Bayou Corne 3D - 2013

3d reflection seismic results in response to

LADNR

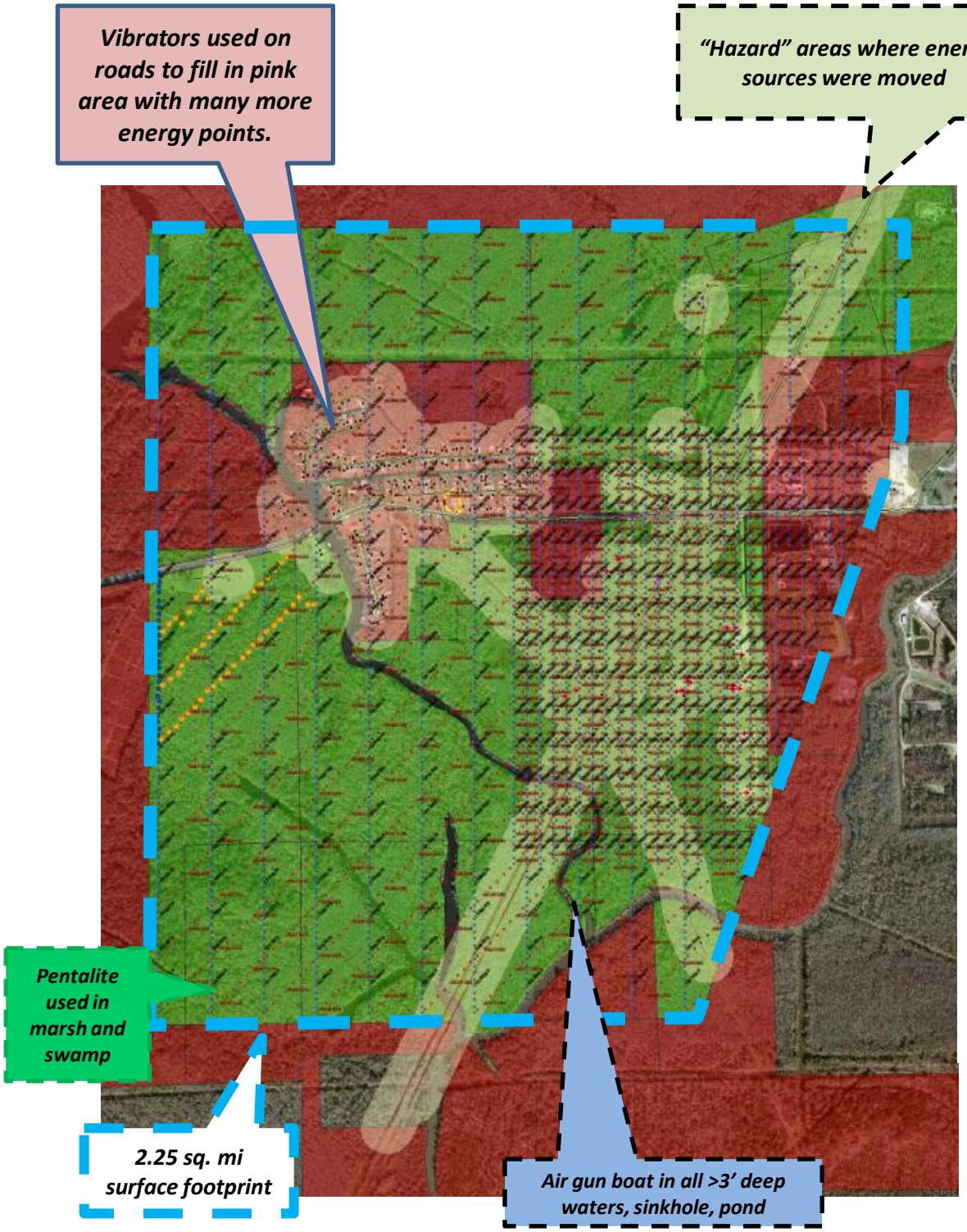
DIRECTIVE 2a, FIFTH AMENDMENT TO THE DECLARATION OF EMERGENCY AND DIRECTIVE

20 APRIL 2013

Bayou Corne 3D - 2013
Summary of Key Findings

- Excellent seismic images provided by new 3D are much better than 2007 Legend seismic data
- OG 3 collapse zone limited to small area at depth and small vertical riser along outside of salt face
- No evidence of void spaces below sinkhole including any area near the base of OG 3 cavern
- No evidence for large gas pockets below sinkhole including any area near the base of OG 3 cavern
- Sinkhole fill disturbed area limited to depth of approximately 400 ft., is contained within berm, and remains far south of Hwy 70 and Bayou Corne
- Small amount of residual Big Hum hydrocarbons near the Hooker # 1, serial # 20913, appears to have been liberated and virtually gone in recent survey
- No evidence of multiple hydrocarbon zones as possible supply to sinkhole and MRAA
- Radial faults appear in the same position as Legend data
- No change in the competency of the sub-surface strata in the area except around sinkhole
- Confirmation of at least 150 ft (+/- 75 ft) of salt between OG 1 cavern and edge of salt
- Napoleonville Dome's western edge of salt in same location as 2007 Legend survey – stable with no movement
- Additional processing and refinement needed on MRAA images due to shallow depth

3D SEISMIC DATA FIELD ACQUISITION DESIGN FOOTPRINT



ACQUISITION:

2540 Energy Source points –
(NE/SW diagonal lines of red dots)
280 vibe points
1814 pentolite
446 air gun shots

2651 Receiver points –
(north/south lines of blue dots)
These were geophones in the marsh and hydrophones in the sinkhole.
(6,622,174 traces were recorded.)

PROCESSING:

The 3D reflection seismic survey yielded **48,906 seismic data traces** placed every 37.5 feet within the 2.5 sq mile 3D seismic area with a 730 max cdp fold.

Planned 3D timeline vs. actual

CREW WORK

	Jan 12-18	Jan 19-25	Jan 26-31	Feb 1-7	Feb 8-14	Feb 15-21	Feb 22-28	Mar 1-7	Mar 8-14	Mar 15-21	Mar 22-28	Apr 29-4	Apr 5-12	Apr 13-20	Apr 21-28
Permits	X	X	X	X											
Survey			X	X	X	X	X	X	X	X					
Drill					X	X	X	X	X	X					
Layout									X	X					
Record										X	X				
Pickup/Depart											X				

PROCESSING

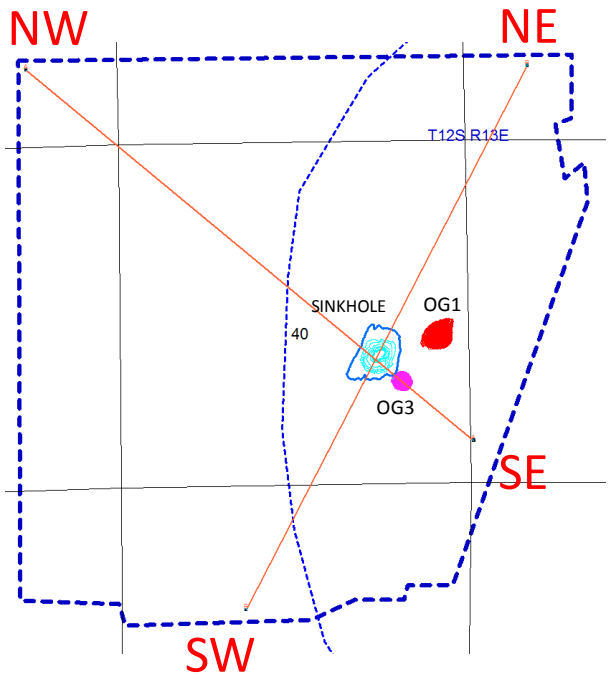
	Mar 1-7	Mar 8-14	Mar 15-21	Mar 22-28	Apr 29-4	Apr 5-12	Apr 13-20
Work up survey and geometry					X		
Pre-Stack Time Migration						X	
Pre-Stack Depth Migration							X
INTERPRETATION							X

Planned timeline in colors, actual timeline boxes w/ “x”

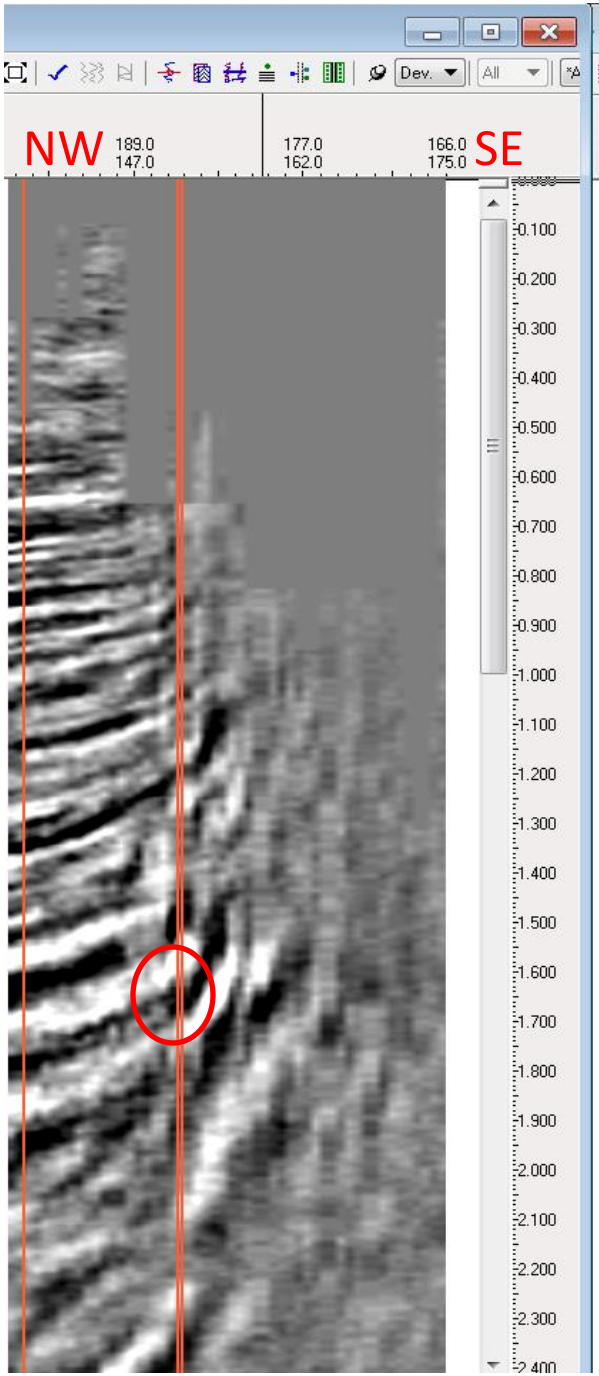
All work completed ahead of schedule.

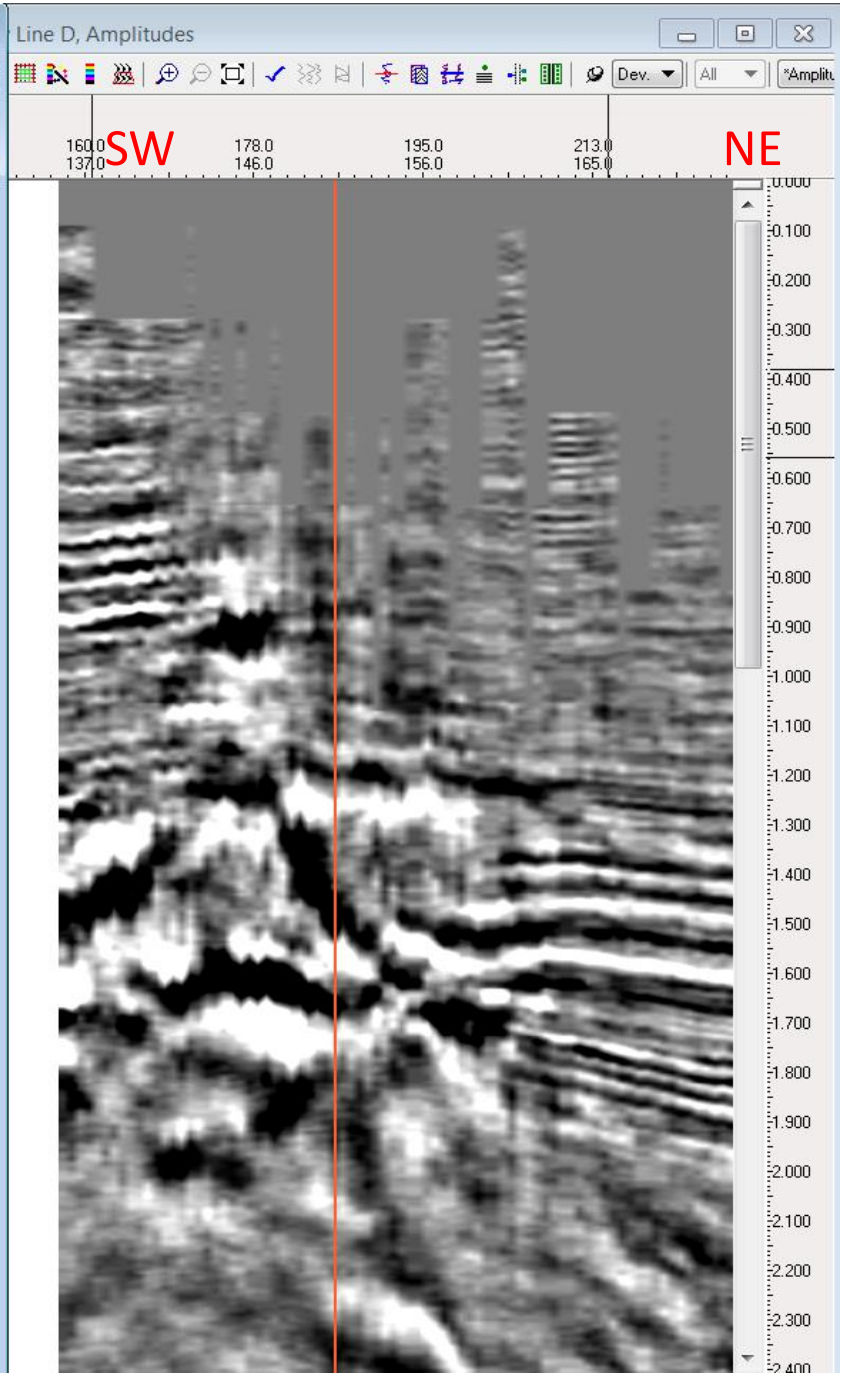
Historical 3D data

TBC is trying to secure a license to this data in order to reprocess it for a clearer image.



O represents same point on both data sets at the Big hum horizon.

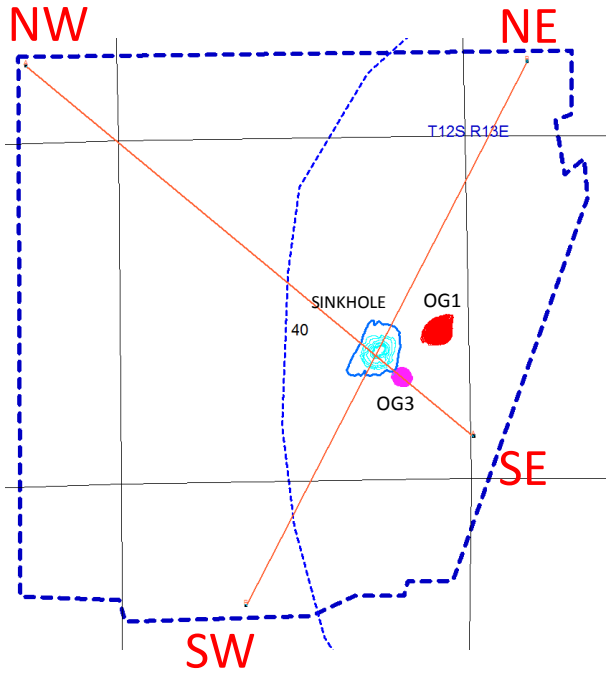




The Legend data shows layers of sediment going across the area.

New 3D Data

The new 3d reflection seismic data gives a very clear image of the sub-surface in the Bayou Corne area.



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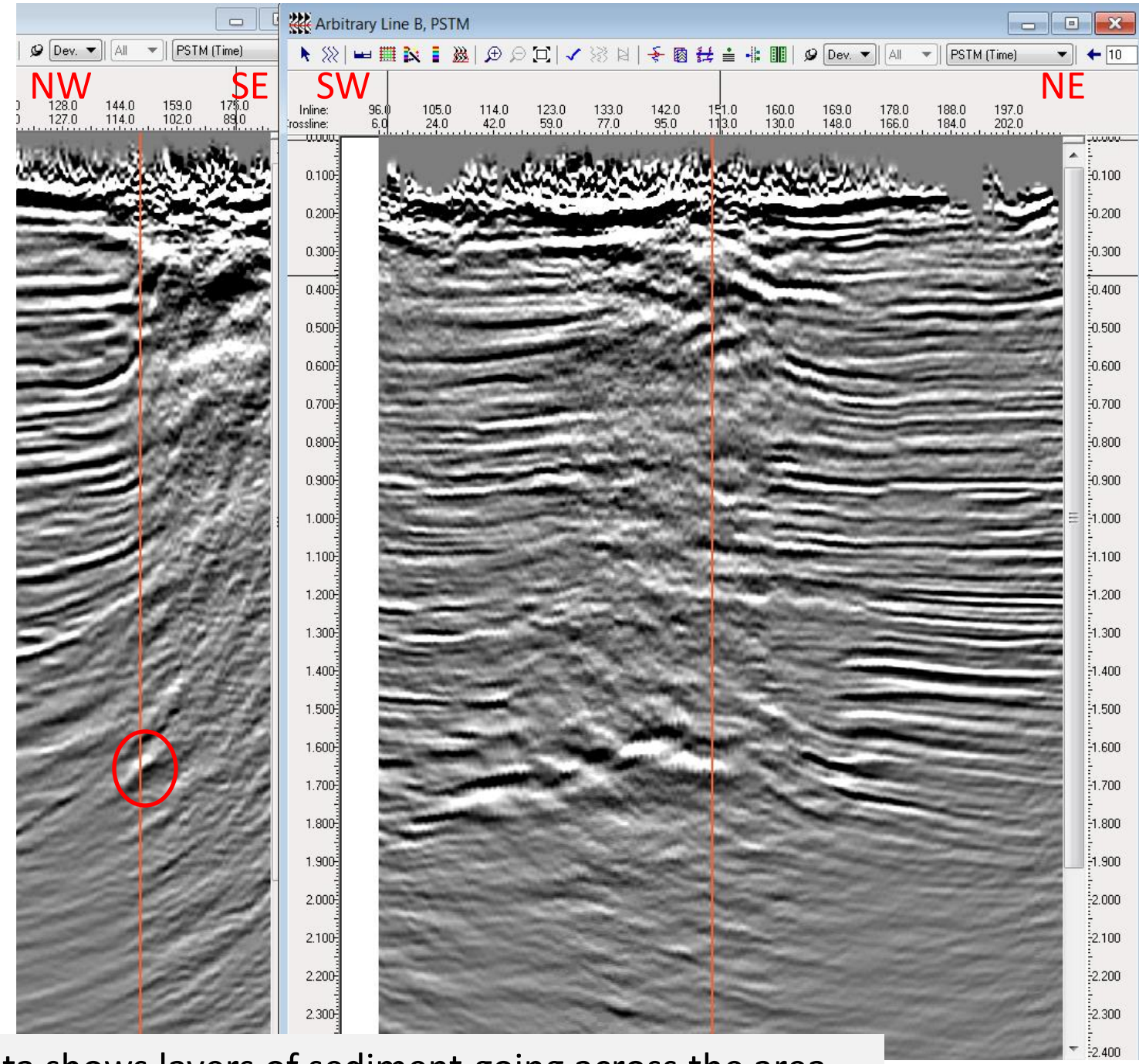
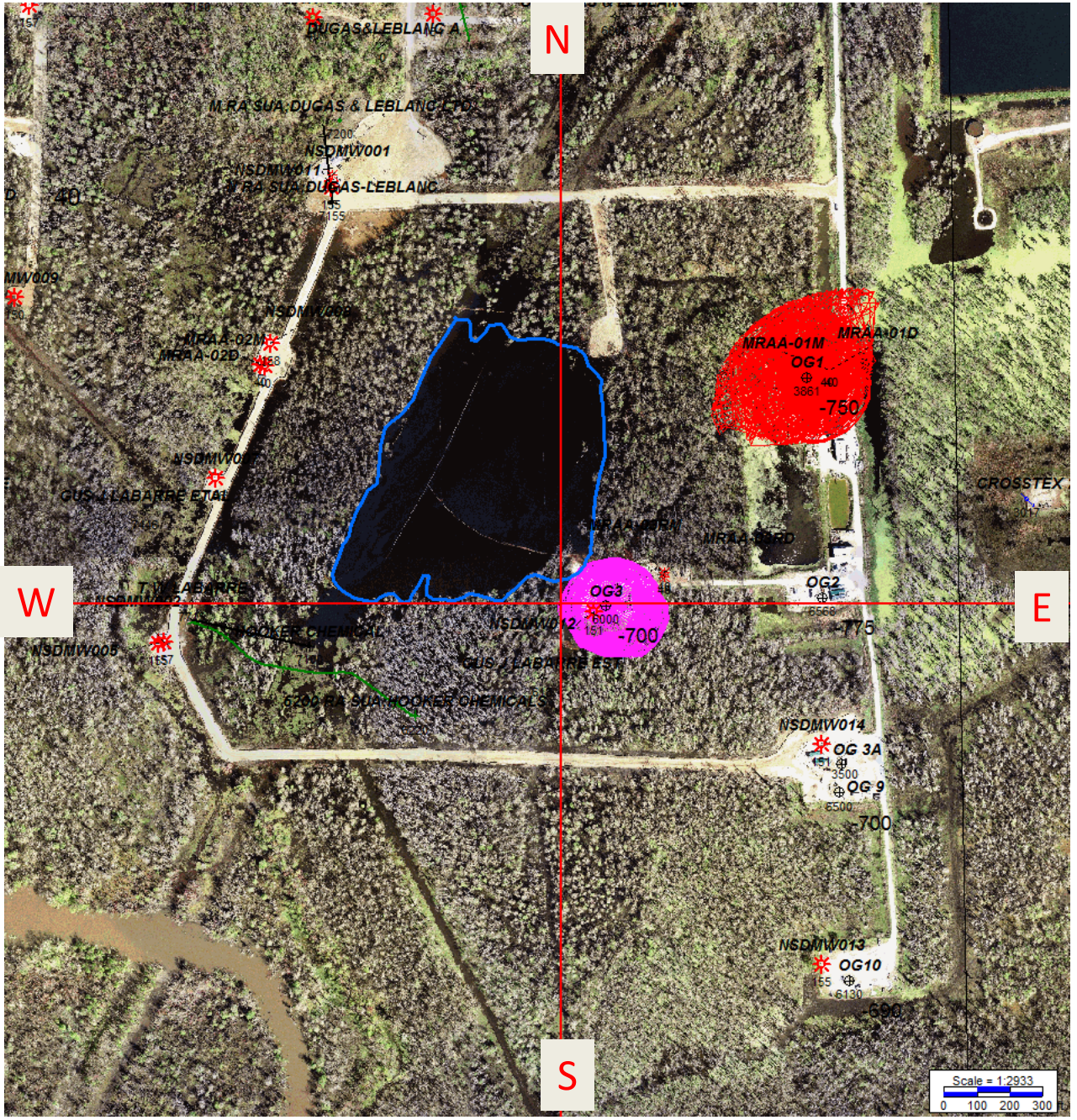


The new data shows layers of sediment going across the area.

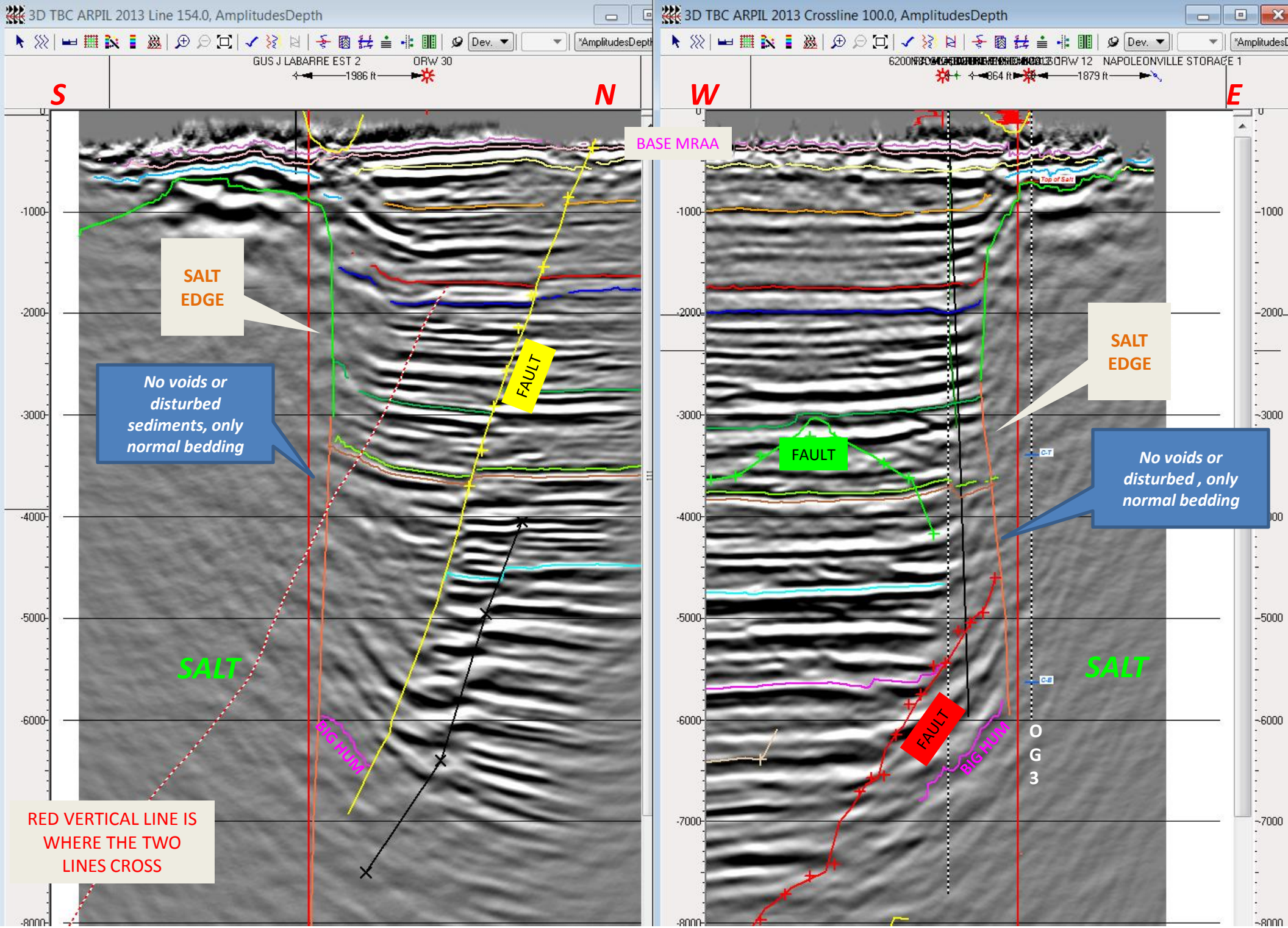
There are no voids, or large new gas pockets.

1. OG 3 collapse zone definition and images



BASE MAP WITH LOCATION OF SEISMIC LINES NEAR OG3

(PAGE 8 AND 9)



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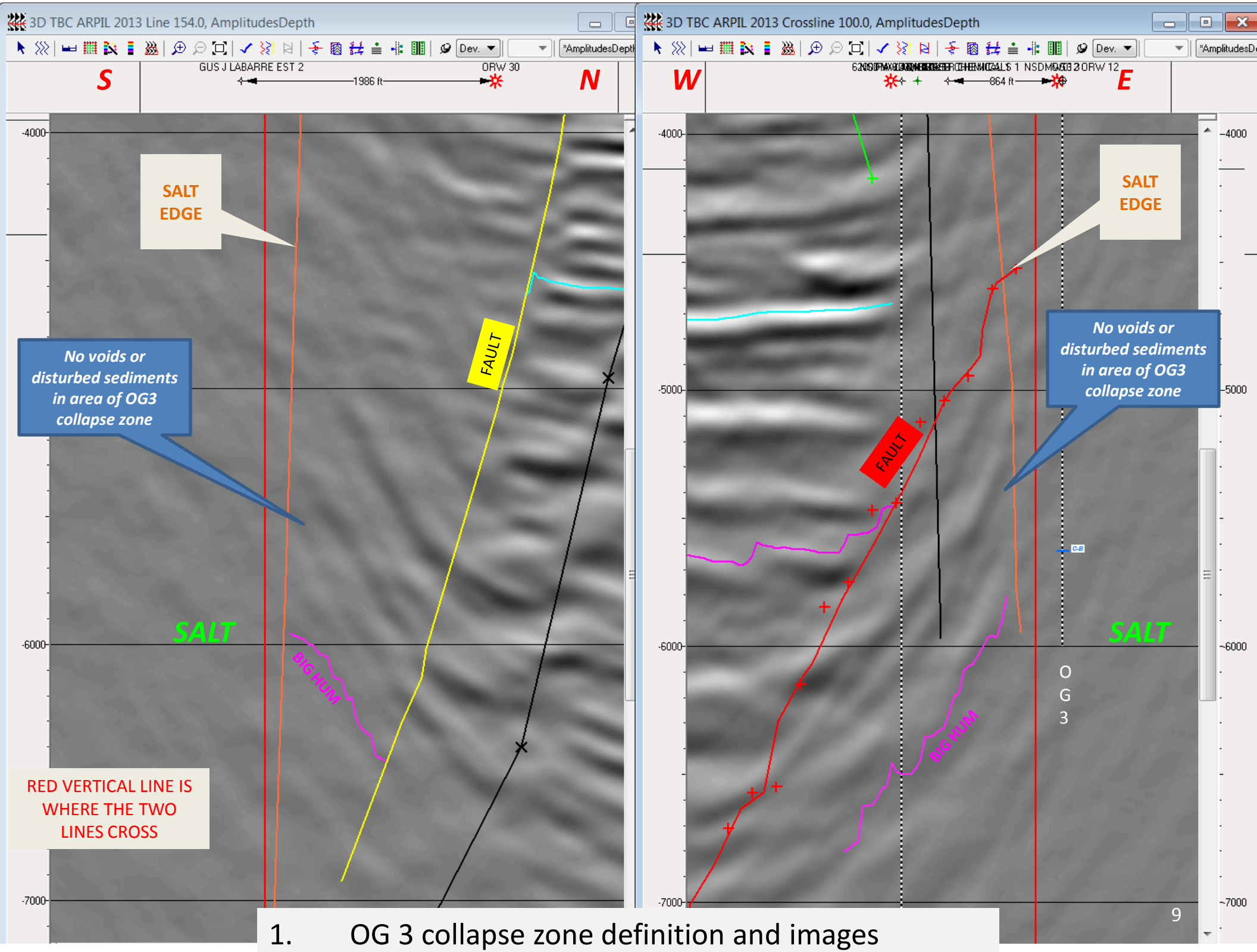
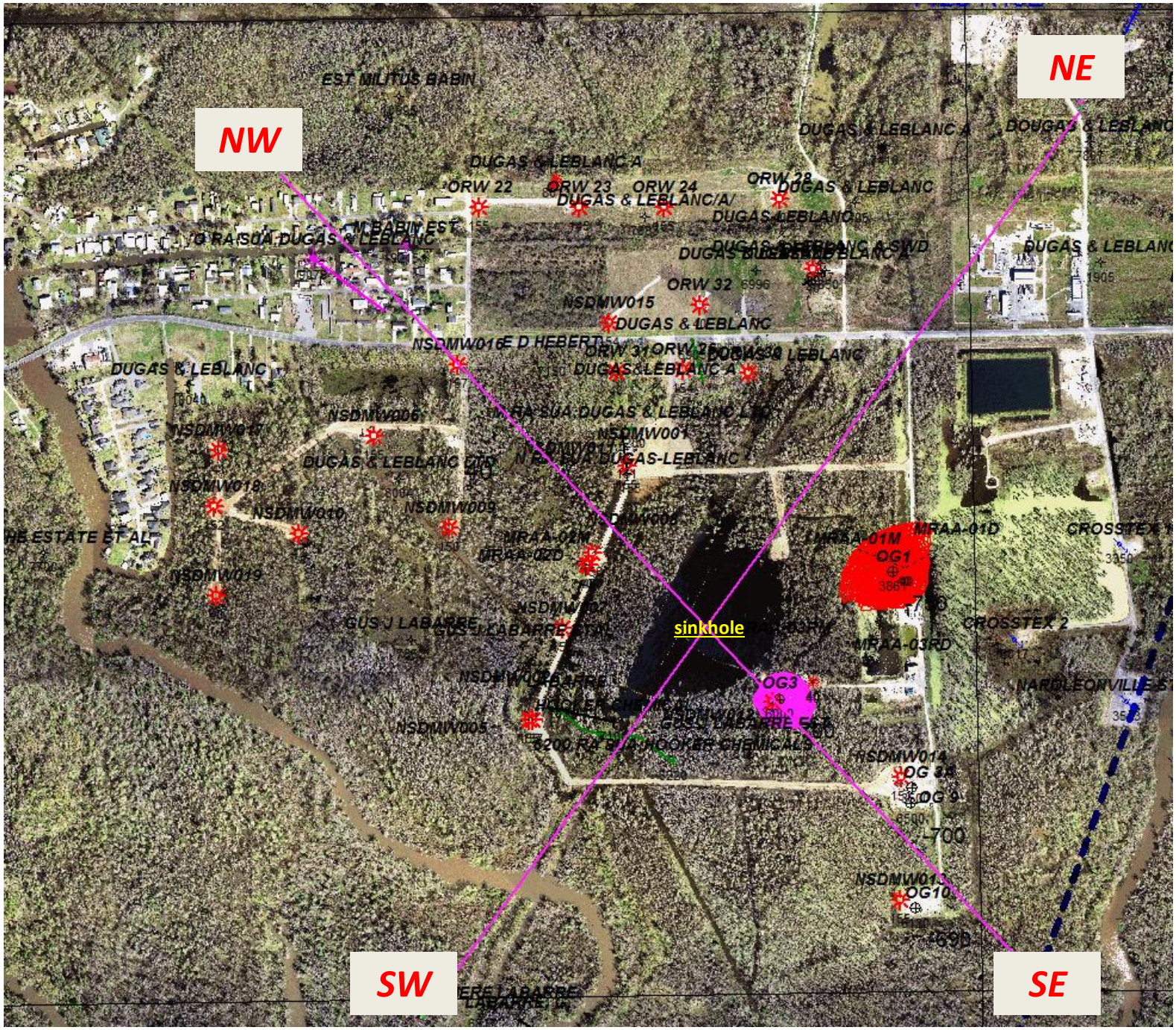


1. OG 3 collapse zone definition and images

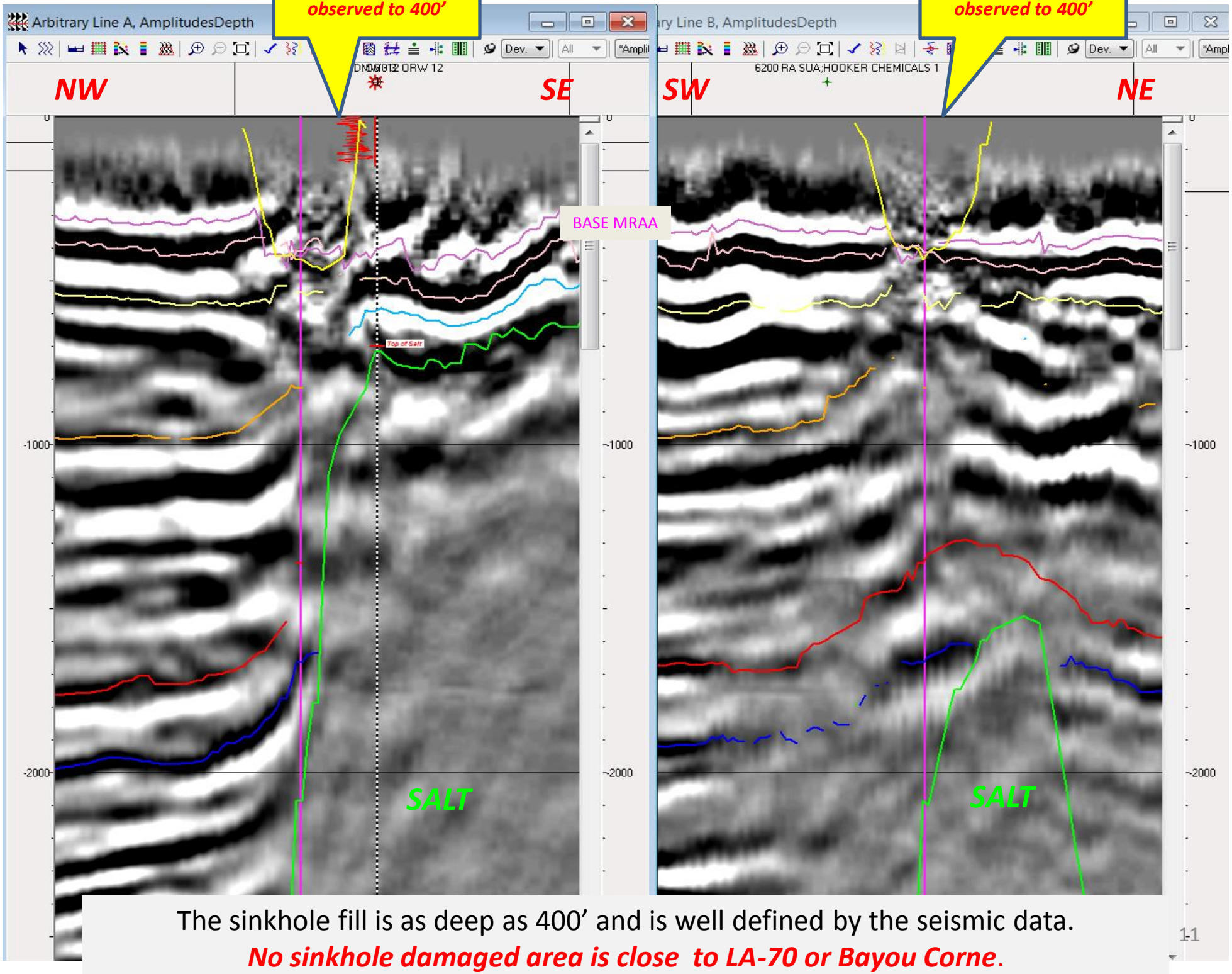
2. Sinkhole structure; Are there void spaces in the disturbed rock zone?



BASE MAP WITH LOCATION OF SEISMIC LINES OVER SINKHOLE

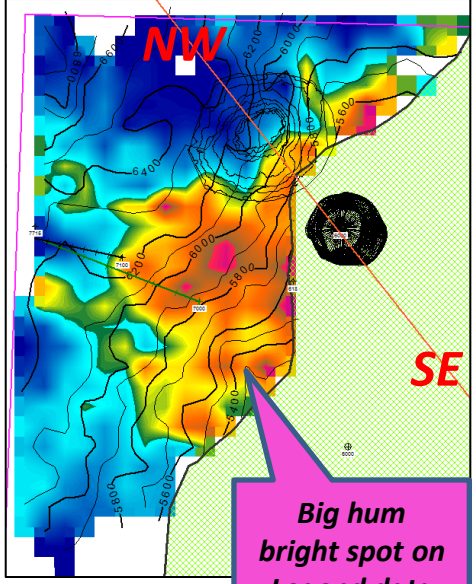
(PAGE 11 AND 12)

2. Sinkhole structure



The sinkhole fill is as deep as 400' and is well defined by the seismic data.

No sinkhole damaged area is close to LA-70 or Bayou Corne.

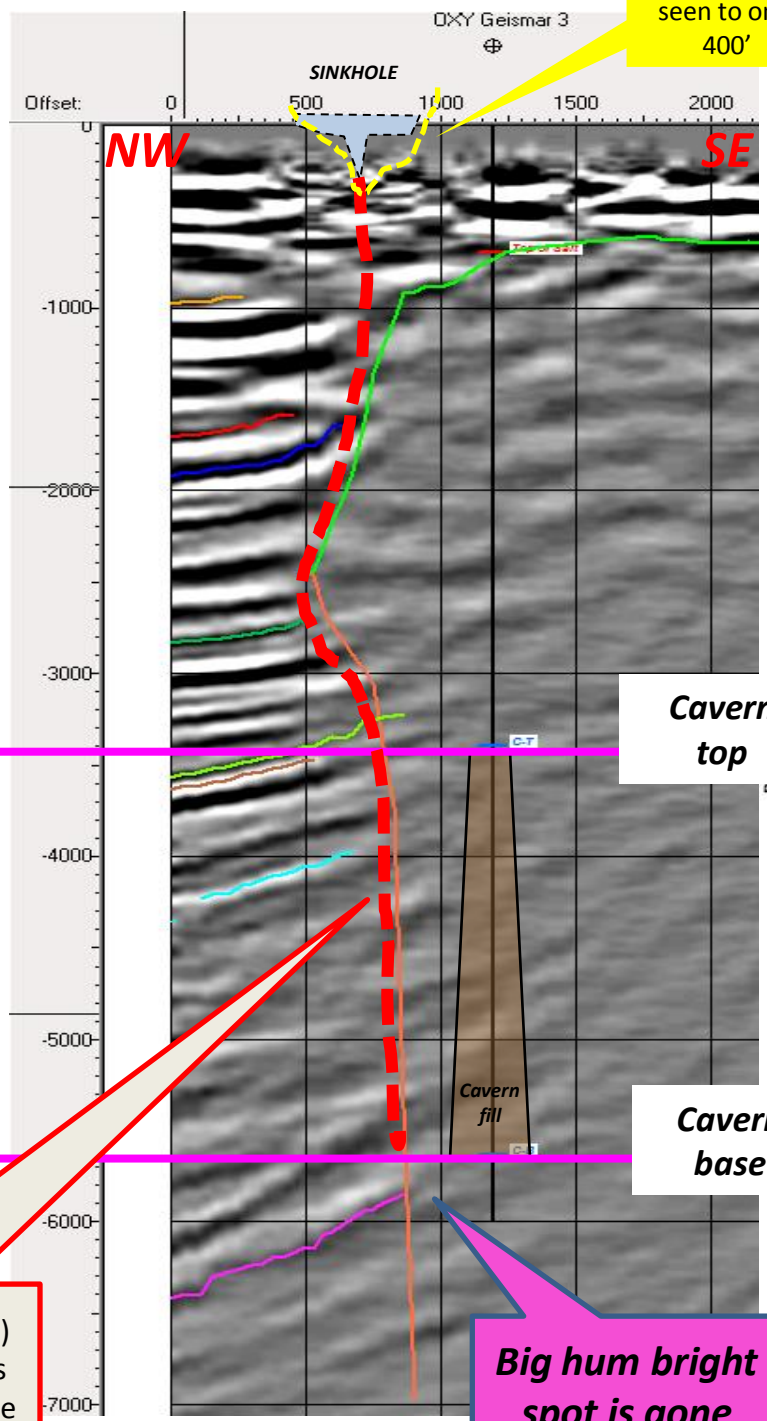


Big hum bright spot on Legend data

NEW 3D SEISMIC SHOWS:

- No sinkhole fill below 400 feet (yellow dashed line)
- No voids
- No new gas pockets
- No change in salt face
- Big hum gas and oil appears to have been liberated

The pathway (red dashed line) of gas and oil to the surface is so small, we don't see it on the seismic data.

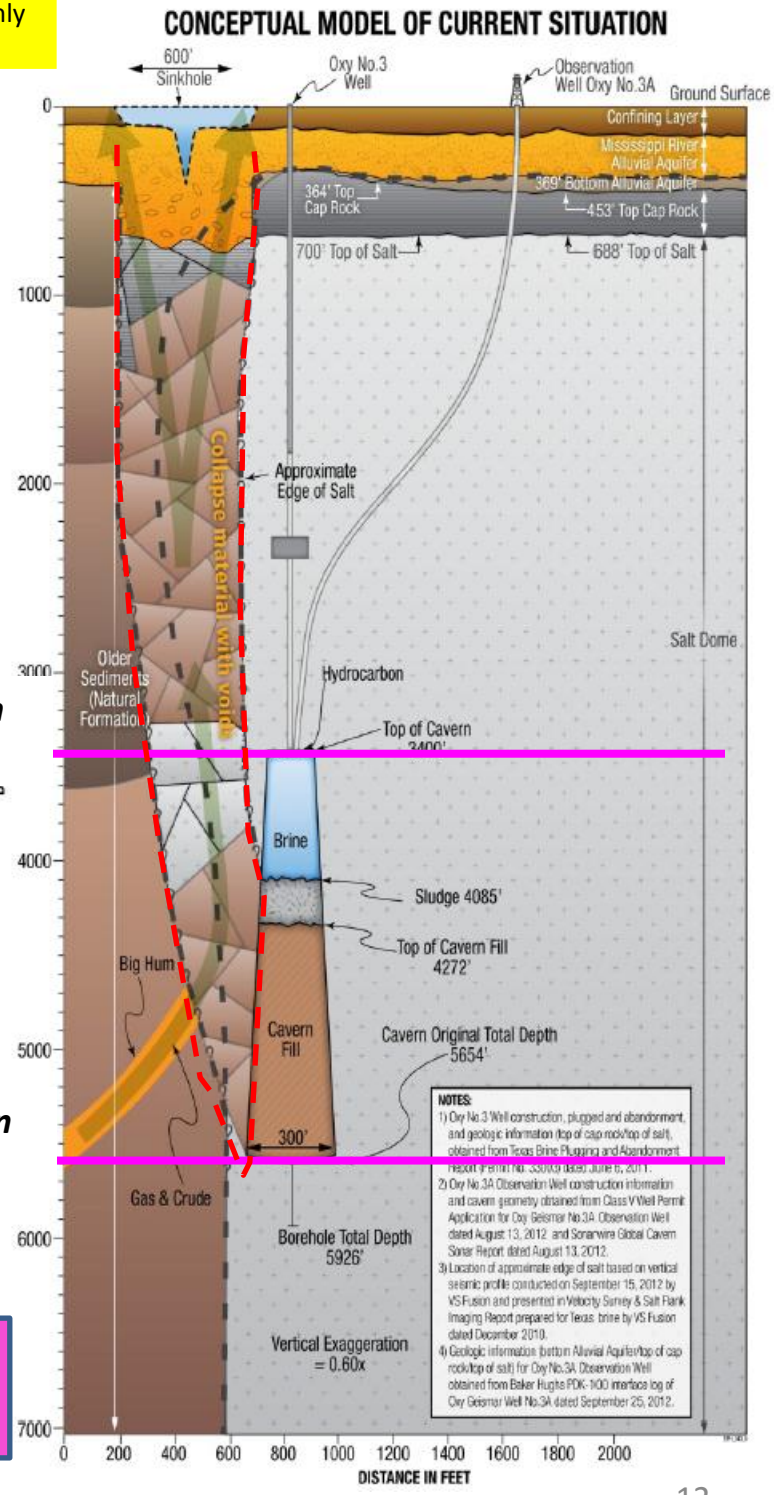


Sinkhole fill seen to only 400'

Cavern top

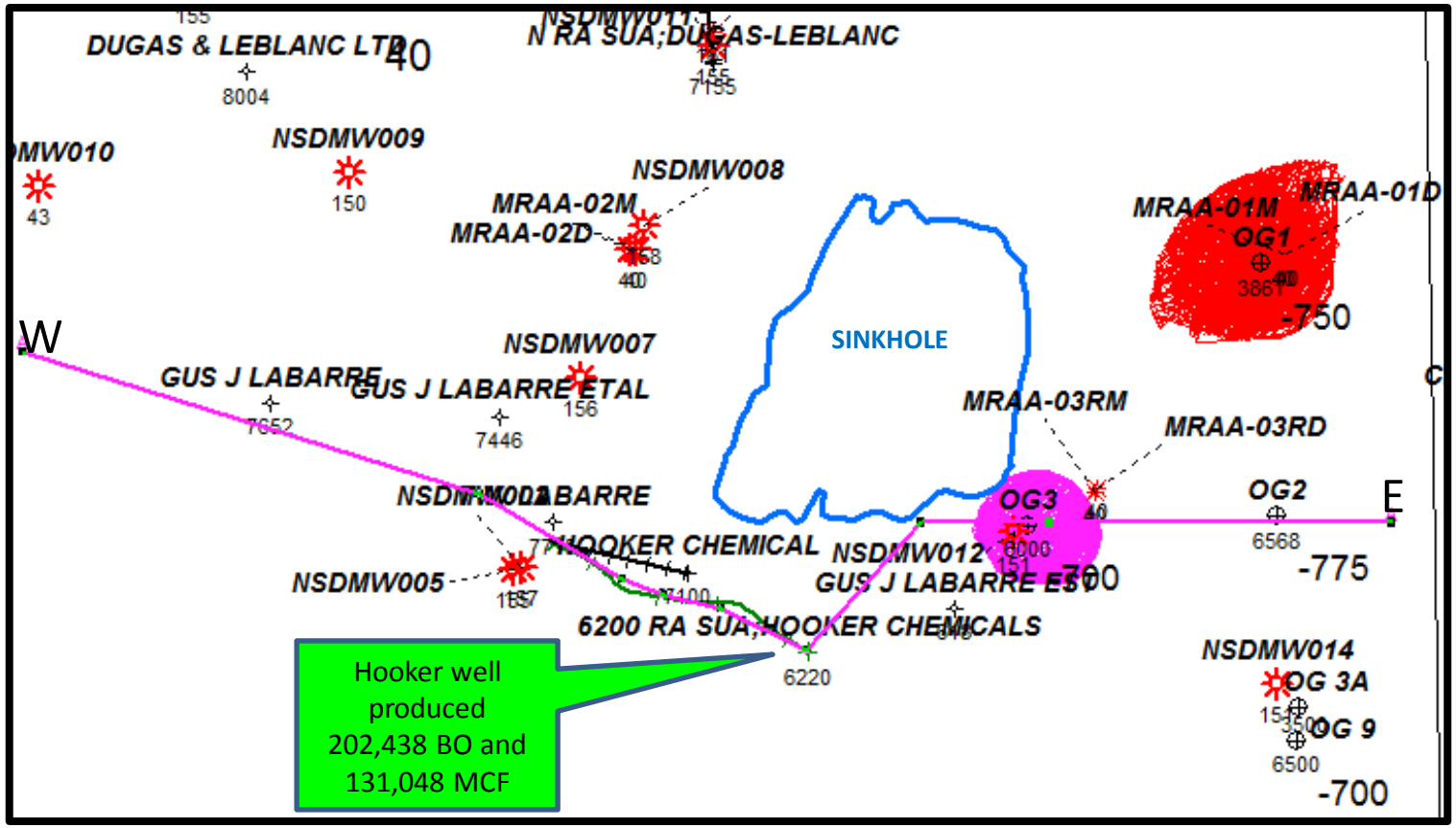
Cavern base

Big hum bright spot is gone



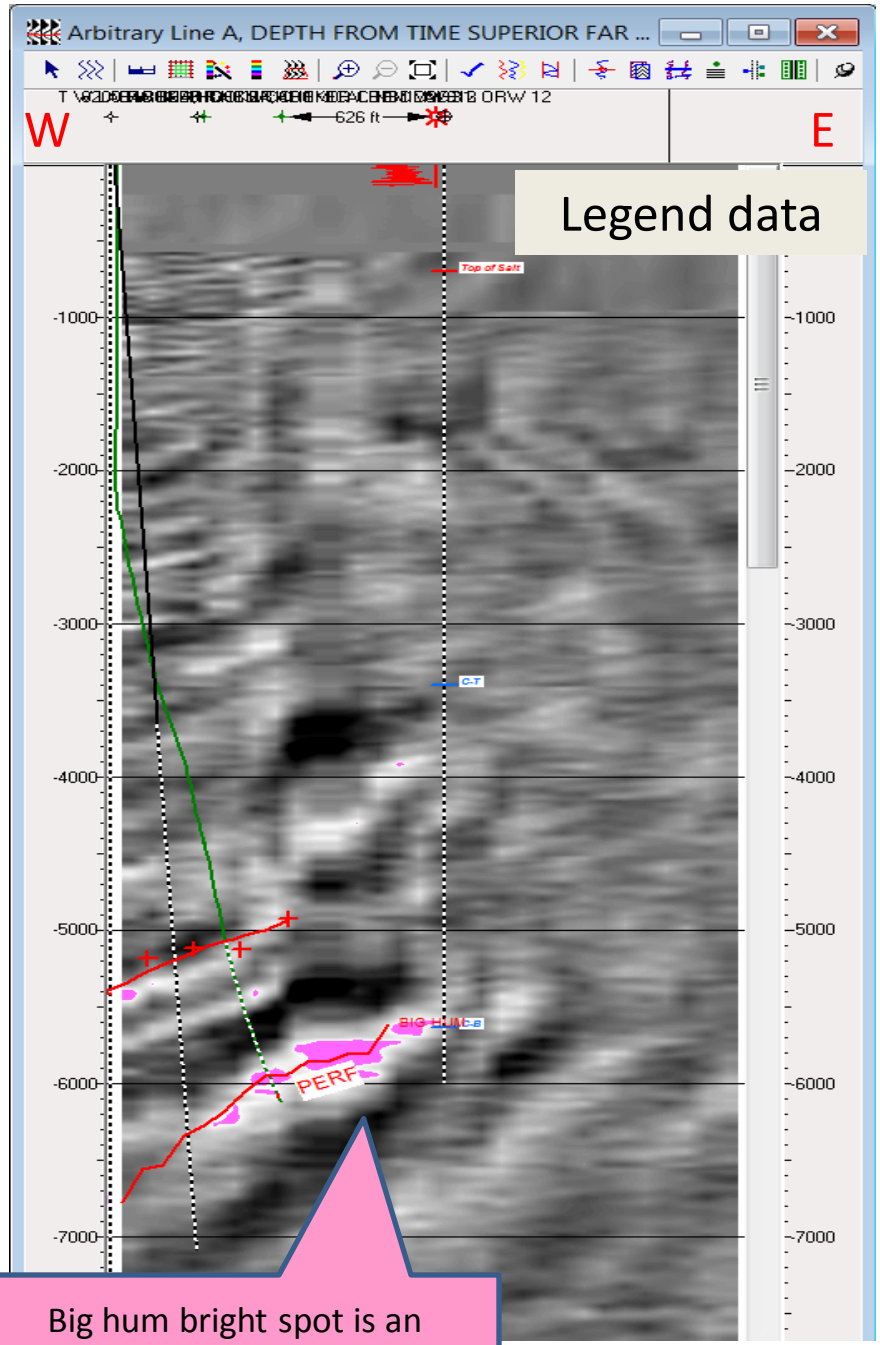
3D SEISMIC IMAGE COMPARED TO CB&I's CONCEPTUAL MODEL

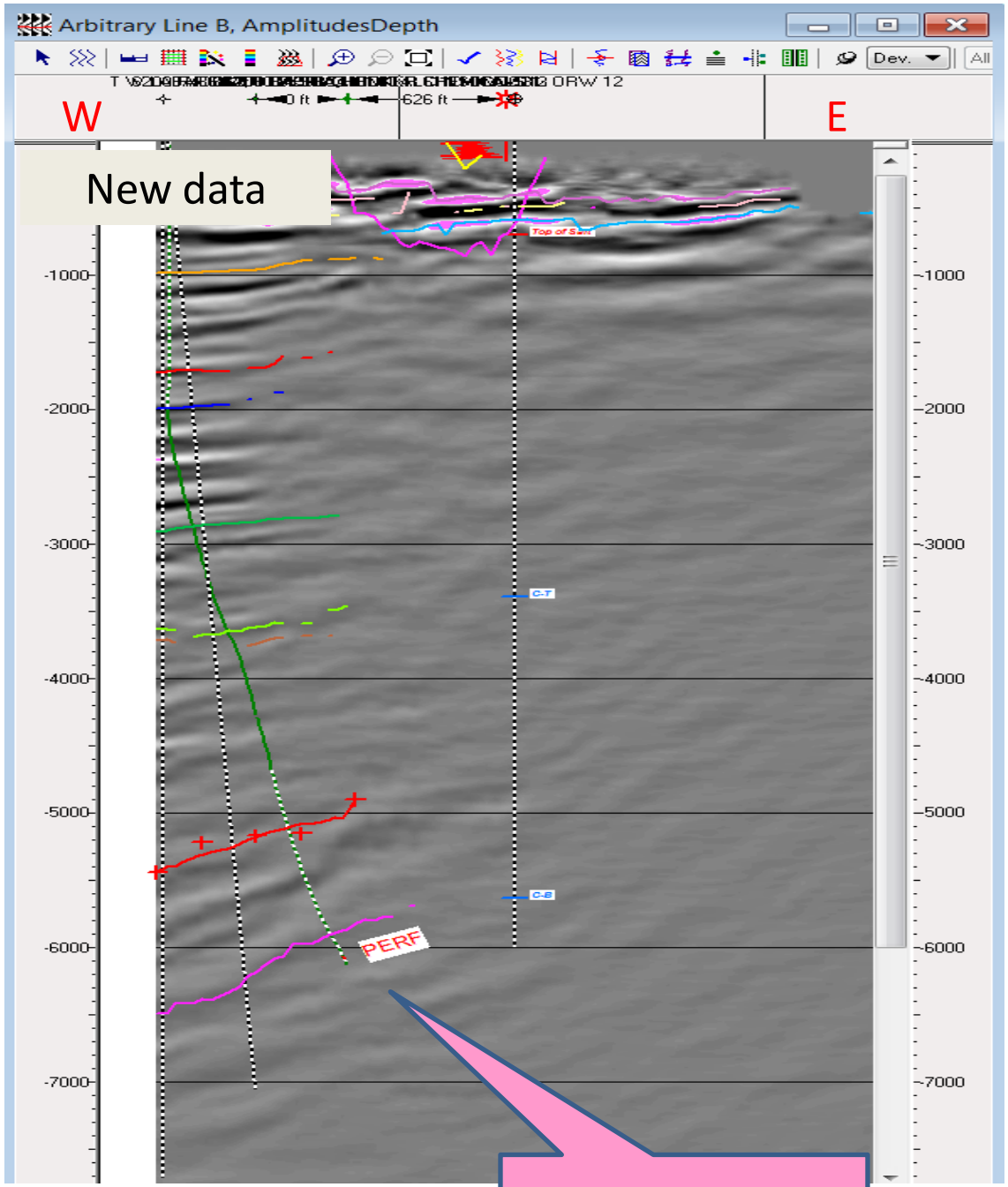
4. Are there hydrocarbon zones that could be contributing to the sinkhole and gas in the MRAA? If so, where are they and how large are they?



A seismic line (pink) drawn through the Hooker well and cavern clearly shows that there is a large bright amplitude on the Legend data that is not present on the new seismic data. The area of the original Big hum amplitude has been mapped and reservoir analysis will tell how much oil and gas remained and may have been liberated. No other areas within the new 3d have changed. There may have been tiny amounts of oil and gas trapped next to the salt dome, but they are so small that they do not get imaged even by the new high frequency 3d data.

4. Are there hydrocarbon zones that could be contributing to the sinkhole and gas in the MRAA? If so, where are they and how large are they?





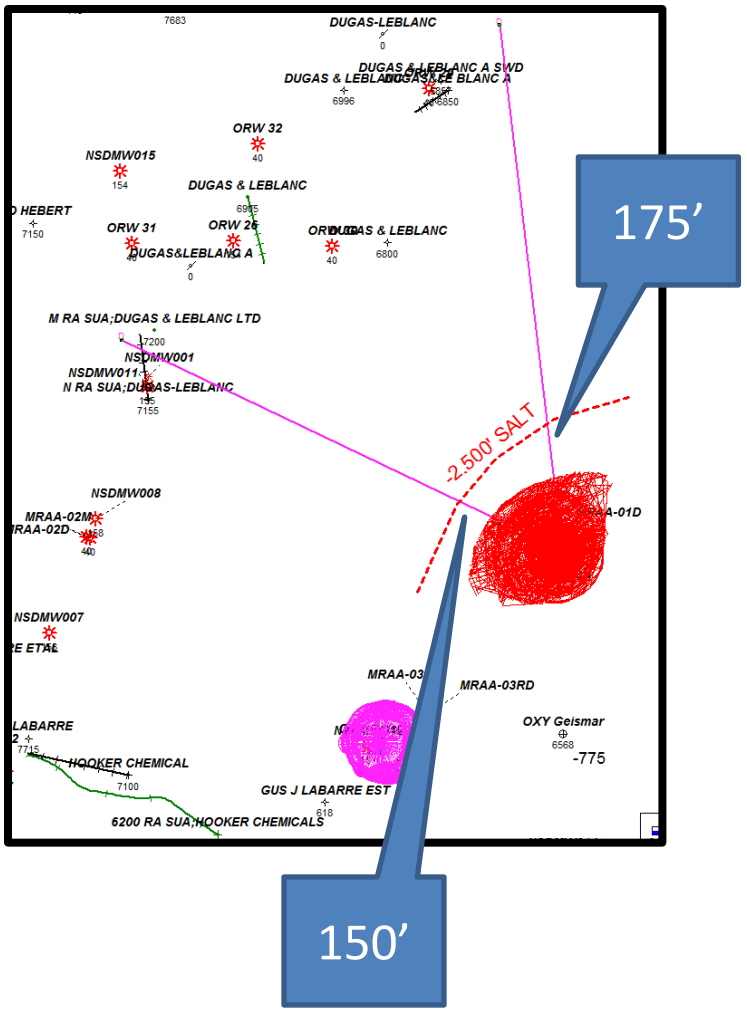
Big hum bright spot is an indicator of gas and oil remaining after the Hooker well was plugged..

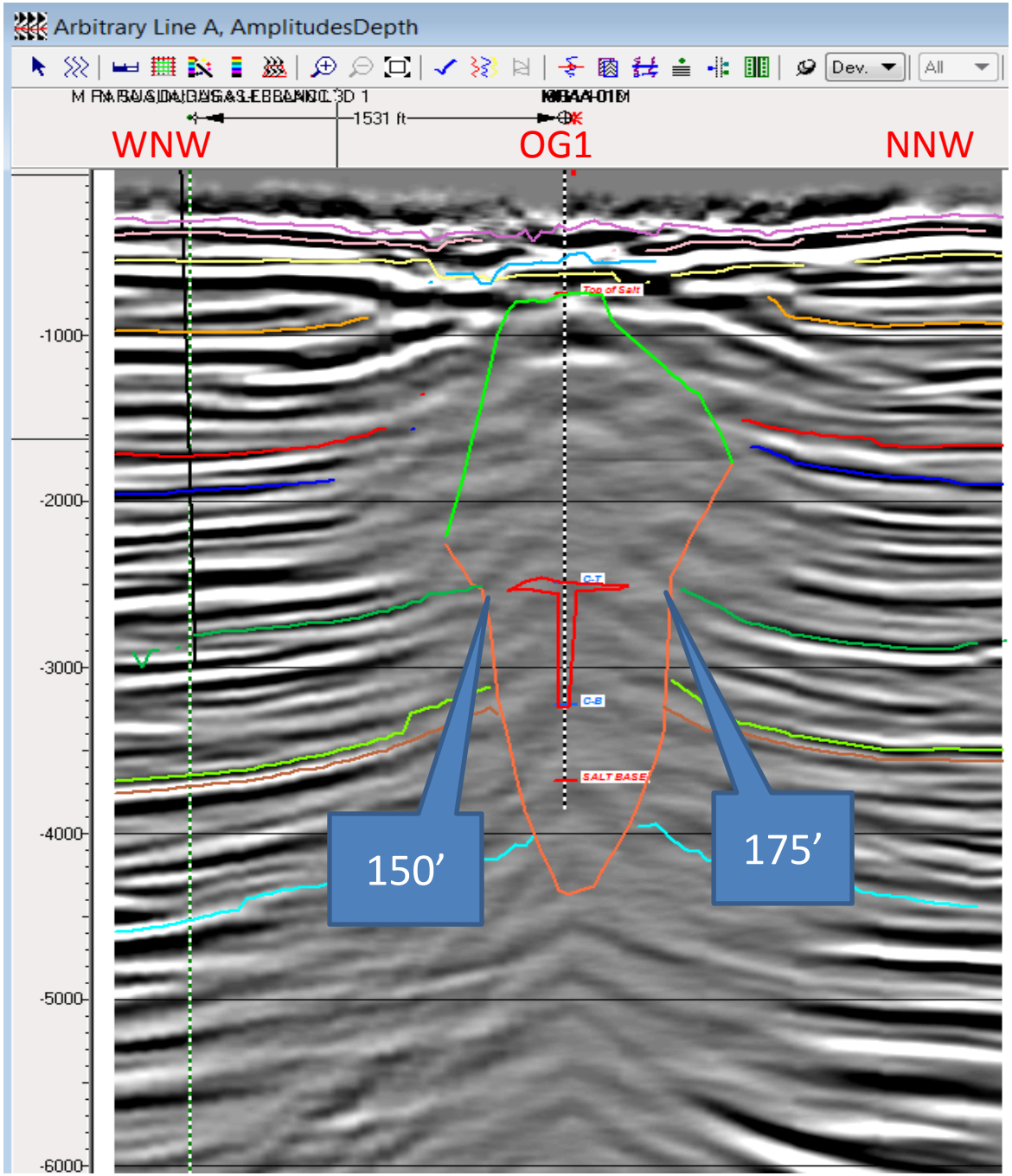
BEFORE >>>>>>>>>>>>>>> AFTER

Change of reflectors over time

Big hum bright spot is no longer present

5. OG 1 edge of cavern distance to edge of salt

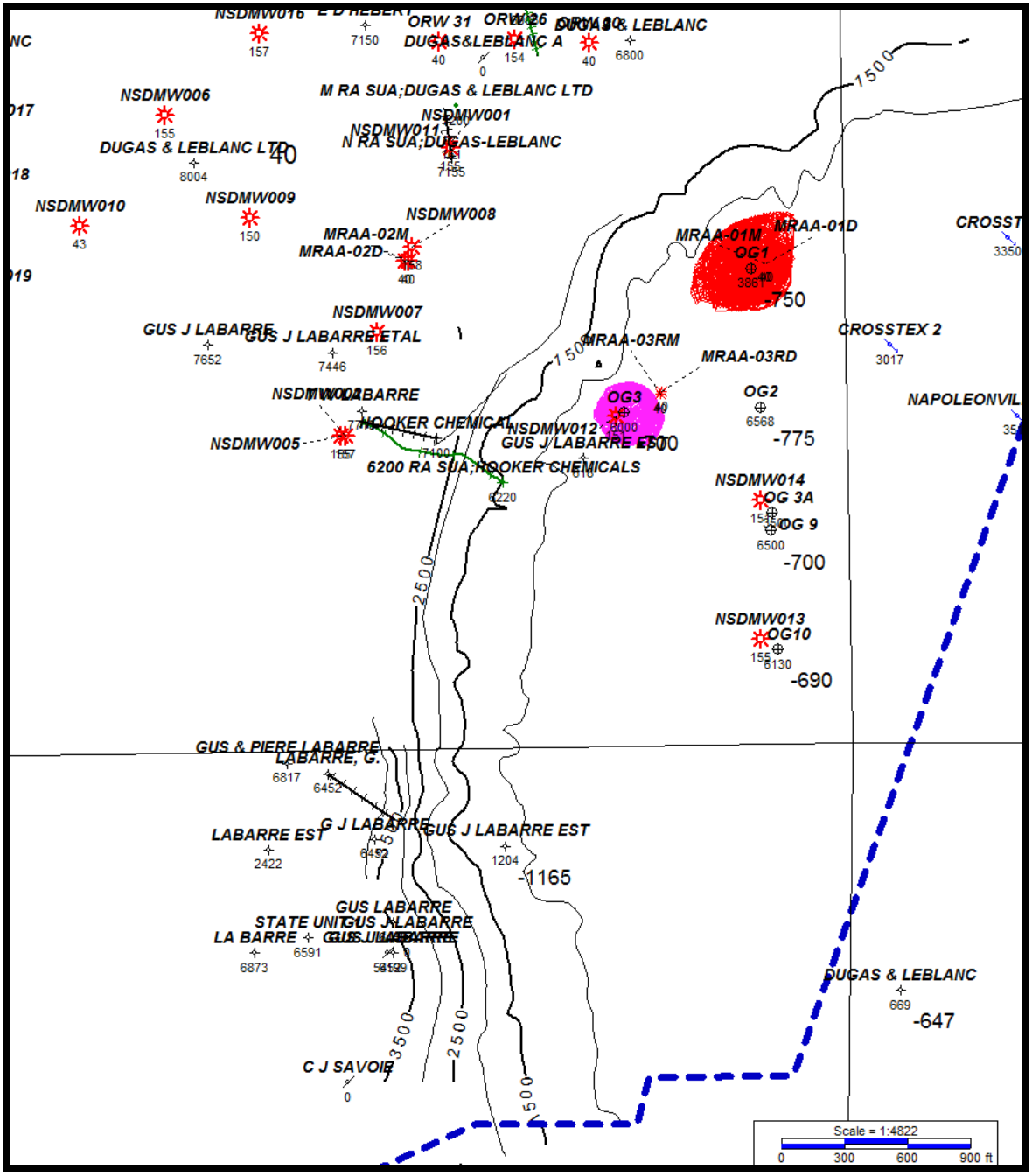




The current uncertainty is 75'. The salt edge and cavern image may be brought out with finer bin sampling during further processing. This should raise the accuracy of the salt edge and lower the uncertainty. The processor is calculating the amount of time it will take to get this done.

The new 3d seismic shows the edge of the salt to be 150-175 feet away from the cavern top of the OG 1.

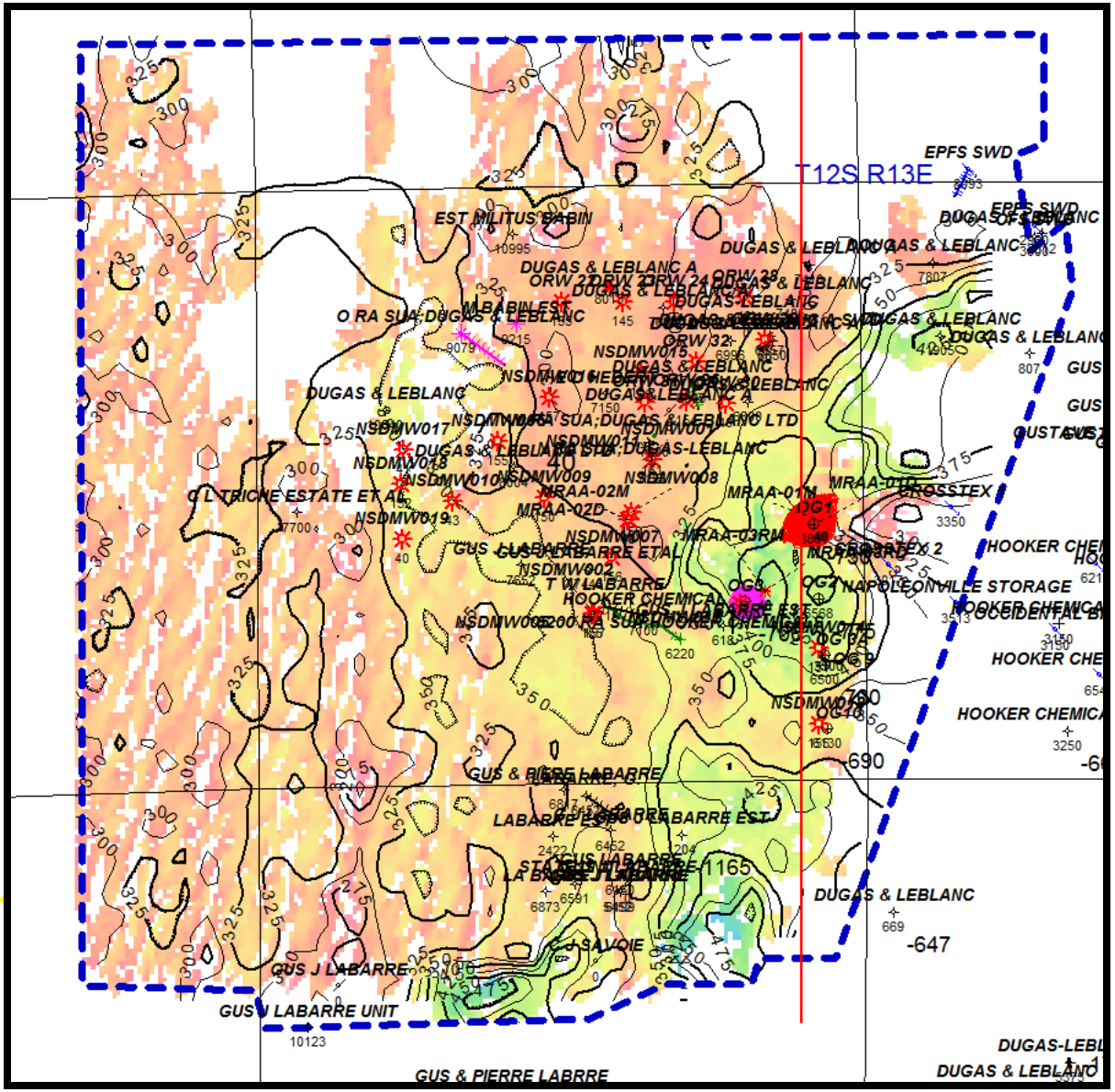
6. Edge of salt vs. OG 1, 2, & 3 and OT 9 & 10



TOP SALT STRUCTURE MAP 500’ CONTOURS.

This map may change when the Legend data is added.

7. MRAA gas zone definition and lateral extent definition.



NEAR BASE MRAA STRUCTURE MAP 25’ CONTOURS.

This map shows the structure of the MRAA. The area under Bayou Corne is un-imaged due to the town. Dip of the MRAA is to the Southeast. Processing is underway to try to bring out the relationship of the MRAA gas to the seismic data. A team of experts is working to fully integrate the engineering, geology and seismic data to determine how to mitigate the issues of the shallow gas in the MRAA.