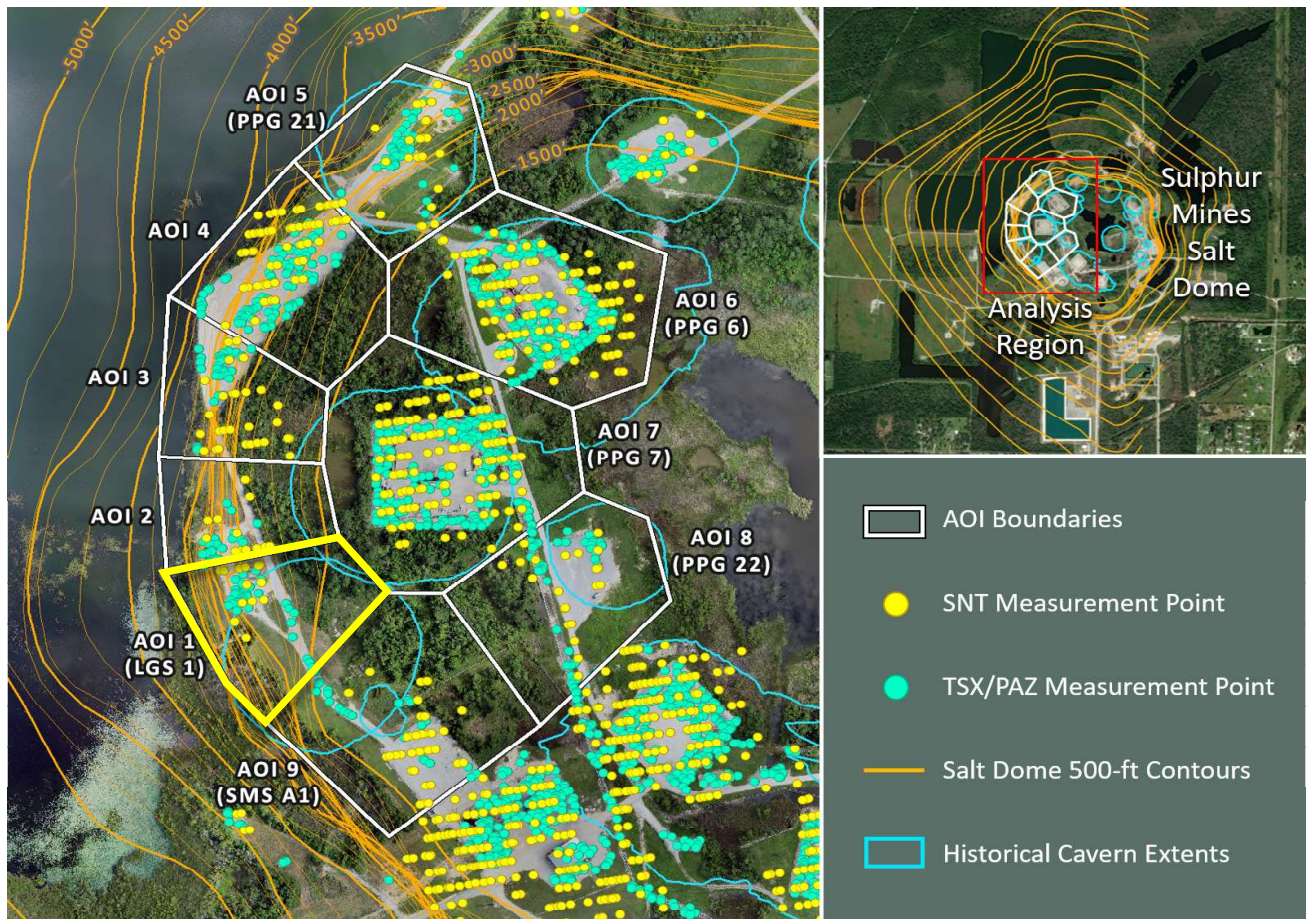Suite 280
Baton Rouge, LA 70809

Date Signed: November 15, 2023
Austin, Texas

Nathaniel L. Byars, P.E.
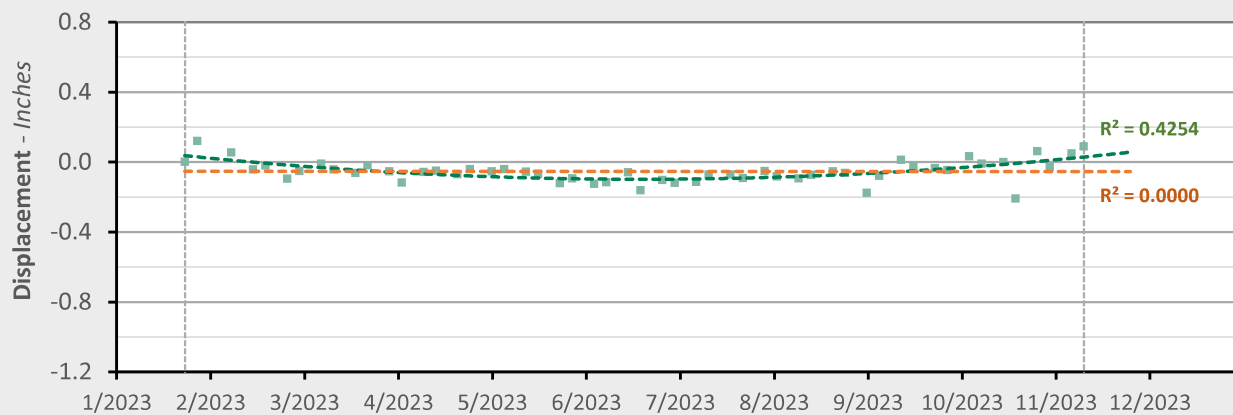Principal Engineer
Louisiana License No. 40697

Dataset
Satellite Source
TerraSAR-X - PAZ Constellation
Most Recent Image Date
Friday, November 10, 2023

Analysis Report Date:

November 15, 2023

AOI 1 *(LGS 1)* - Location Map

Legend:
- AOI Boundaries
- SNT Measurement Point
- TSX/PAZ Measurement Point
- Salt Dome 500-ft Contours
- Historical Cavern Extents

AOI 1 *(LGS 1)* - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: **38**

$R^2 = 0.4254$

$R^2 = 0.0000$

	Nonlinear Trend	Linear Trend
Velocity:	+0.65 in/yr	-0.00 in/yr
Acceleration:	+1.66 in/yr^2	0.00 in/yr^2

- ■ LOS Displacement Measurement
- - - Nonlinear Trend Line (Quadratic Regression)
- - - Linear Trend Line (Linear Regression)

AOI 2 - Location Map

Legend:
- AOI Boundaries
- ● SNT Measurement Point
- ● TSX/PAZ Measurement Point
- — Salt Dome 500-ft Contours
- — Historical Cavern Extents

Map labels: AOI 5 (PPG 21), AOI 4, AOI 3, AOI 2, AOI 1 (LGS 1), AOI 6 (PPG 6), AOI 7 (PPG 7), AOI 8 (PPG 22), AOI 9 (SMS A1)

Inset: Sulphur Mines Salt Dome, Analysis Region
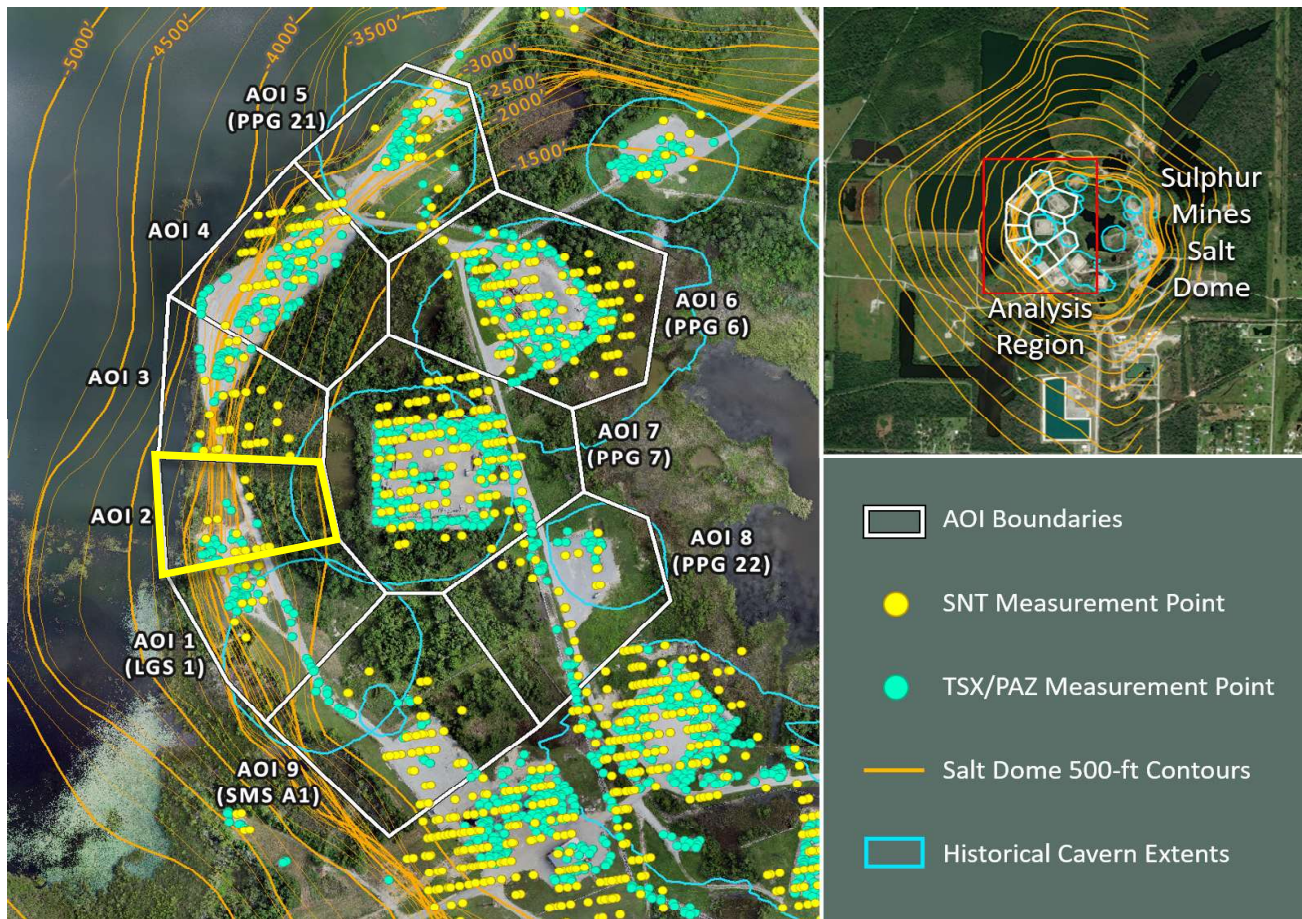
AOI 2 - Displacement Time Series

TSX/PAZ (11/10/2023) Point Count: **23**

R² = 0.4304
R² = 0.0011
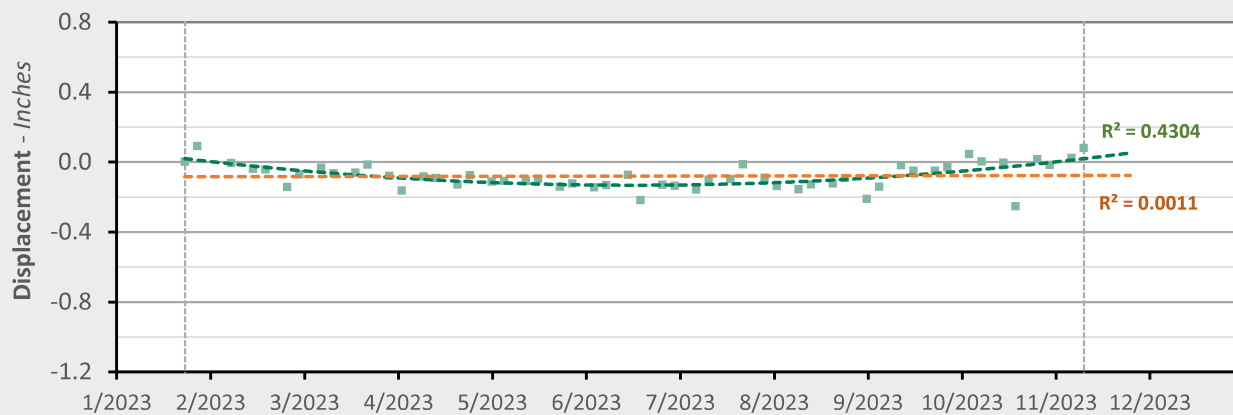
	Nonlinear Trend	Linear Trend
Velocity:	+0.76 in/yr	+0.01 in/yr
Acceleration:	+1.93 in/yr²	0.00 in/yr²

Legend:
- ■ LOS Displacement Measurement
- ---- Nonlinear Trend Line (Quadratic Regression)
- ---- Linear Trend Line (Linear Regression)

AOI 3 - Location Map

AOI 5
(PPG 21)

AOI 4

AOI 3

AOI 2

AOI 1
(LGS 1)

AOI 9
(SMS A1)

AOI 6
(PPG 6)

AOI 7
(PPG 7)

AOI 8
(PPG 22)

Sulphur
Mines
Salt
Dome

Analysis
Region

AOI Boundaries

SNT Measurement Point

TSX/PAZ Measurement Point

Salt Dome 500-ft Contours

Historical Cavern Extents
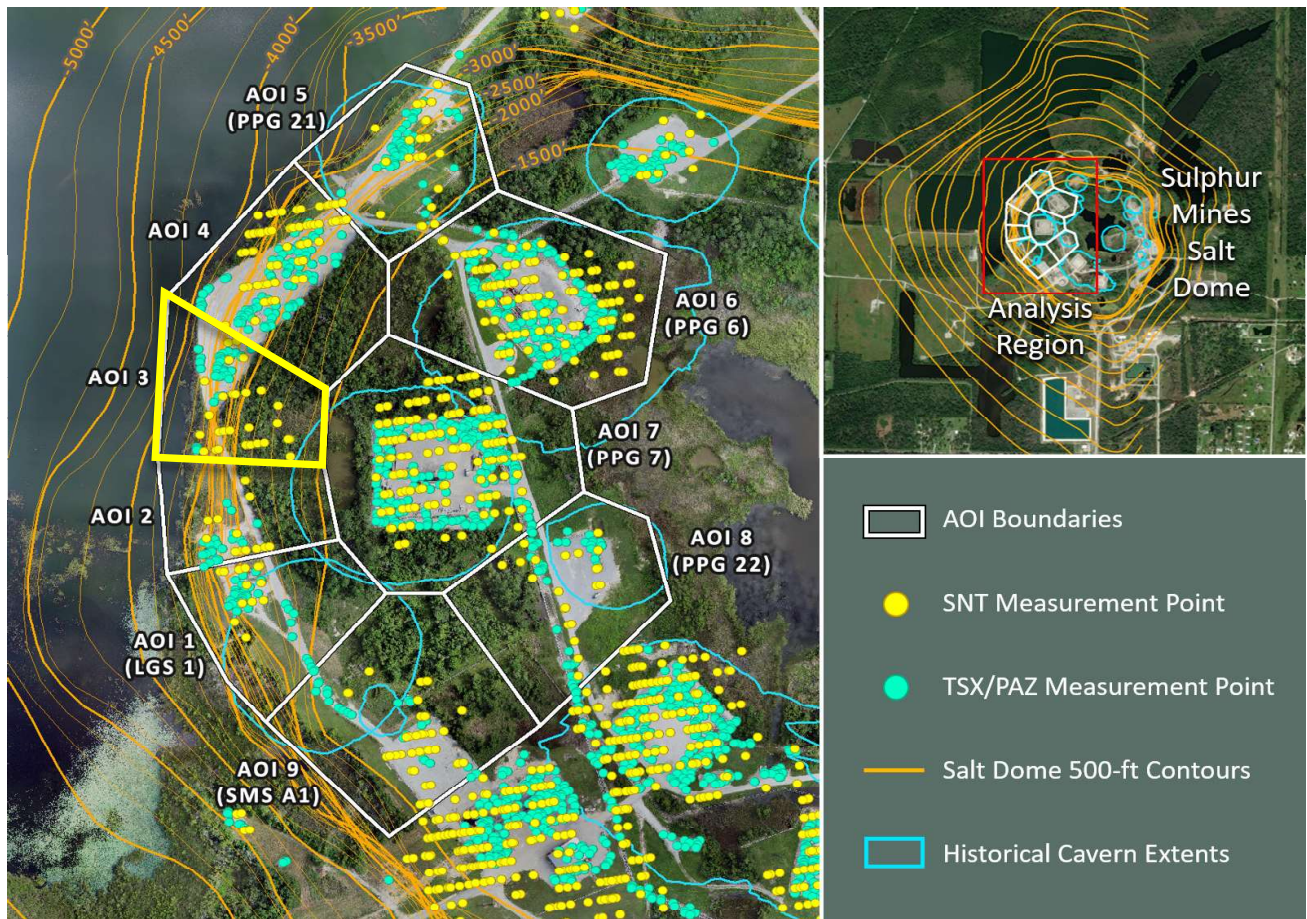
AOI 3 - Displacement Time Series

TSX/PAZ (11/10/2023) Point Count: **39**

$R^2 = 0.595$

$R^2 = 0.2683$
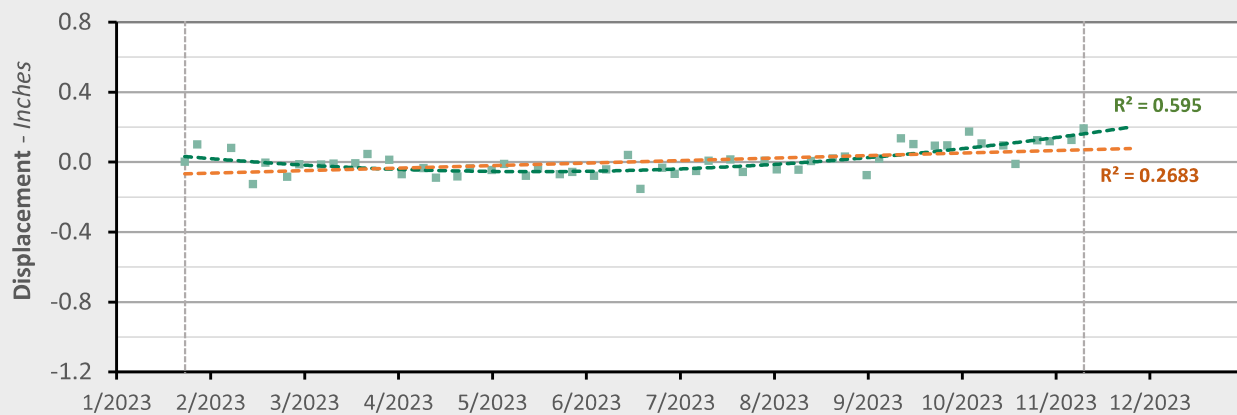
	Nonlinear Trend	Linear Trend
Velocity:	+0.89 in/yr	+0.17 in/yr
Acceleration:	+1.83 in/yr^2	0.00 in/yr^2

- LOS Displacement Measurement
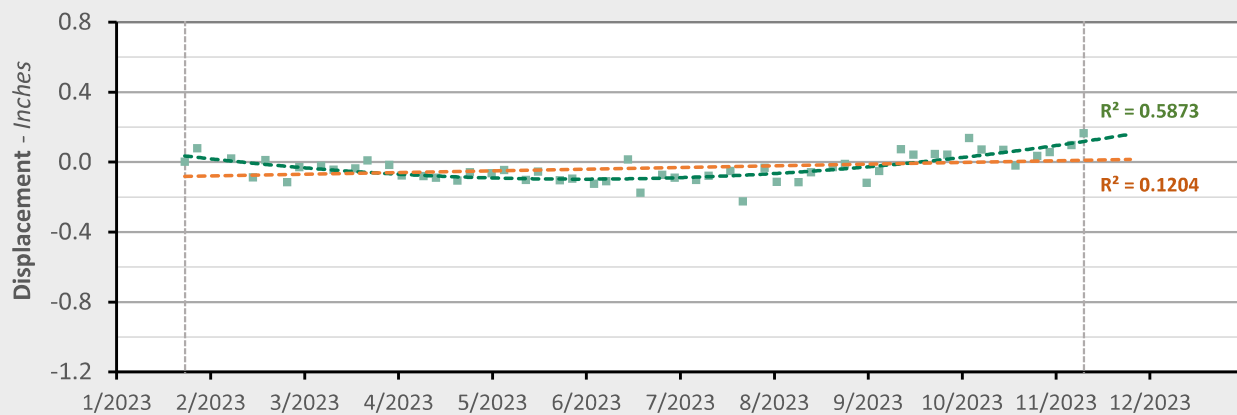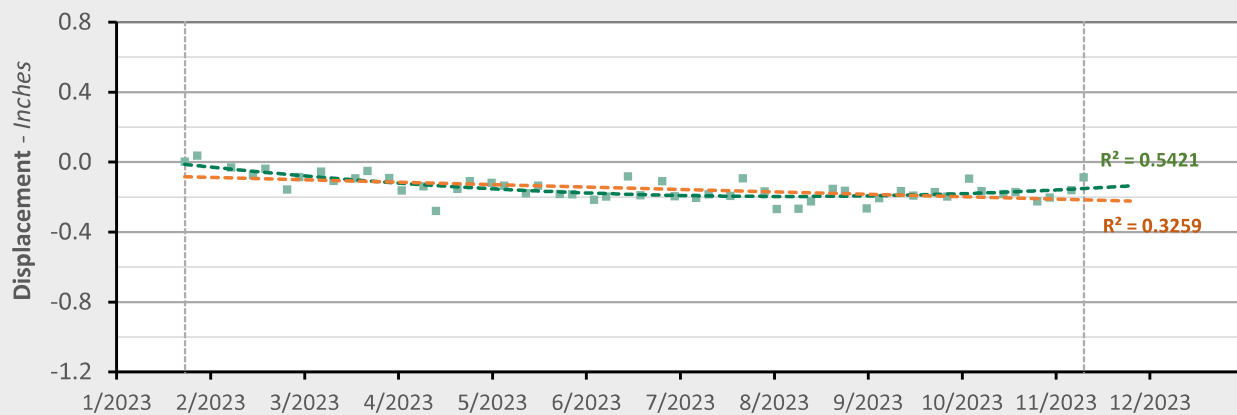- Nonlinear Trend Line (Quadratic Regression)
- Linear Trend Line (Linear Regression)

AOI 4 - Location Map

Legend:
- AOI Boundaries
- ● SNT Measurement Point
- ● TSX/PAZ Measurement Point
- — Salt Dome 500-ft Contours
- — Historical Cavern Extents

Labels on map: AOI 5 (PPG 21), AOI 4, AOI 3, AOI 2, AOI 1 (LGS 1), AOI 9 (SMS A1), AOI 6 (PPG 6), AOI 7 (PPG 7), AOI 8 (PPG 22), Sulphur Mines Salt Dome, Analysis Region
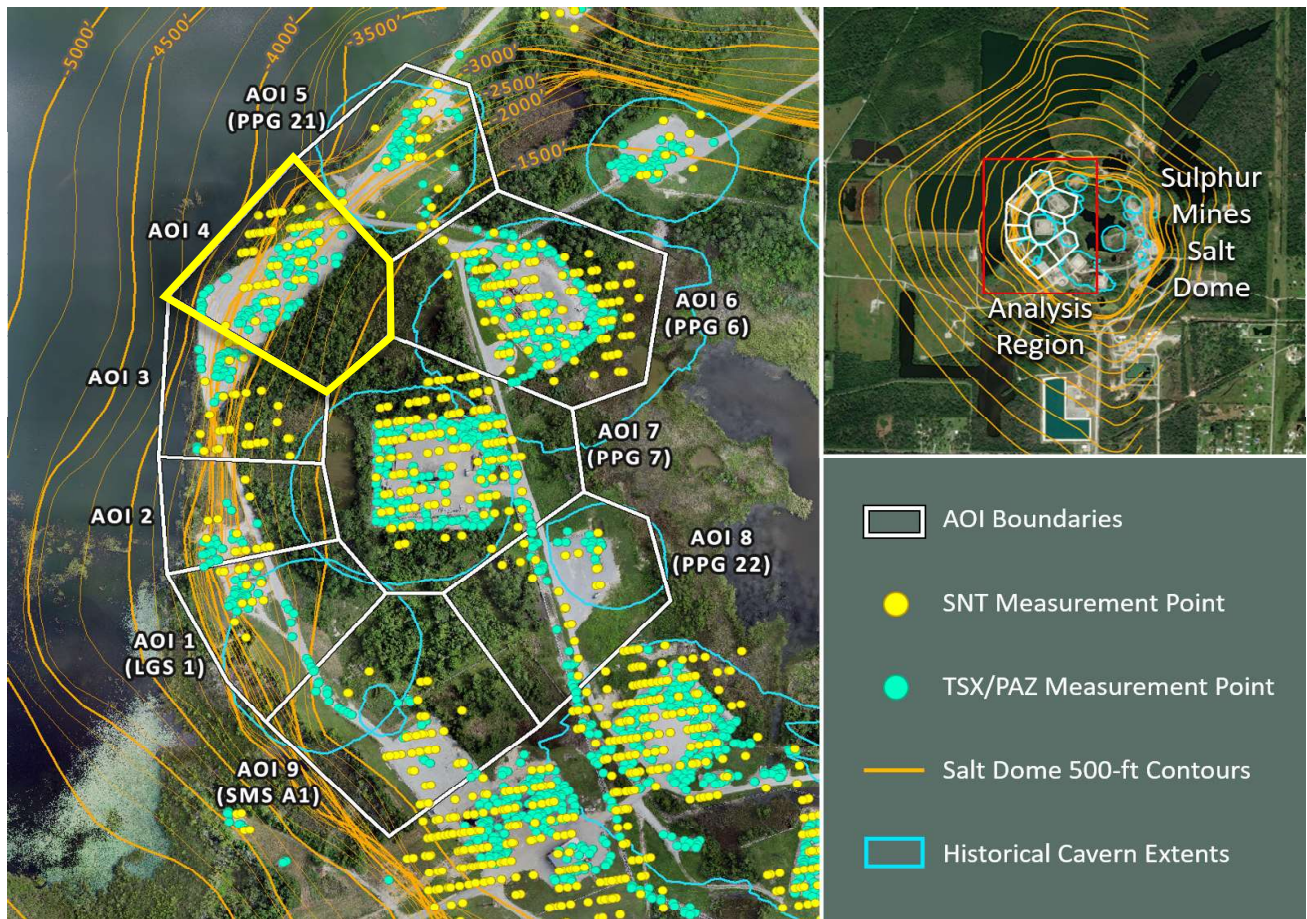
AOI 4 - Displacement Time Series

TSX/PAZ (11/10/2023) Point Count: **103**

$R^2 = 0.5873$

$R^2 = 0.1204$

Legend: LOS Displacement Measurement ■ ; Nonlinear Trend Line (Quadratic Regression); Linear Trend Line (Linear Regression)

	Nonlinear Trend	Linear Trend
Velocity:	+0.97 in/yr	+0.12 in/yr
Acceleration:	+2.18 in/yr^2	0.00 in/yr^2

AOI 5 *(PPG 21)* - Location Map

Legend:
- ▭ AOI Boundaries
- 🟡 SNT Measurement Point
- 🟢 TSX/PAZ Measurement Point
- ━ Salt Dome 500-ft Contours
- ━ Historical Cavern Extents
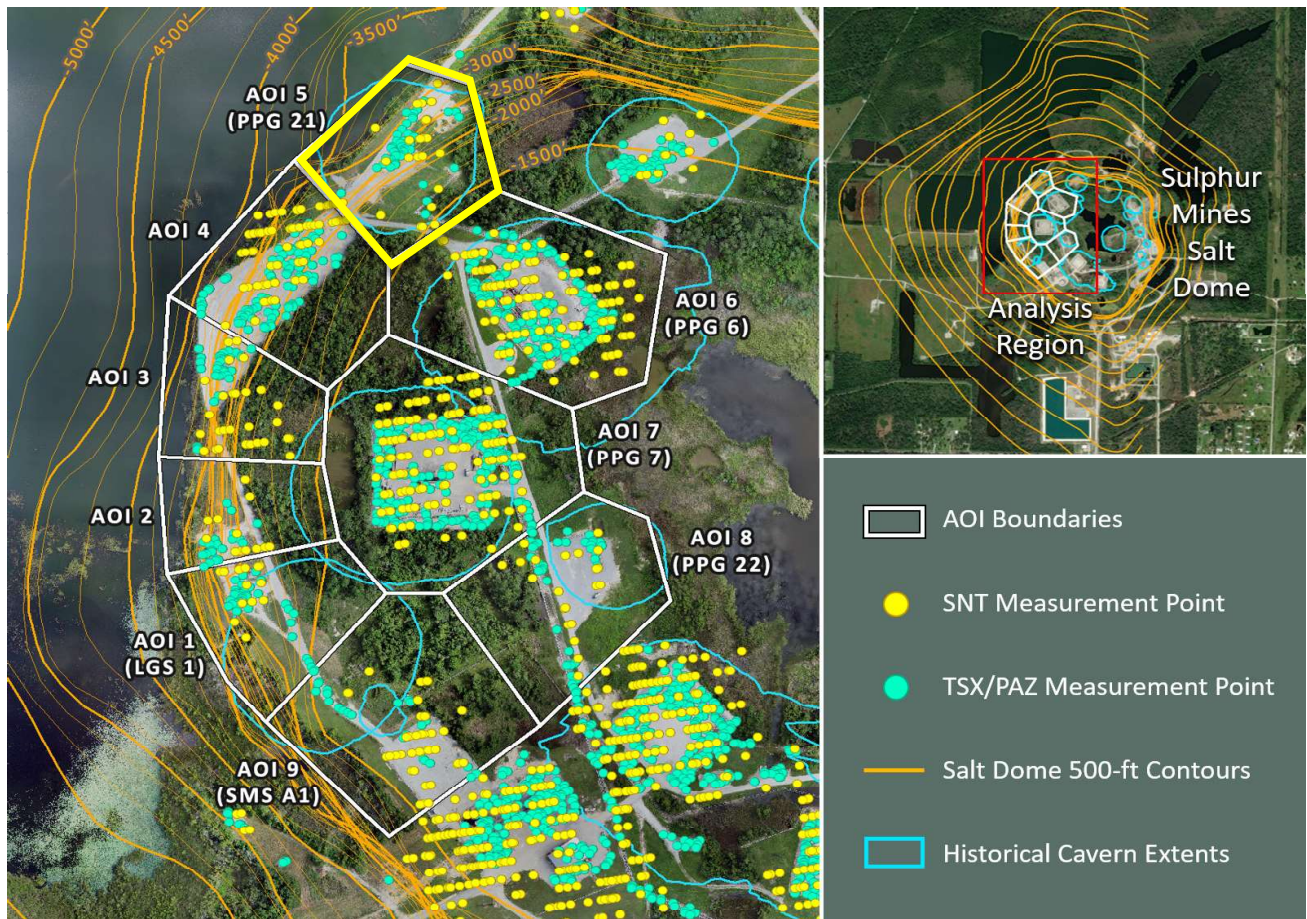
AOI 5 *(PPG 21)* - Displacement Time Series TSX/PAZ (11/10/2023) Point Count: **46**

R² = 0.5421
R² = 0.3259

	Nonlinear Trend	Linear Trend
Velocity:	+0.34 in/yr	-0.17 in/yr
Acceleration:	+1.30 in/yr^2	0.00 in/yr^2

- ▪ LOS Displacement Measurement
- ┅ Nonlinear Trend Line (Quadratic Regression)
- ┅ Linear Trend Line (Linear Regression)

AOI 6 *(PPG 6)* - Location Map

Legend:
- AOI Boundaries
- SNT Measurement Point
- TSX/PAZ Measurement Point
- Salt Dome 500-ft Contours
- Historical Cavern Extents
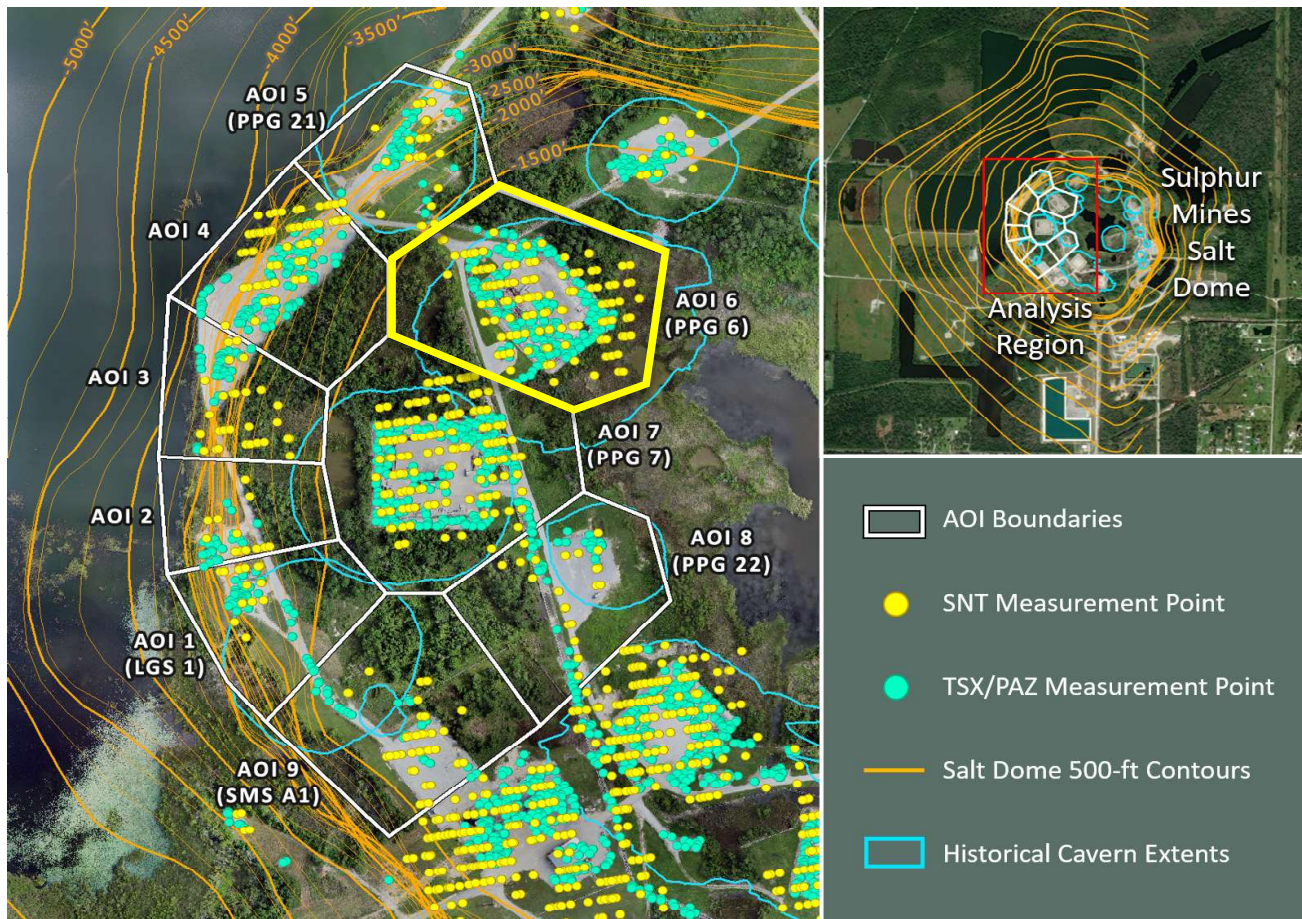
AOI 6 *(PPG 6)* - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: **212**

$R^2 = 0.8730$

$R^2 = 0.7463$
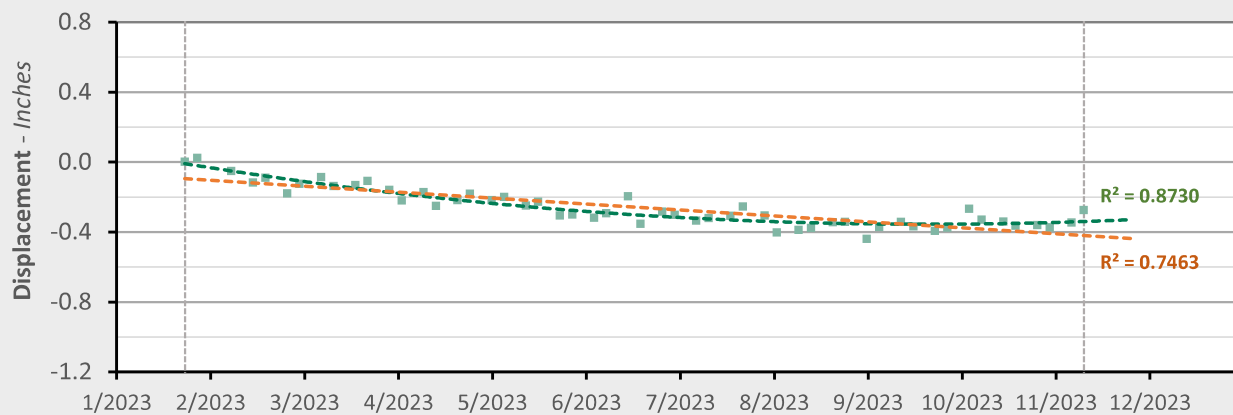
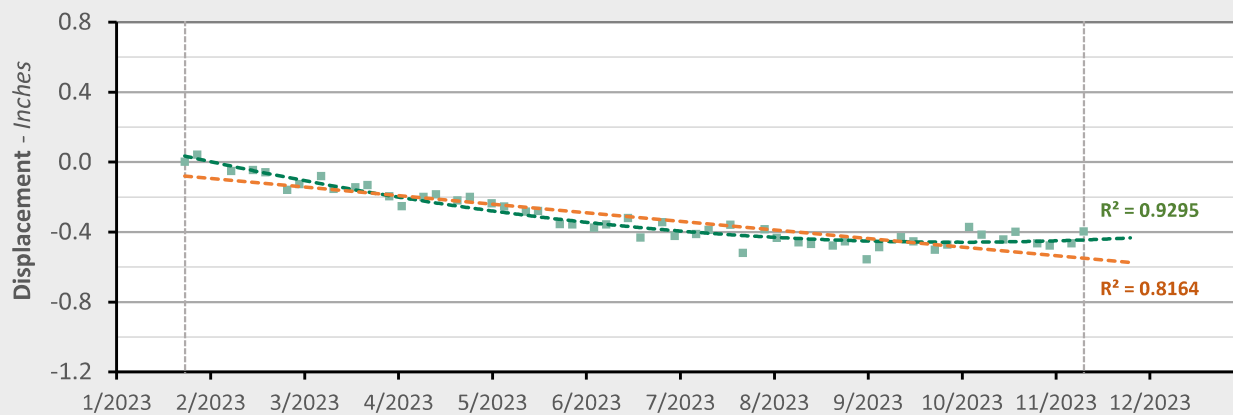|	Nonlinear Trend	Linear Trend
Velocity:	+0.22 in/yr	-0.41 in/yr
Acceleration:	+1.61 in/yr^2	0.00 in/yr^2

Legend:
- LOS Displacement Measurement
- Nonlinear Trend Line (Quadratic Regression)
- Linear Trend Line (Linear Regression)

AOI 7 *(PPG 7)* - Location Map

AOI 5
(PPG 21)

AOI 4

AOI 3

AOI 2

AOI 1
(LGS 1)

AOI 6
(PPG 6)

AOI 7
(PPG 7)

AOI 8
(PPG 22)

AOI 9
(SMS A1)

Sulphur
Mines
Salt
Dome

Analysis
Region

⬛ AOI Boundaries

🟡 SNT Measurement Point

🟢 TSX/PAZ Measurement Point

— Salt Dome 500-ft Contours

▭ Historical Cavern Extents
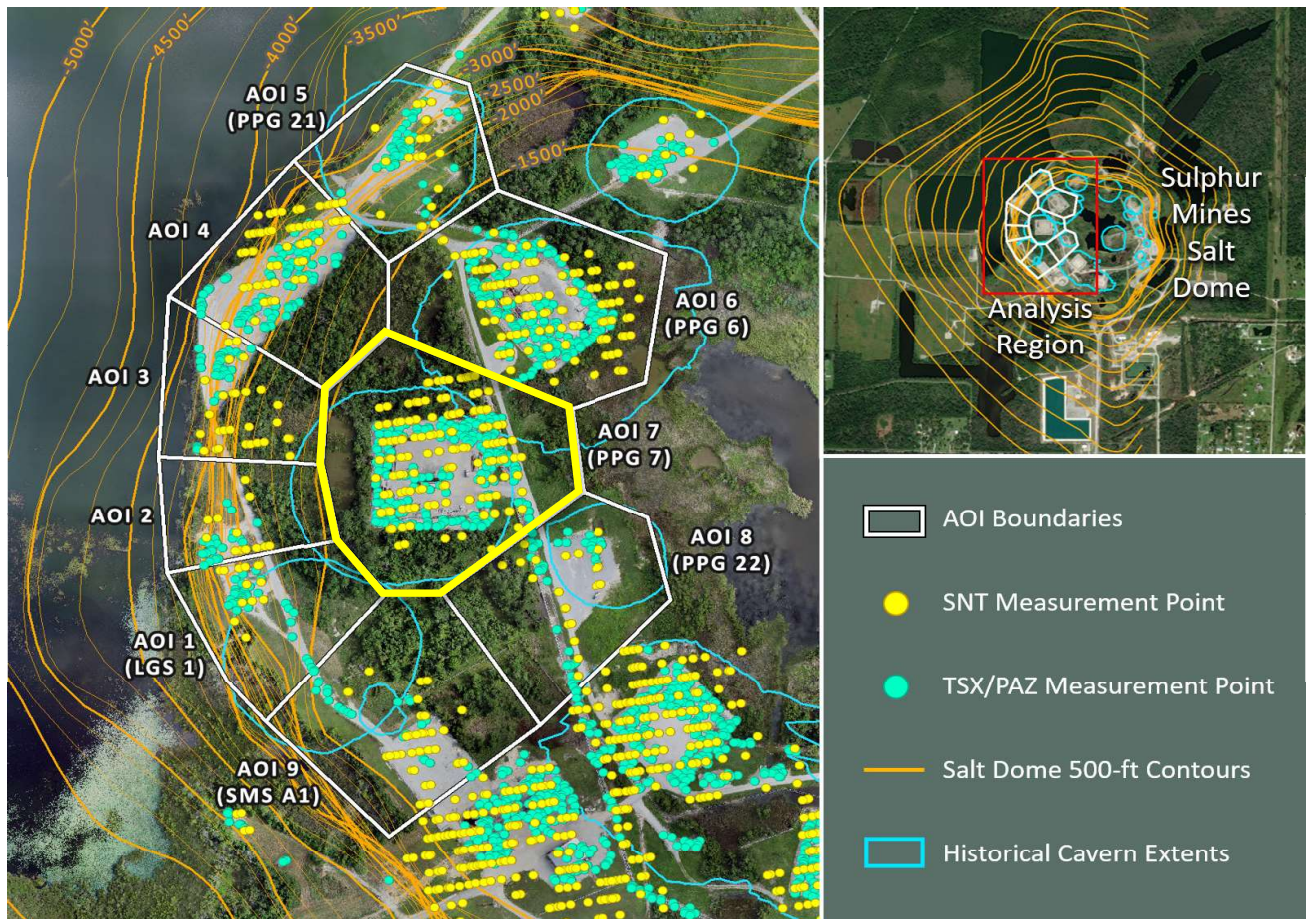
AOI 7 *(PPG 7)* - Displacement Time Series TSX/PAZ (11/10/2023) Point Count: **214**

$R^2 = 0.8203$

$R^2 = 0.5297$
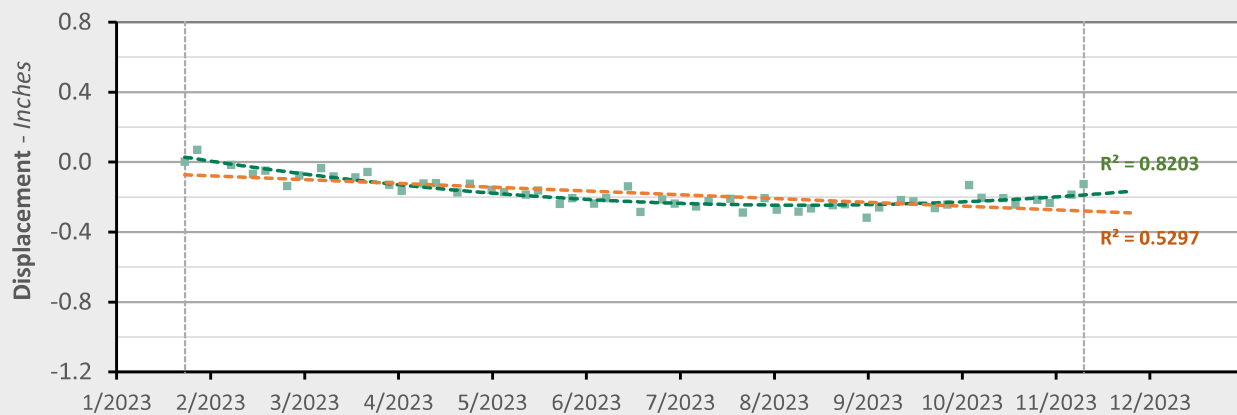
	Nonlinear Trend	Linear Trend
Velocity:	+0.47 in/yr	-0.26 in/yr
Acceleration:	+1.86 in/yr^2	0.00 in/yr^2

■ LOS Displacement Measurement
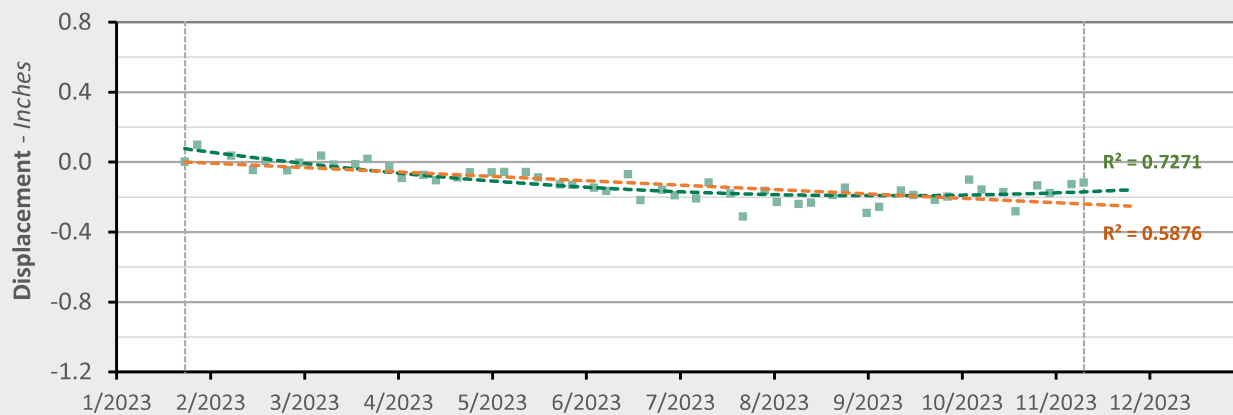- - - Nonlinear Trend Line (Quadratic Regression)
- - - Linear Trend Line (Linear Regression)

AOI 8 *(PPG 22)* - Location Map

Legend:
- AOI Boundaries
- ● SNT Measurement Point
- ● TSX/PAZ Measurement Point
- Salt Dome 500-ft Contours
- Historical Cavern Extents

Map labels: AOI 5 (PPG 21), AOI 4, AOI 3, AOI 2, AOI 1 (LGS 1), AOI 6 (PPG 6), AOI 7 (PPG 7), AOI 8 (PPG 22), AOI 9 (SMS A1), Sulphur Mines Salt Dome, Analysis Region
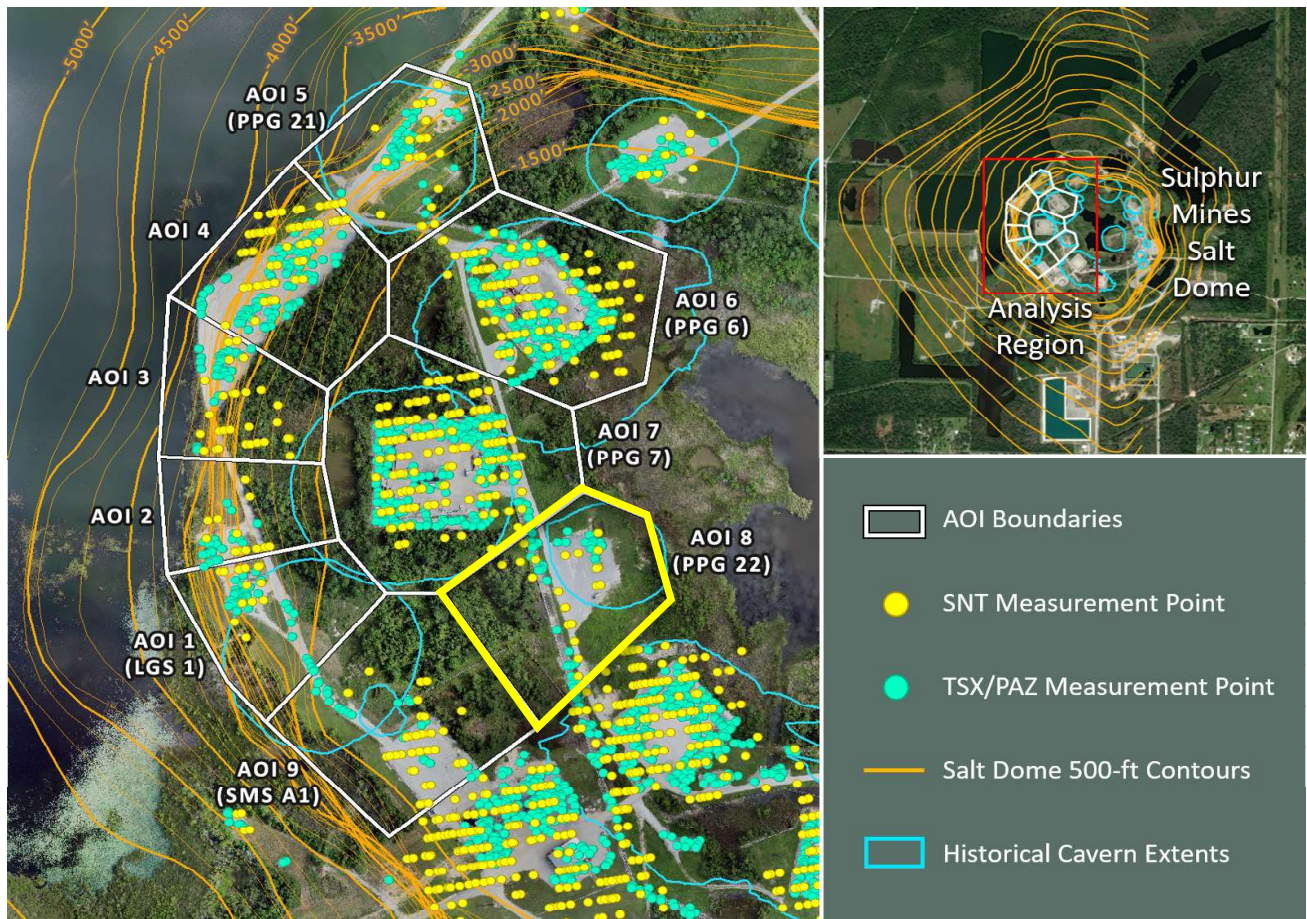
AOI 8 *(PPG 22)* - Displacement Time Series TSX/PAZ (11/10/2023) Point Count: **40**

Displacement time series chart, Y-axis: Displacement - Inches (-1.2 to 0.8), X-axis: 1/2023 to 12/2023.

R² = 0.9295 (Nonlinear Trend)
R² = 0.8164 (Linear Trend)

	Nonlinear Trend	Linear Trend
Velocity:	+0.23 in/yr	-0.59 in/yr
Acceleration:	+2.11 in/yr²	0.00 in/yr²

Legend:
- ■ LOS Displacement Measurement
- - - Nonlinear Trend Line (Quadratic Regression)
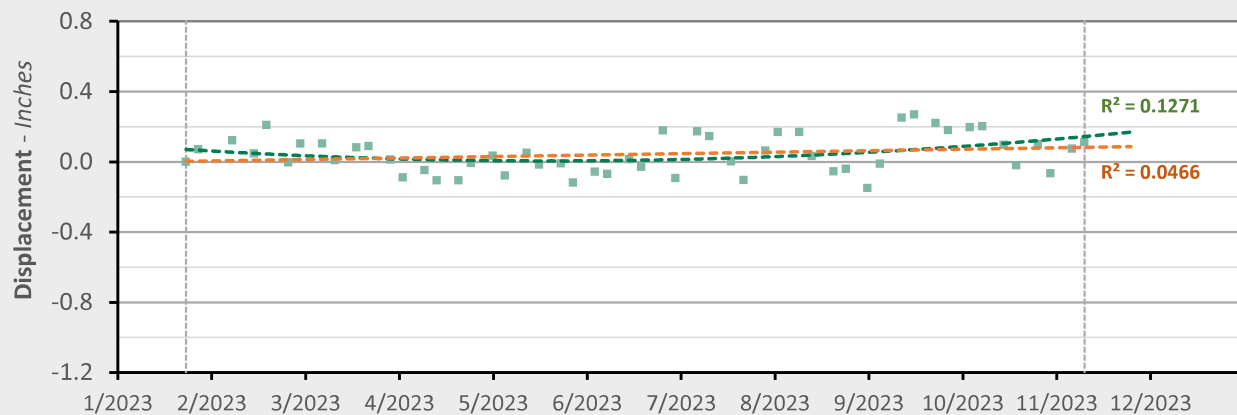- - - Linear Trend Line (Linear Regression)

AOI 9 *(PPG A1)* - Location Map

Legend:
- ▭ AOI Boundaries
- 🟡 SNT Measurement Point
- 🟢 TSX/PAZ Measurement Point
- — Salt Dome 500-ft Contours
- — Historical Cavern Extents
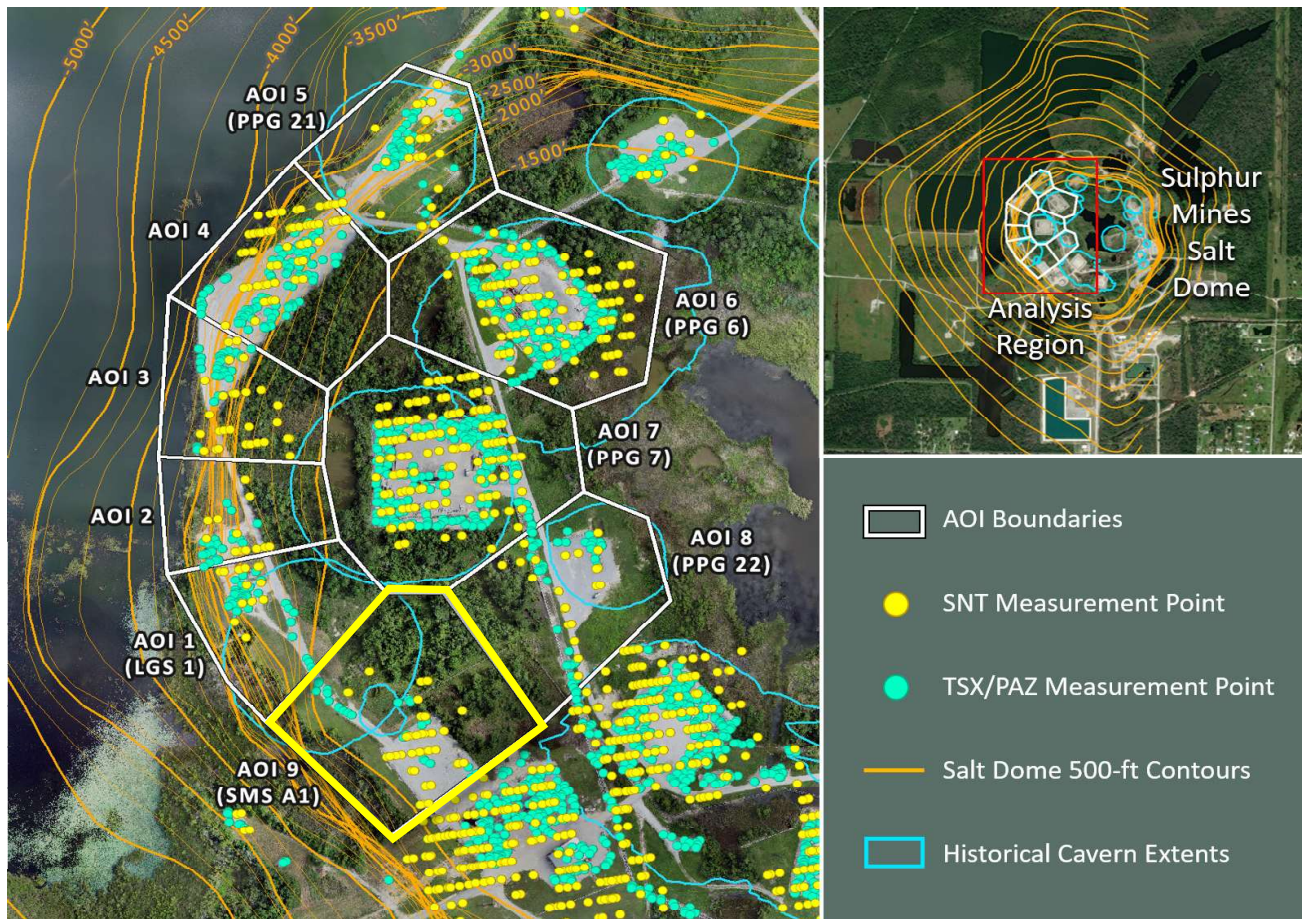
AOI 9 *(SMS A1)* - Displacement Time Series TSX/PAZ (11/10/2023) Point Count: **26**

R² = 0.7271
R² = 0.5876

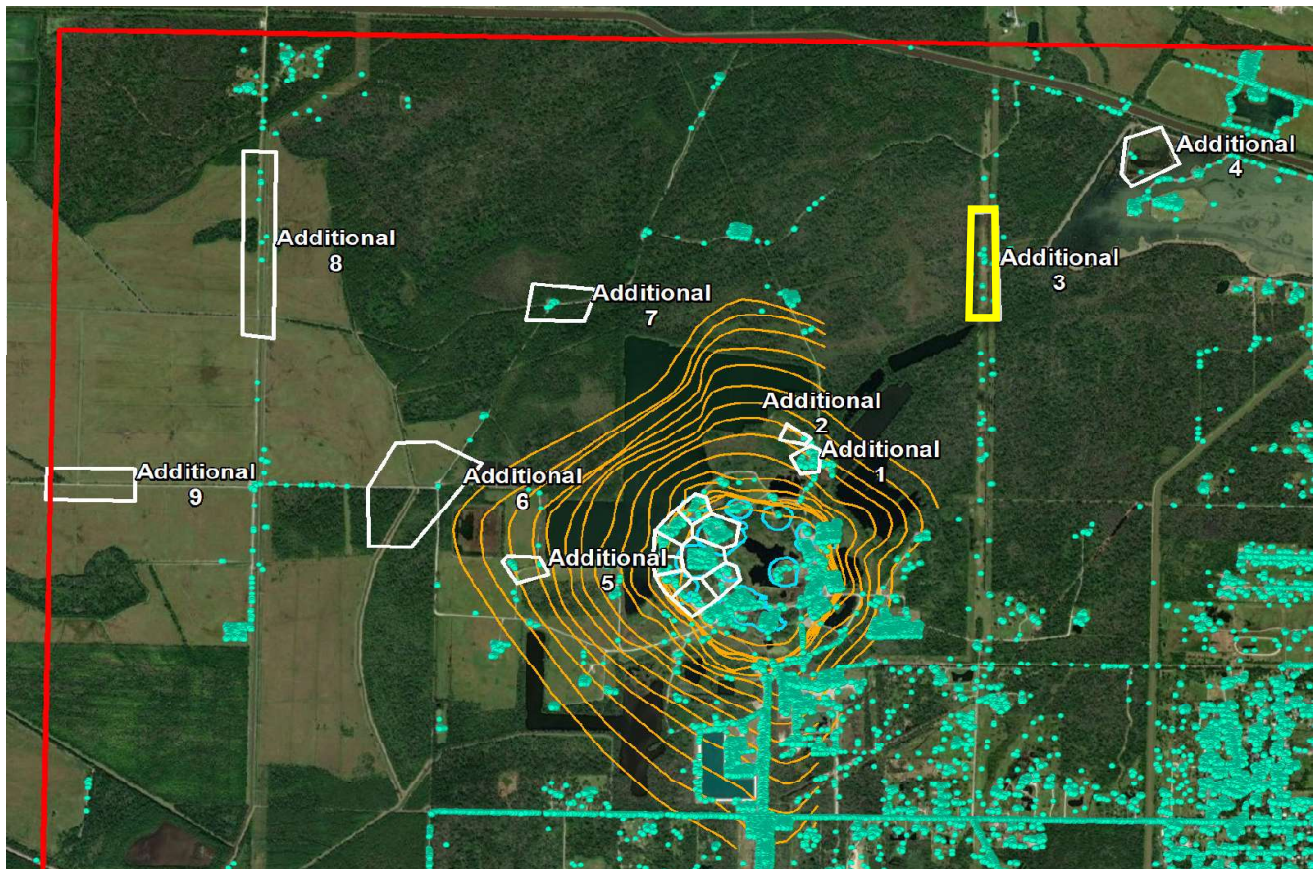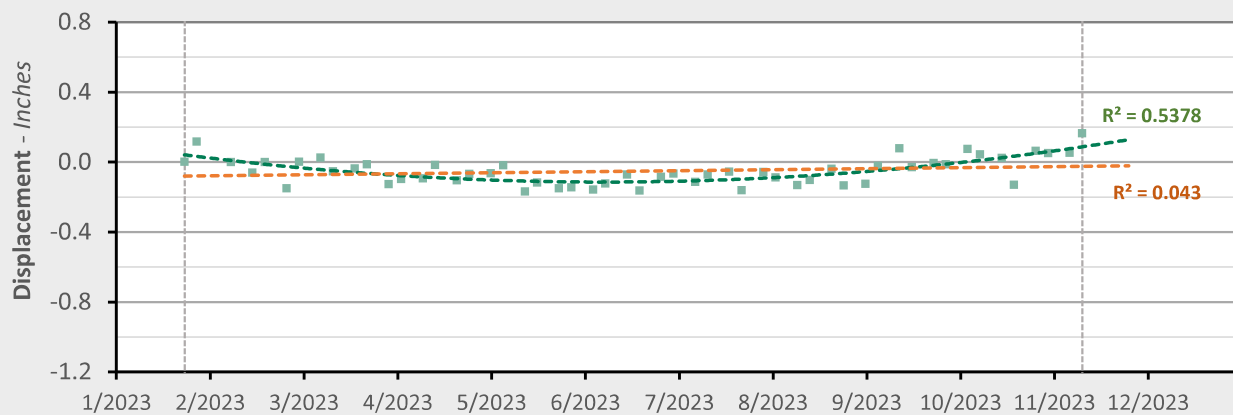|	Nonlinear Trend	Linear Trend
Velocity:	+0.25 in/yr	-0.30 in/yr
Acceleration:	+1.41 in/yr²	0.00 in/yr²

- ■ LOS Displacement Measurement
- --- Nonlinear Trend Line (Quadratic Regression)
- --- Linear Trend Line (Linear Regression)

Additional 1 - Location Map
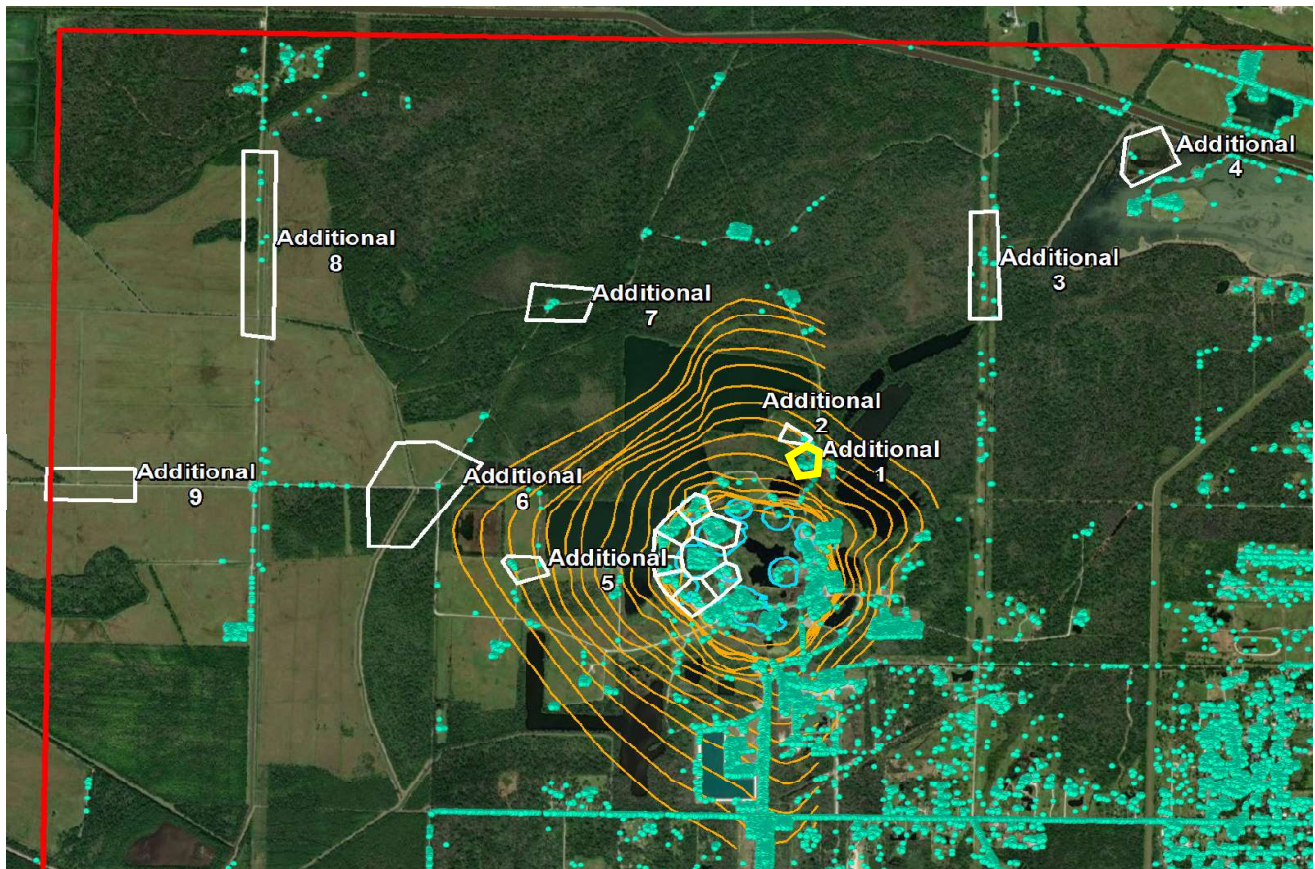
Additional 1 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: **63**
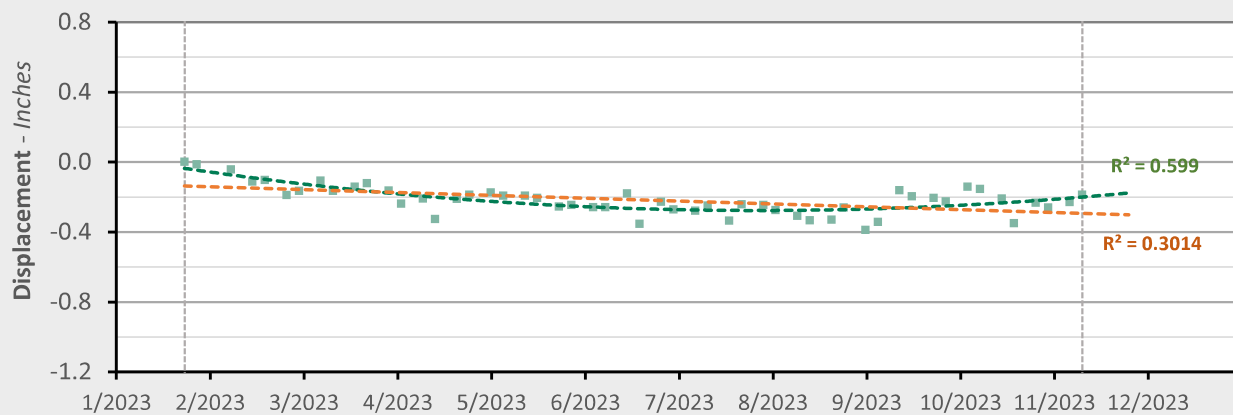
	Nonlinear Trend	Linear Trend
Velocity:	+0.54 in/yr	-0.20 in/yr
Acceleration:	+1.87 in/yr^2	0.00 in/yr^2

■ LOS Displacement Measurement   — — Nonlinear Trend Line (Quadratic Regression)   — — Linear Trend Line (Linear Regression)

Additional 2 - Location Map
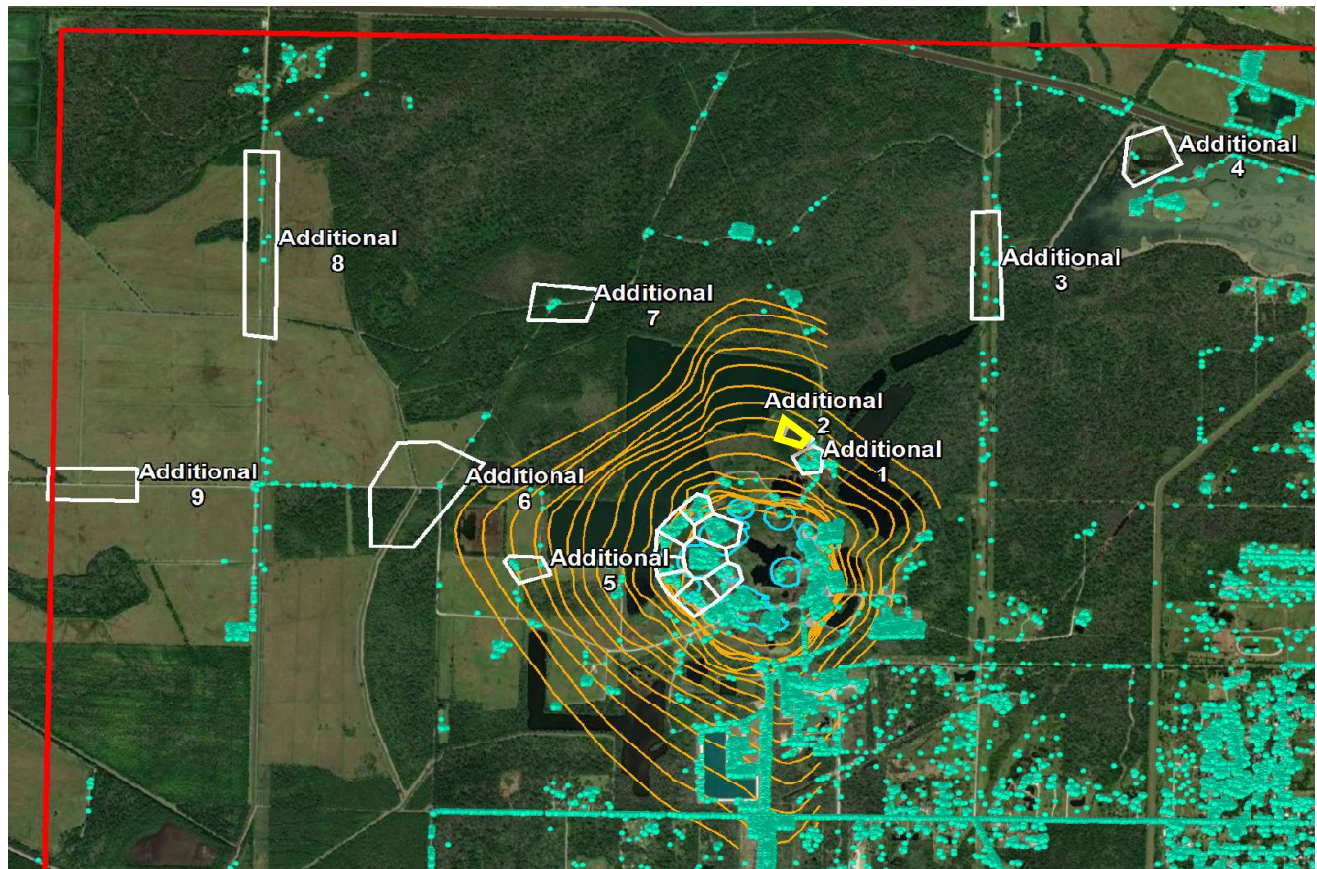
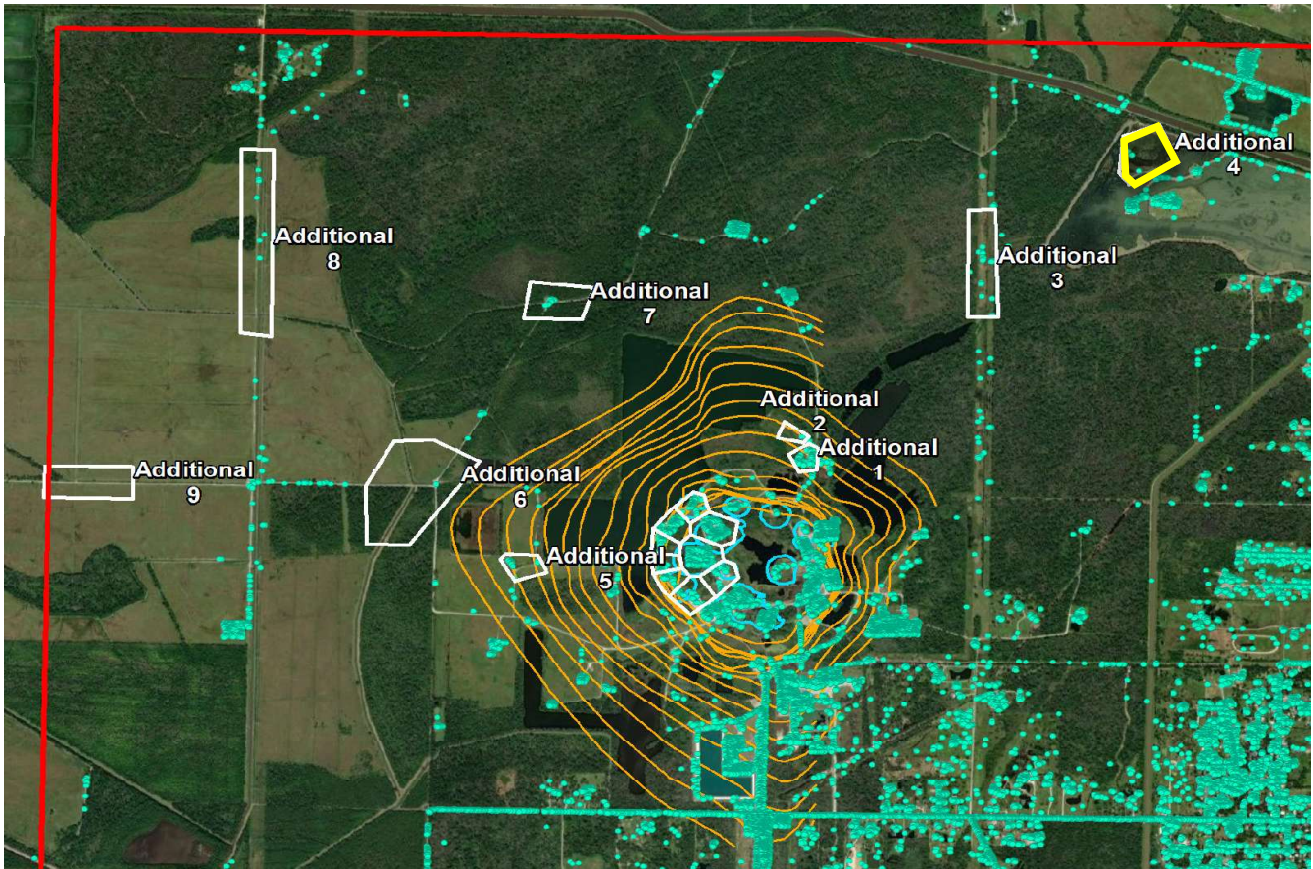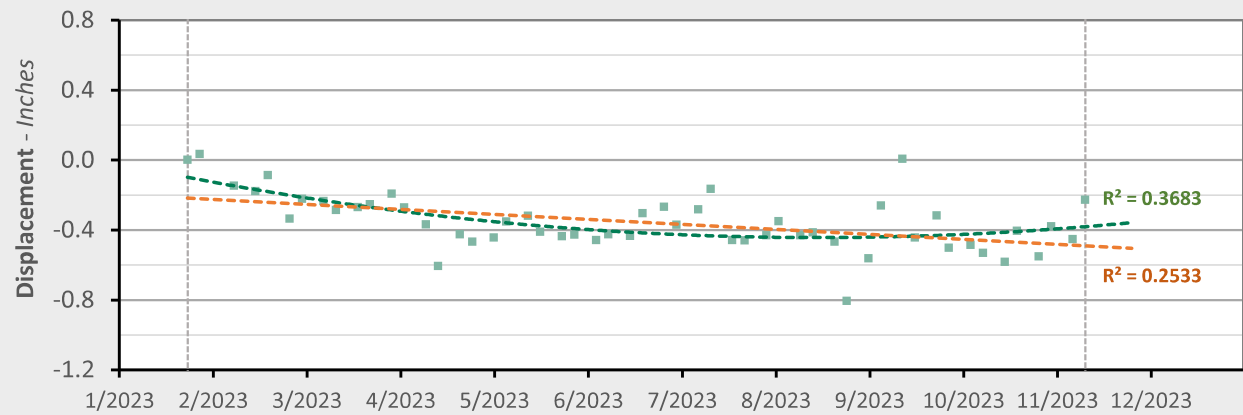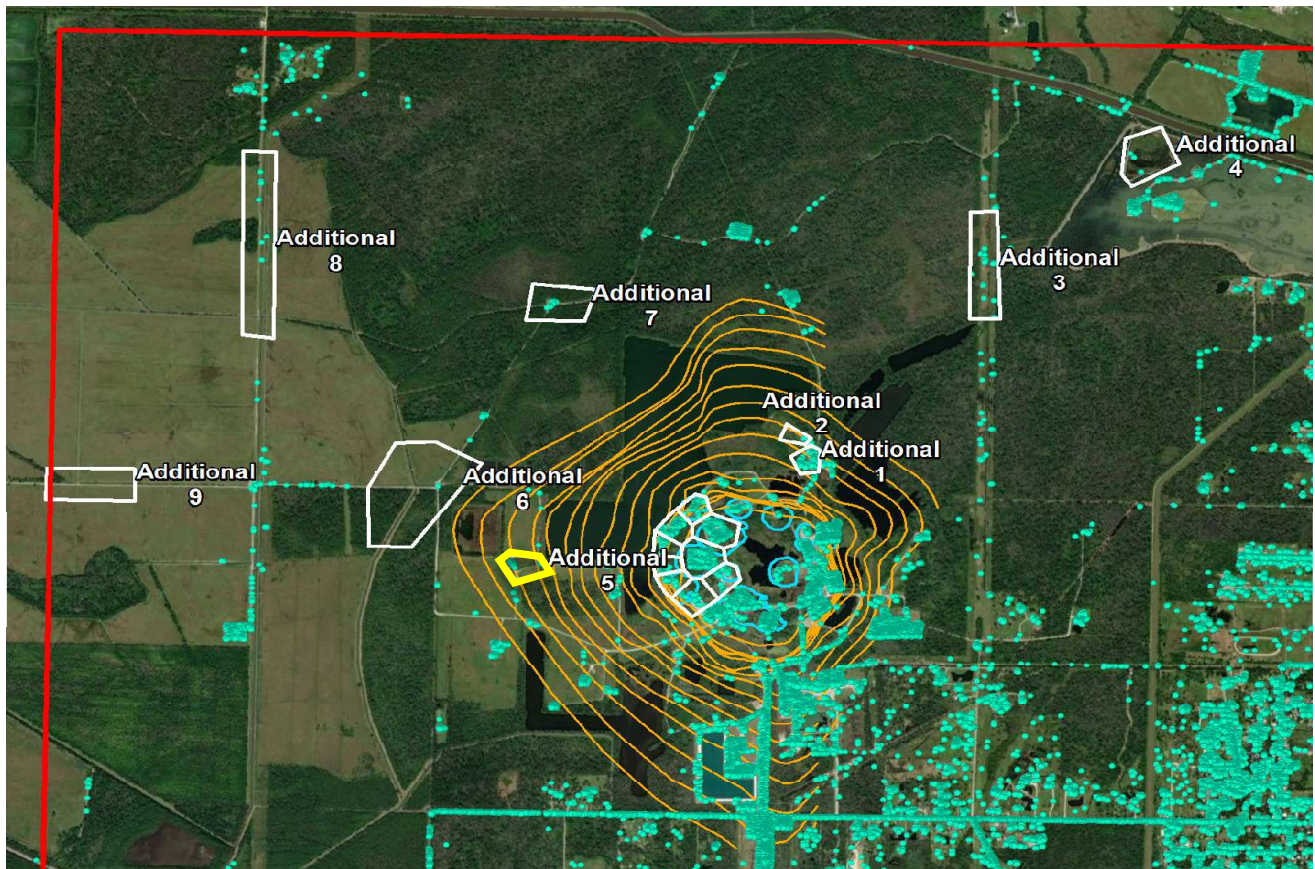## Additional 2 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: 2

	Nonlinear Trend	Linear Trend
Velocity:	+0.59 in/yr	+0.10 in/yr
Acceleration:	+1.25 in/yr^2	0.00 in/yr^2

■ LOS Displacement Measurement   — — Nonlinear Trend Line (Quadratic Regression)   — — Linear Trend Line (Linear Regression)

LONQUIST & CO. LLC

Additional 3 - Location Map

Additional 3 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: **26**

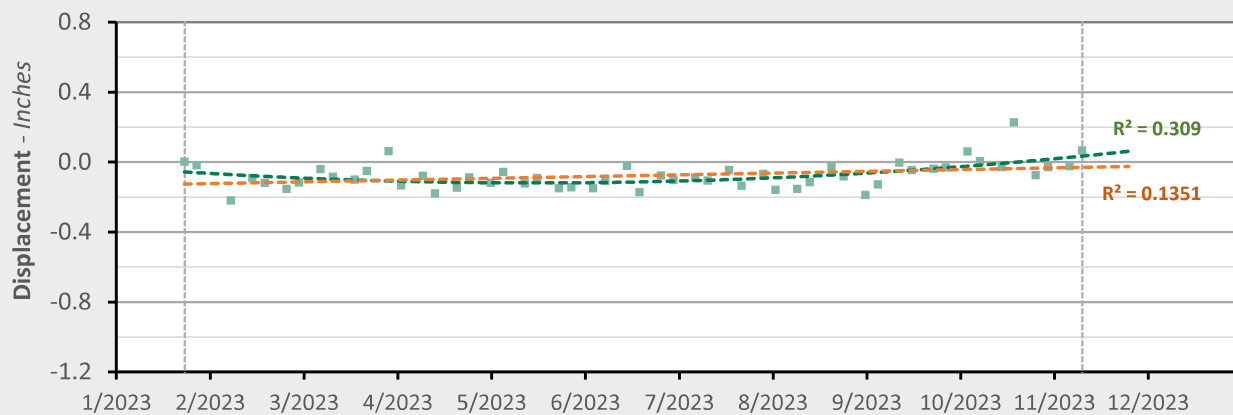|	Nonlinear Trend	Linear Trend
Velocity:	+0.95 in/yr	+0.07 in/yr
Acceleration:	+2.26 in/yr^2	0.00 in/yr^2

- ■ LOS Displacement Measurement
- – – Nonlinear Trend Line (Quadratic Regression)
- – – Linear Trend Line (Linear Regression)

Additional 4 - Location Map

Additional 4 - Displacement Time Series

TSX/PAZ (11/10/2023) Point Count: **3**

	Nonlinear Trend	Linear Trend
Velocity:	+0.52 in/yr	-0.34 in/yr
Acceleration:	+2.22 in/yr^2	0.00 in/yr^2

- ■ LOS Displacement Measurement
- Nonlinear Trend Line (Quadratic Regression)
- Linear Trend Line (Linear Regression)

Additional 5 - Location Map

Additional 5 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: **14**
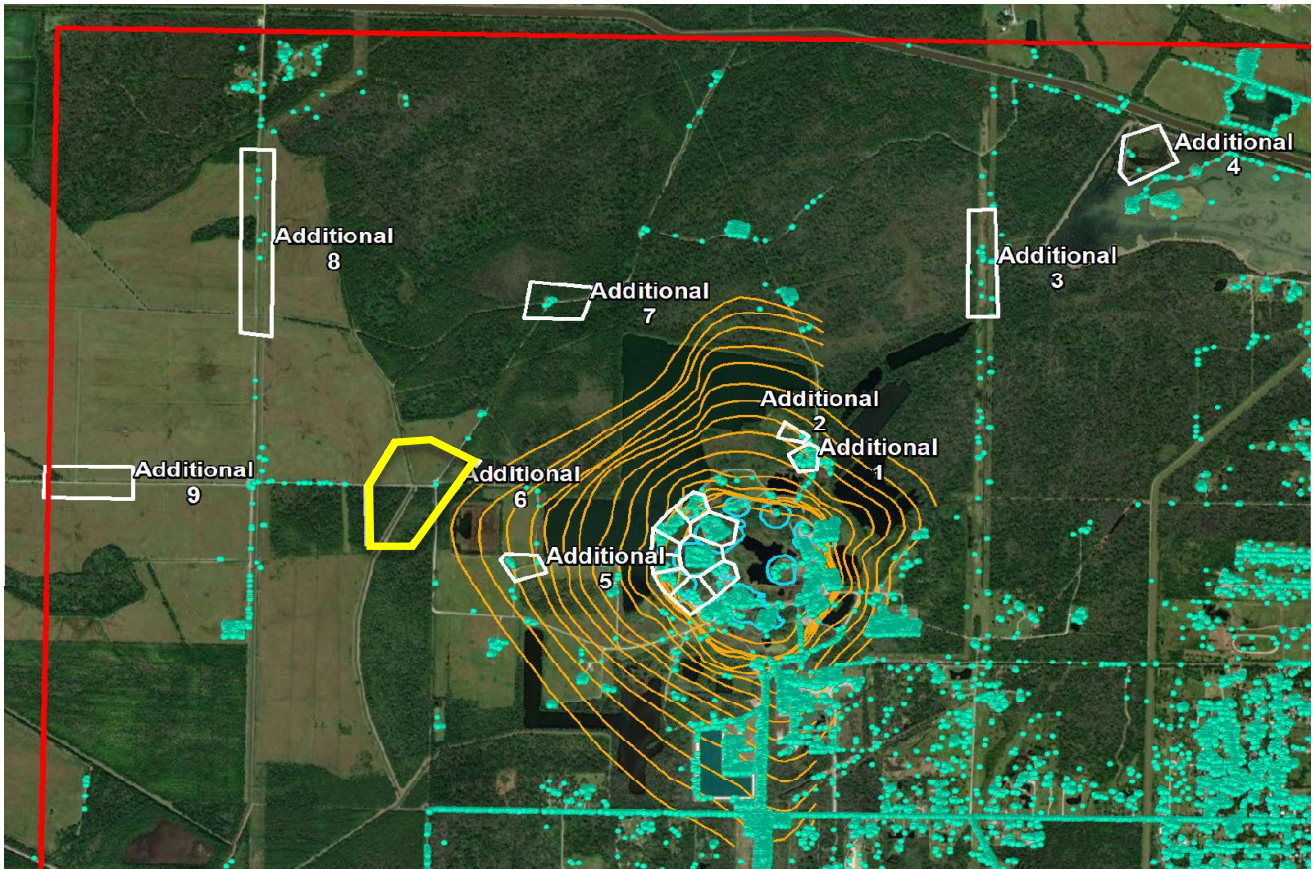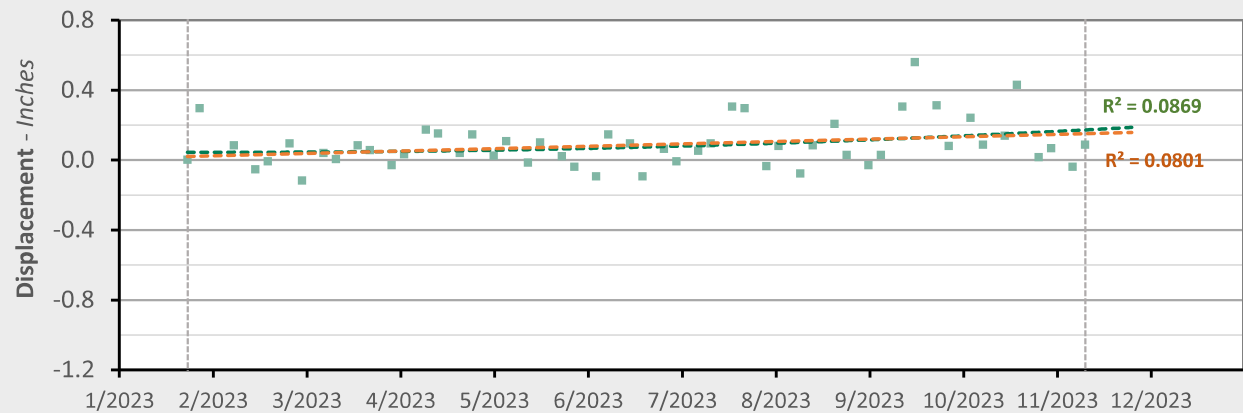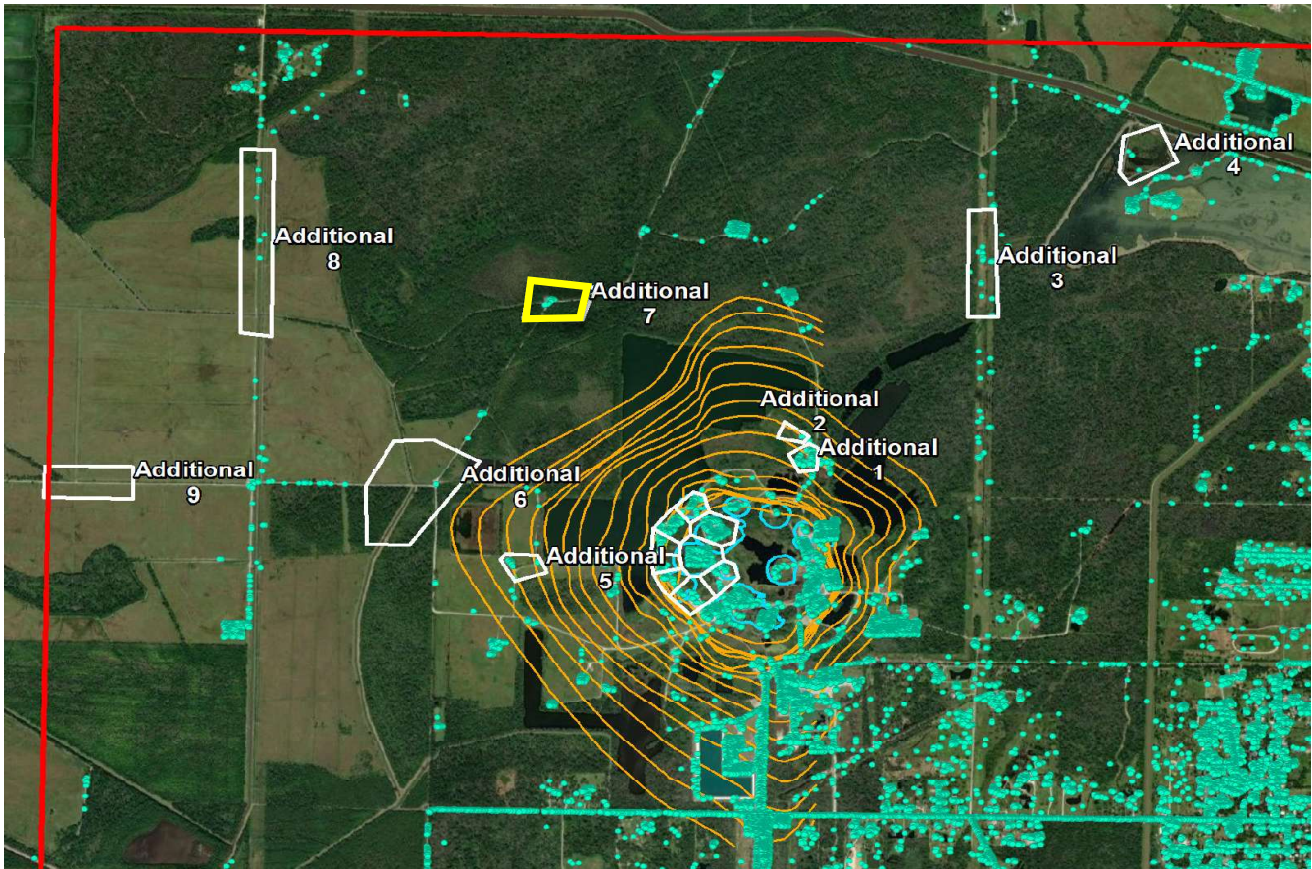

	Nonlinear Trend	Linear Trend
Velocity:	+0.63 in/yr	+0.12 in/yr
Acceleration:	+1.31 in/yr^2	0.00 in/yr^2

- LOS Displacement Measurement
- Nonlinear Trend Line (Quadratic Regression)
- Linear Trend Line (Linear Regression)

LONQUIST & CO. LLC

Additional 6 - Location Map

Additional 6 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: 1

	Nonlinear Trend	Linear Trend
Velocity:	+0.34 in/yr	+0.16 in/yr
Acceleration:	+0.45 in/yr^2	0.00 in/yr^2

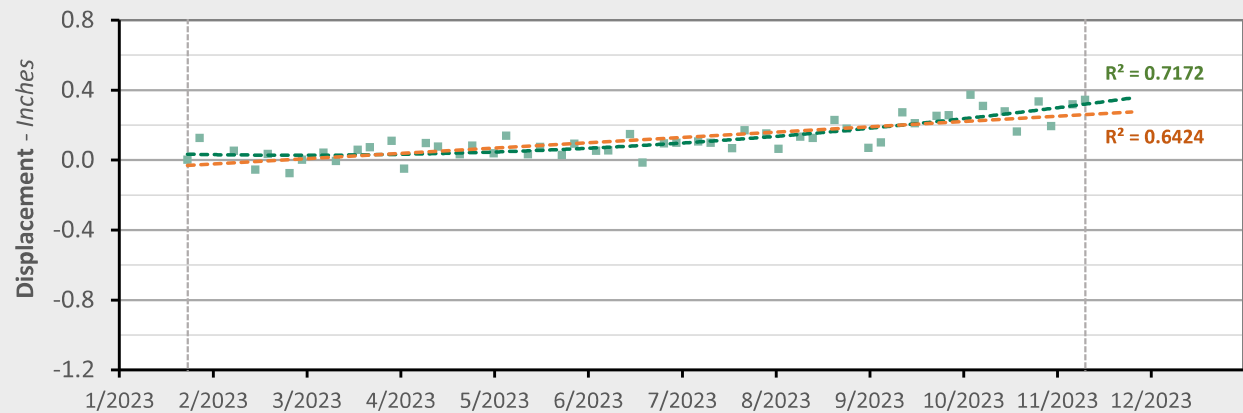■ LOS Displacement Measurement   - - - Nonlinear Trend Line (Quadratic Regression)   - - - Linear Trend Line (Linear Regression)

Additional 7 - Location Map
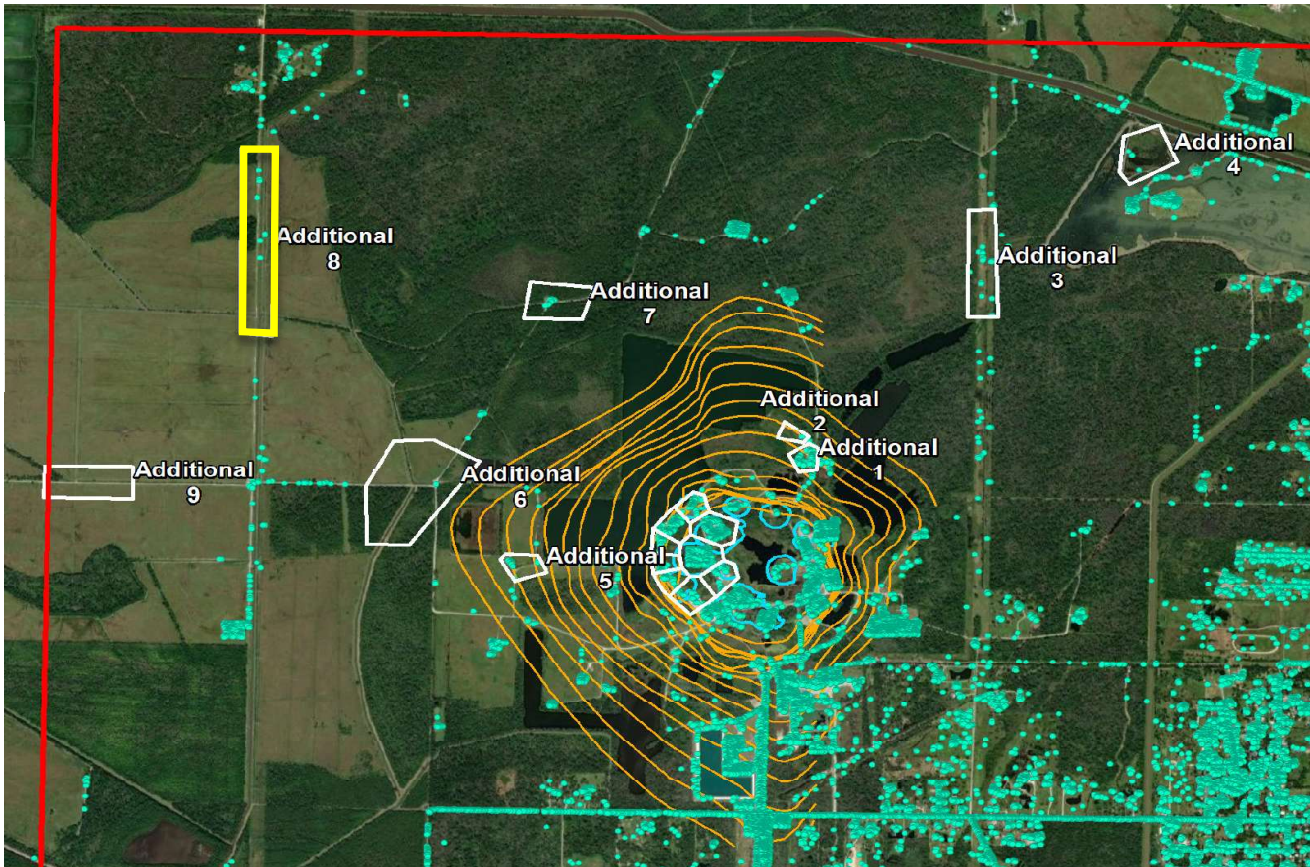

Additional 7 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: 10

$R^2 = 0.7172$

$R^2 = 0.6424$

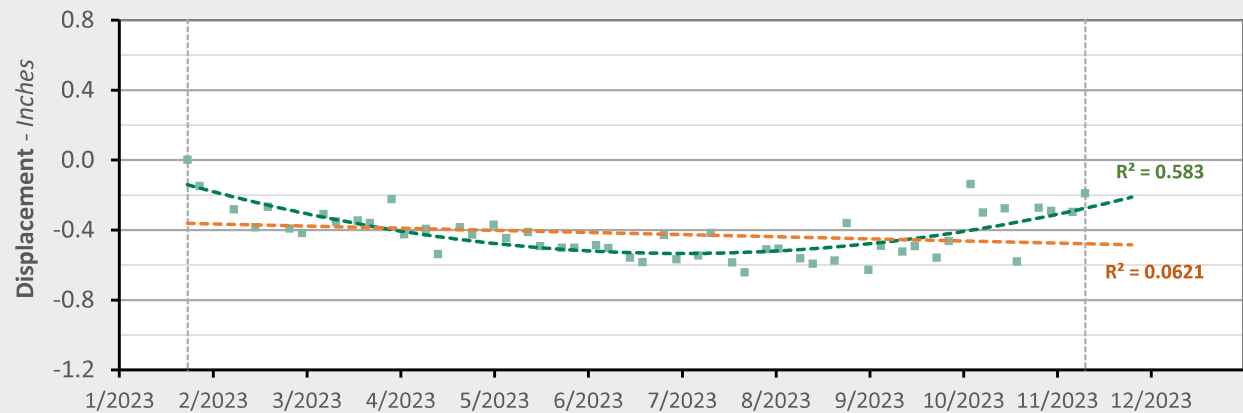|	Nonlinear Trend	Linear Trend
Velocity:	+0.84 in/yr	+0.37 in/yr
Acceleration:	+1.20 in/yr^2	0.00 in/yr^2

- ■ LOS Displacement Measurement
- - - Nonlinear Trend Line (Quadratic Regression)
- - - Linear Trend Line (Linear Regression)

Additional 8 - Location Map
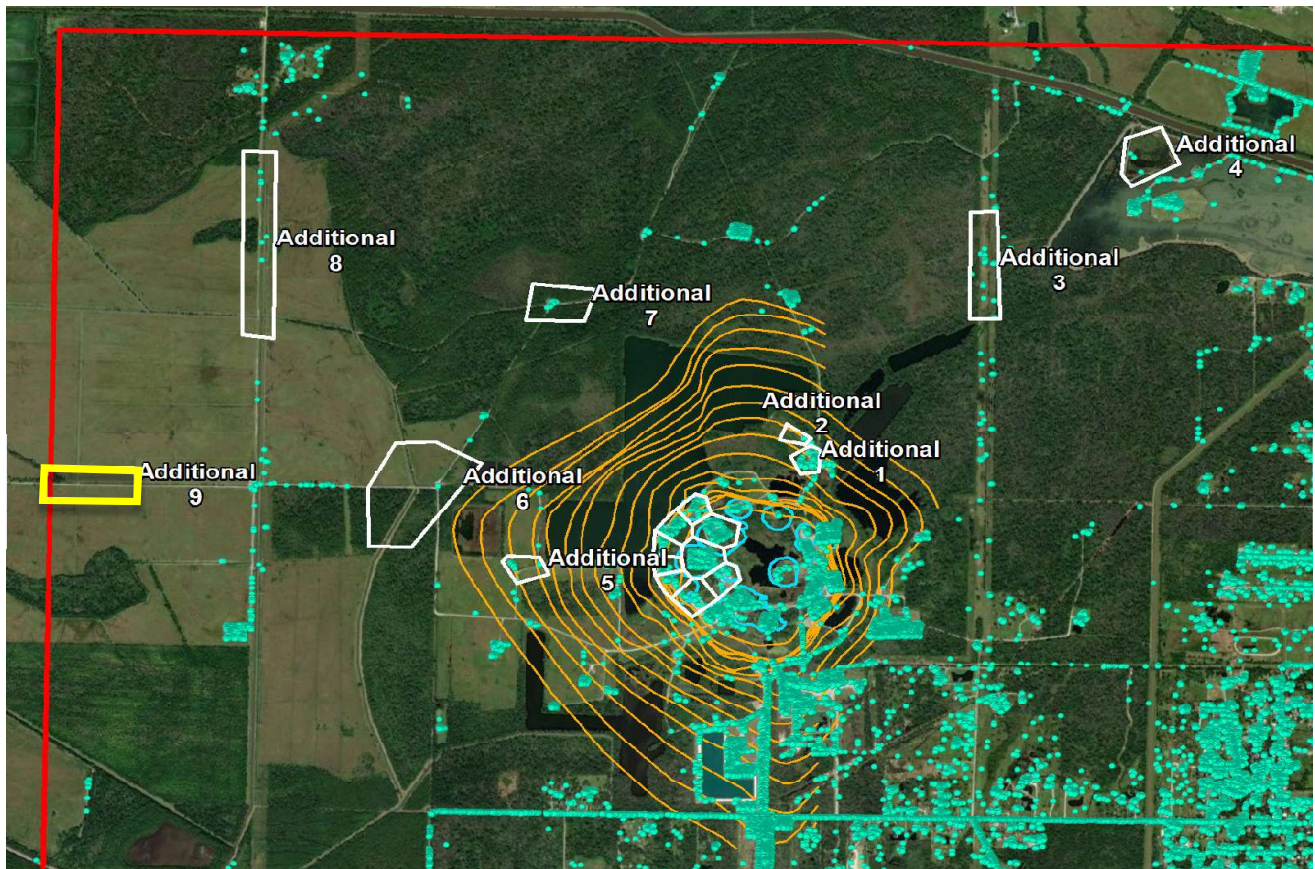

Additional 8 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: 7

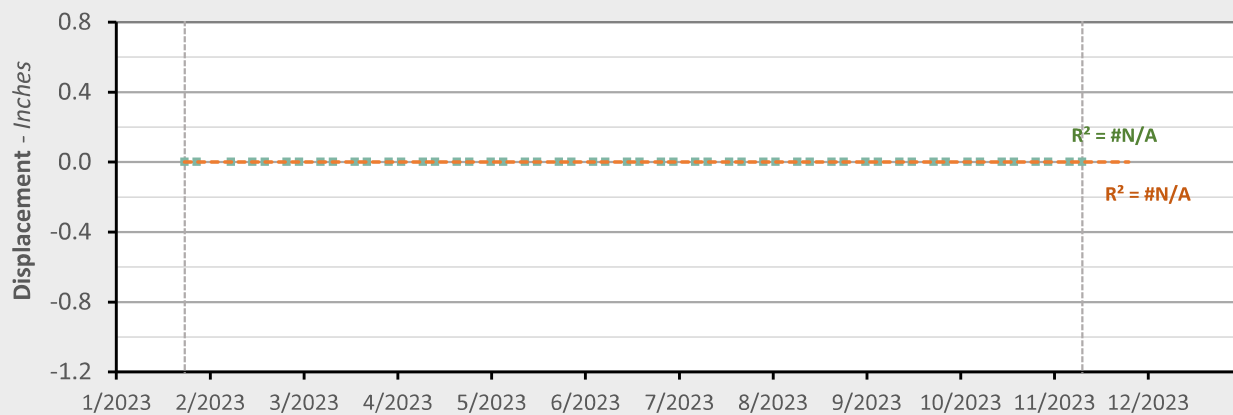|	Nonlinear Trend	Linear Trend
Velocity:	+1.45 in/yr	-0.15 in/yr
Acceleration:	+4.09 in/yr^2	0.00 in/yr^2

- ■ LOS Displacement Measurement
- - - Nonlinear Trend Line (Quadratic Regression)
- - - Linear Trend Line (Linear Regression)

Additional 9 - Location Map

Additional 9 - Displacement Time Series   TSX/PAZ (11/10/2023) Point Count: 0

	Nonlinear Trend		Linear Trend	
Velocity:	#VALUE!	in/yr	#VALUE!	in/yr
Acceleration:	#VALUE!	in/yr^2	0.00	in/yr^2

■ LOS Displacement Measurement   - - - Nonlinear Trend Line (Quadratic Regression)   - - - Linear Trend Line (Linear Regression)