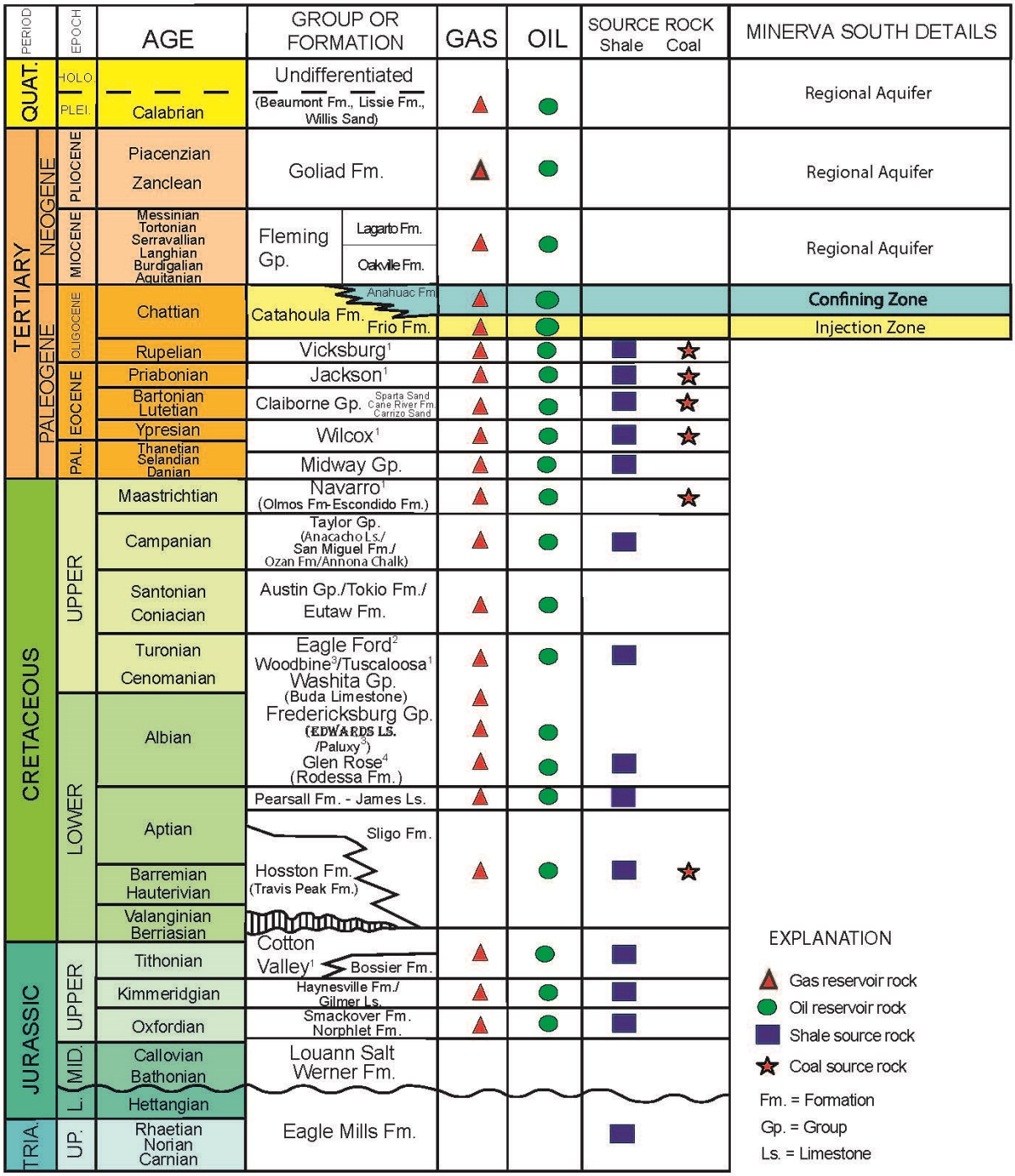
Figure 2.1.1-1 General Stratigraphic Column of Gulf of Mexico Coastal Plain



[1] Indicates classification of Group or Formation, depending on locality use.

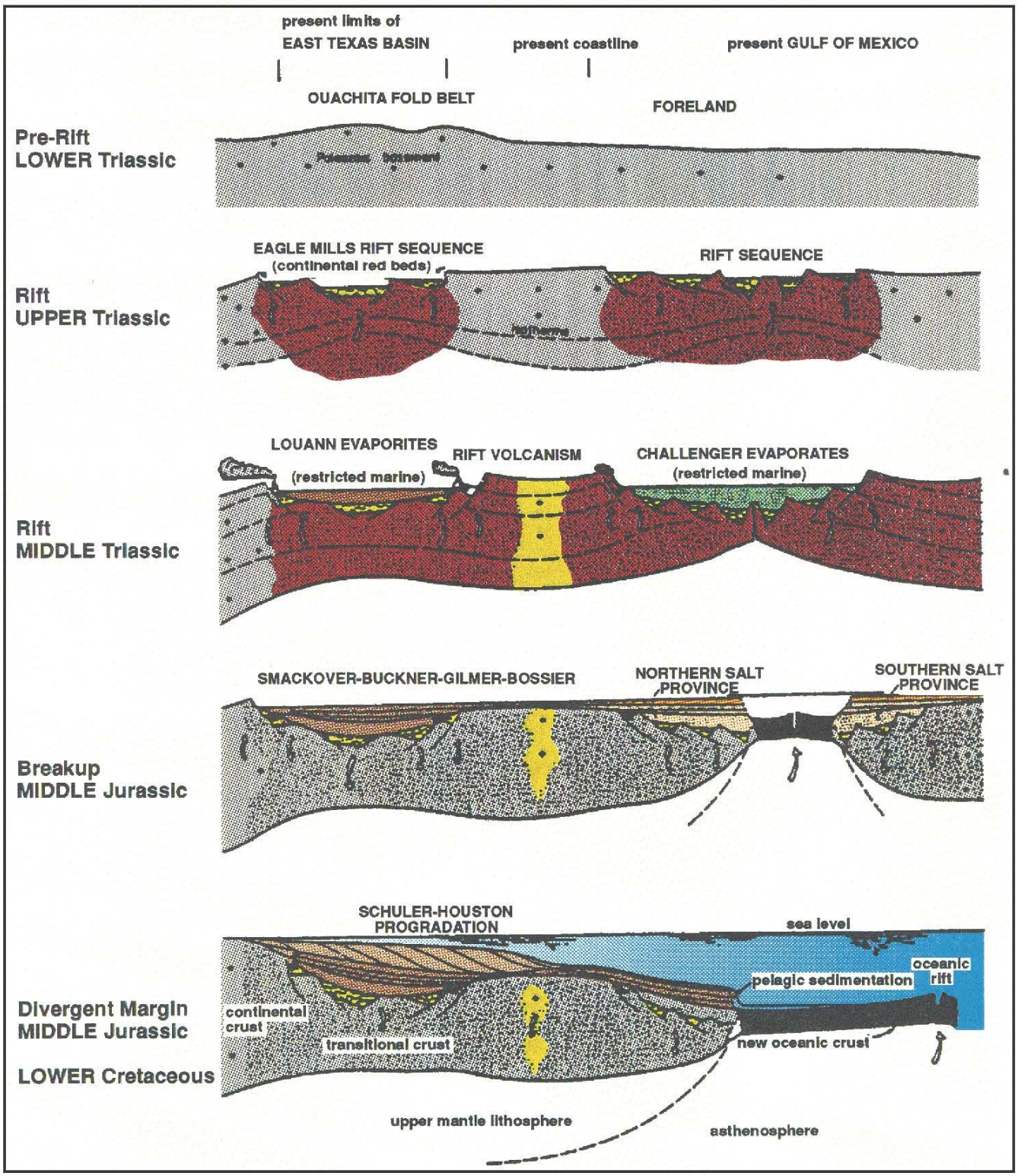
[2] Indicates classification of Group, Formation, Clay or Shale, depending on locality use.

[3] Indicates classification of Formation or Sand, depending on locality use.

[4] Indicates classification of Formation or Limestone, depending on locality use.

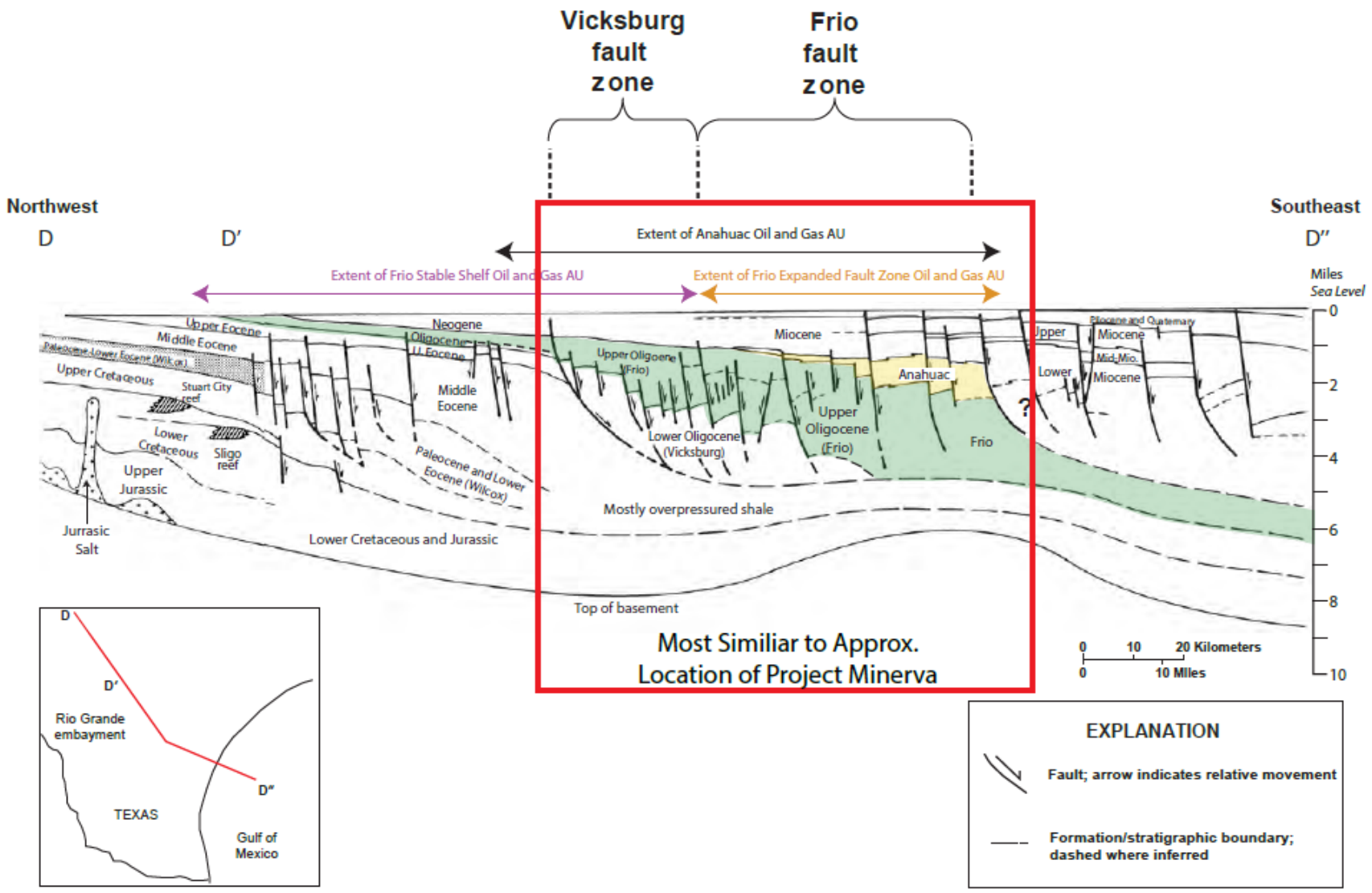
Modified from Swanson, Karlsen, & Valentine 2013

Figure 2.1.1-2 Evolutionary Stages of the Gulf of Mexico and East Texas Basin



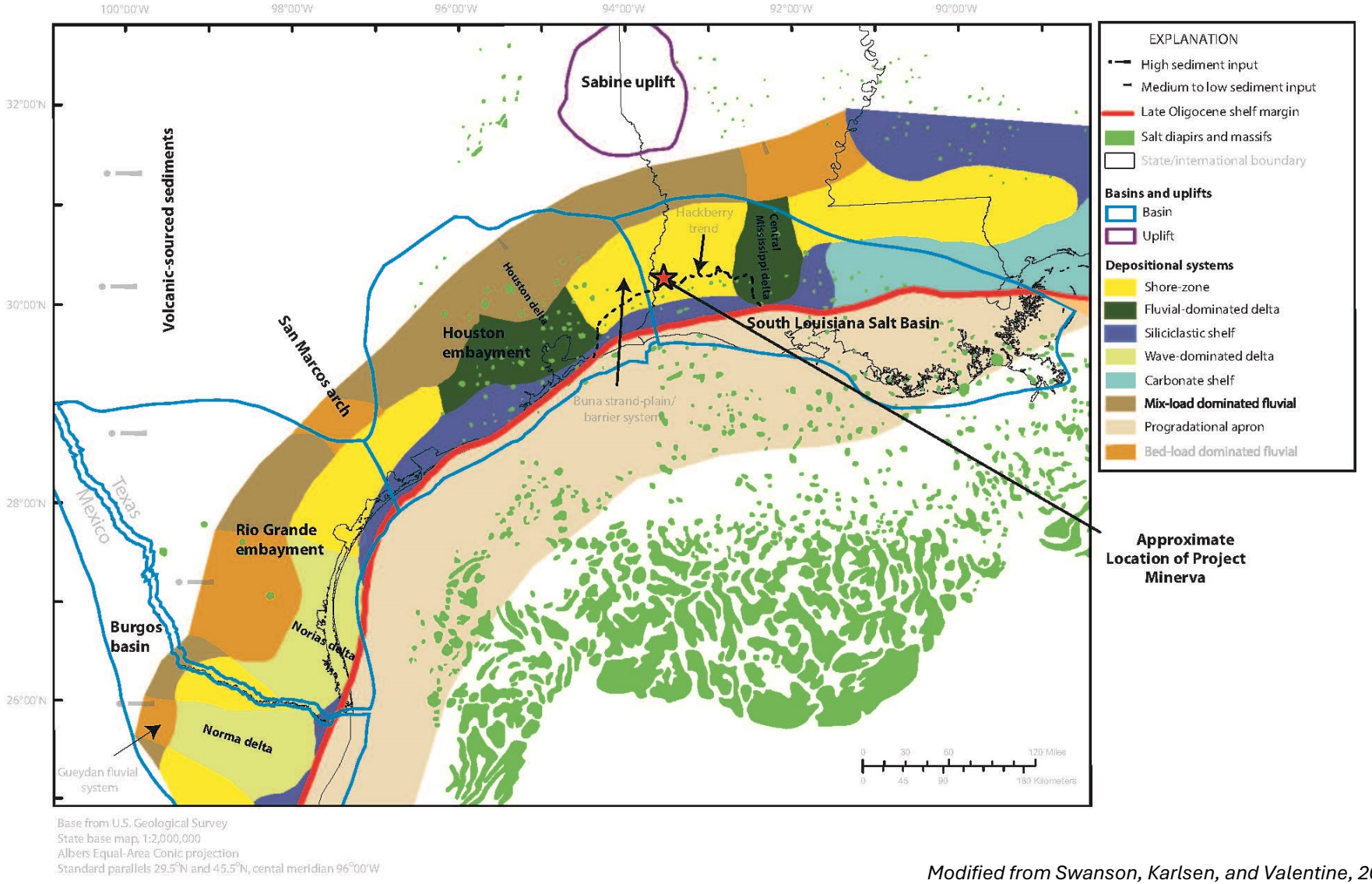
Modified from Kreitler, et al., 1981

Figure 2.1.1-3 Schematic Cross-Section of Cretaceous Shelf Margin, Growth Faults, and Fault Zones



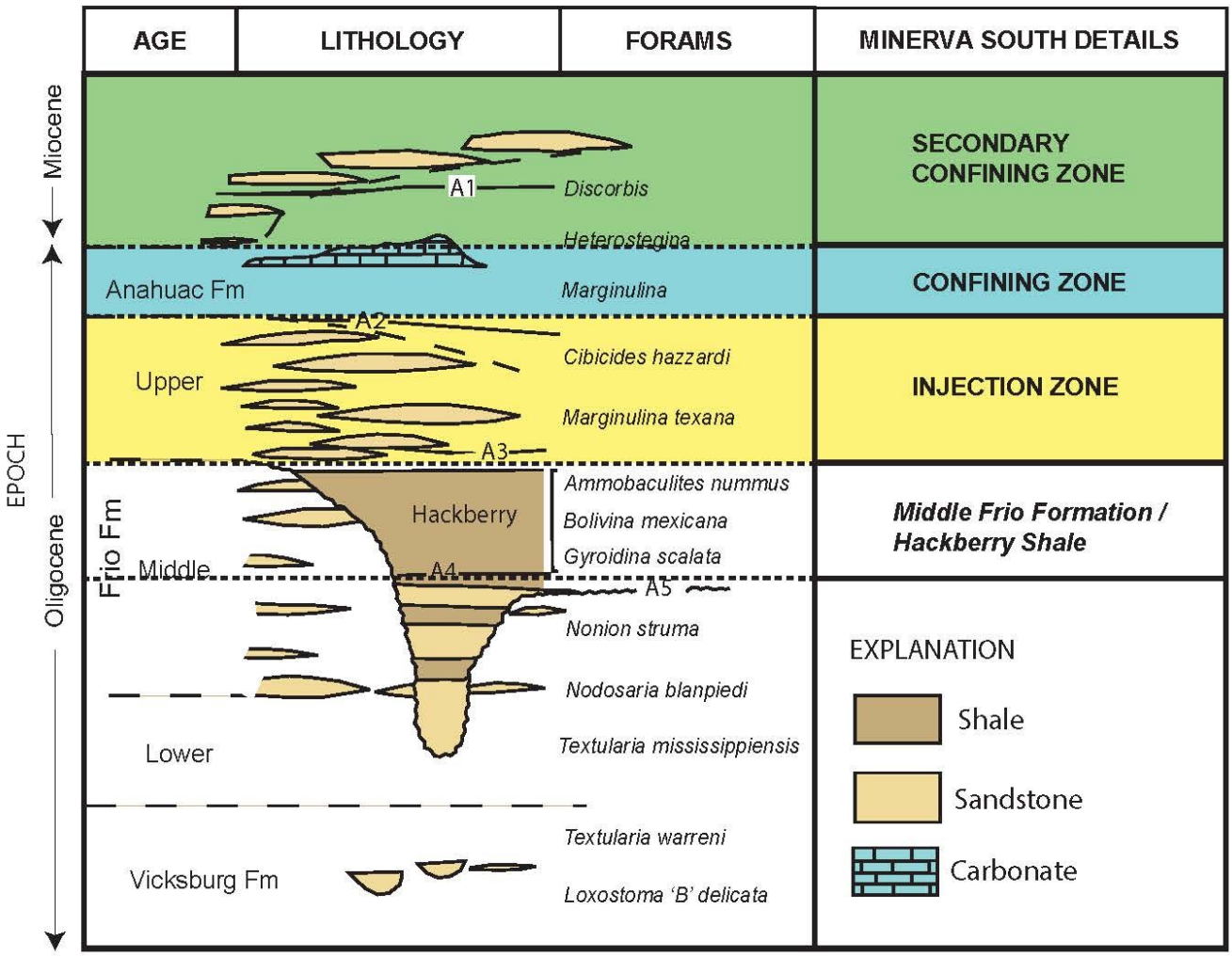
(Modified from Swanson, Karlsen, & Valentine, 2013)

Figure 2.1.1-4 Depositional Environments of the Northern Gulf of Mexico



Modified from Swanson, Karlsen, and Valentine, 2013

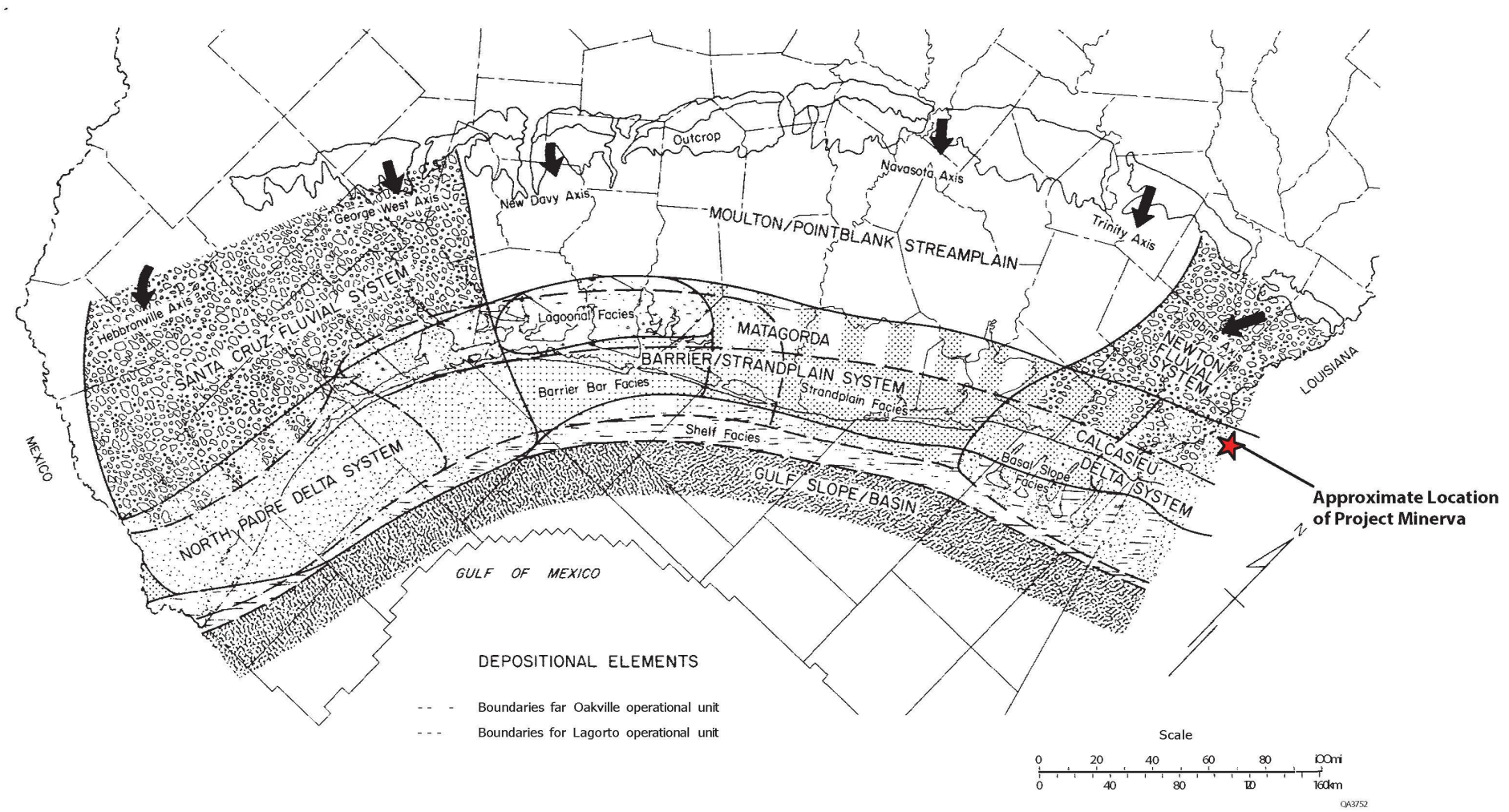
Figure 2.1.1-5 Depositional Cycles of the Northern Gulf of Mexico



1-A5 = Foraminifera marker horizons

Modified from Swanson, Karlsen, & Valentine 2013

Figure 2.1.1-6 Lower Miocene Depositional Systems and Elements of the North Gulf Coast

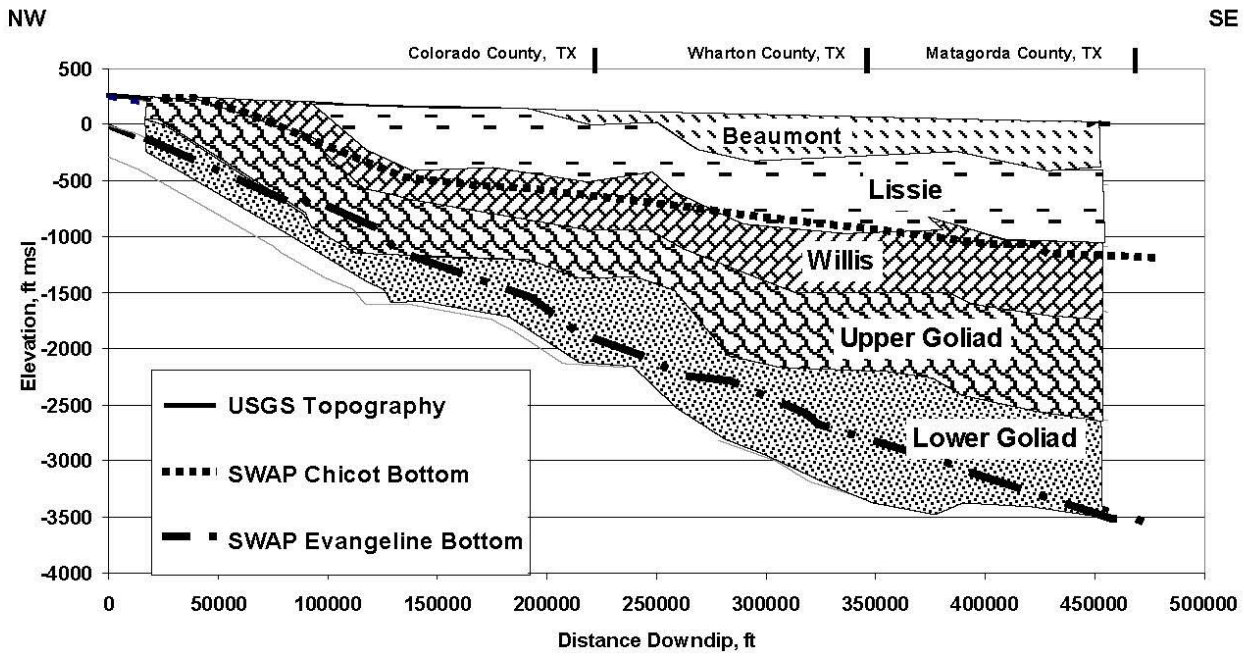


Modified from Galloway, 1985

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Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**

Figure 2.1.1-7 Cross-Section of Pliocene and Pleistocene Deposits



Explanation

Lagoon, Coastal Barrier

Bay, Flood-basin

Meanderbelt

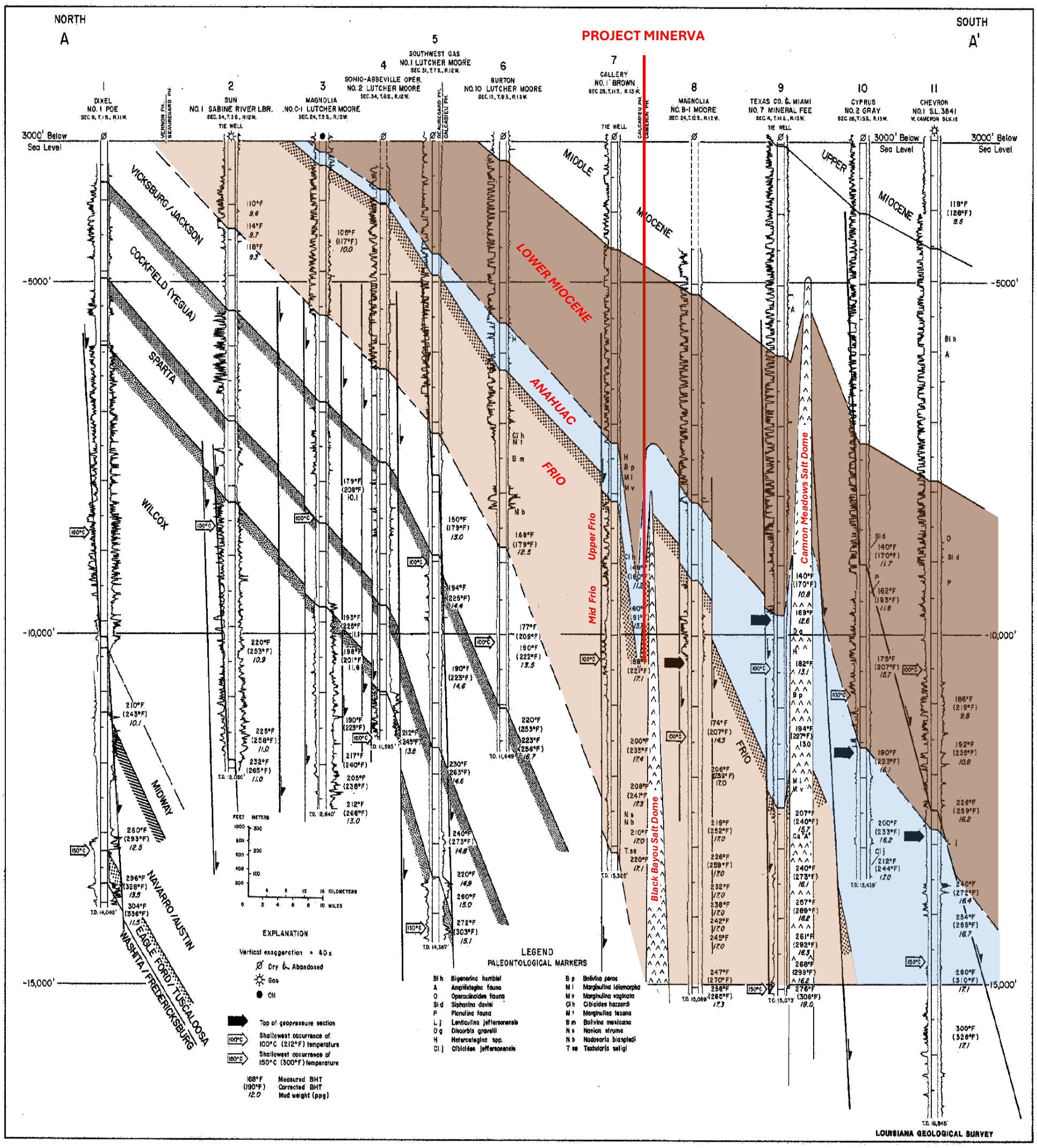
Fluvial-Deltaic Bay

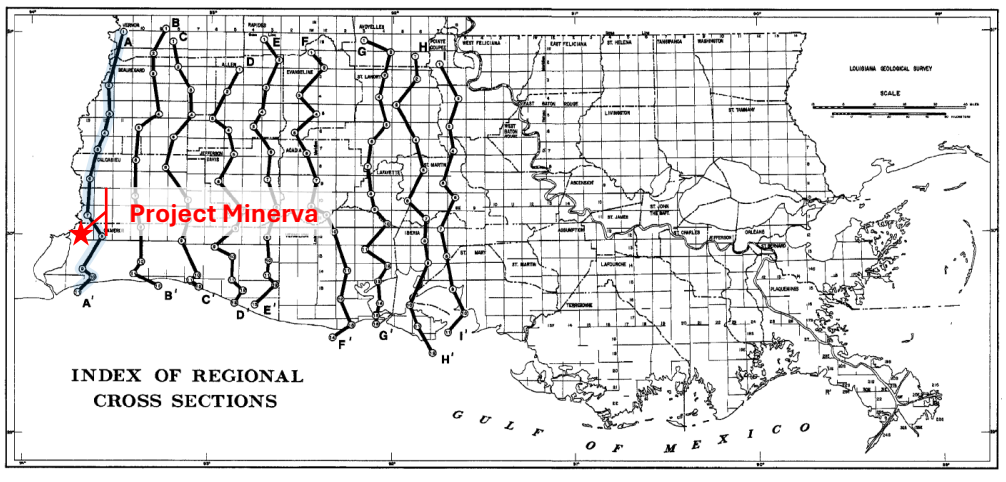
Fluvial-Deltaic, Wave Dominated

Note:
Source Water Assessment and Protection (SWAP) (Young, et al., 2006)
United States Geological Society (USGS)

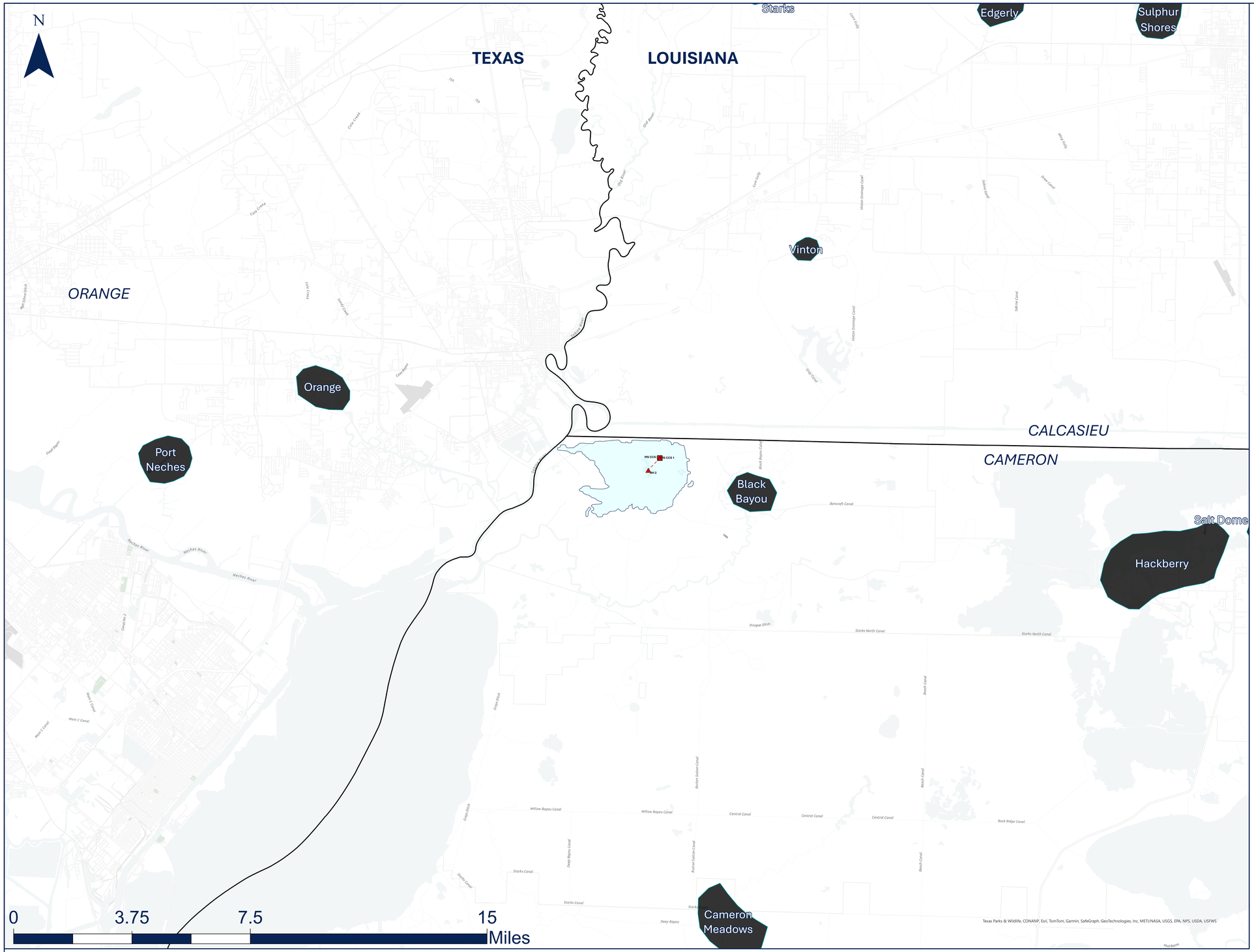
Modified from Young, et al., 2006

Figure 2.1.1-8 Regional North-South Geologic Cross-Section of Southwest Louisiana





(Modified from Jones et al, 1954)

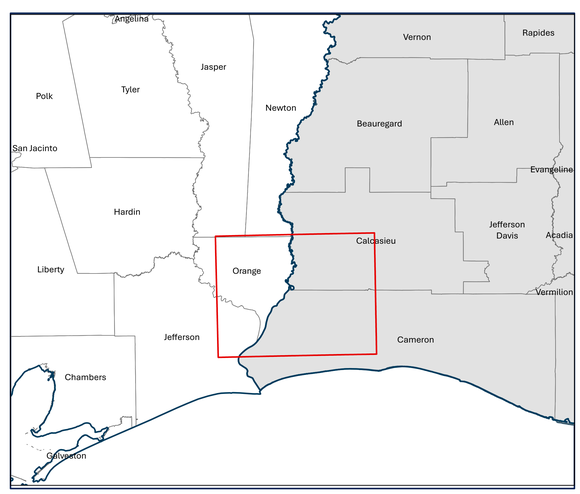


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FIGURE 2.1.1-9
Regional Salt Diapirs

MAP LEGEND

- Delineated Area of Review
- Regional Salt Features
- SONRIS Parishes
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory



MAP DETAILS

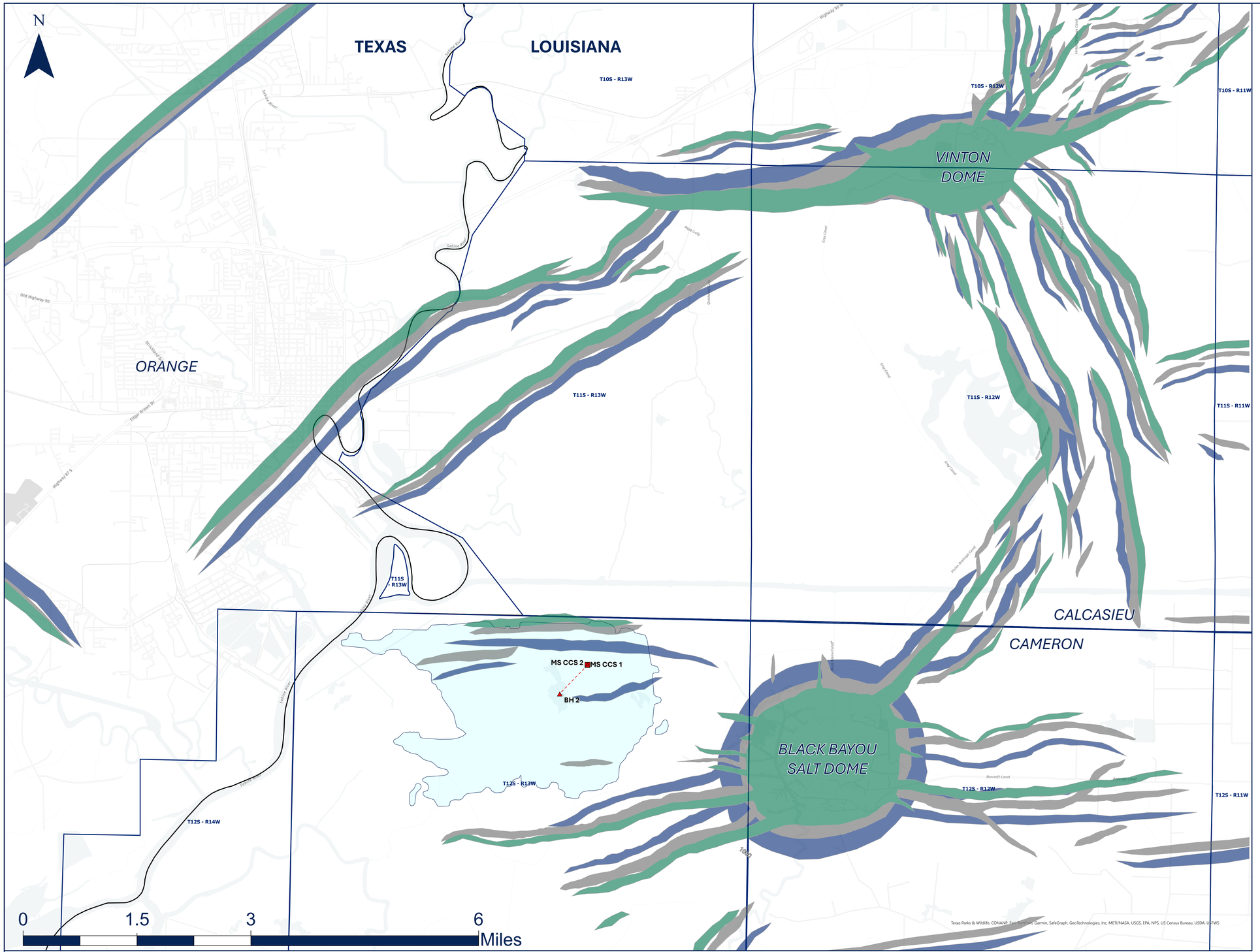
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SPATIAL REFERENCE

PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032



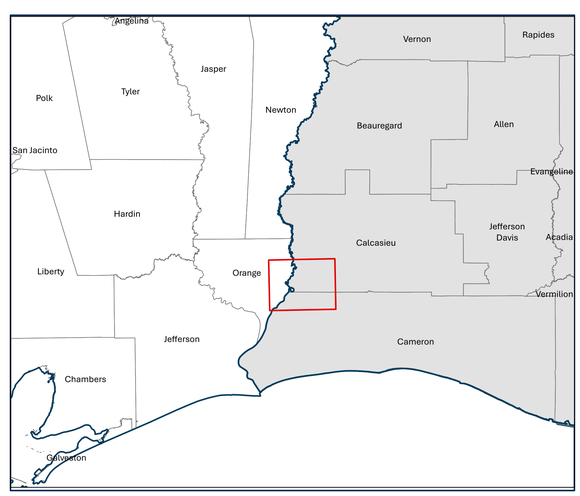
GCS

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FIGURE 2.1.1-10
Salt Diapirs Adjacent to Project Minerva

MAP LEGEND

- Top Anahuac Faults
- Top Upper Frio Faults
- Top Mid Frio Faults
- Delineated Area of Review
- SONRIS Parishes
- PLSS Townships & Ranges
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory



MAP DETAILS

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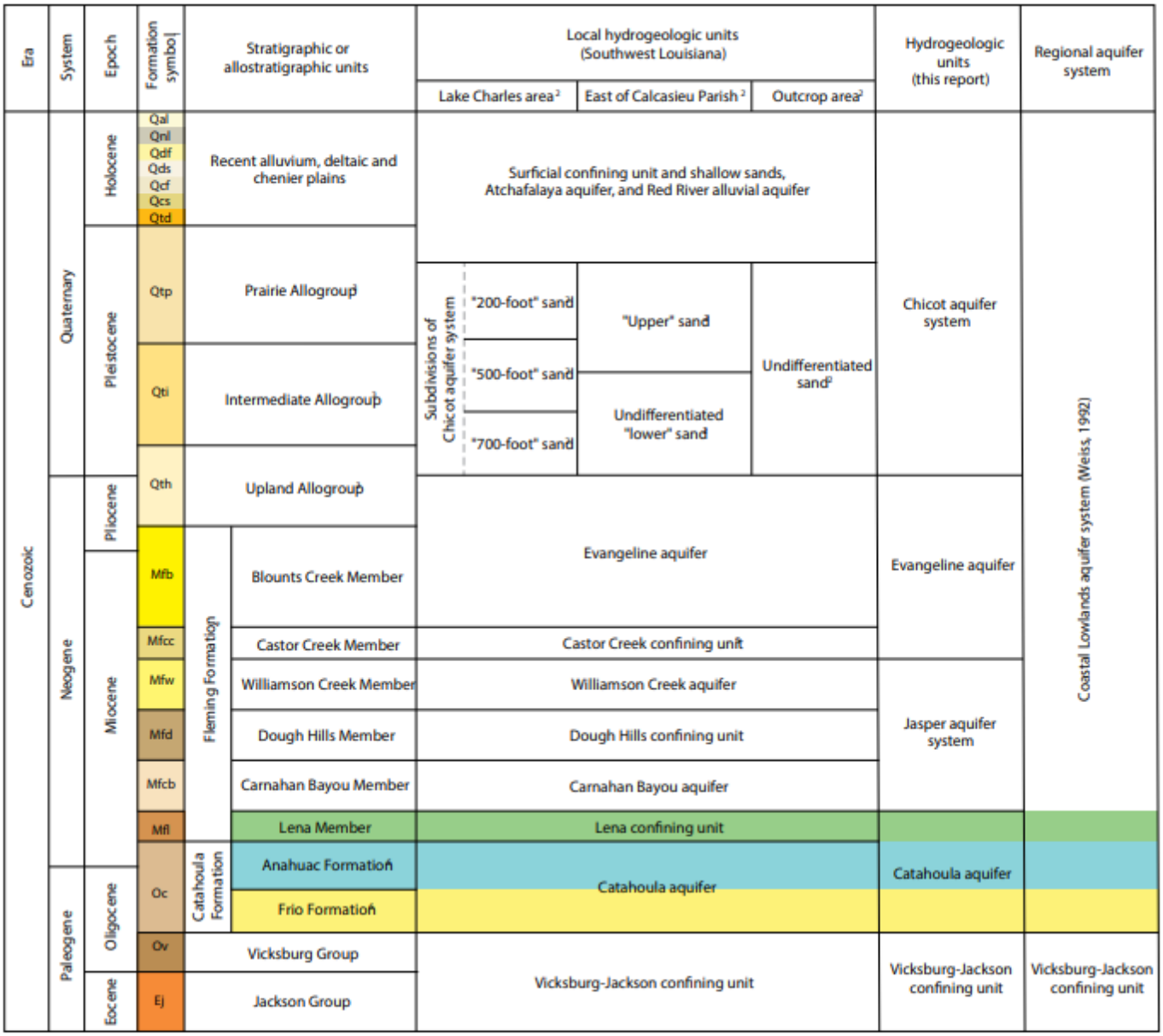
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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Figure 2.1.1-11 Stratigraphic Column of the Hydrogeologic Framework of Southwestern Louisiana



[1]Snead and McCulloh, 1984.
[2]Nyman, 1984.
[3]Prior to designation as allostratigraphic units, these were termed the Prairie, Intermediate, and High Terraces or Terrace Complexes (Snead and McCulloh, 1984).
[4]Mapped as the Fleming Group, with the members as formation-rank stratigraphic units, by McCulloh and Heinrich (1999).
[5]Previously referred to as the "Burkeville aquiclude" (Turcan and others, 1966; Whitfield, 1975). "Burkeville confining unit" still in general usage in Texas (Young and others, 2012).
[6]Recognized in the subsurface only.

EXPLANATION

- Secondary Confining Zone
- Confining Zone
- Injection Zone

Modified from Lindaman, 2023

Figure 2.1.1-12 Regional Hydrostatigraphic Cross Section for Southeastern, Texas

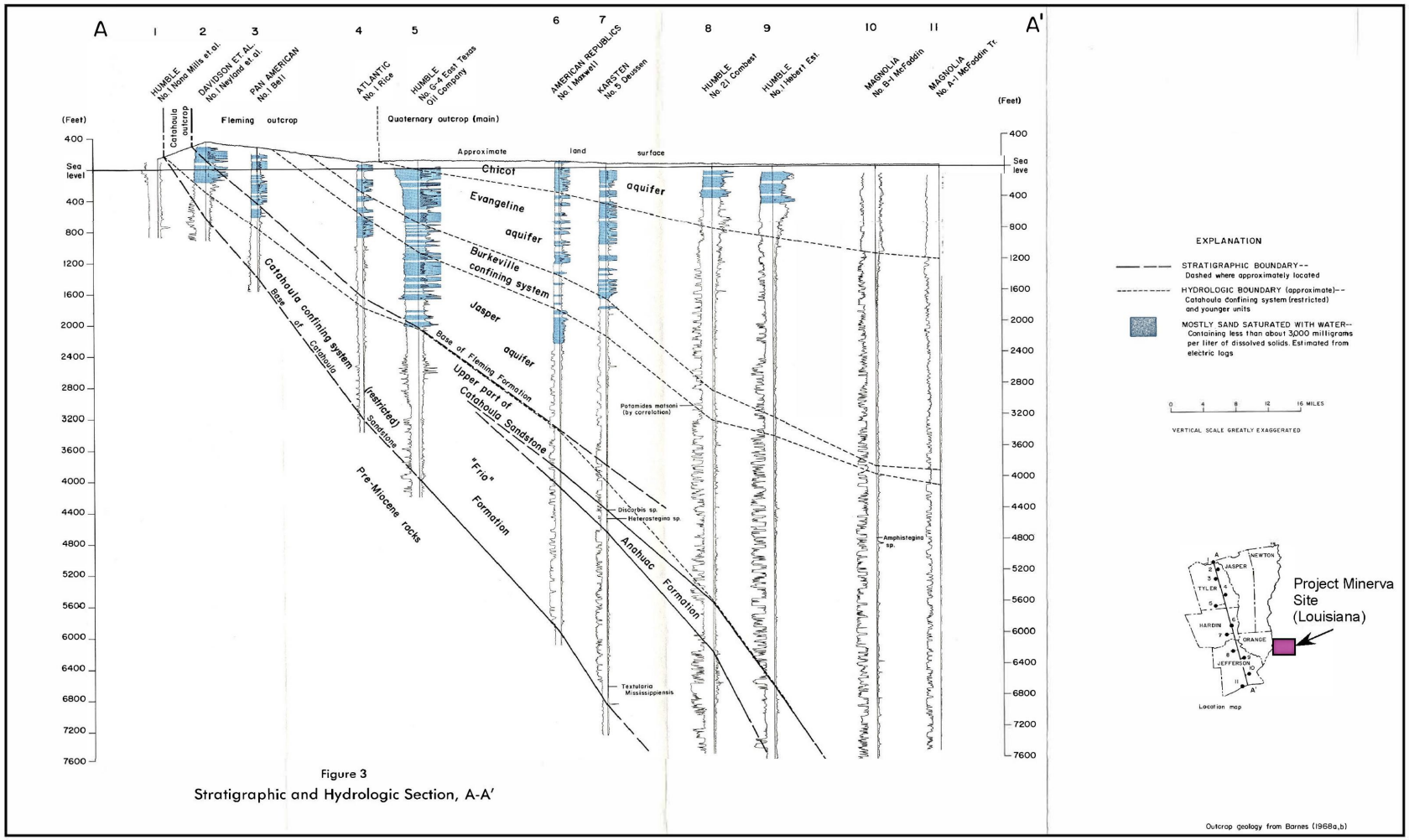
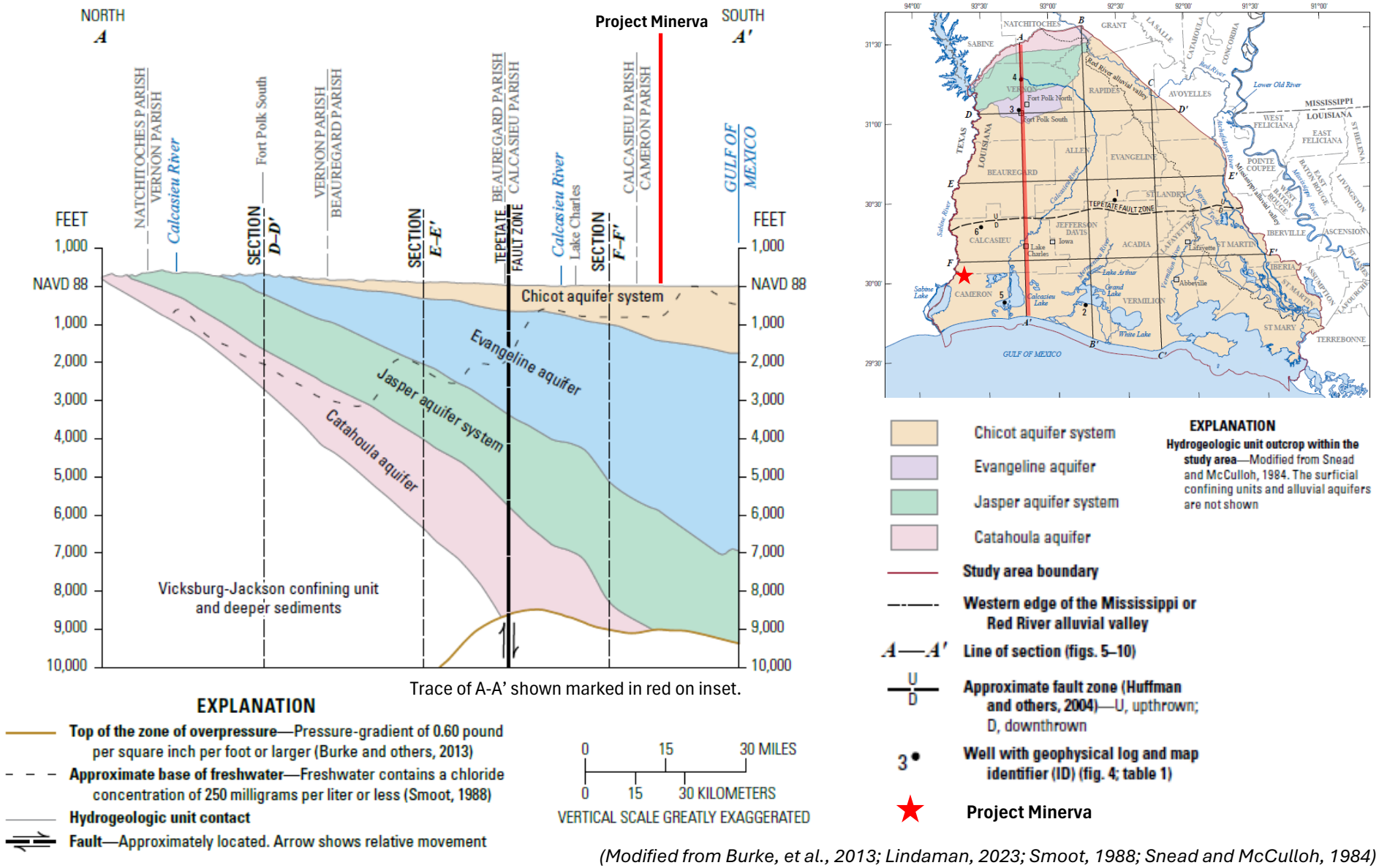


Figure 3
Stratigraphic and Hydrologic Section, A-A'

(Modified from Baker, 1986)

Figure 2.1.1-13 Regional North-South Hydrogeologic Cross-Section of Southwestern Louisiana

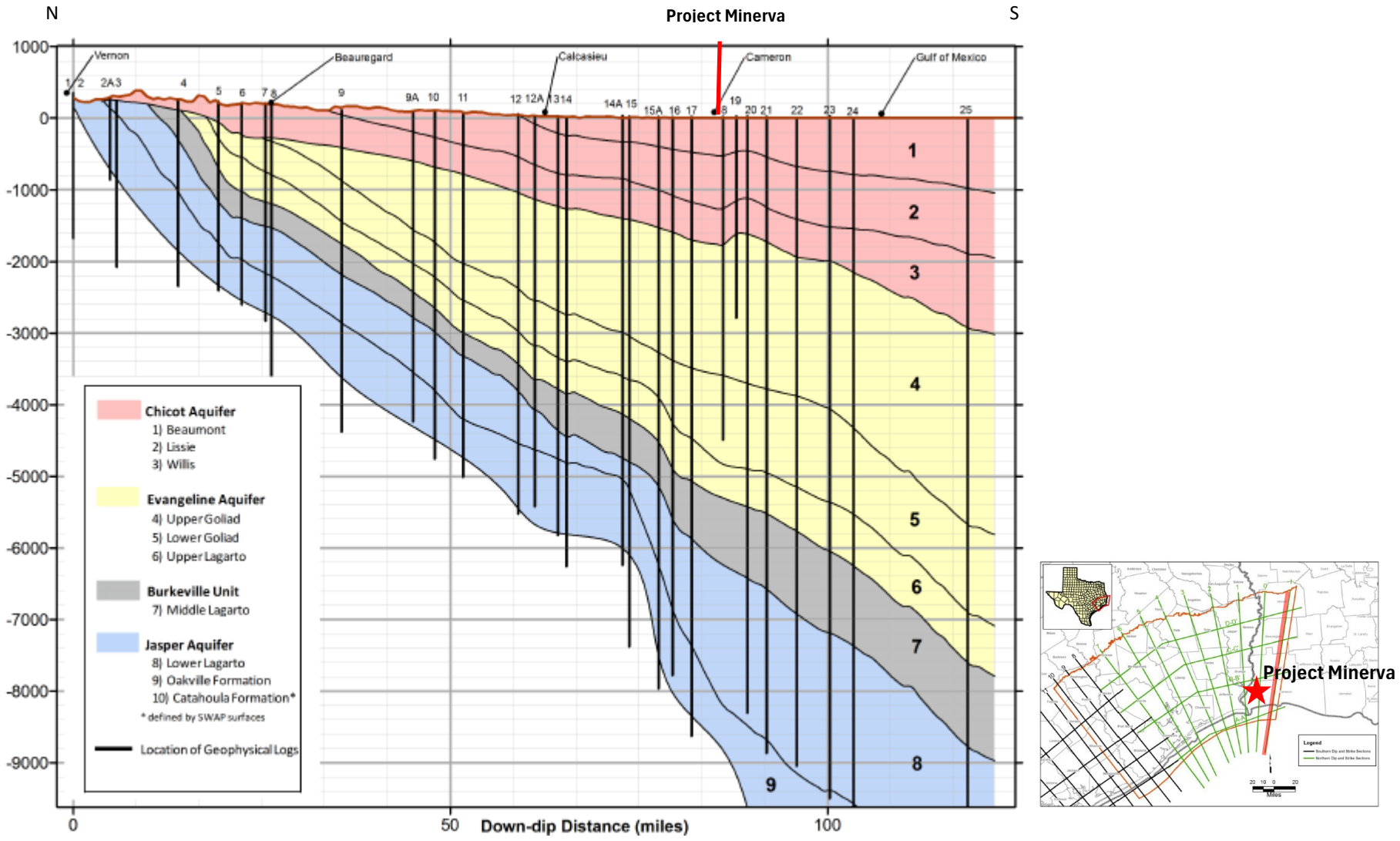


(Modified from Burke, et al., 2013; Lindaman, 2023; Smoot, 1988; Snead and McCulloh, 1984)

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Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**

Figure 2.1.1-14 Regional North-South Hydrogeologic Cross-Section of the Gulf Coast Aquifer—TWDB



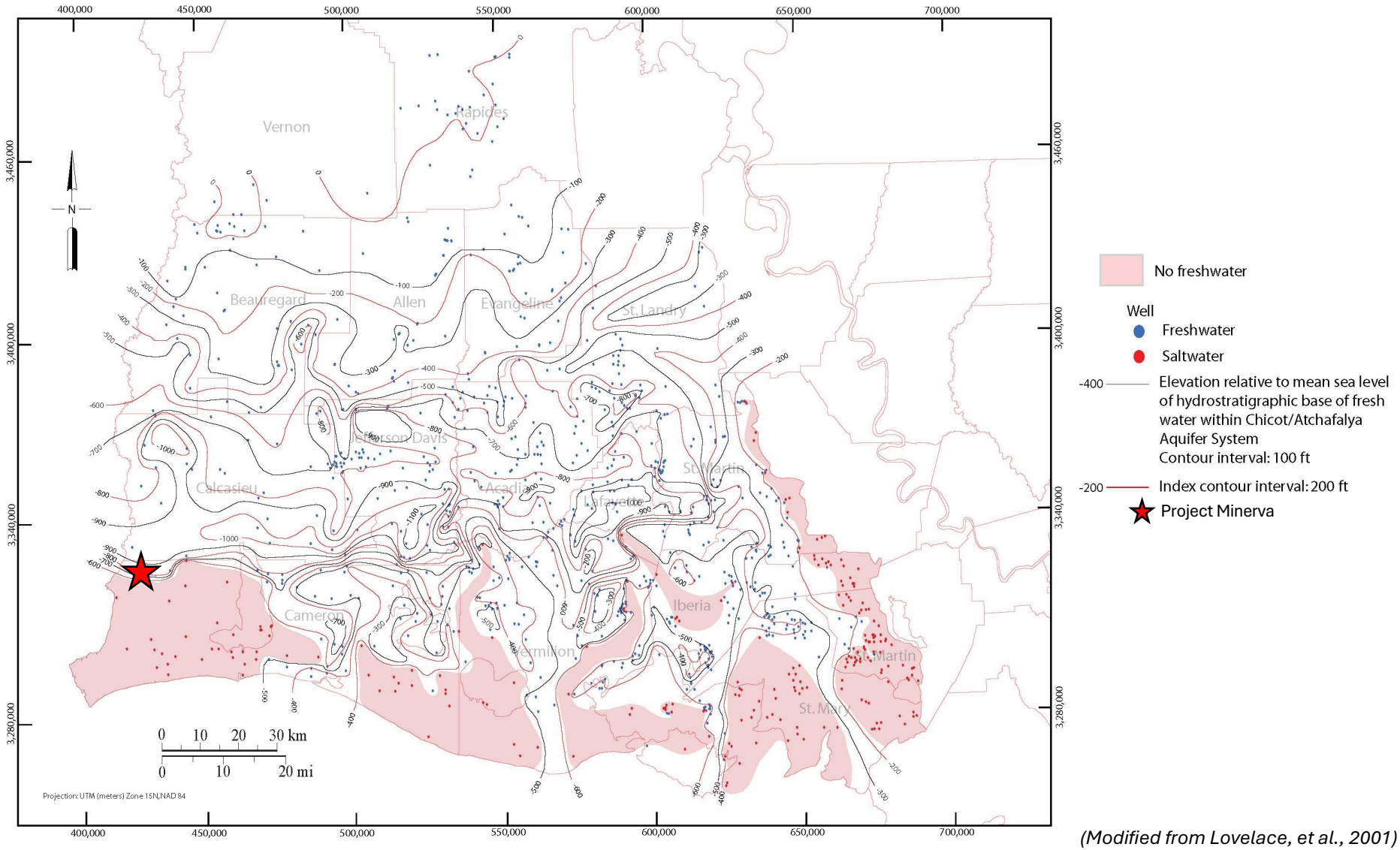
Section Line –1. See inset for section trace in red.

(Modified from Young et al, 2012)

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Project: **Minerva**	Project ID: **R06-LA-0002**
Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**

Figure 2.1.1-15 Boundary Extent of Fresh Groundwater of the Chicot Aquifer System in Southwest Louisiana

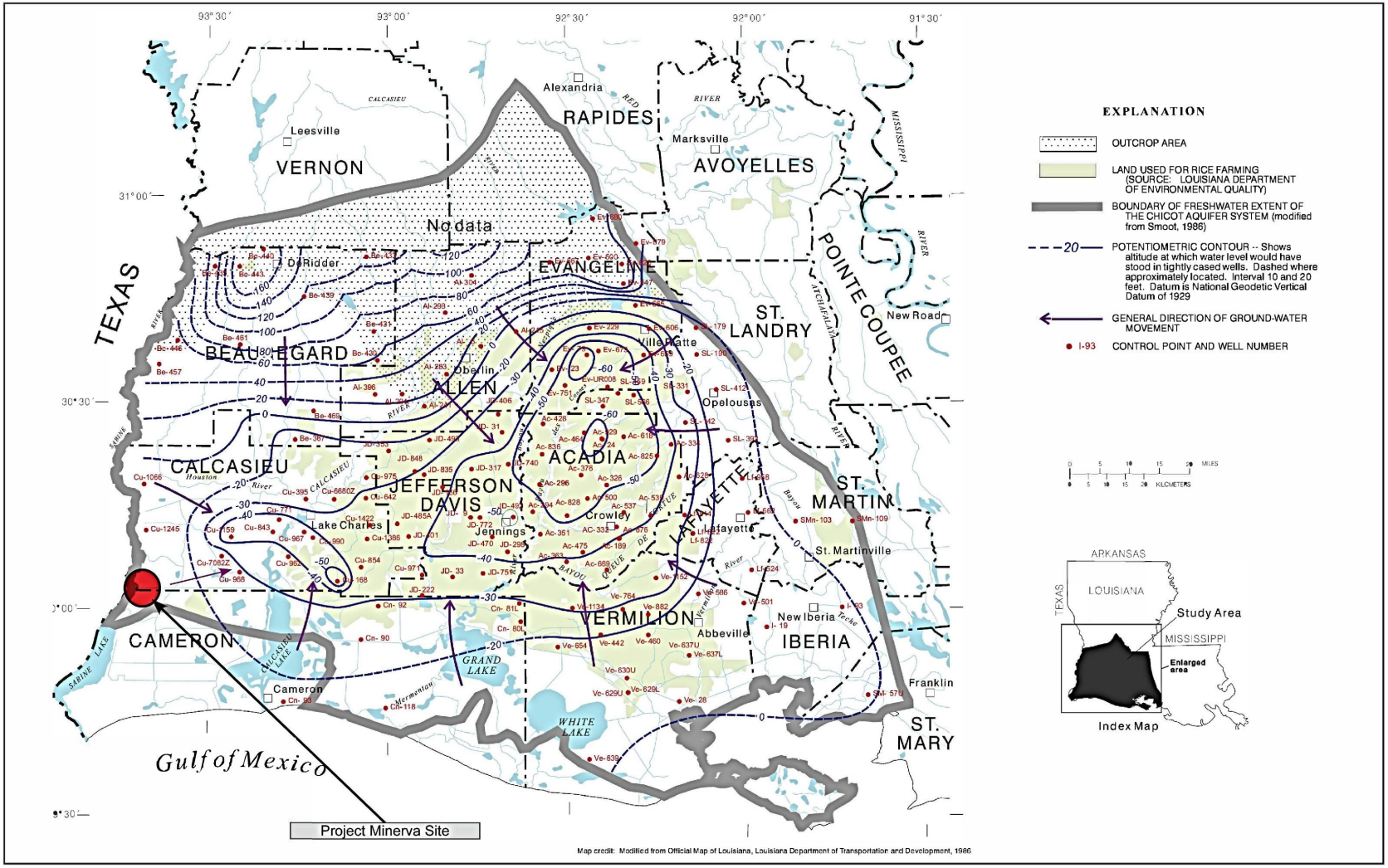


(Modified from Lovelace, et al., 2001)

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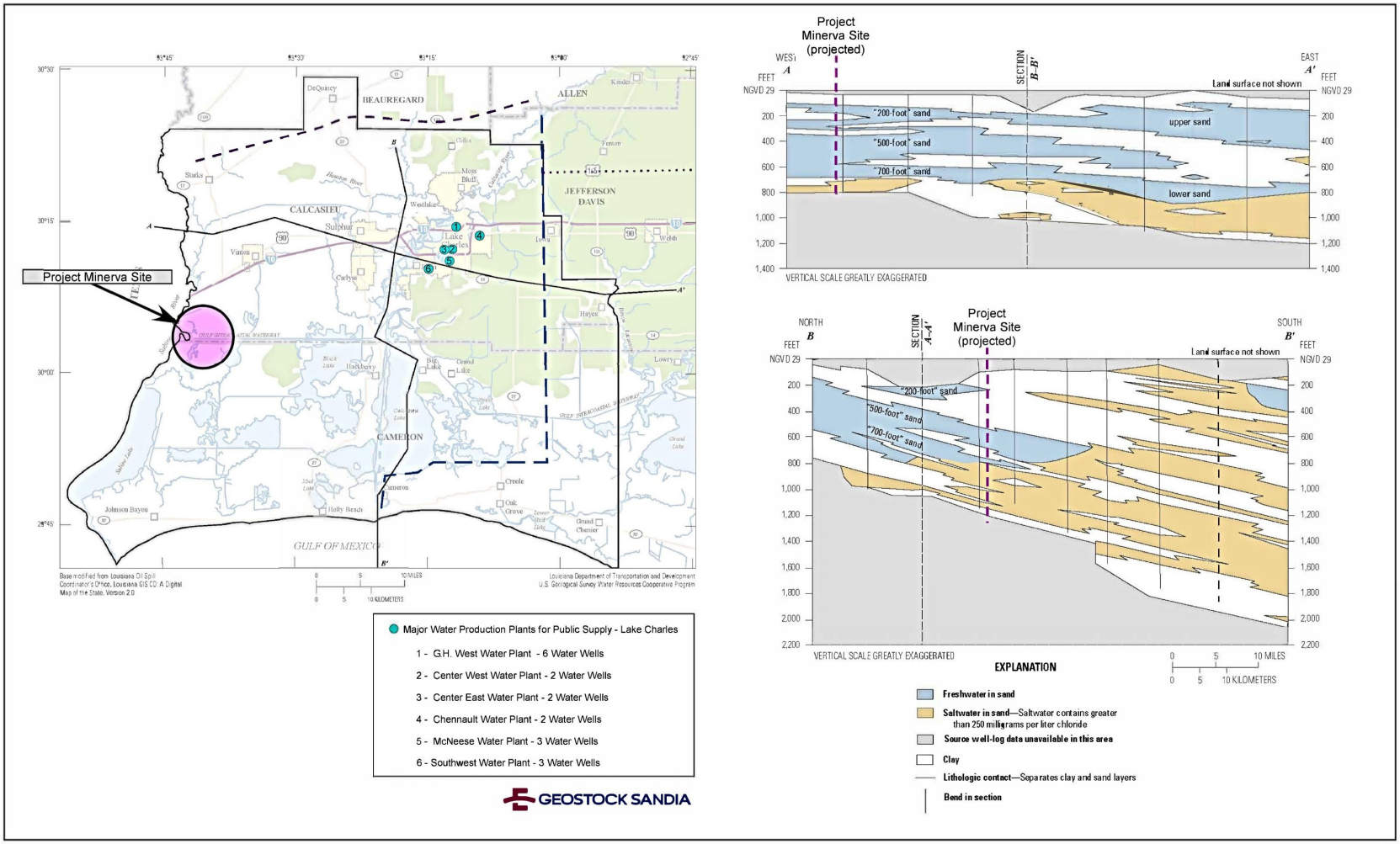
Minerva South CCS Well Nos. 001 & 002	
Project: **Minerva**	Project ID: **R06-LA-0002**
Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**

Figure 2.1.1-16 Potentiometric Surface and Direction of Groundwater Flow of Chicot Aquifer System in Southwestern Louisiana

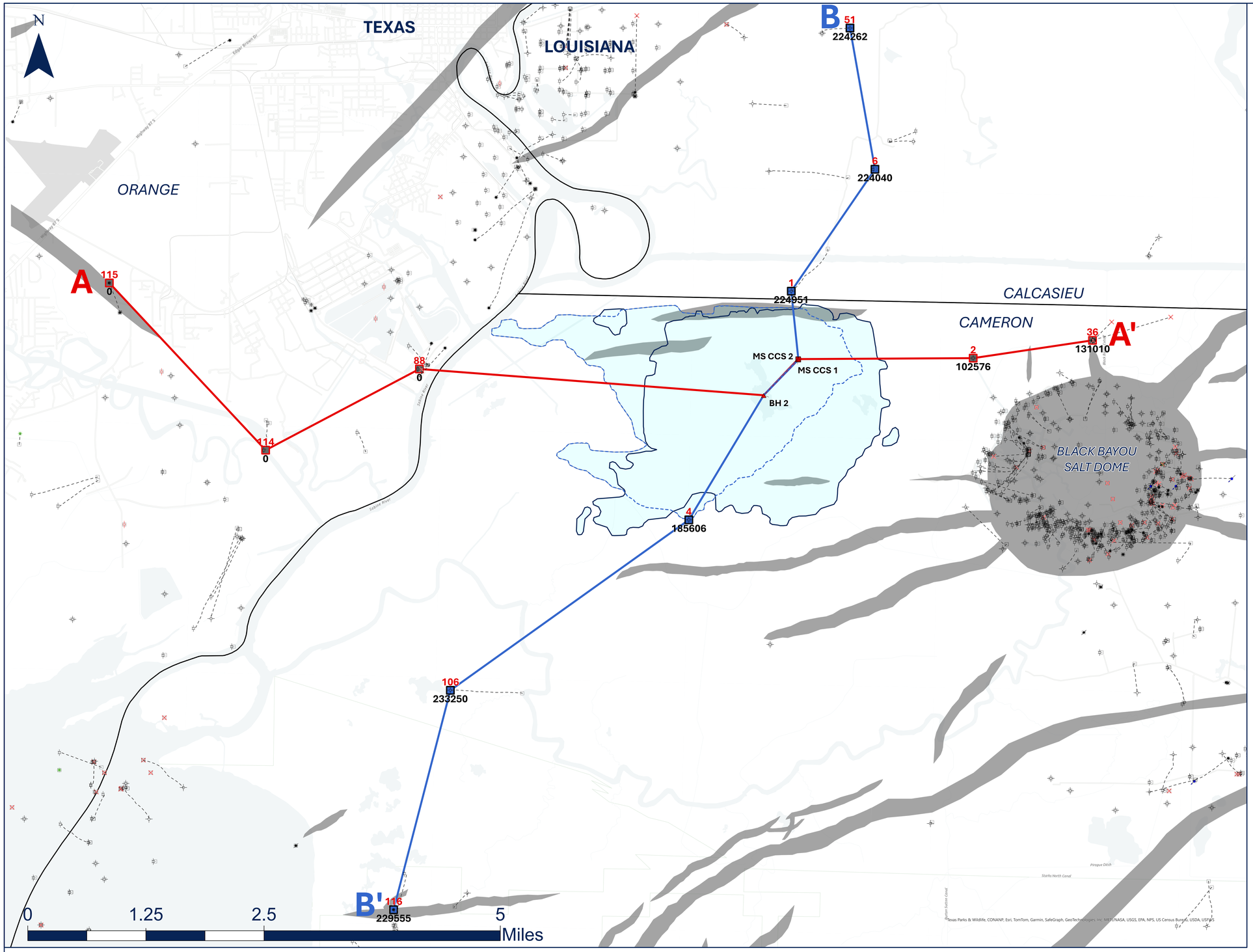


Modified from Lovelace et al., 2004

Figure 2.1.1-17 Regional Chicot Aquifer Cross-Section Across Calcasieu and Cameron Parishes Delineating Saltwater Encroachment



Modified from White and Griffith, 2020



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FIGURE 2.1.2-1
Basemap of Cross-Sections at Project Minerva

MAP LEGEND

- Maximum Extent of Stable CO2 Plume
- Maximum Extent of Pressure Front
- Delineated Area of Review
- SONRIS Parishes
- Top Upper Frio Faults
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Cross Section Well

- A-A'
- B-B'

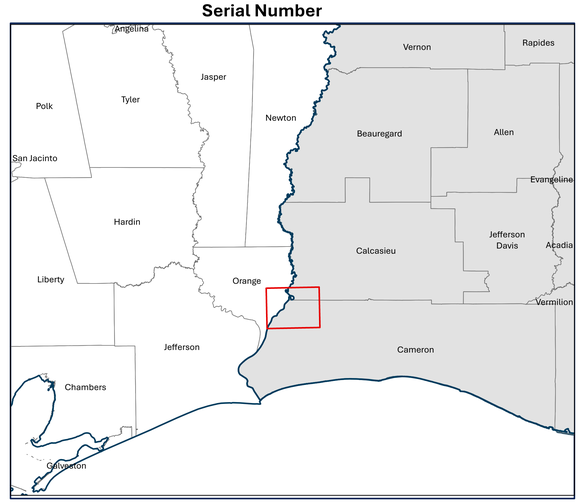
Cross Section Line

- A-A'
- B-B'

X-Sec Well Label

Map ID *See Table 1.1-1 For Map ID Well Assignments*

Serial Number



MAP DETAILS

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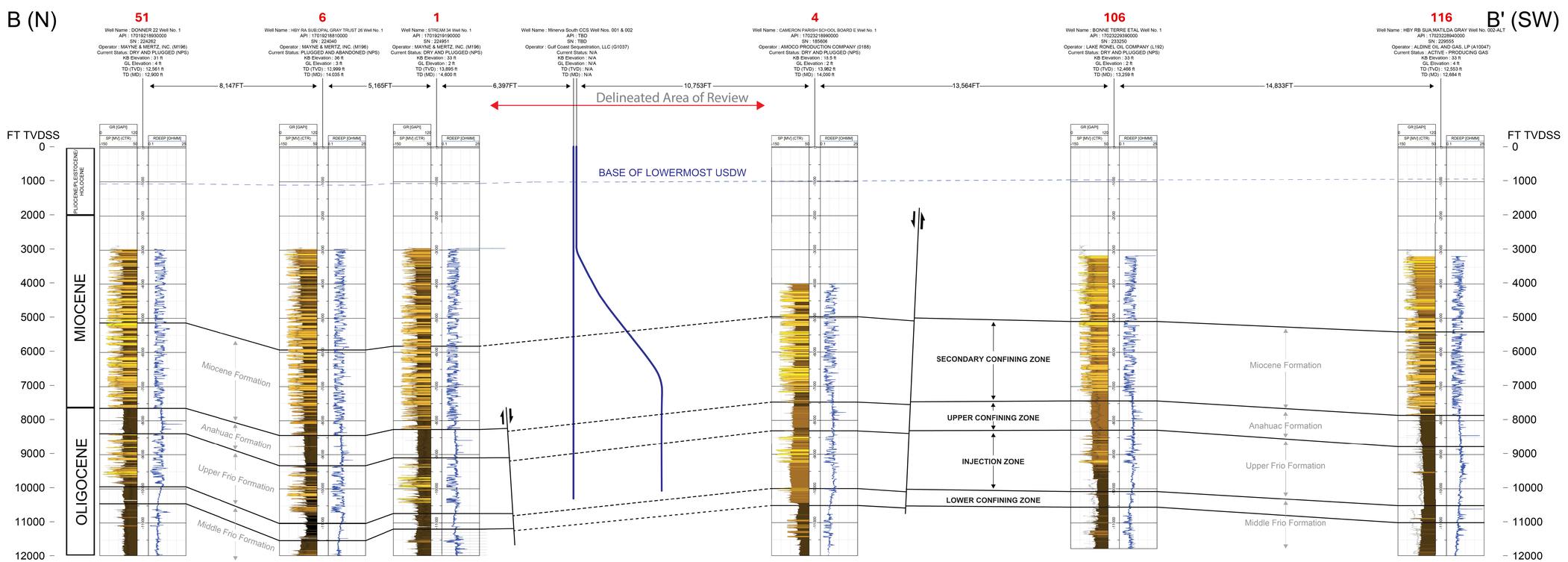
SPATIAL REFERENCE

PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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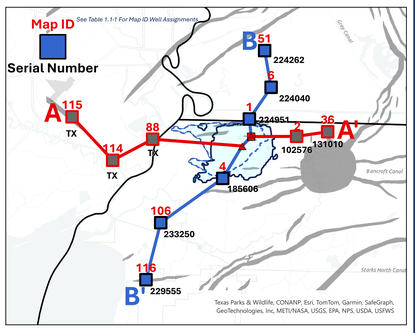
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FIGURE 2.1.2-2

North-Southwest Geologic Cross-Section (B-B') at Project Minerva

LOG CURVES

-150	50	SP (MV) CENTERED IN TRACK
0	120	GR (GAPI) HNGS SPECTROSCOPY GAMMA RAY FROM DENSITY
0.1	25	RDEEP (OHMM) DEEP INDUCTION RESISTIVITY FROM ELOG



MAP DETAILS

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APPROVED BY	K GARRETT	**DATE**	8/15/2024
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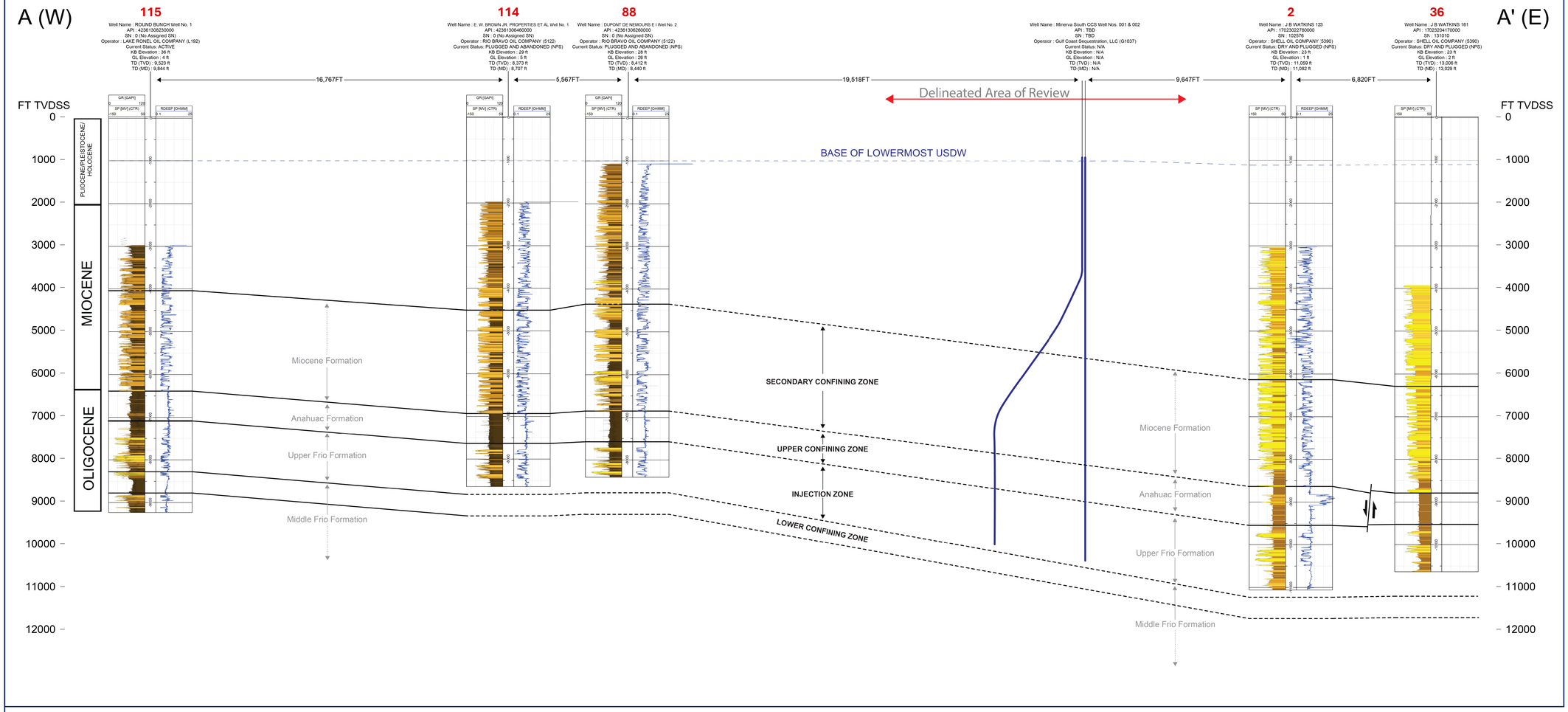
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

Note: See Table 1.1-1 for Map ID Well Assignments

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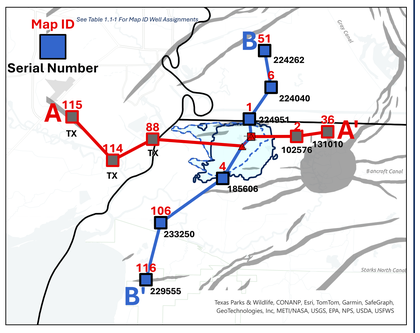
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FIGURE 2.1.2-3

West-East Geologic Cross-Section (A-A') at Project Minerva

LOG CURVES

-150	50	SP (MV) CENTERED IN TRACK
0	120	GR (GAPI) HNGS SPECTROSCOPY GAMMA RAY FROM DENSITY
0.1	25	RDEEP (OHMM) DEEP INDUCTION RESISTIVITY FROM ELOG



MAP DETAILS

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DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

Note: See Table 1.1-1 for Map ID Well Assignments

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Figure 2.1.2-4 Paleogeographic Reconstruction of Hackberry Depositional Environments

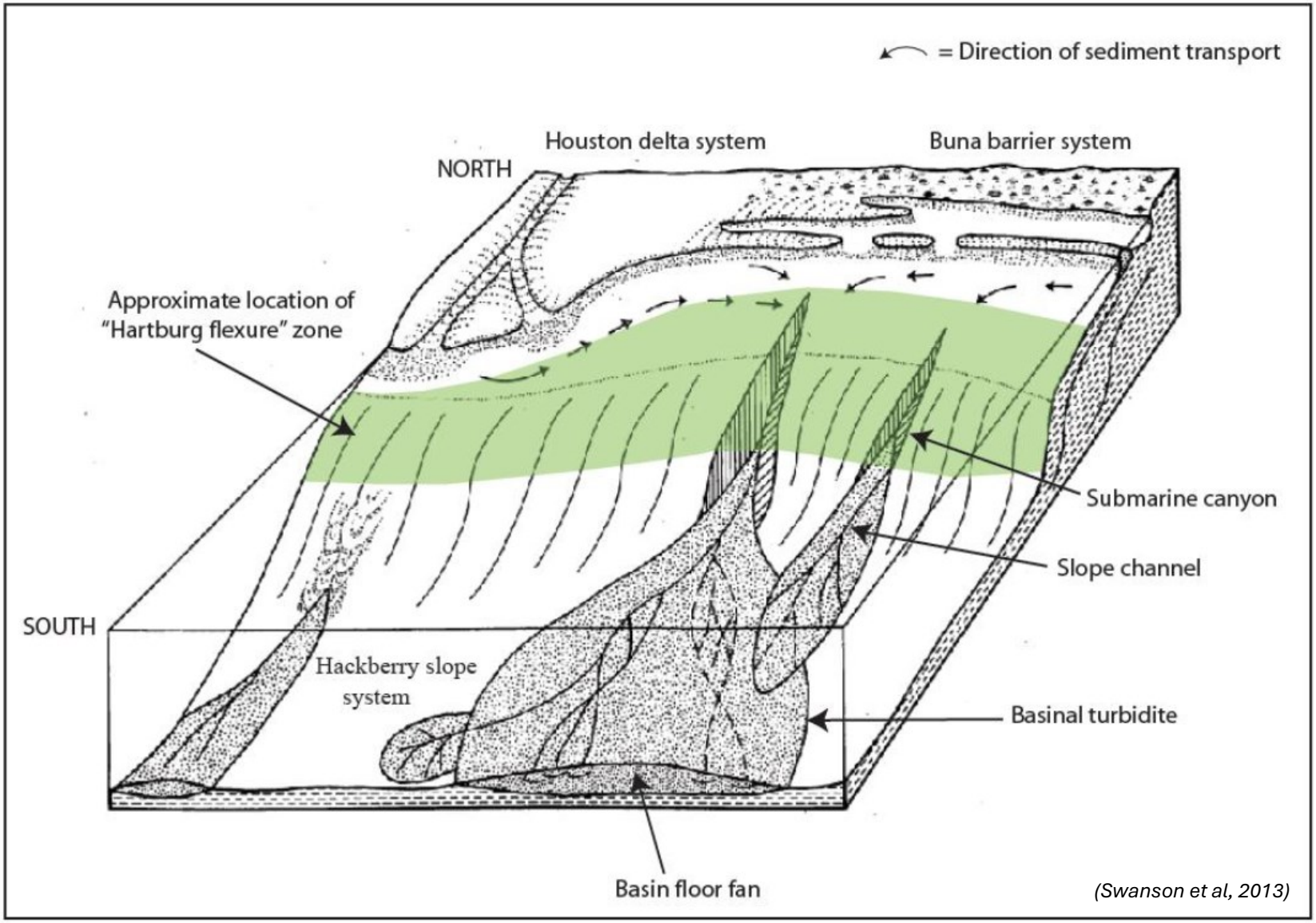
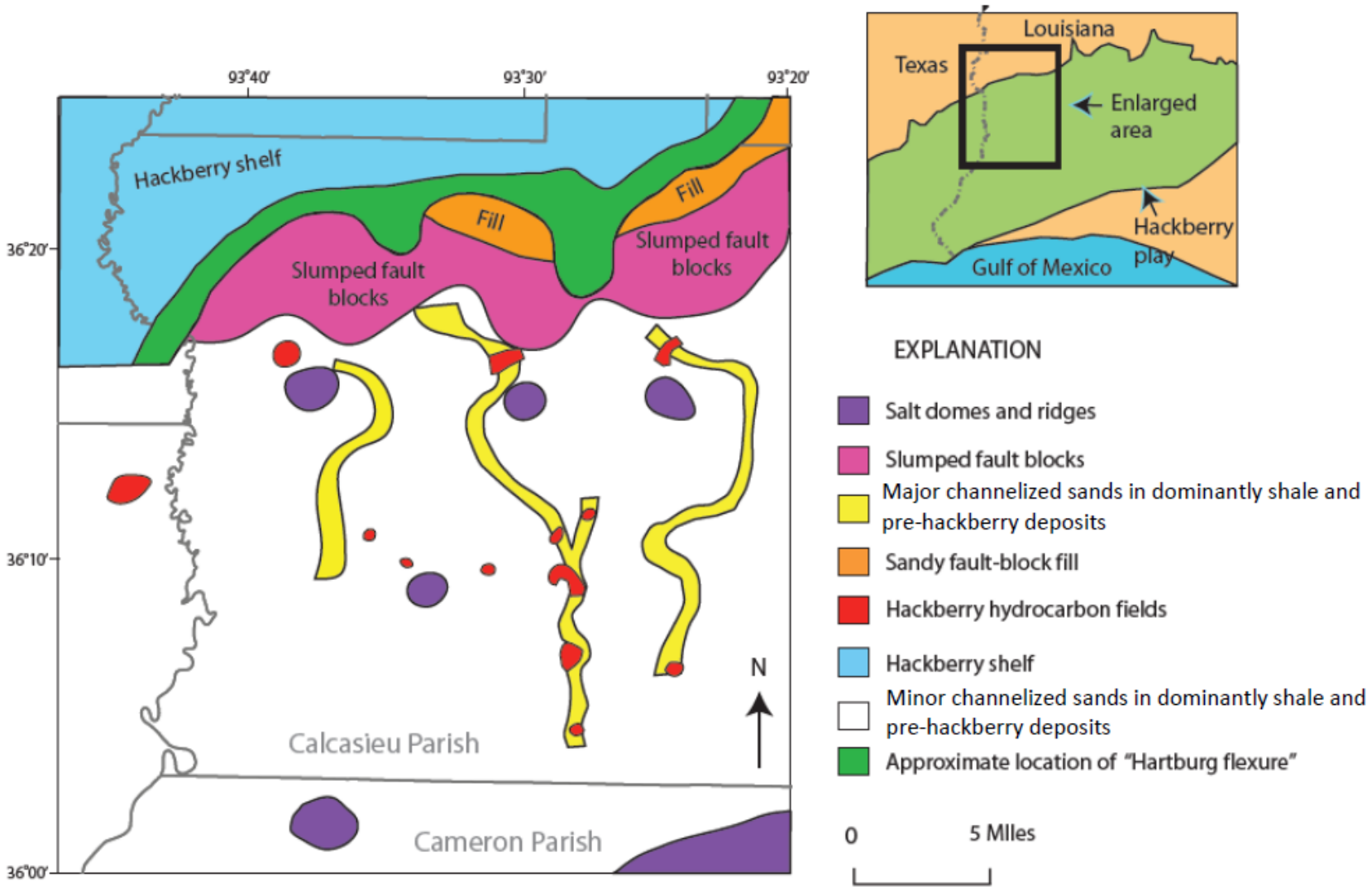
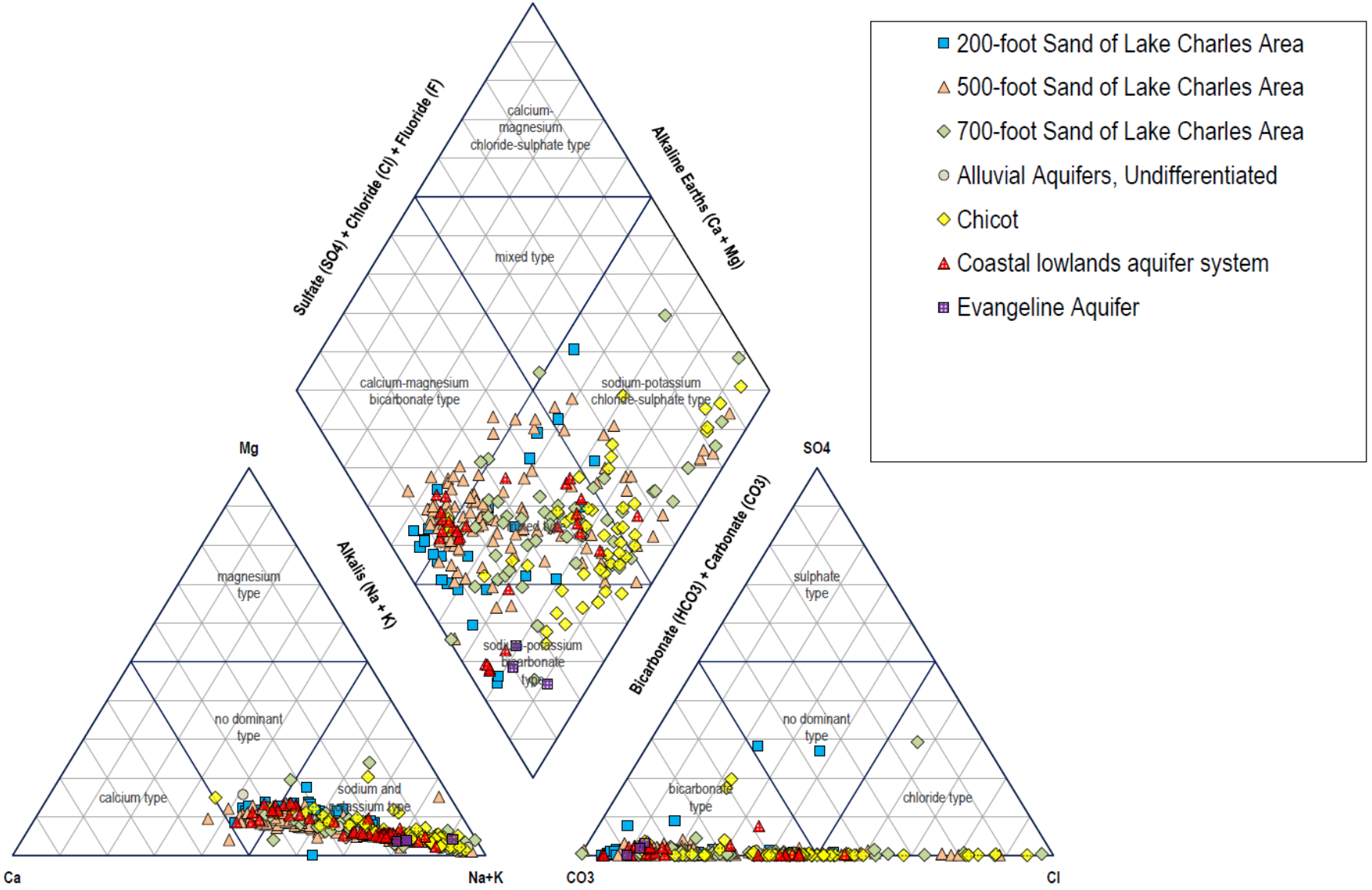


Figure 2.1.2-5 Generalized Depositional Environments of the Hackberry Trend in Southern Louisiana



(Swanson & Karlsen, 2013)

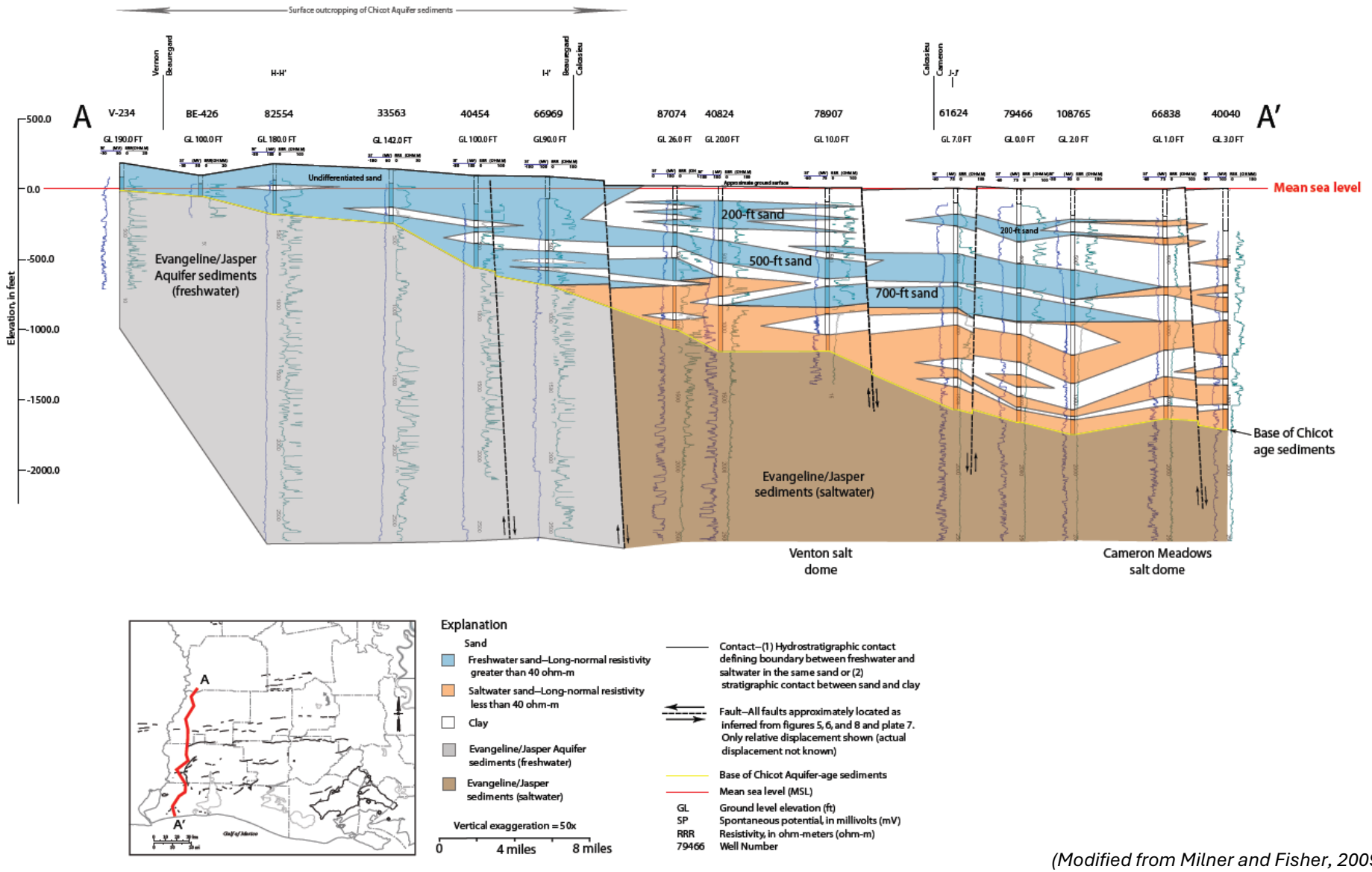
Figure 2.1.2-6 Piper Diagram of Water Chemistry in the Lake Charles Area



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Figure 2.1.2-7 Chicot Aquifer System Cross-Section Across Calcasieu and Cameron Parishes



(Modified from Milner and Fisher, 2009)

Figure 2.2.1-1 Big Island 3D Survey Header for the PSTM

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CARD    LINE: BIG ISLAND 3D
CARD    GRAY-STREAM SUBSET
CARD    LINE (INLINE) RANGE: 1196-1721
CARD    CDP (XLINE) RANGE: 1710-2056
CARD    TOTAL #TRACES   : 126219
CARD    DATA LENGTH: 6000 MS
CARD    SAMPLE RATE: 4 MS
CARD    PRESTACK KIRCHOFF MIGRATION
CARD    ENHANCEMENT APPLIED
CARD    ---------------------------------
CARD    TRACE HEADER INFO
CARD    X-COORD          BYTE 193-196
CARD    Y-COORD          BYTE 197-200
CARD    INLINE           BYTE  17-20
CARD    XLINE            BYTE  21-24
CARD    ---------------------------------
CARD    INLINE  XLINE   X-COORD         Y-COORD
CARD    1196    1710    1246036.00      510173.00
CARD    1196    2056    1246036.00      548233.00
CARD    1721    1710    1303786.00      510173.00
CARD    1721    2056    1303786.00      548233.00
CARD    ---------------------------------
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
C
```

Figure 2.2.1-2 Black Bayou 3D Survey Header for the MIGNR Processed Data Set

```
    blackbayou3d_seitel_gray-extract_8mm_tape-mig-w-nr_file-000001-001052-001443.txt

C 1 BLACK BAYOU 3D - SAM GARY JR PORTION    TAPE # BB9906VC
C 2 ENHANCED NOISE-SUPP'D MIG'D DMO STACK   IL/XL THIS TAPE:1001-1871/1001-1836
C 3 8.5 SEC DATA LENGTH ON TAPE, 4 MS SAMPLE RATE
C 4 DATUM: 0 FT (MSL)           VR: 5500 FT/SEC
C 5 BIN SIZE: 110I 110X
C 6 CRBS/LINE:      1086            #INLINES:    871
C 7 TOTAL CRBS:   945906
C 8 HEADERS:  IL#=BYTES 9-12 AND 197-200    XL#=BYTES 13-16 AND 201-204
C 9 CRB X-Y:  BYTES 189-192 AND 193-196 (EXTENDED SEG-Y) ALSO 205-208 & 209-212
C10 INL:  1001  XL:  1001   X: 1224586.50   Y:  432183.00
C11 INL:  1001  XL:  2086   X: 1224586.50   Y:  551533.00
C12 INL:  1871  XL:  1001   X: 1320286.50   Y:  432183.00
C13 INL:  1871  XL:  2086   X: 1320286.50   Y:  551533.00
C14 PROCESSING SEQUENCE:
C15   REFORMAT/GAIN RECOVERY: SPHER DIV 1/tv**2 +1DB/SEC
C16   DECON:  SURFACE-CONSISTENT, 200 MS OP, 0.1% PW, SINGLE GATE
C17   DATUM STATICS CORRECTION:  DATUM=0 FT  VR=5500 FT/SEC
C18   AUTOSTATICS:  RONEN-CLAERBOUT STACK-POWER-OPTIMIZATION
C19   SPECTRAL BALANCING:  3/6-85/95 HZ
C20   AUTOSTATICS:  RONEN-CLAERBOUT STACK-POWER-OPTIMIZATION
C21   DMO:  RADON DOMAIN
C22   TRACE EQUALIZATION:  2000 MS OVERLAPPING (50%) MEAN SCALING
C23   STACK: SQUARE-ROOT, OFFSETS ARE MUTE LIMITED
C24   MIGRATION:  PSPI, 100% OF FINAL DMO STACKING VELS USED
C25   SPECTRAL BALANCING:  3/6-78/88, 30 HZ PASSBANDS
C26   NOISE SUPPRESSION:  F-XY DECON
C27
C28
C29
C30
C31   FILTERED:
C32      5/10-75/85 HZ FROM 0.0 TO 1.0 SEC
C33      3/06-65/75 HZ FROM 1.5 TO 3.5 SEC
C34      3/06-40/50 HZ FROM 4.5 TO 6.0 SEC
C35      3/06-25/35 HZ AT   8.5 SEC
C36   MULTI-WINDOW MEAN SCALING:  2000 MS WINDOWS, 50% OVERLAP
C37 PROCESSED FOR:  SEITEL DATA/SAM GARY JR & ASSOC, MARCH 1999
C38 PROCESSED BY:  VECTOR SEISMIC DATA PROCESSING, INC.
C39                     HOUSTON, TX  U.S.A.
              1052        1001     1836    2126 @  4000
```

Figure 2.2.1-4 Detectable Fault Trough Variants in Seismic Data



C

C'

106 4 MS CCS 2 MS CCS 1 1 6 23

Geomodel Formation Tops
- -
- ana1
- ana2
- frio_0
- frio_05
- frio_1
- frio_2
- frio_3
- frio_4
- frio_5
- frio_6
- frio_7
- frio_8
- frio_9

tvdss ft

feet

0 0.5 1 1.5 2miles

1:18000

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FIGURE 2.2.1-5
Structural Geostatistical Model Cross-Section Showing Anahuac and Upper Frio Formations

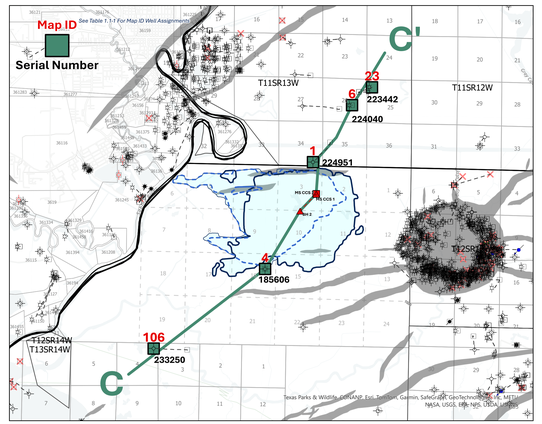
PROJECT MINERVA

MINERVA SOUTH CCS WELL NOS. 001 & 002

CAMERON PARISH, LA

PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032

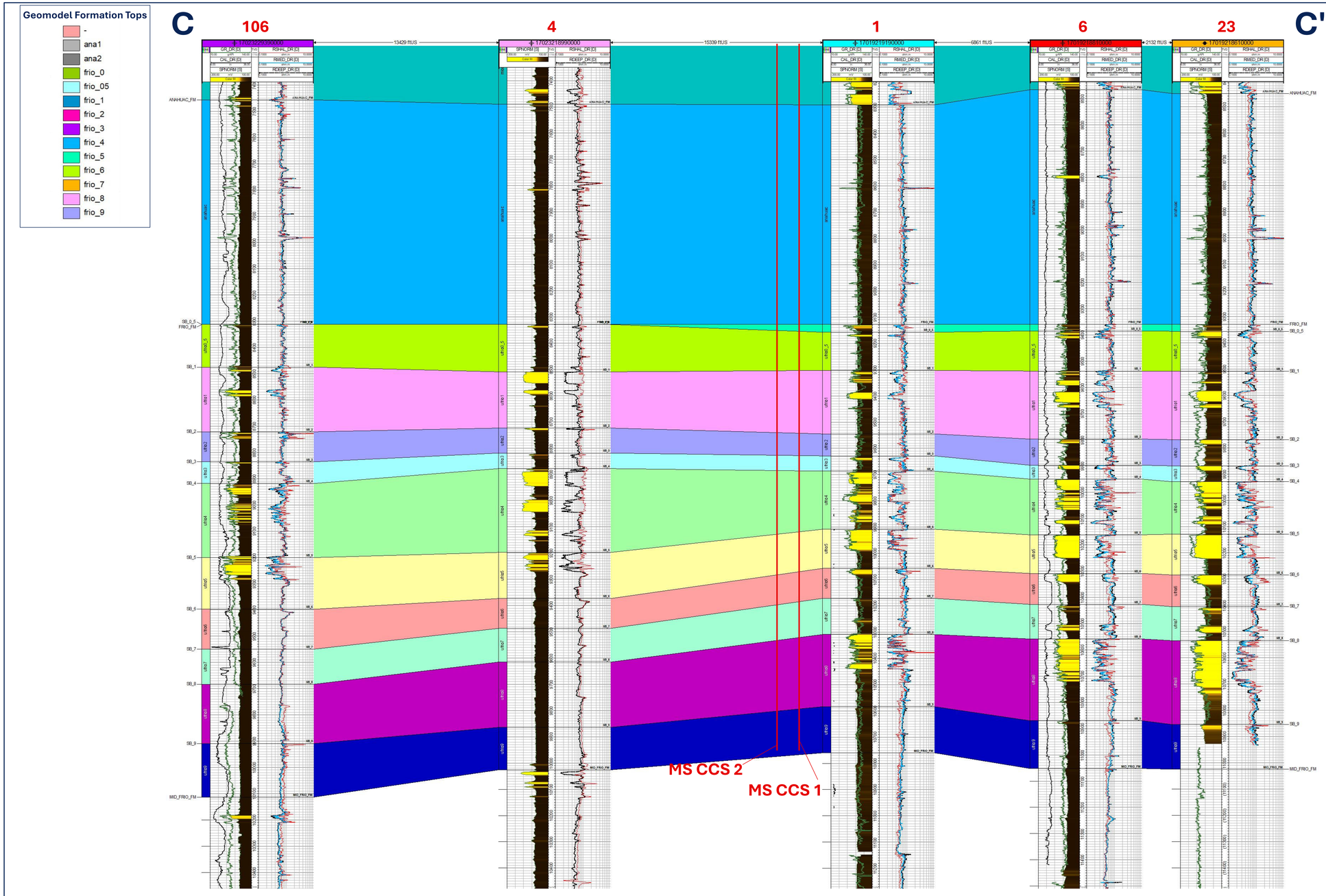


Note: See Table 1.1-1 for Map ID Well Assignments

LOUISIANA BOARD OF PROFESSIONAL GEOSCIENTISTS
KAYCEE GARRETT
1325
Est. 2011

MAP DETAILS

PREPARED BY	R WENCEL
DATE PREPARED	8/21/2024 9:47 AM
APPROVED BY	K GARRETT
DATE APPROVED	8/21/2024
MAP SCALE	1:18,000
PAGE SIZE	54.33 W X 27.54 H



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FIGURE 2.2.1-6
Correlation of Geostatistical Model Formation Tops with Well Logs

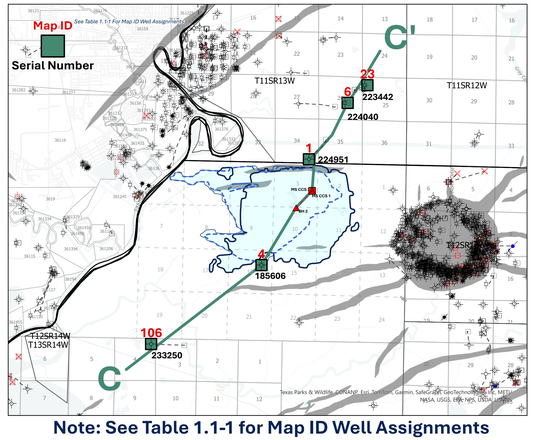
PROJECT MINERVA

MINERVA SOUTH CCS WELL NOS. 001 & 002

CAMERON PARISH, LA

PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032

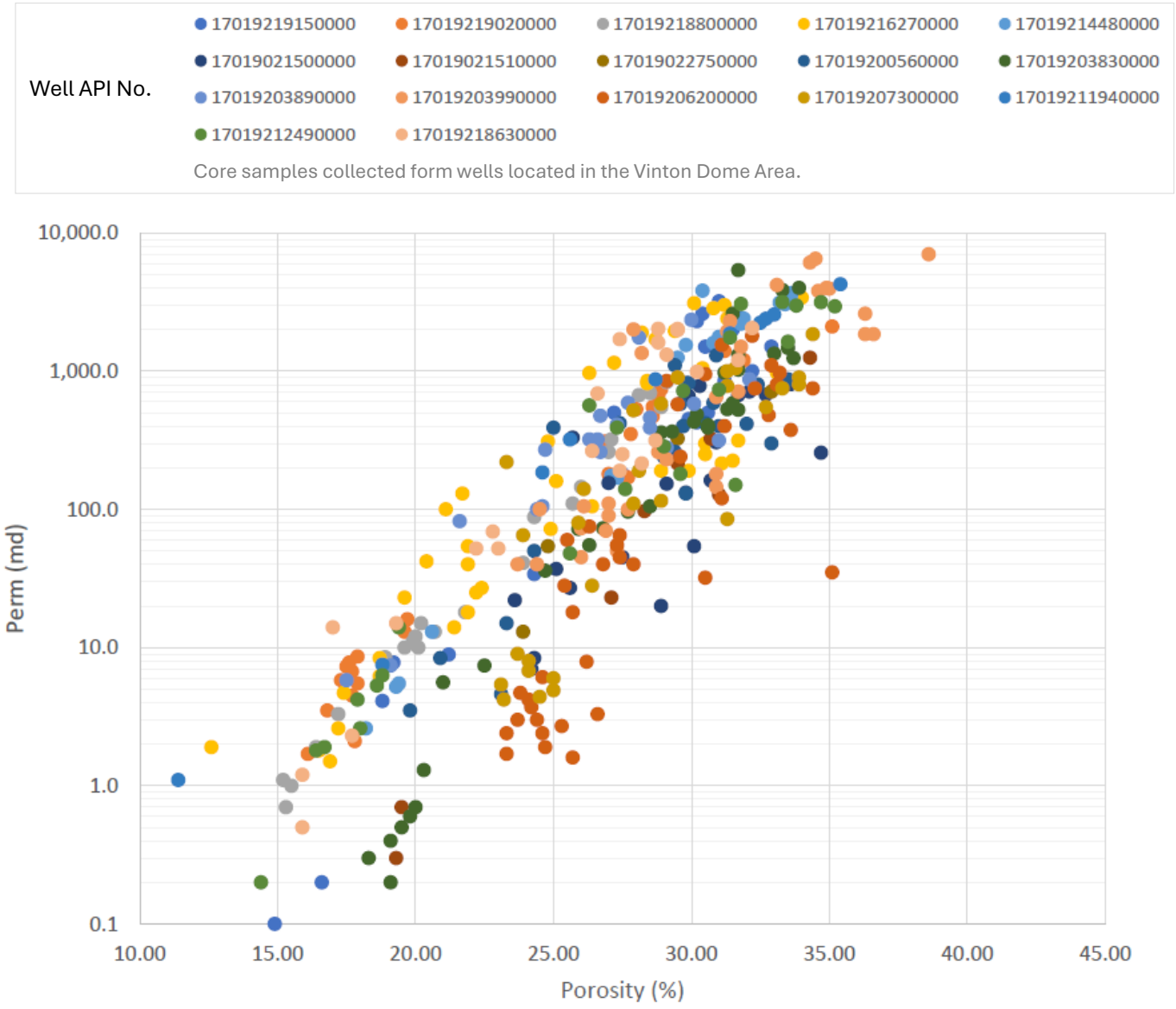


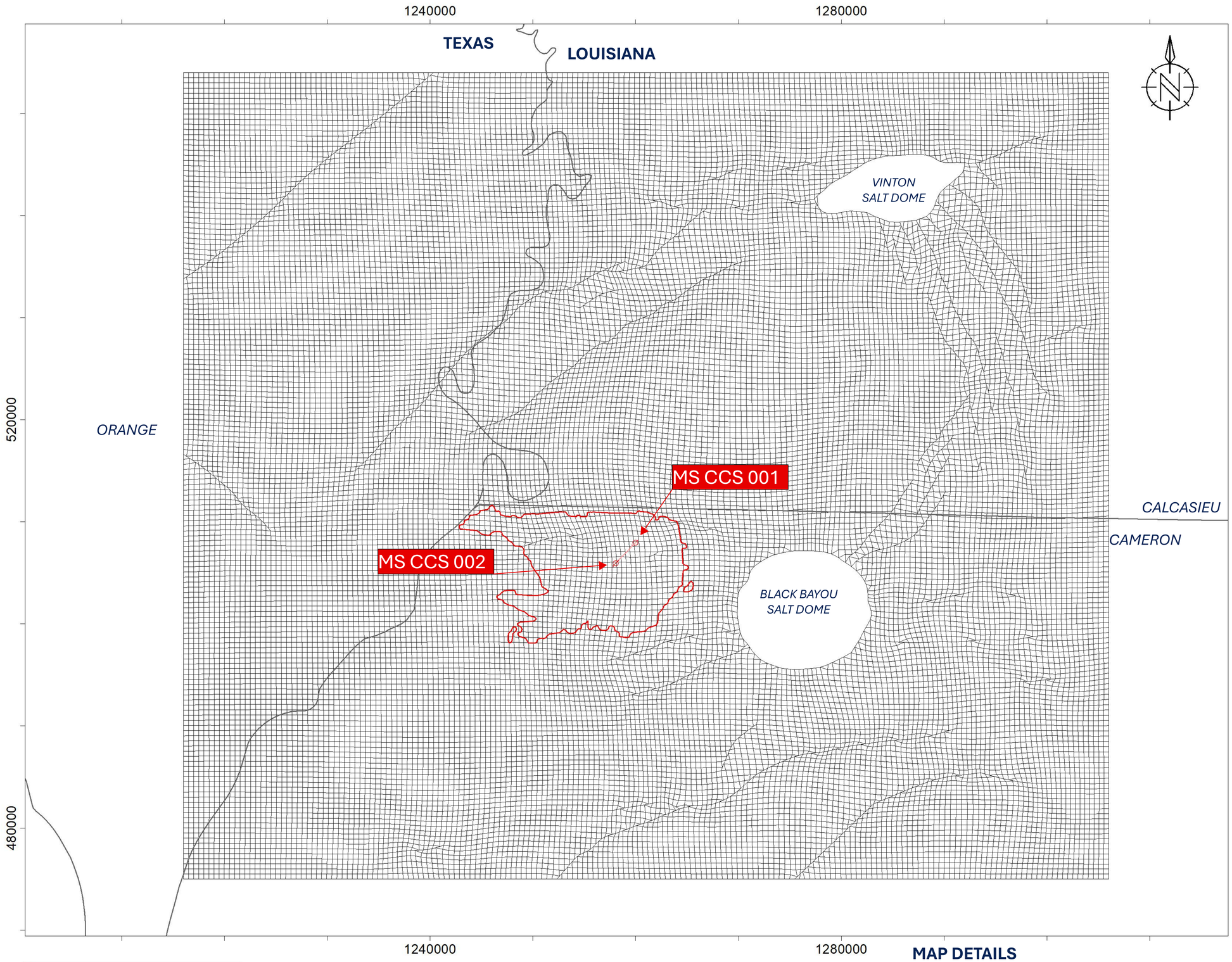
Note: See Table 1.1-1 for Map ID Well Assignments

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MAP DETAILS	
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APPROVED BY	K GARRETT
DATE APPROVED	8/21/2024
MAP SCALE	1:18,000
PAGE SIZE	51.81 W X 27.54 H

Figure 2.2.1-7 Porosity-Permeability Relationship Analysis Chart





Map	
Scale 1:40000	*User name* hallstrom
Contour inc	*Date* 07/23/2024

0 2 4 6miles

1:40000

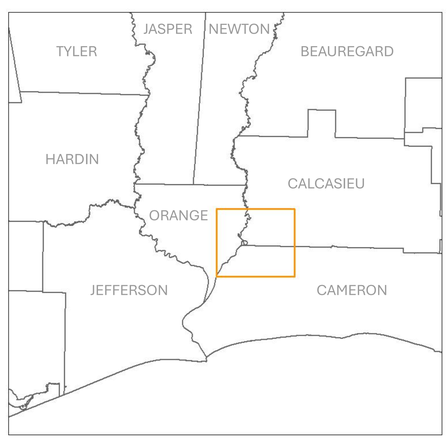
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FIGURE 2.2.1-8

Reservoir Simulation (REVEAL) Grid Derived from Geostatistical Model

- Delineated Area of Review
- Proposed Injection Well Trajectory
- State/County Boundary

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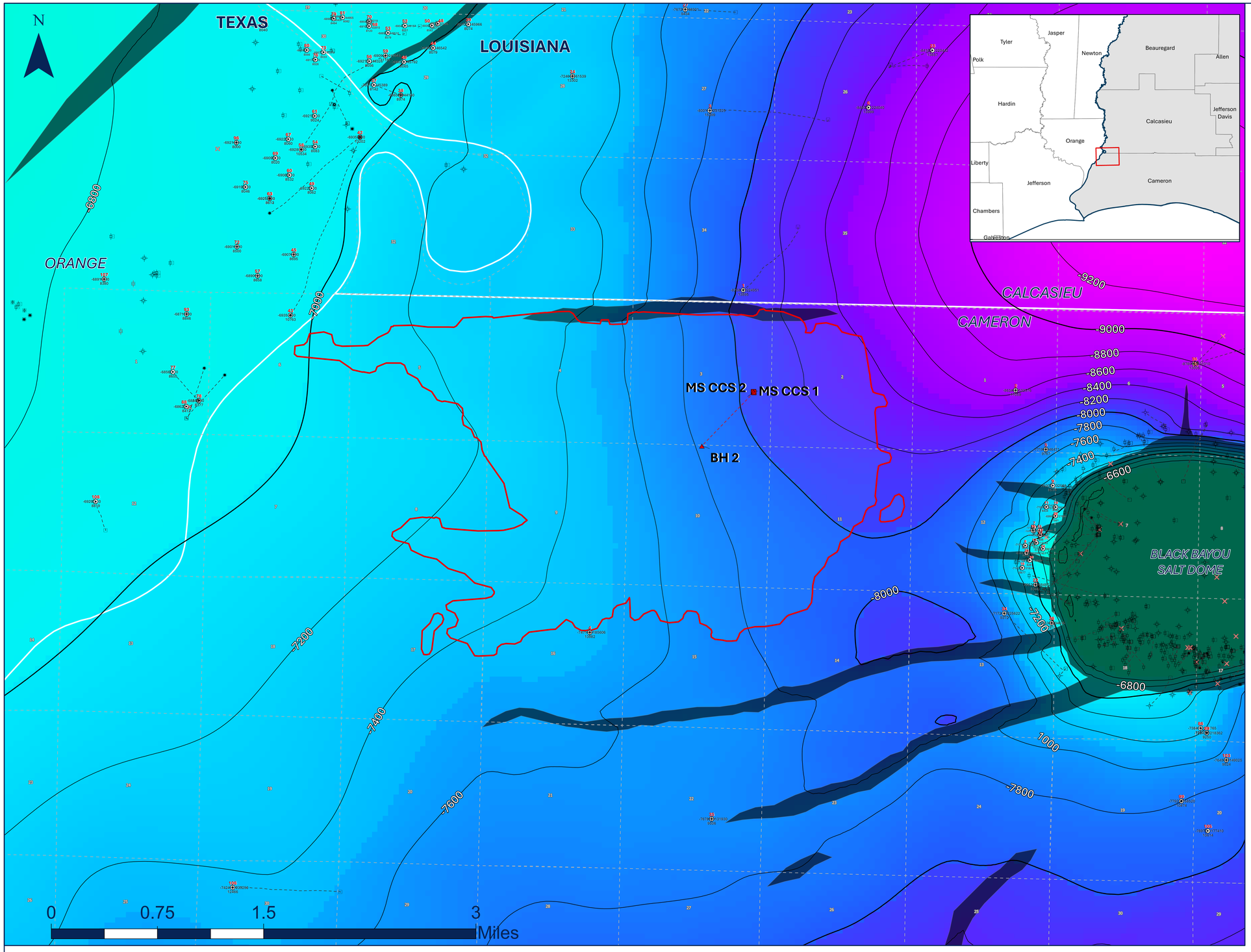


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PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032



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FIGURE 2.2.3-1
Top of Anahuac Formation (Upper Confining Zone) Structure Map

MAP LEGEND

- Delineated Area of Review
- PLSS Sections
- SONRIS Parishes
- Top Anahuac Faults
- Anahuac Structure Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Structure Contour Interval (ft)

- 1000 ft Contour Interval
- 200 ft Contour Interval

Elevation Depth (ft) TVDss

-4000 to -9000

Control Point Labels

Map ID
Structure Depth (ft TVDSS) ● Serial Number
Total Depth (TVDSS)

MAP DETAILS

PREPARED BY	R WENCEL	**DATE**	8/19/2024 8:25 PM
APPROVED BY	K GARRETT	**DATE**	8/21/2024
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SPATIAL REFERENCE

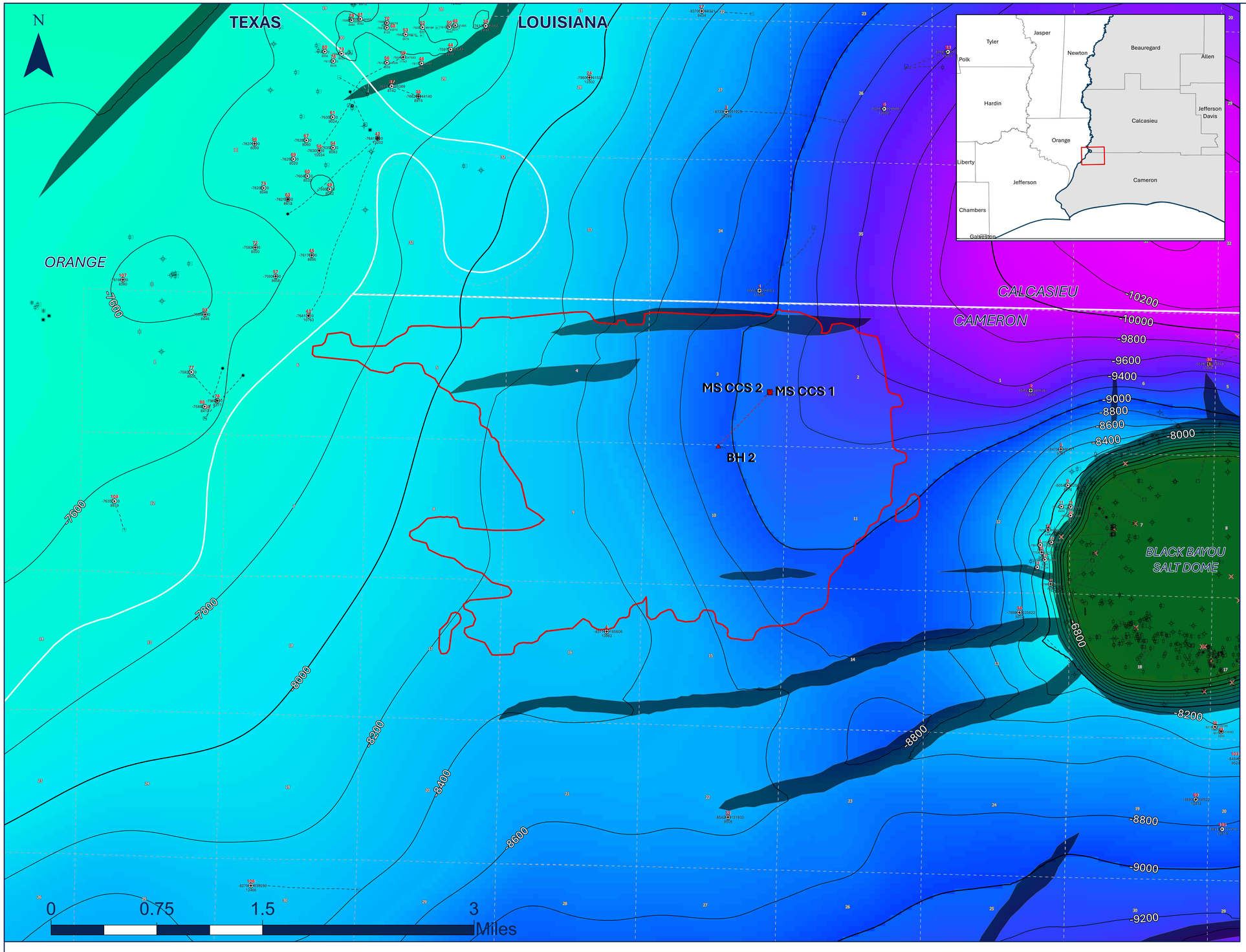
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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Note: See Table 1.1-1 for all Well Data associated with control points



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FIGURE 2.2.3-2
Top of Upper Frio Formation (Injection Zone) Structure Map

MAP LEGEND

- Delineated Area of Review
- Top Upper Frio Faults
- SONRIS Parishes
- PLSS Sections
- Upper Frio Structure Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Structure Contour Interval (ft)

- 200 ft Contour Interval
- 1000 ft Contour Interval

Elevation Depth (ft) TVDss

-4000 -5000 -6000 -7000 -8000 -9000 -10000

Control Point Labels

Map ID
Structure Depth (ft TVDSS) ● Serial Number
Total Depth (TVDSS)

MAP DETAILS

PREPARED BY	R WENCEL	**DATE**	8/19/2024 8:09 PM
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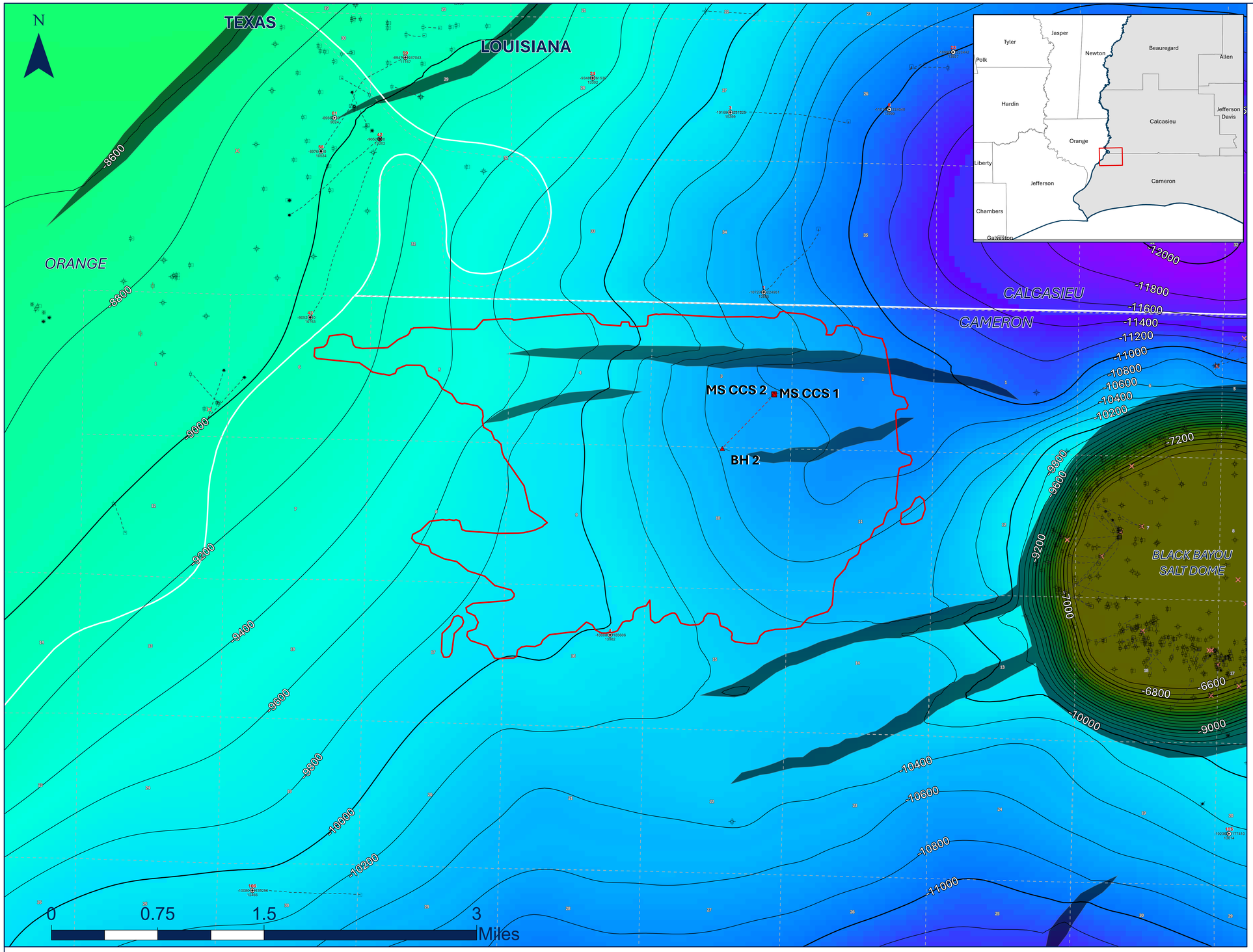
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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1325
Est. 2011

Note: See Table 1.1-1 for all Well Data associated with control points



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FIGURE 2.2.3-3
Top of Middle Frio Formation (Lower Confining Zone) Structure Map

MAP LEGEND

- Delineated Area of Review
- Top Mid Frio Faults
- SONRIS Parishes
- PLSS Sections
- Middle Frio Structure Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Structure Contour Interval (ft)

- 1000 ft Contour Interval
- 200 ft Contour Interval

Elevation Depth (ft) TVDss

-5000 -6000 -7000 -8000 -9000 -10000 -11000 -12000

Control Point Labels

Map ID
Structure Depth (ft TVDSS) ● Serial Number
Total Depth (TVDSS)

MAP DETAILS

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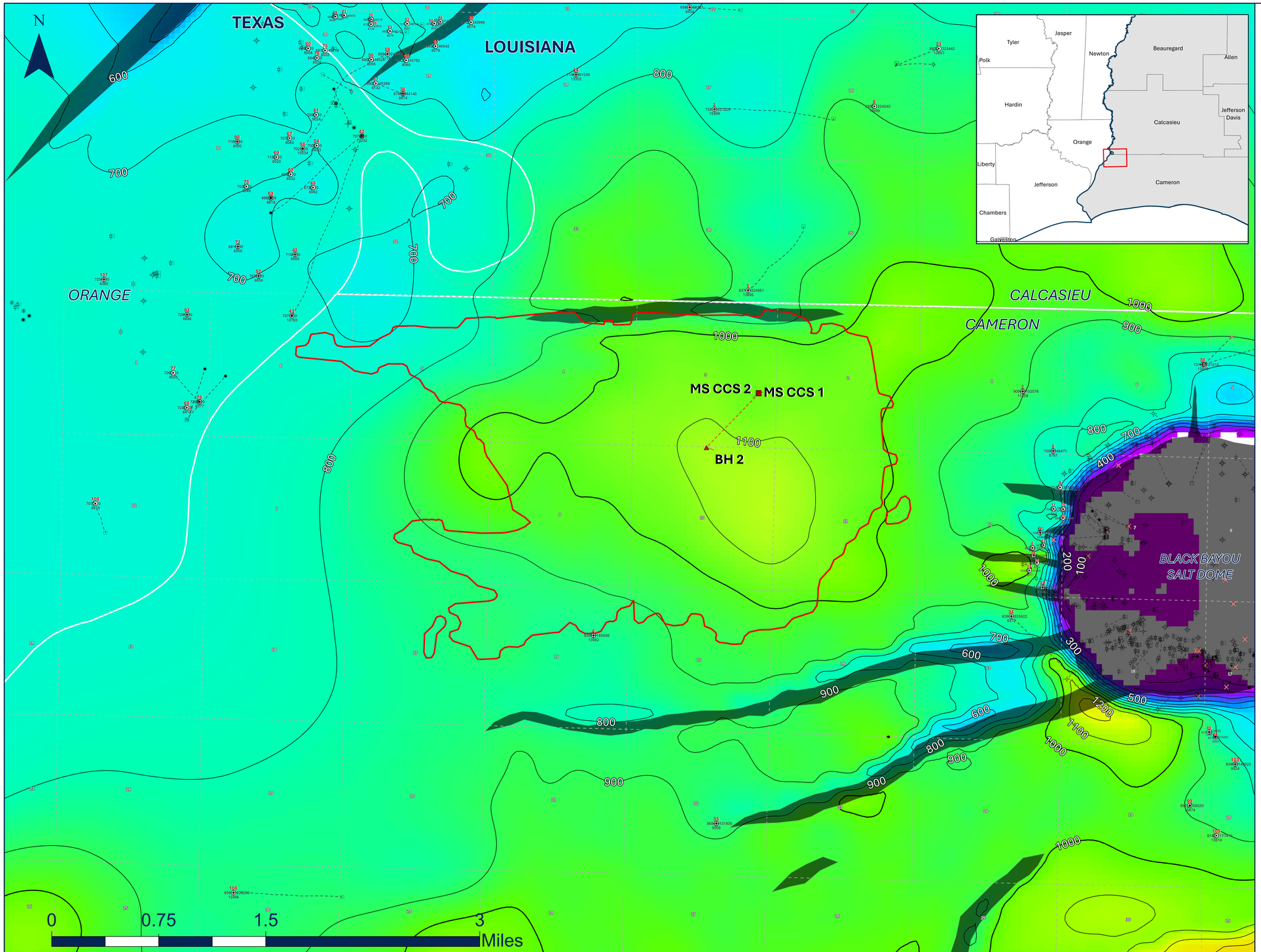
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DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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Note: See Table 1.1-1 for all Well Data associated with control points



GCS

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FIGURE 2.2.4-1
Anahuac Formation (Upper Confining Zone) Isopach Map

MAP LEGEND

- Top Anahuac Faults
- SONRIS Parishes
- PLSS Sections
- Delineated Area of Review
- Anahuac Isopach Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Isopach Contour Interval (ft)

- 1000 ft Contour Interval
- 100 ft Contour Interval

Isopach Thickness (ft)

1400
1000
600
200

Control Point Labels

Map ID
Isopach Thickness (ft) ● Serial Number
Total Depth (TVDSS)

MAP DETAILS

PREPARED BY	R WENCEL	**DATE**	8/20/2024 1:31 PM
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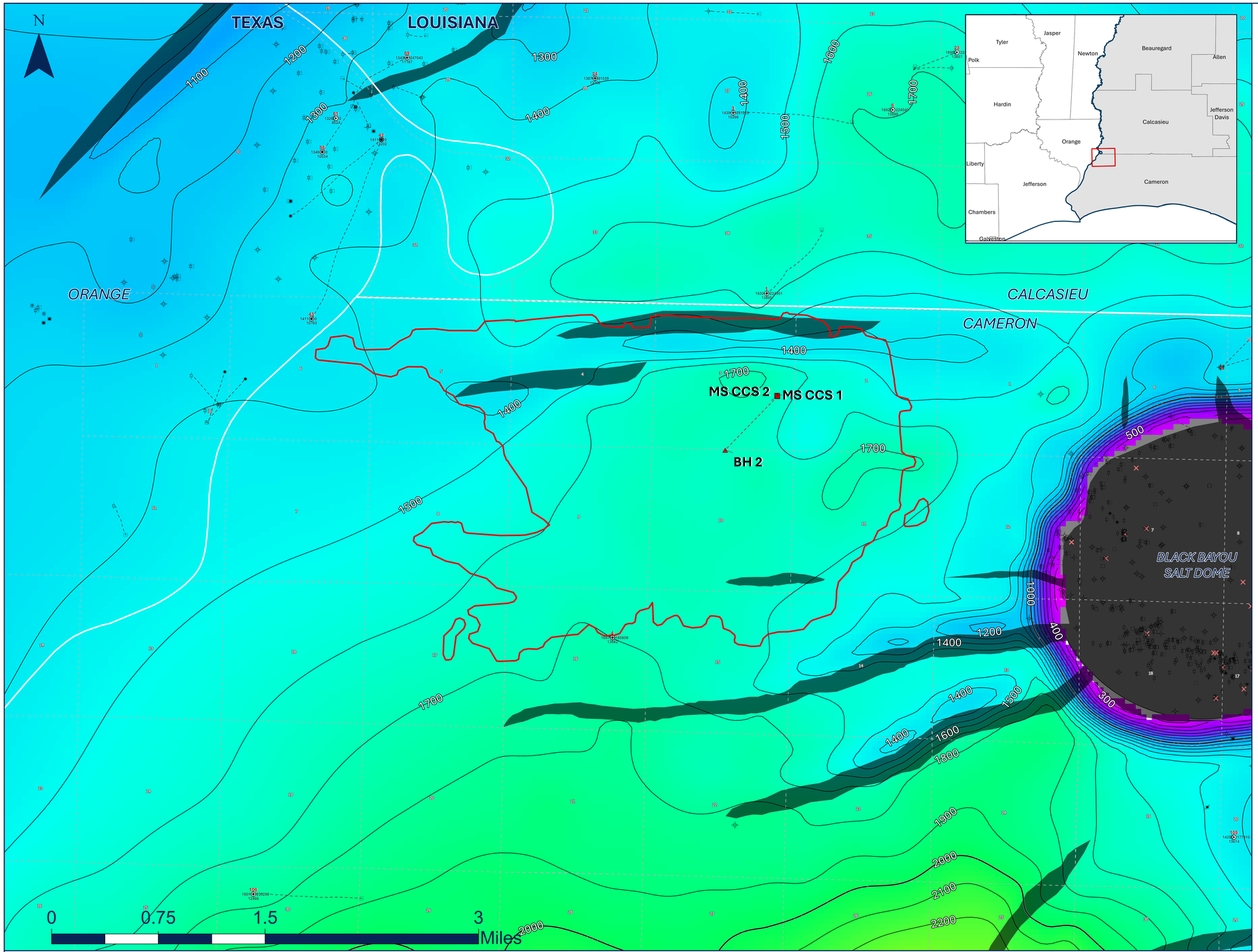
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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1325
Est. 2011

Note: See Table 1.1-1 for all Well Data associated with control points



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FIGURE 2.2.4-2
Upper Frio Formation (Injection Zone) Isopach Map

MAP LEGEND

- Delineated Area of Review
- Top Upper Frio Faults
- SONRIS Parishes
- PLSS Sections
- Injector Well Pad
- Injector Bottom Hole
- Upper Frio Isopach Control Point
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Isopach Contour Interval (ft)

- 100 ft Contour Interval
- 1000 ft Contour Interval

Isopach Thickness (ft)

3000
2000
1000
0

Control Point Labels

Map ID
Isopach Thickness (ft) — Serial Number
Total Depth (TVDSS)

MAP DETAILS

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APPROVED BY	K GARRETT	**DATE**	8/21/2024
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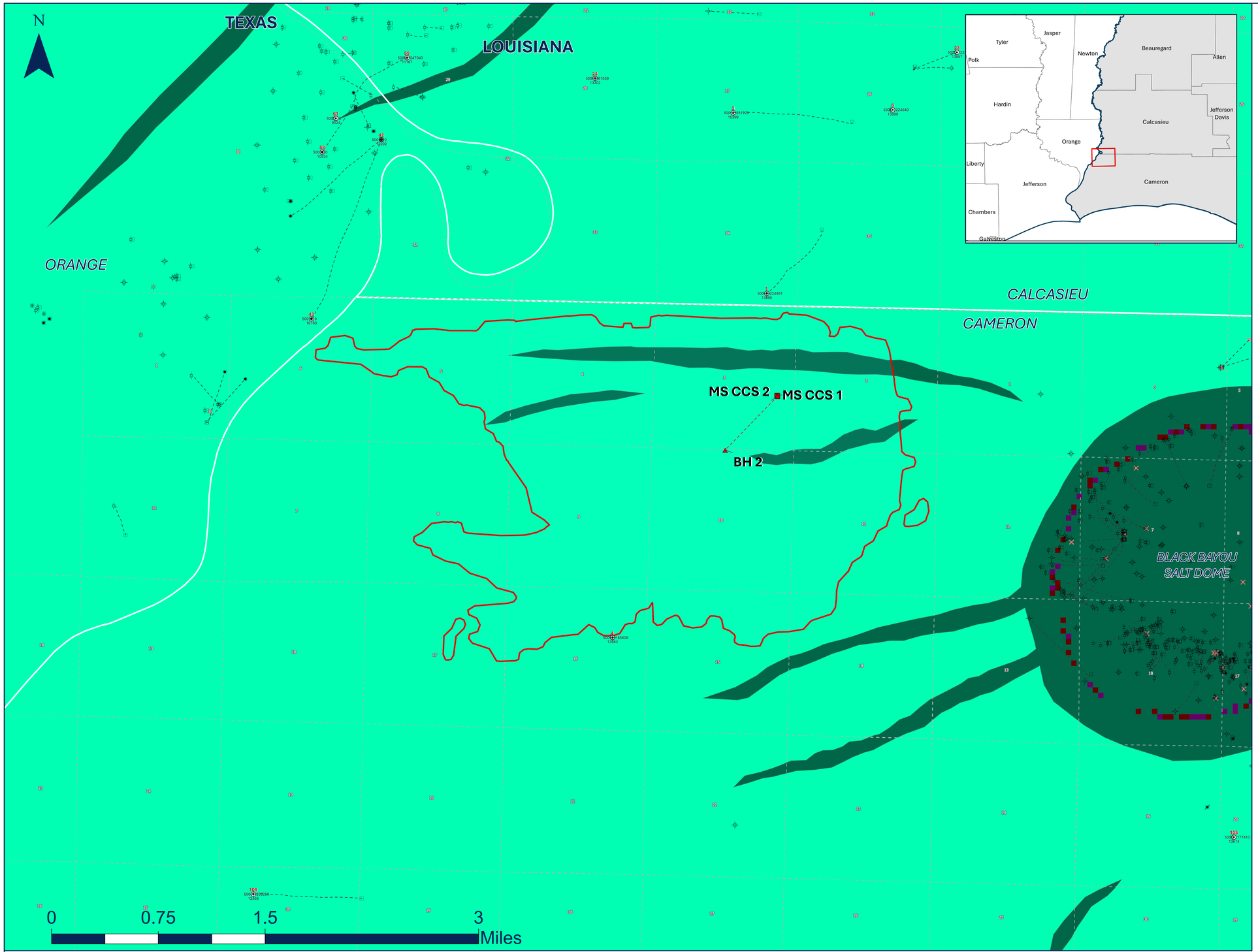
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

LOUISIANA BOARD OF PROFESSIONAL GEOSCIENTISTS
KAYCEE GARRETT
1325
Est. 2011

Note: See Table 1.1-1 for all Well Data associated with control points



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FIGURE 2.2.4-3
Middle Frio Formation (Lower Confining Zone) Isopach Map

MAP LEGEND

- Delineated Area of Review
- PLSS Sections
- SONRIS Parishes
- Top Mid Frio Faults
- Middle Frio Isopach Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Isopach Thickness (ft)

-500

-500

Control Point Labels

Map ID
Isopach Thickness (ft) Serial Number
Total Depth (TVDSS)

MAP DETAILS

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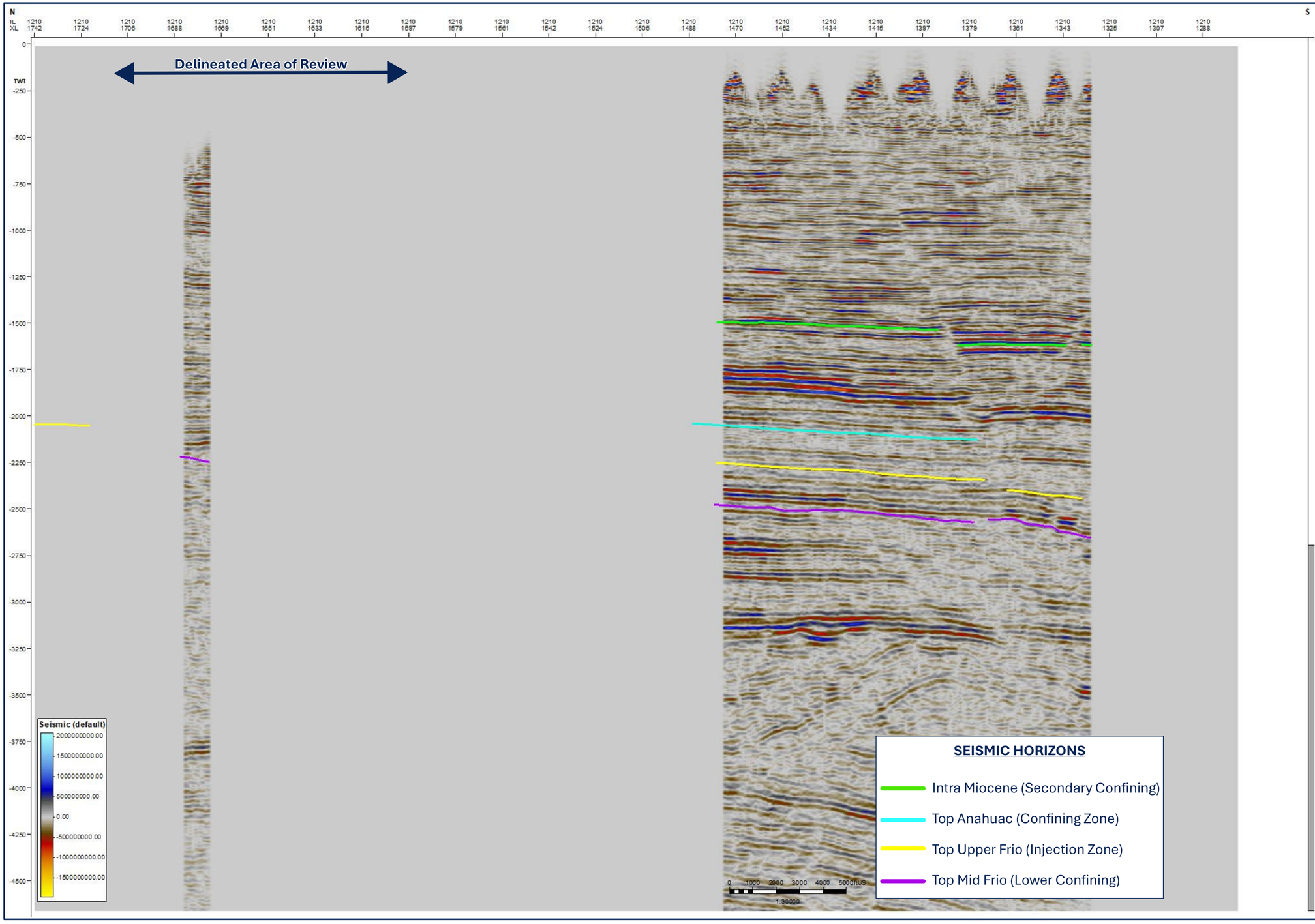
PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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Note: Lower Confining Zone is defined as the first 500' of the Middle Frio Formation resulting in a constant Isopach Grid



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FIGURE 2.3.1-1

Black Bayou 3D: InLine 1210

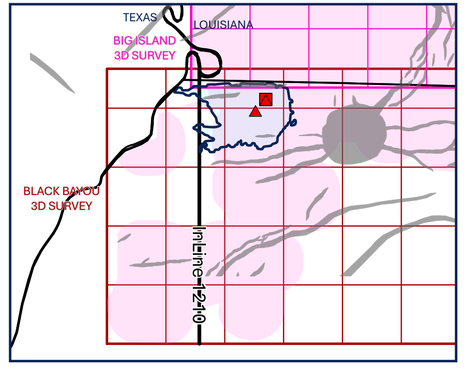
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CAMERON PARISH, LA

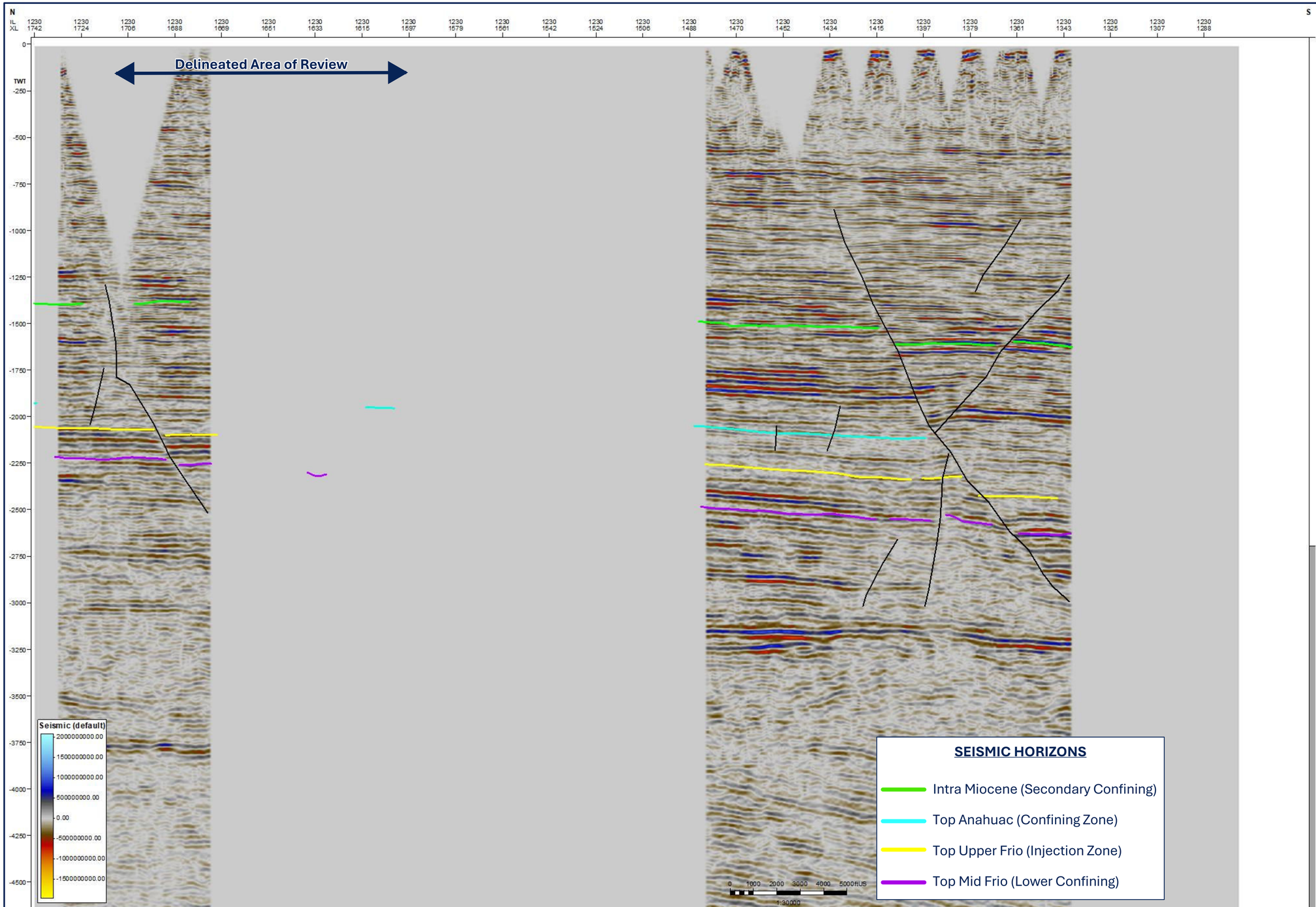
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FIGURE 2.3.1-2

Black Bayou 3D: InLine 1230

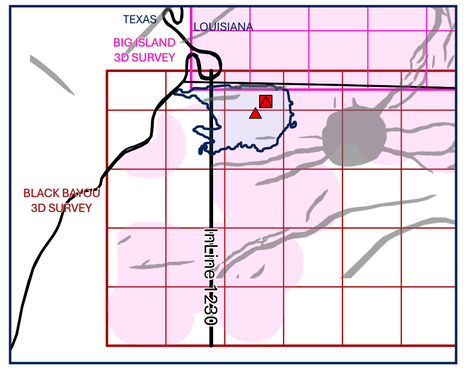
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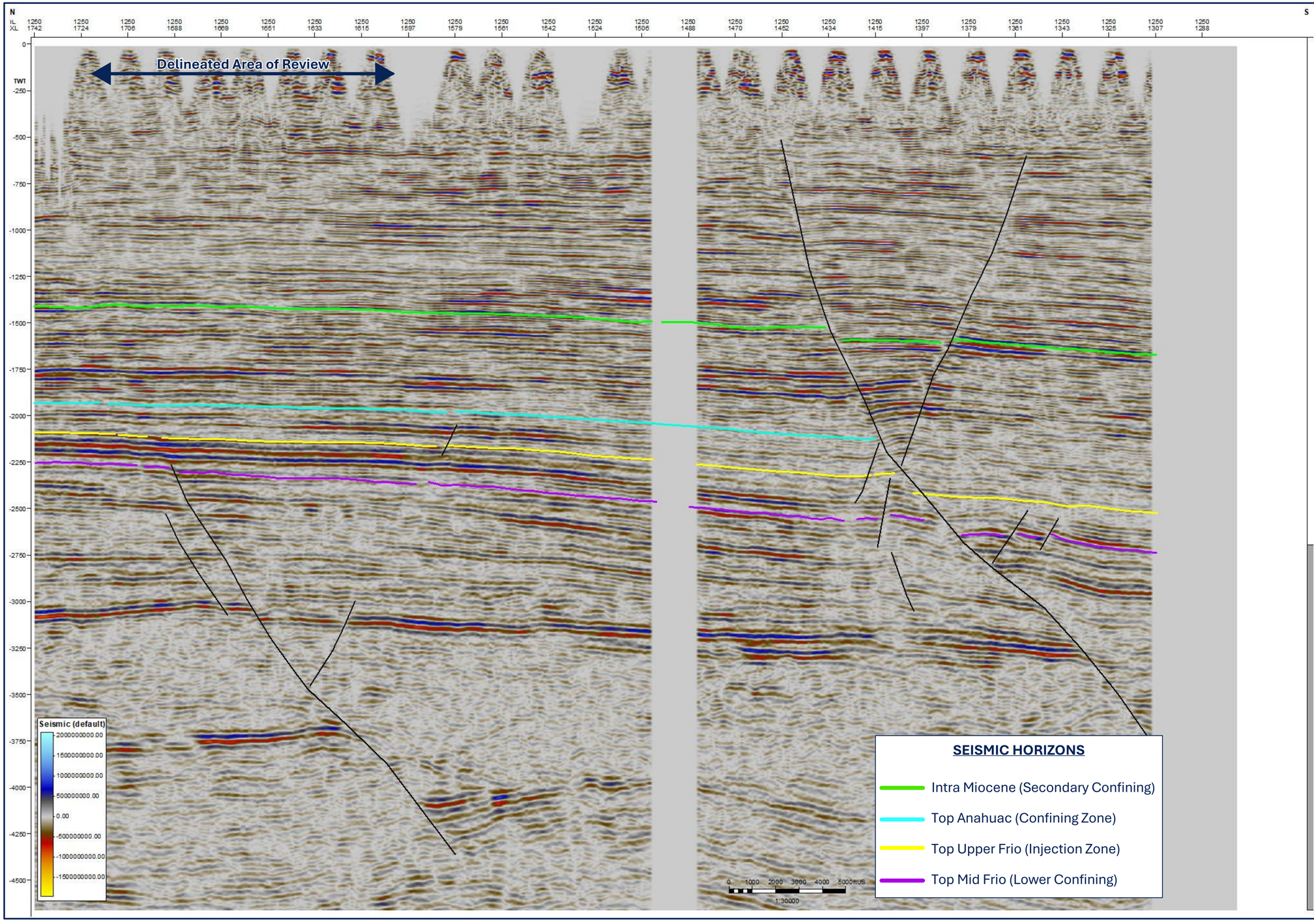
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FIGURE 2.3.1-3

Black Bayou 3D: InLine 1250

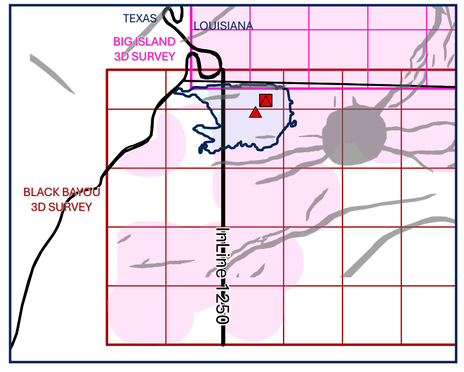
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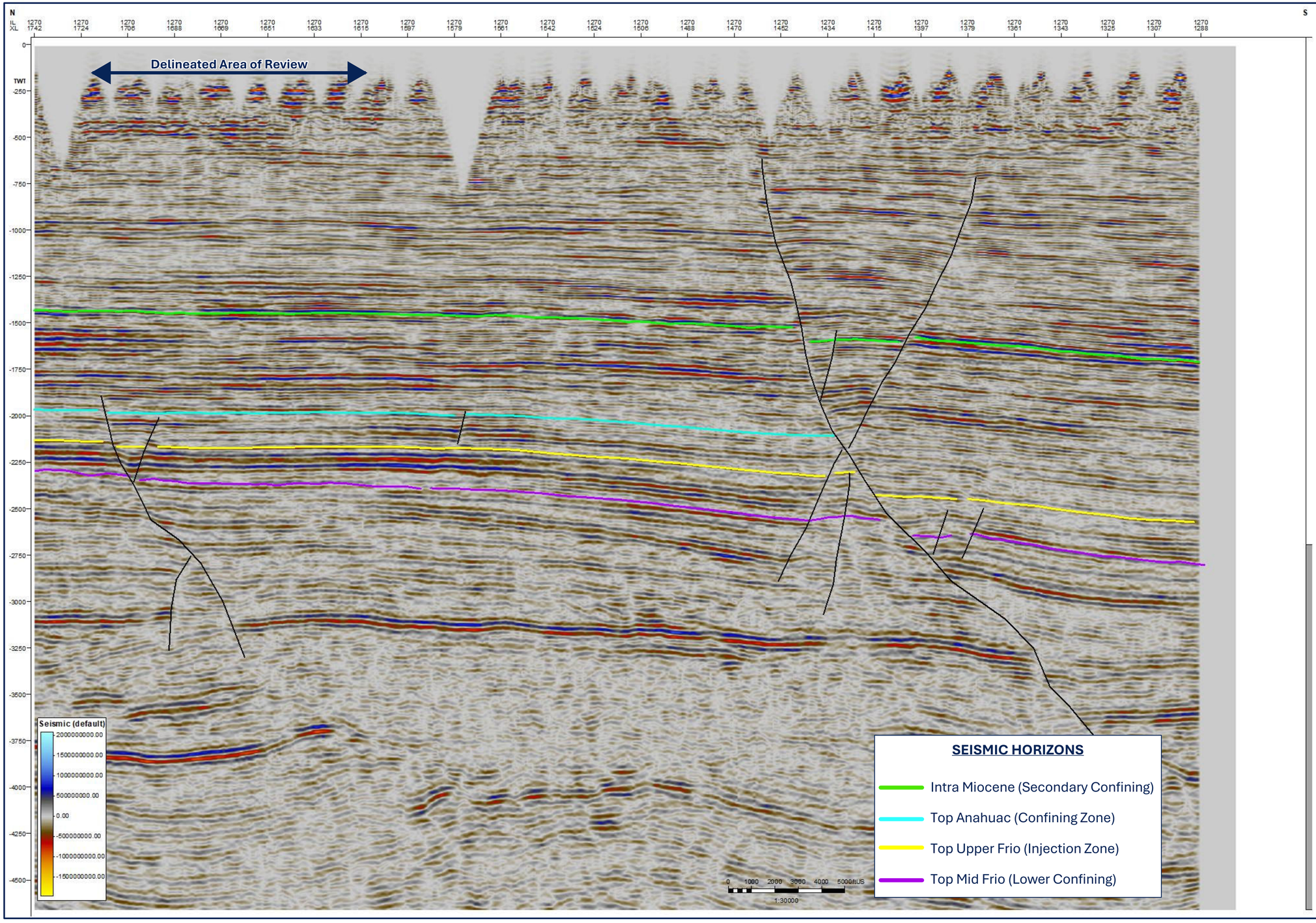
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FIGURE 2.3.1-4

Black Bayou 3D: InLine 1270

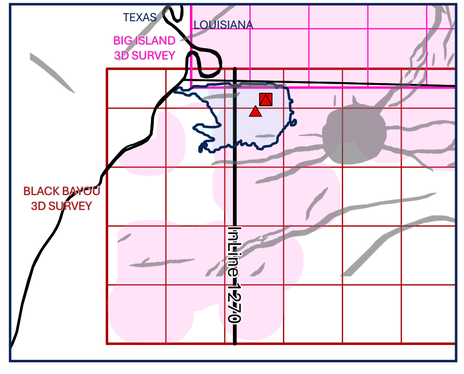
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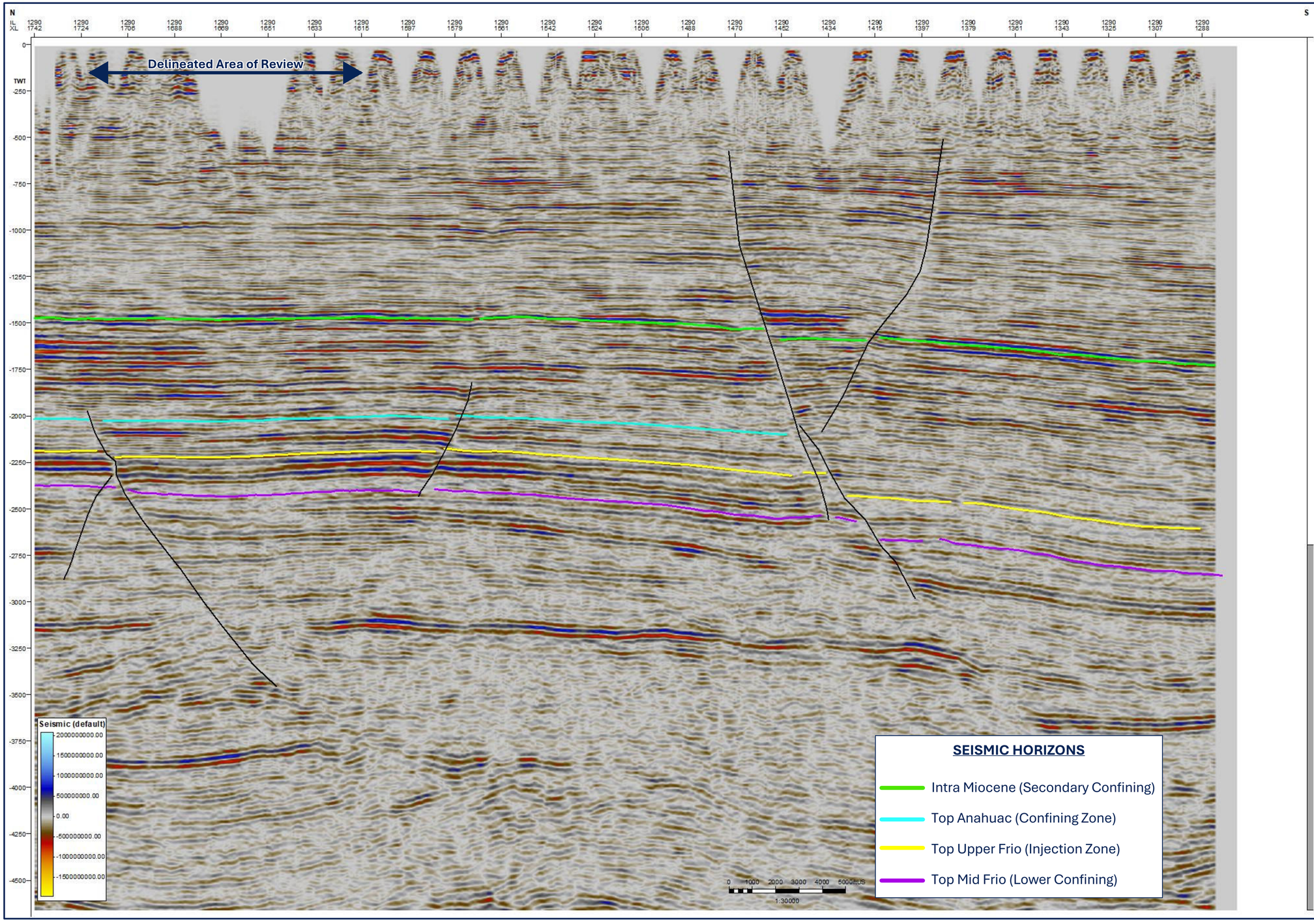
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FIGURE 2.3.1-5

Black Bayou 3D: InLine 1290

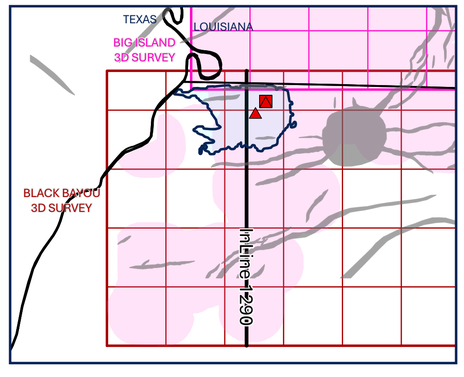
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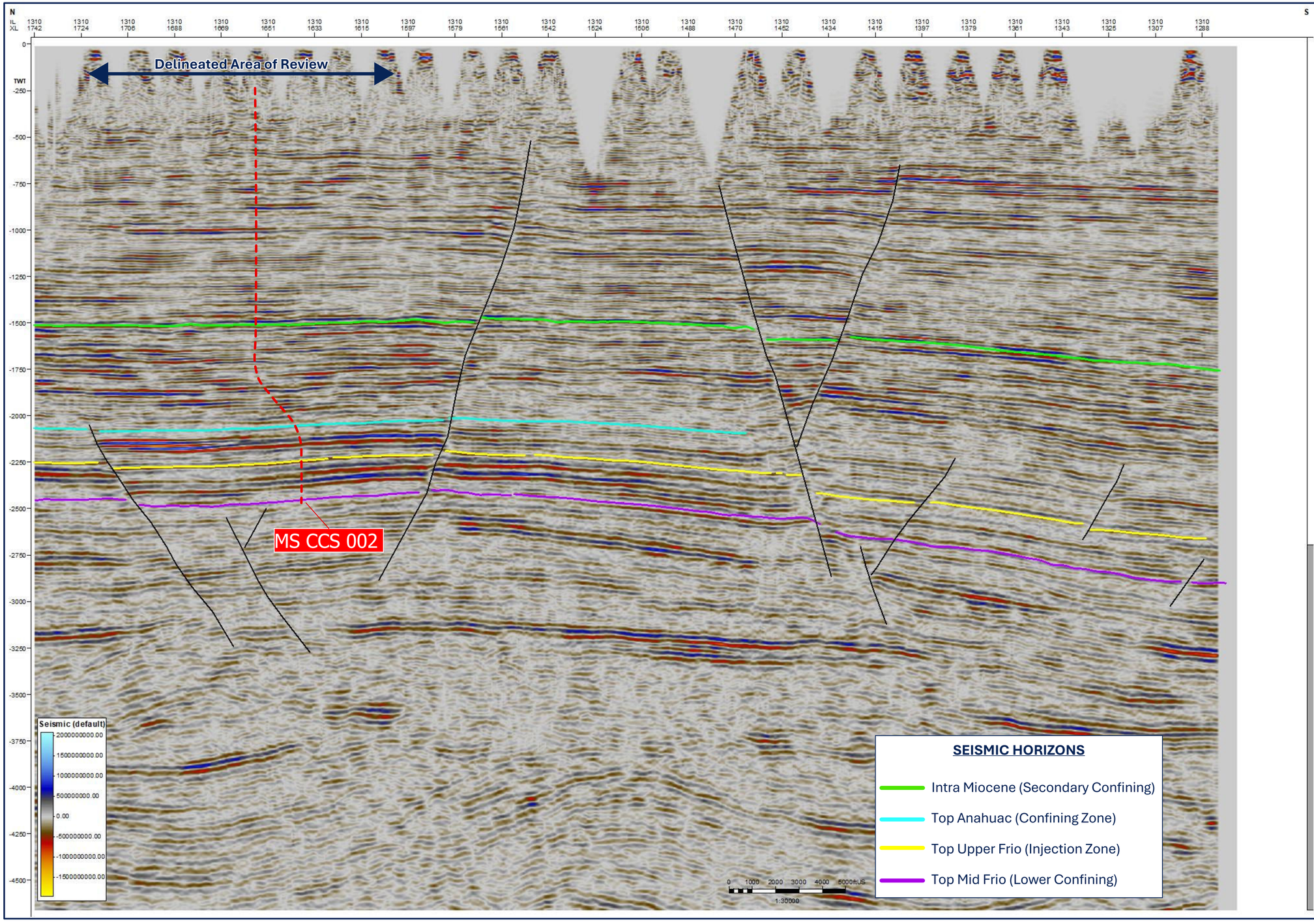
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FIGURE 2.3.1-6

Black Bayou 3D: InLine 1310 Through MS CCS 002

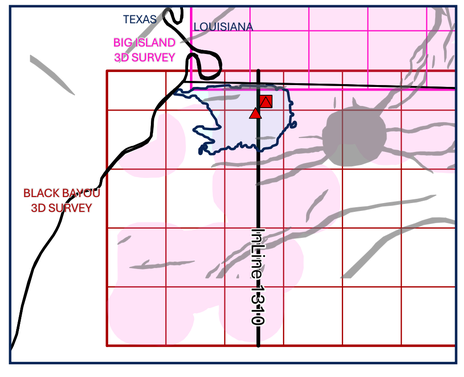
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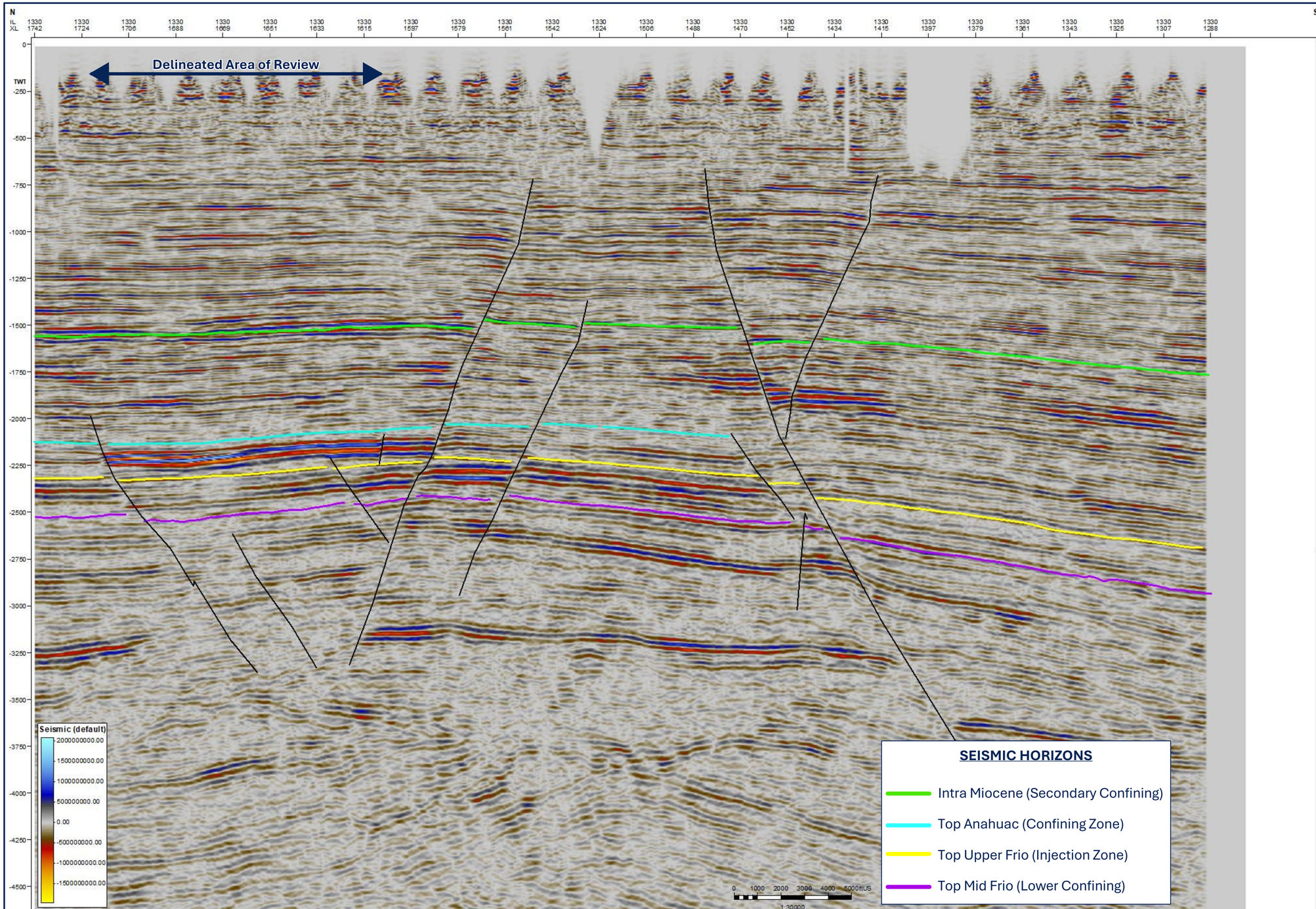
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FIGURE 2.3.1-7

Black Bayou 3D: InLine 1330

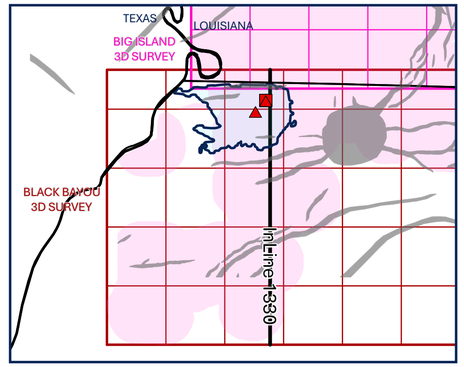
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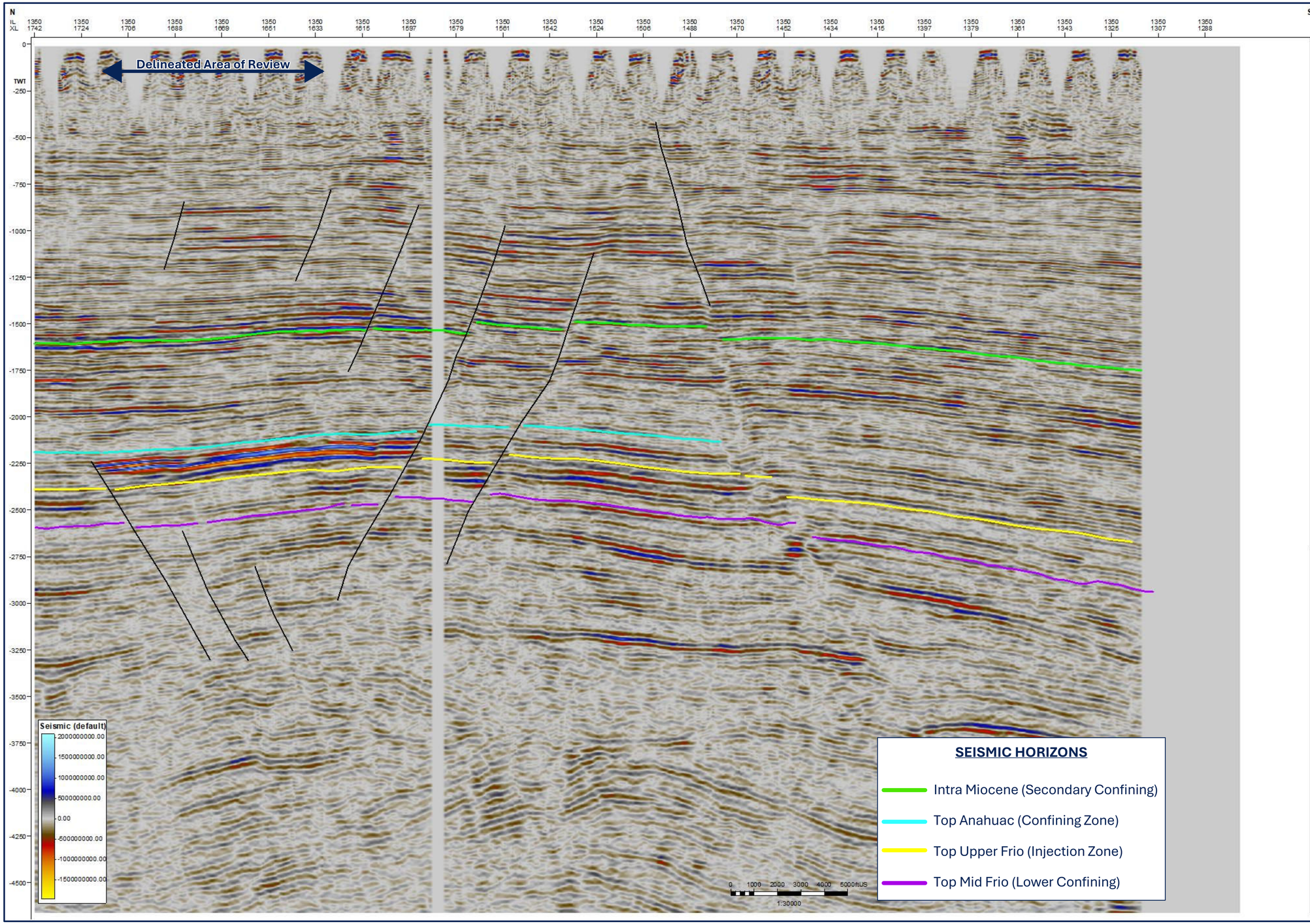
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FIGURE 2.3.1-8

Black Bayou 3D: InLine 1350

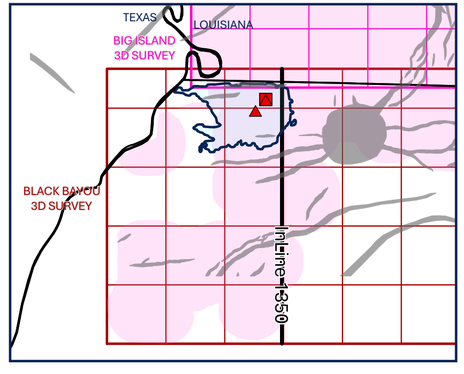
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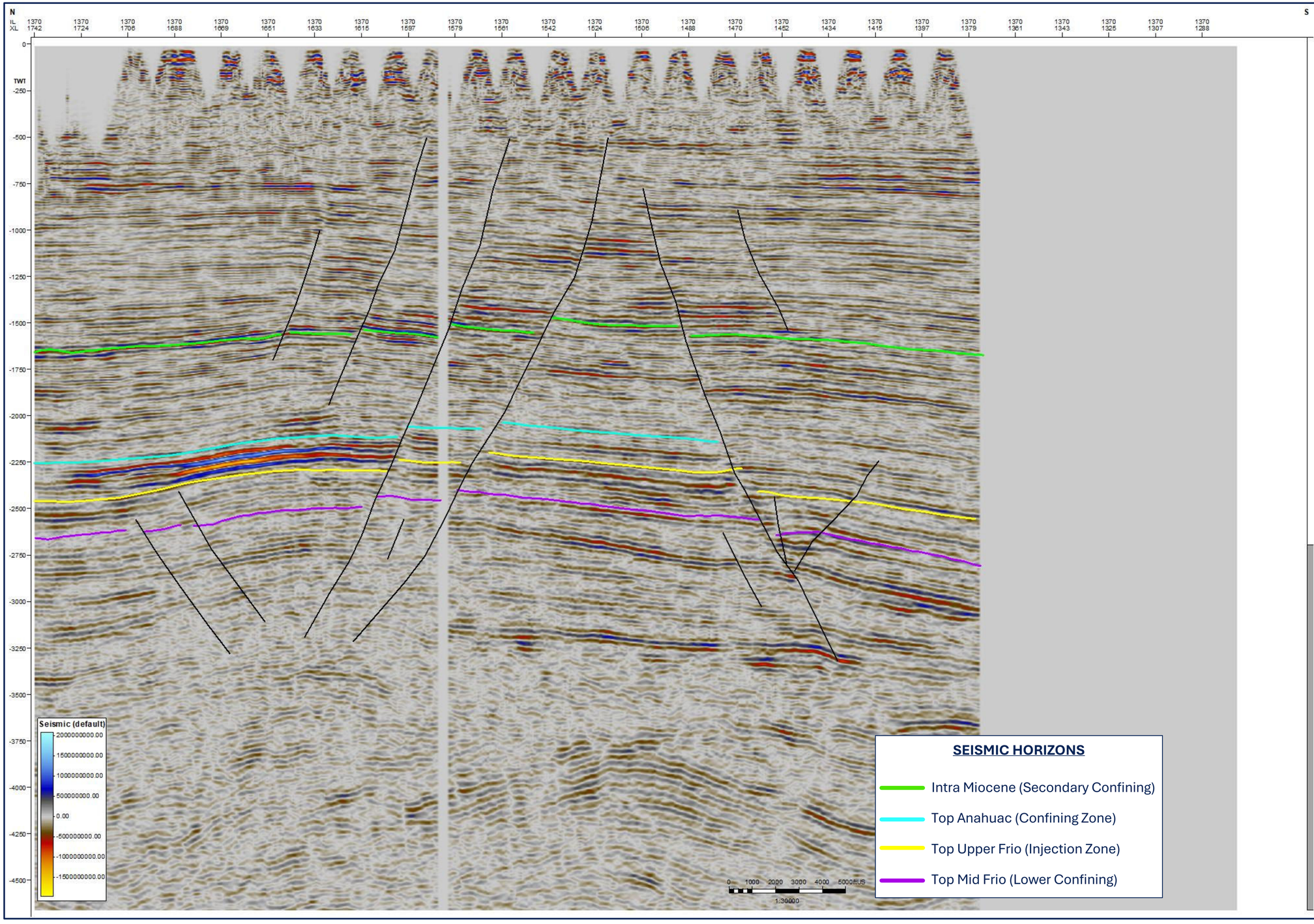
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FIGURE 2.3.1-9

Black Bayou 3D: InLine 1370

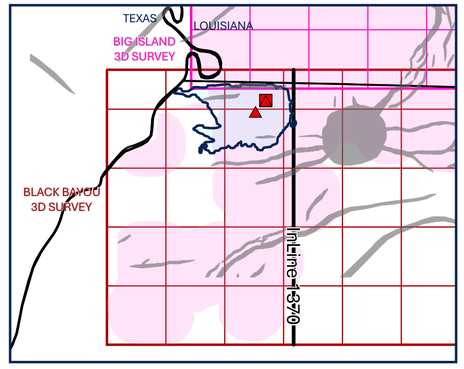
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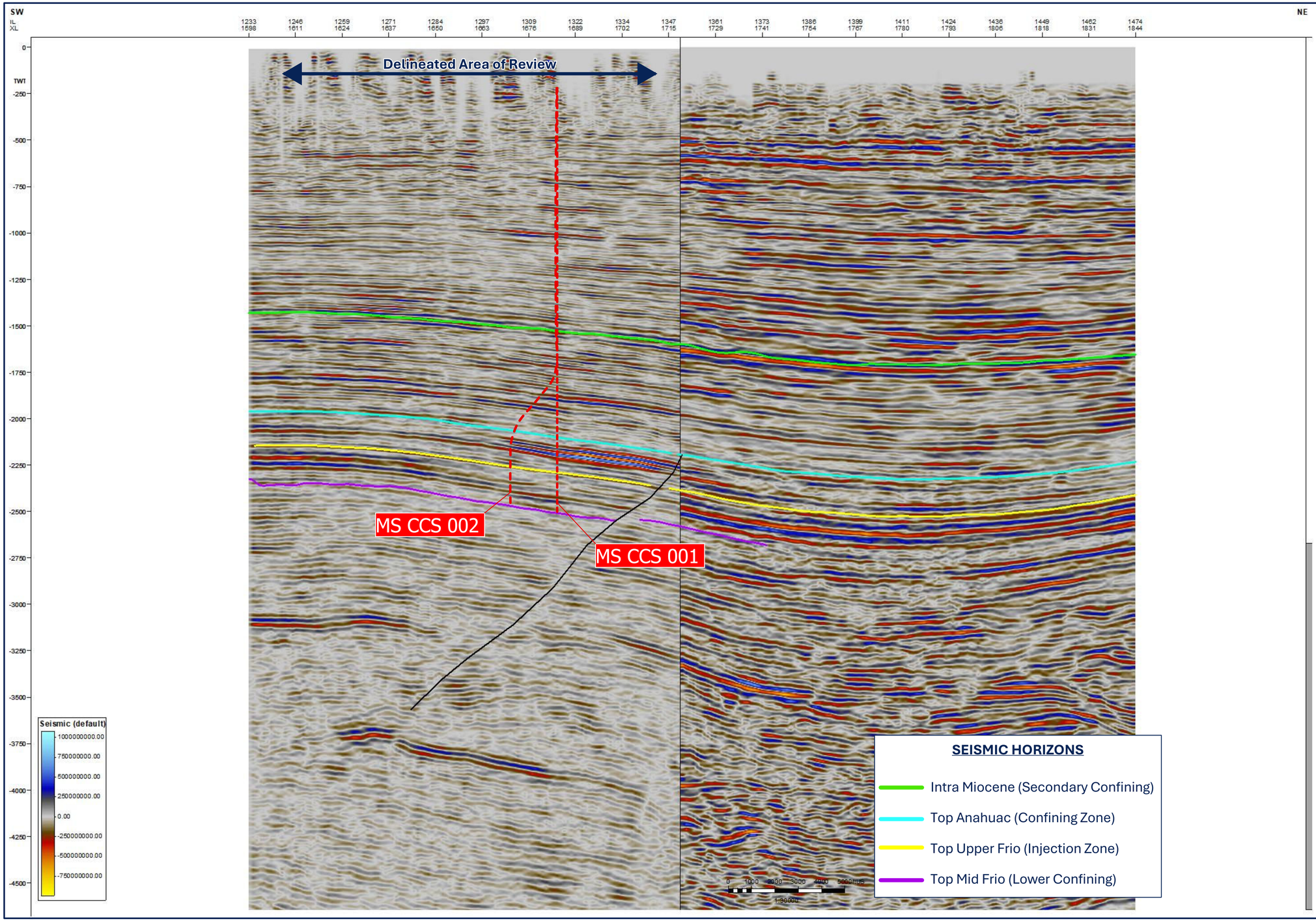
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FIGURE 2.3.1-10

Black Bayou 3D: Composite NE-SW Line Through MS CCS 001 & MS CCS 002

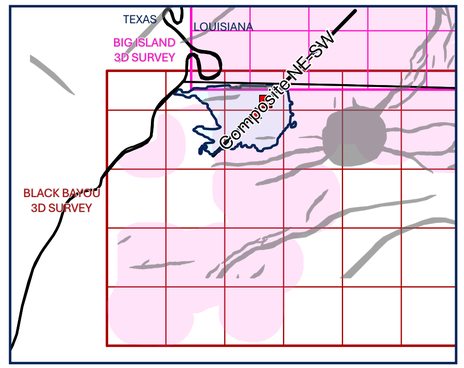
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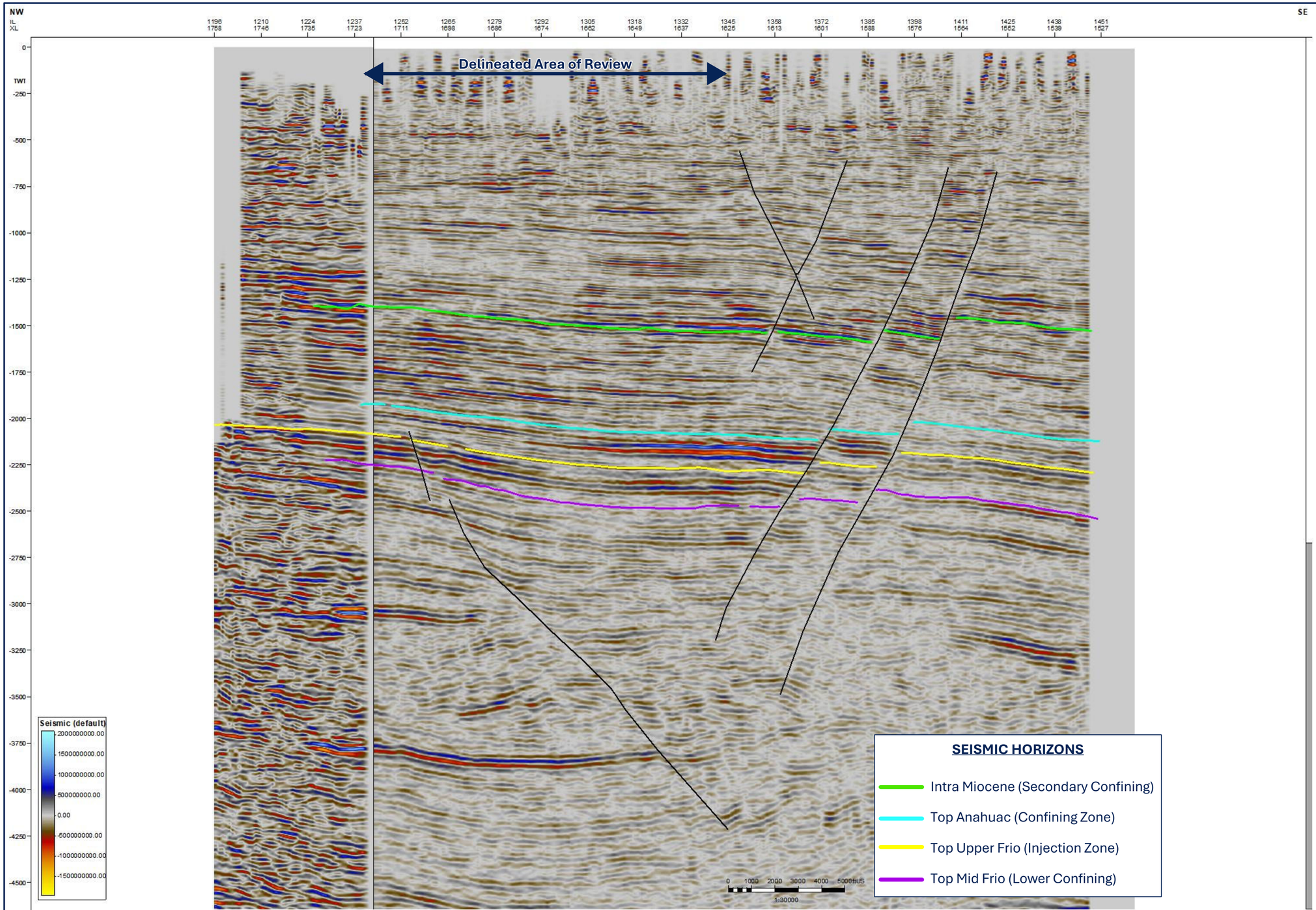
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FIGURE 2.3.1-11

Black Bayou 3D: Composite NW-SE Line

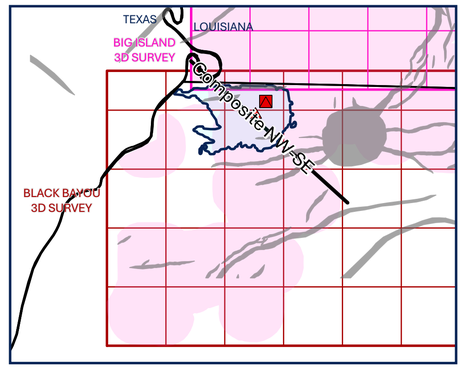
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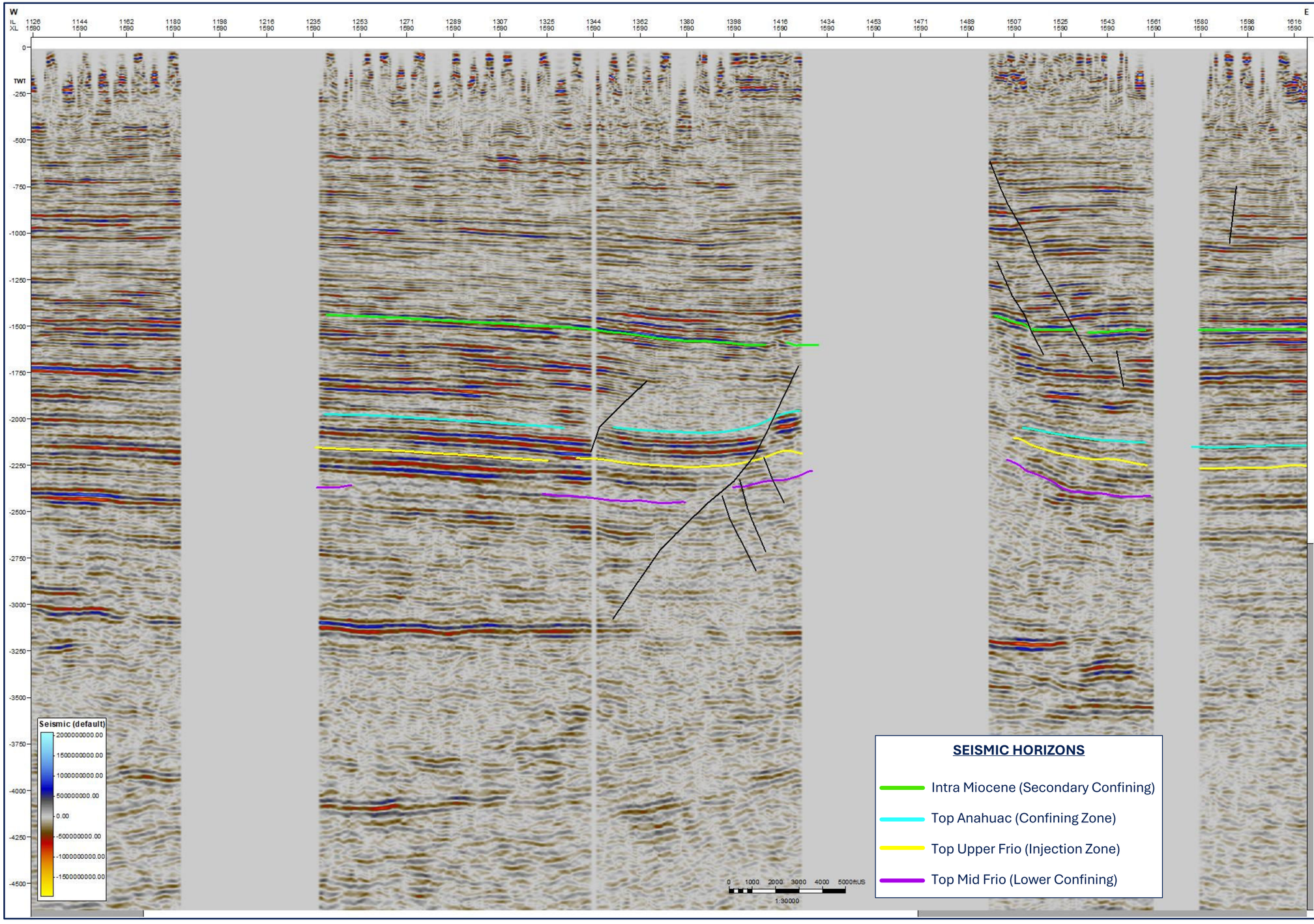
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SEISMIC HORIZONS

- Intra Miocene (Secondary Confining)
- Top Anahuac (Confining Zone)
- Top Upper Frio (Injection Zone)
- Top Mid Frio (Lower Confining)

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FIGURE 2.3.1-12

Black Bayou 3D: XLine 1590

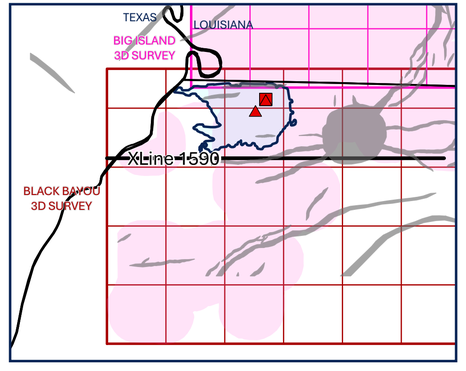
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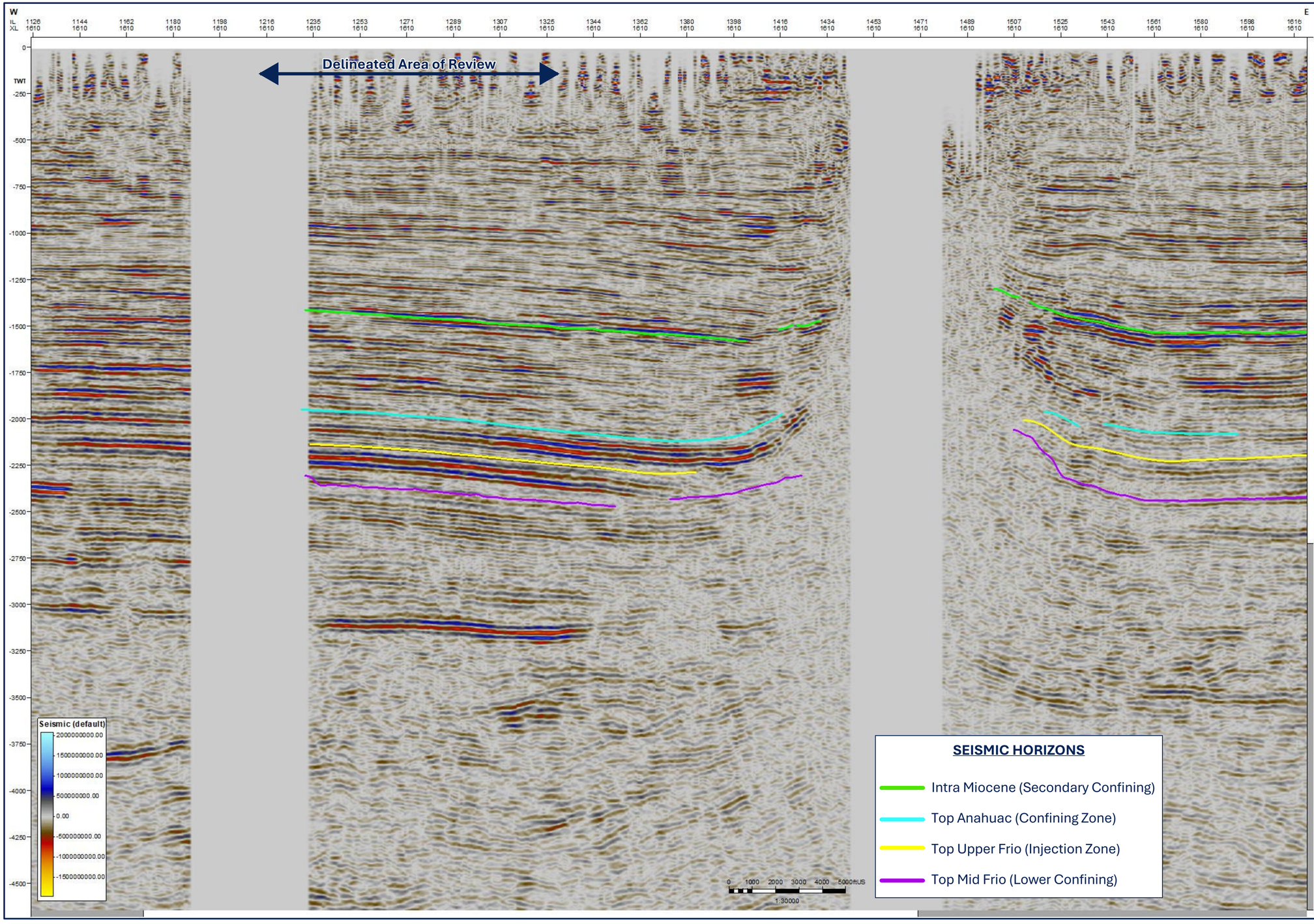
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SEISMIC HORIZONS

- Intra Miocene (Secondary Confining)
- Top Anahuac (Confining Zone)
- Top Upper Frio (Injection Zone)
- Top Mid Frio (Lower Confining)

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FIGURE 2.3.1-13

Black Bayou 3D: XLine 1610

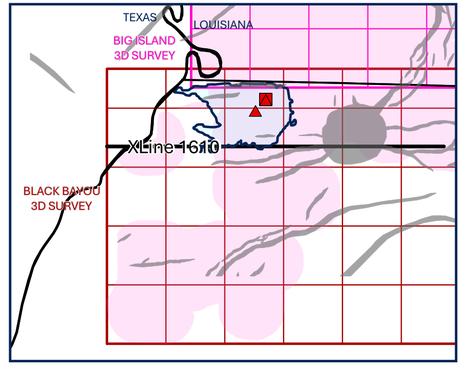
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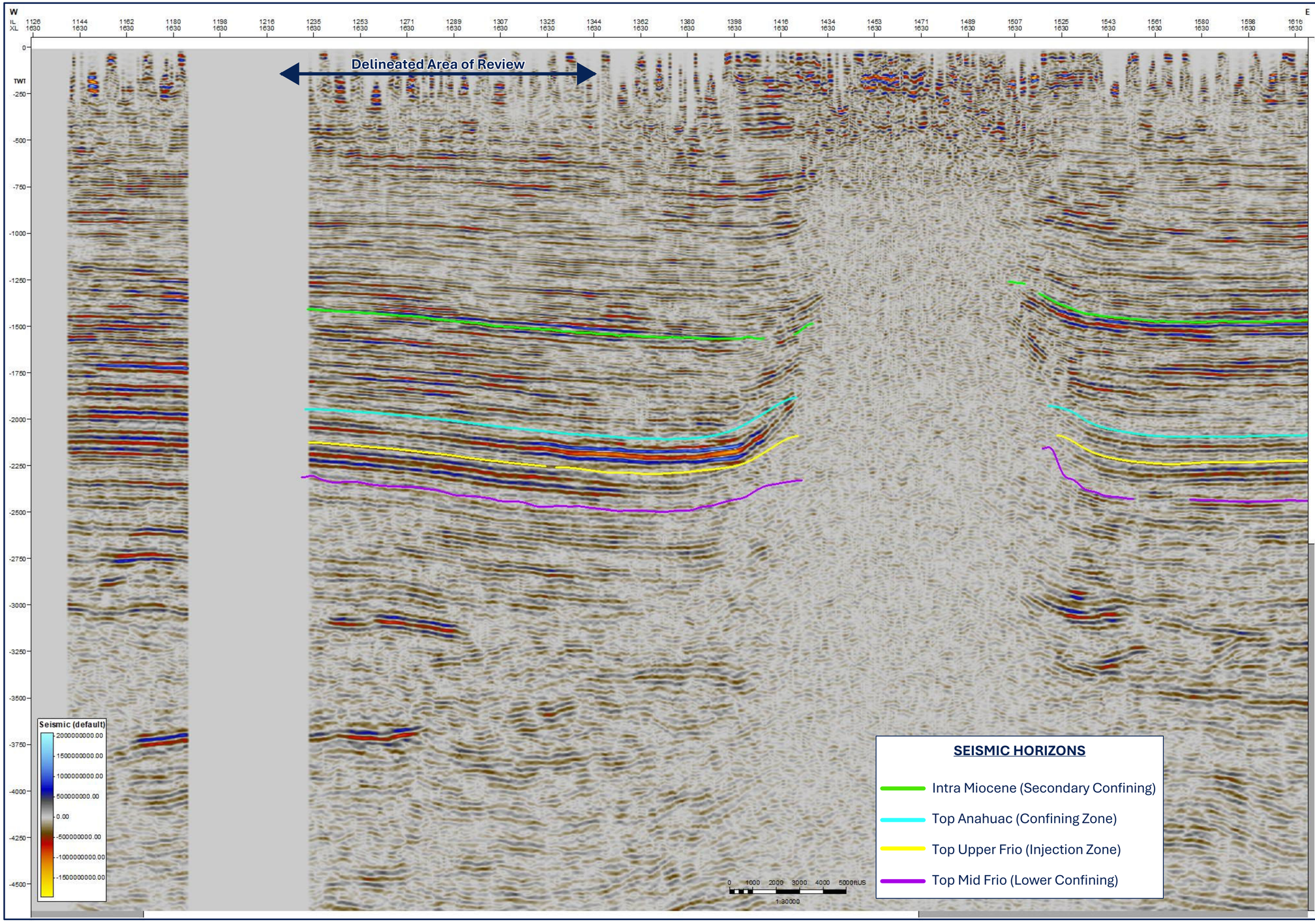
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FIGURE 2.3.1-14

Black Bayou 3D: XLine 1630

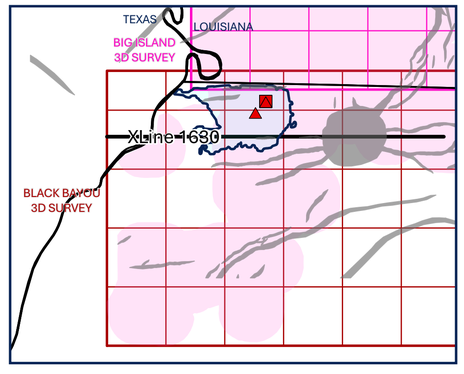
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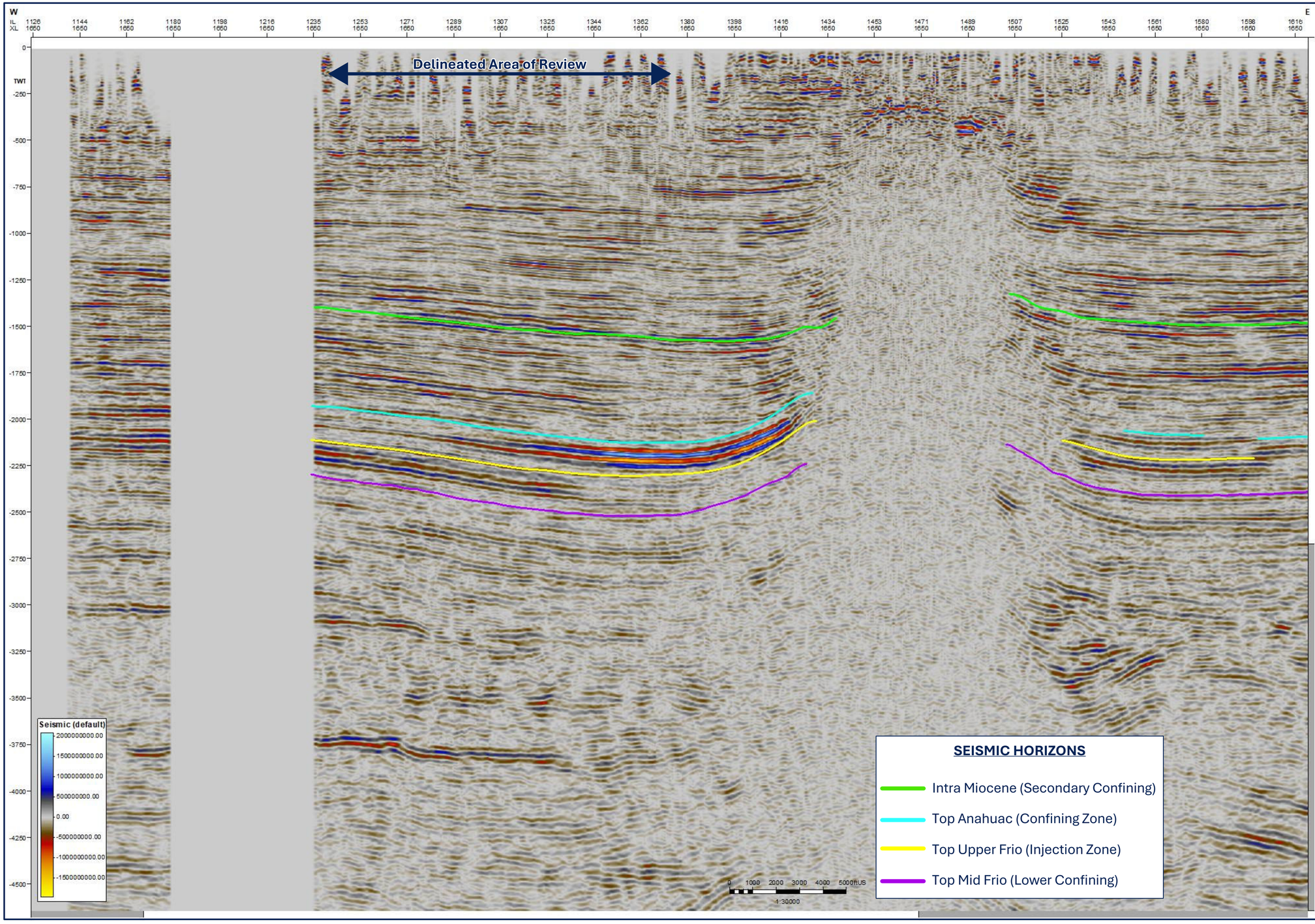
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FIGURE 2.3.1-15

Black Bayou 3D: XLine 1650

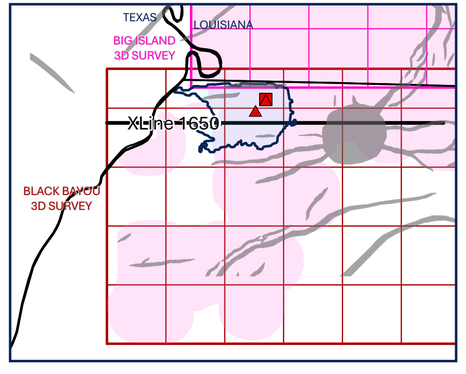
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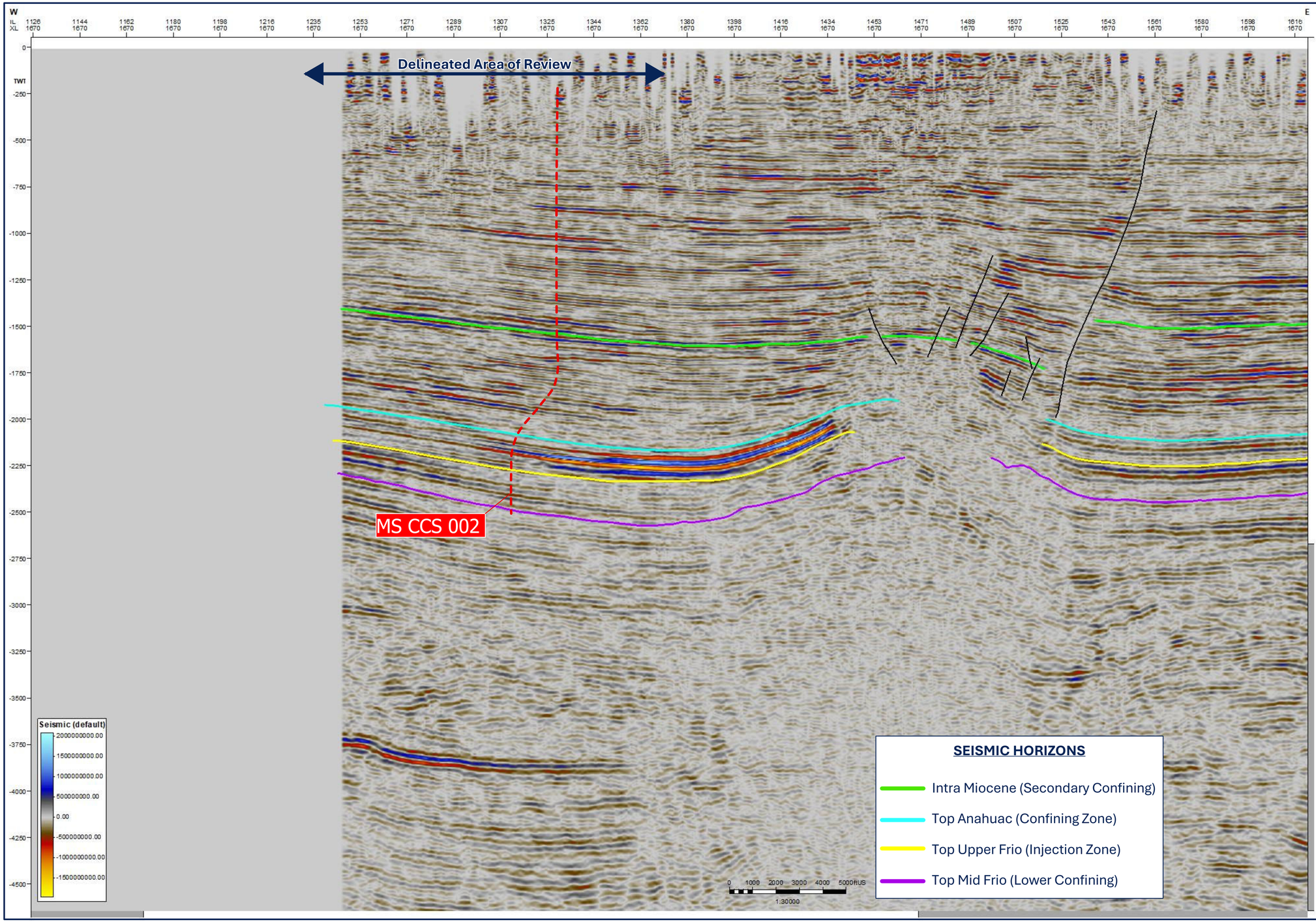
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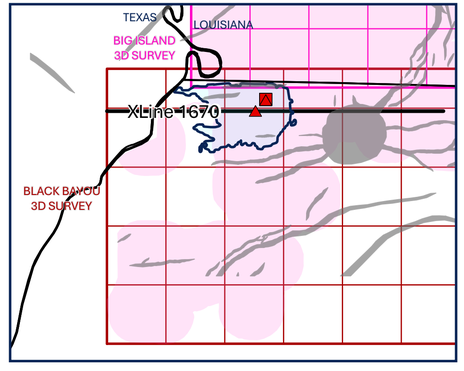
LDENR APPL NOS: 45031 & 45032



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MAP SCALE	1:30,000
PAGE SIZE	28.88 W X 16.60 H





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FIGURE 2.3.1-16

Black Bayou 3D: XLine 1670 Through MS CCS 002

PROJECT MINERVA

MINERVA SOUTH CCS WELL NOS. 001 & 002

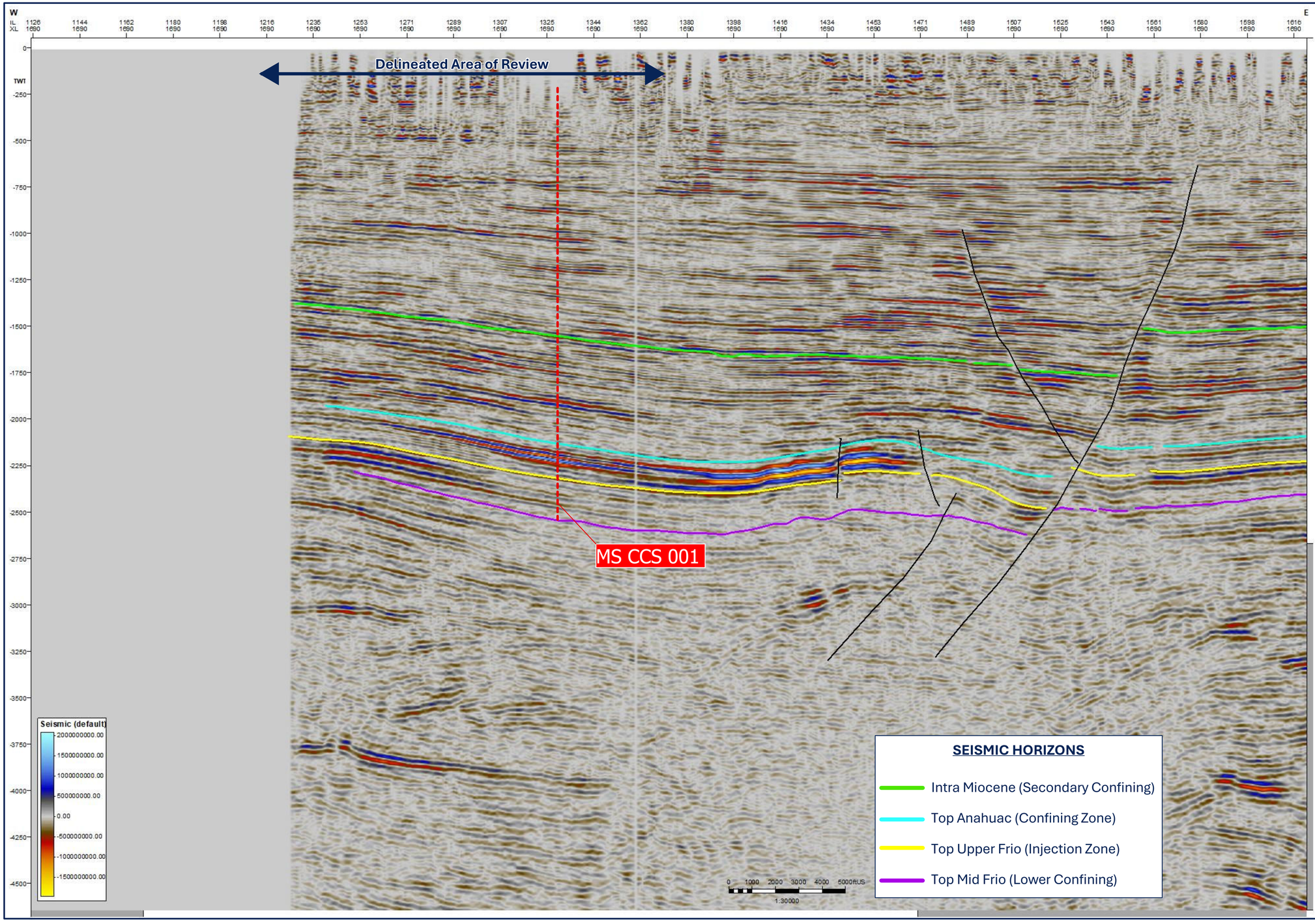
CAMERON PARISH, LA

PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032

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FIGURE 2.3.1-17

Black Bayou 3D: XLine 1690 Through MS CCS 001

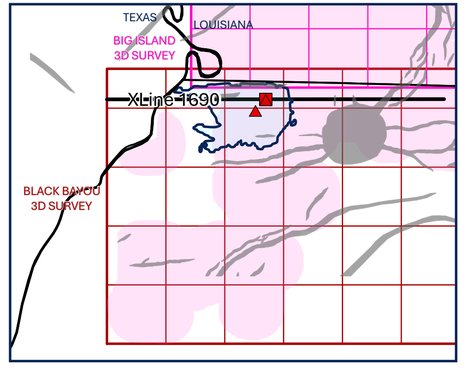
PROJECT MINERVA

MINERVA SOUTH CCS WELL NOS. 001 & 002

CAMERON PARISH, LA

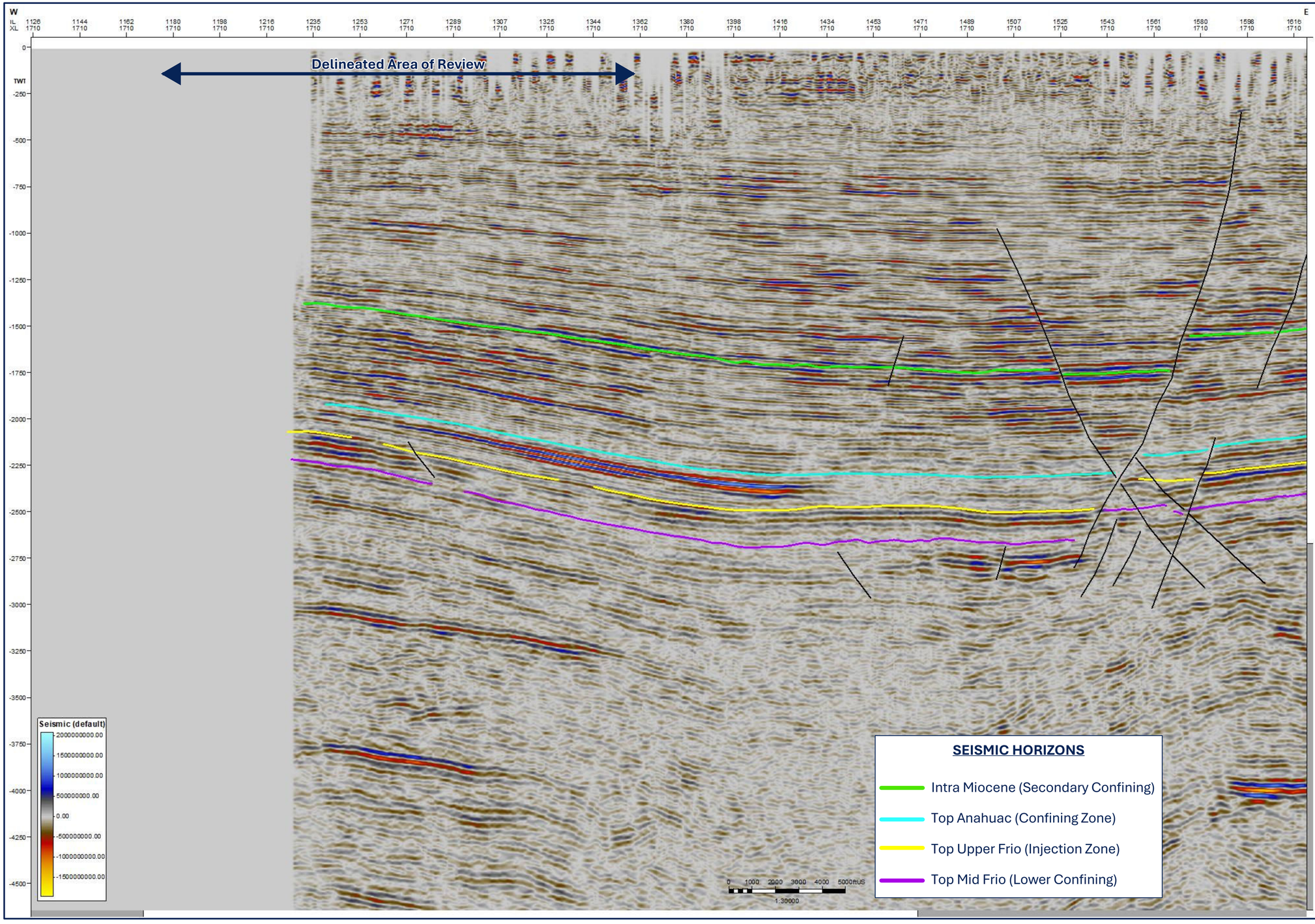
PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032



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APPROVED BY	K GARRETT
DATE APPROVED	8/21/2024
MAP SCALE	1:30,000
PAGE SIZE	28.88 W X 16.60 H



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FIGURE 2.3.1-18

Black Bayou 3D: XLine 1710

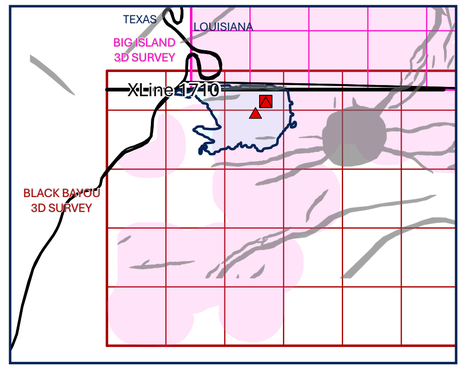
PROJECT MINERVA

MINERVA SOUTH CCS WELL NOS. 001 & 002

CAMERON PARISH, LA

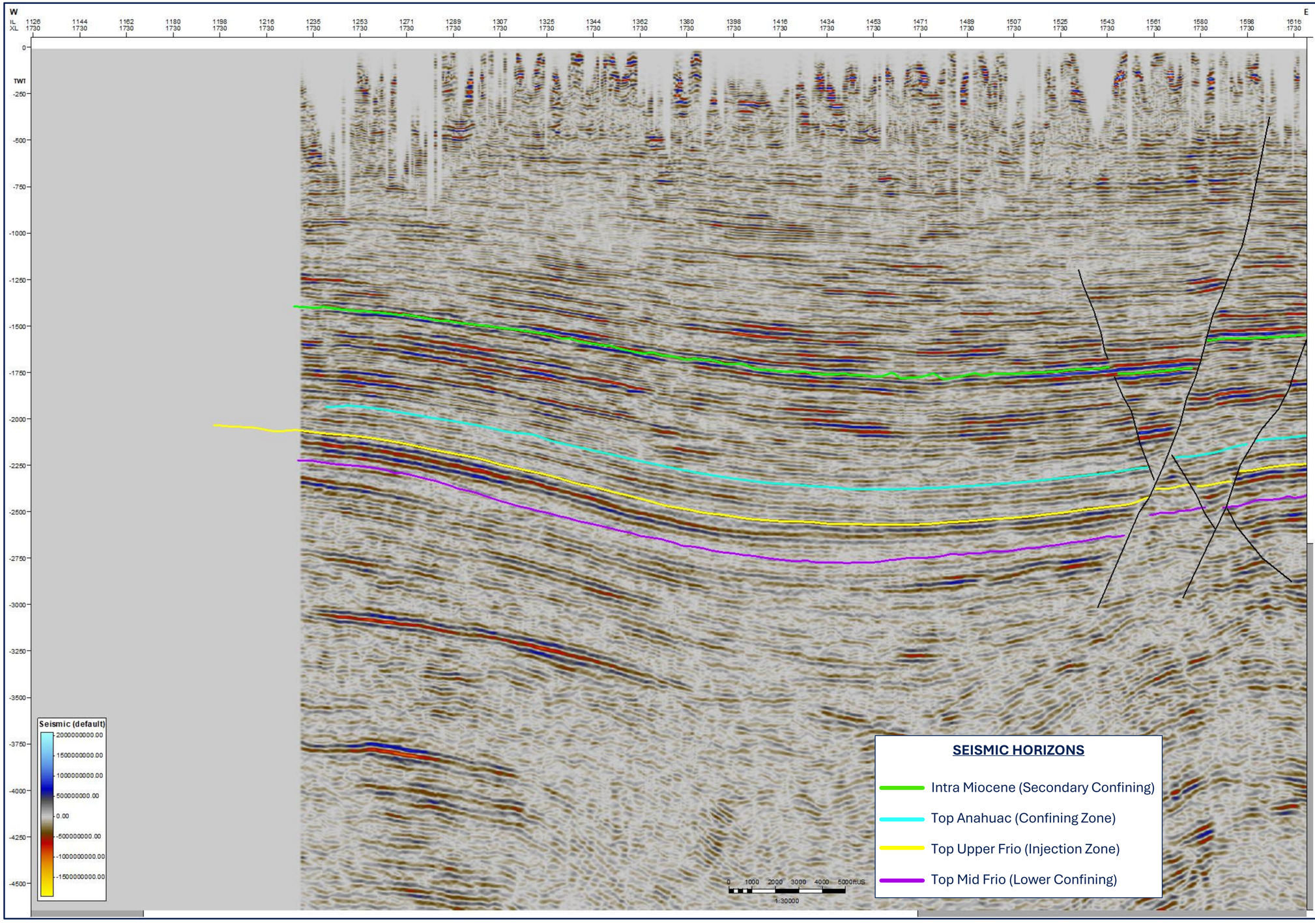
PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032



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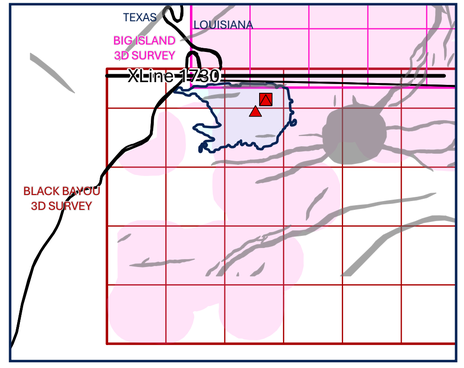
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DATE APPROVED	8/21/2024
MAP SCALE	1:30,000
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FIGURE 2.3.1-19
Black Bayou 3D: XLine 1730

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PROJECT ID: R06-LA-0002
LDENR APPL NOS: 45031 & 45032

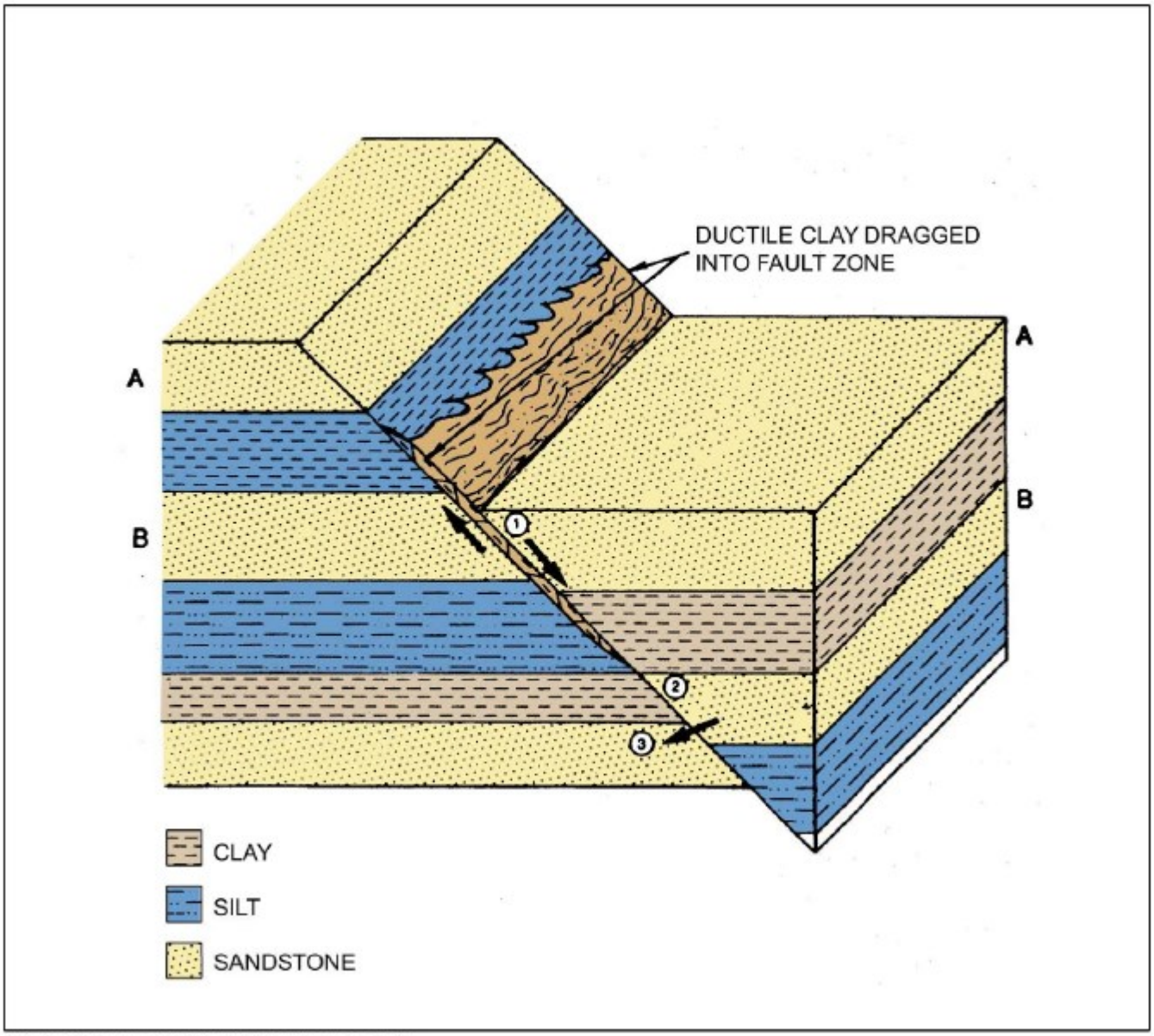


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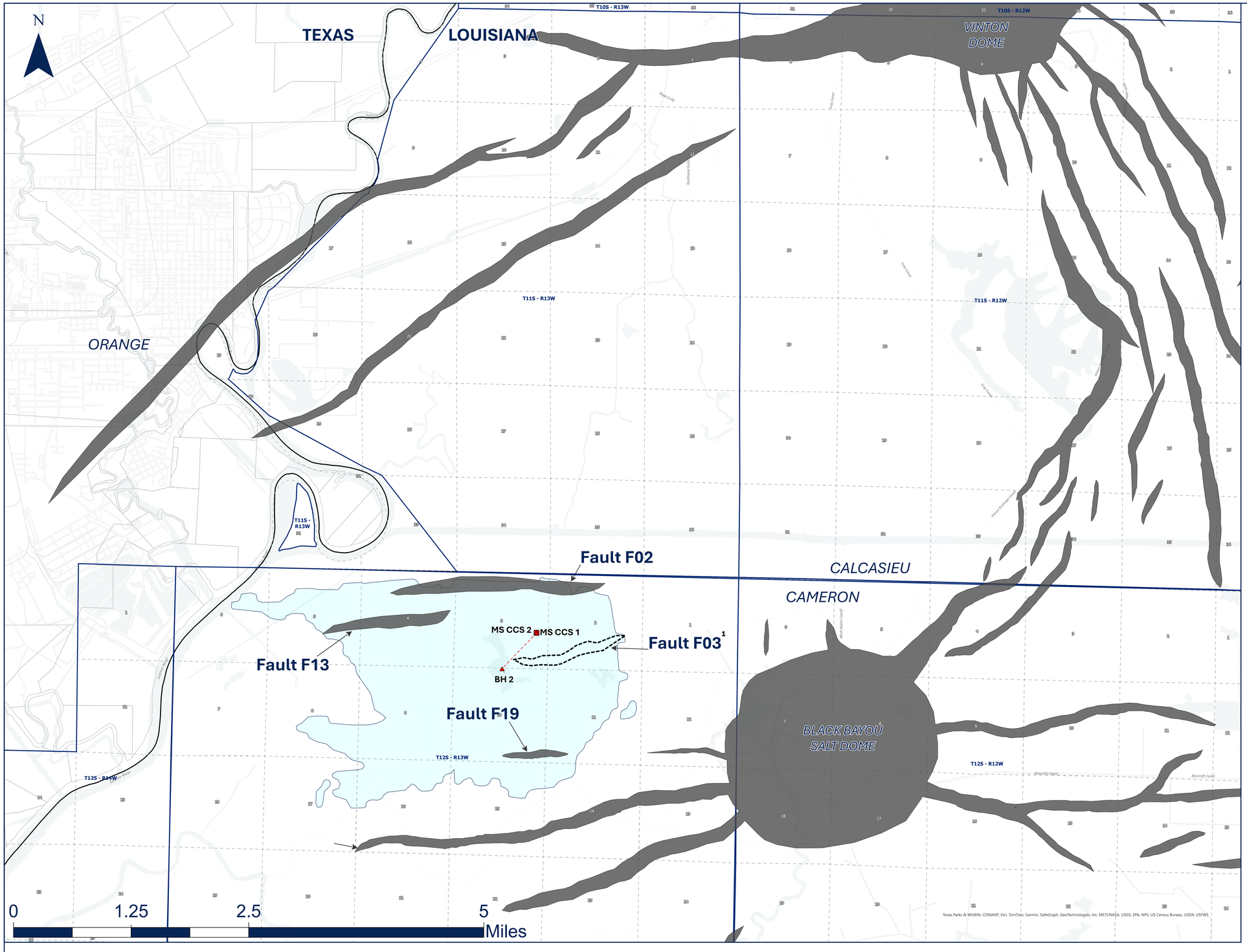
Figure 2.7.2-1 Sealing and Non-Sealing Faults in Louisiana Gulf Coast



Adapted & Revised 5/05/05 ESSJ Sandia Technologies

Modified from Smith, 1980 and Downey, 1984

1. Dragging of ductile cays into fault plane during faulting creates clay seal between two sandstones (**A** and **B**)
2. Juxtaposition of reservoir impermeable clay bed
3. Sandstone-to-sandstone window, or leak in fault plan creating possible spillpoint to migrating



1. Fault tips-out in Mid Frio Formation. Projected intersect at Upper Frio Formation shown.

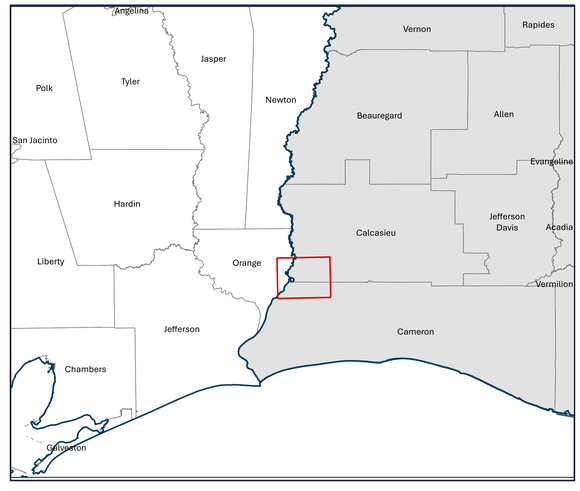
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FIGURE 2.3.3-1
Faults Included in Fault Slip Potential Analysis

MAP LEGEND

- Top Upper Frio Faults
- Projected Upper Frio Fault
- Delineated Area of Review
- PLSS Townships & Ranges
- PLSS Sections
- SONRIS Parishes
- TXRRC Abstracts
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory

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SPATIAL REFERENCE

PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

Figure 2.3.3-2 Fault F02 Divisions, 13 Segments Based on Similar Dip Azimuth Trends

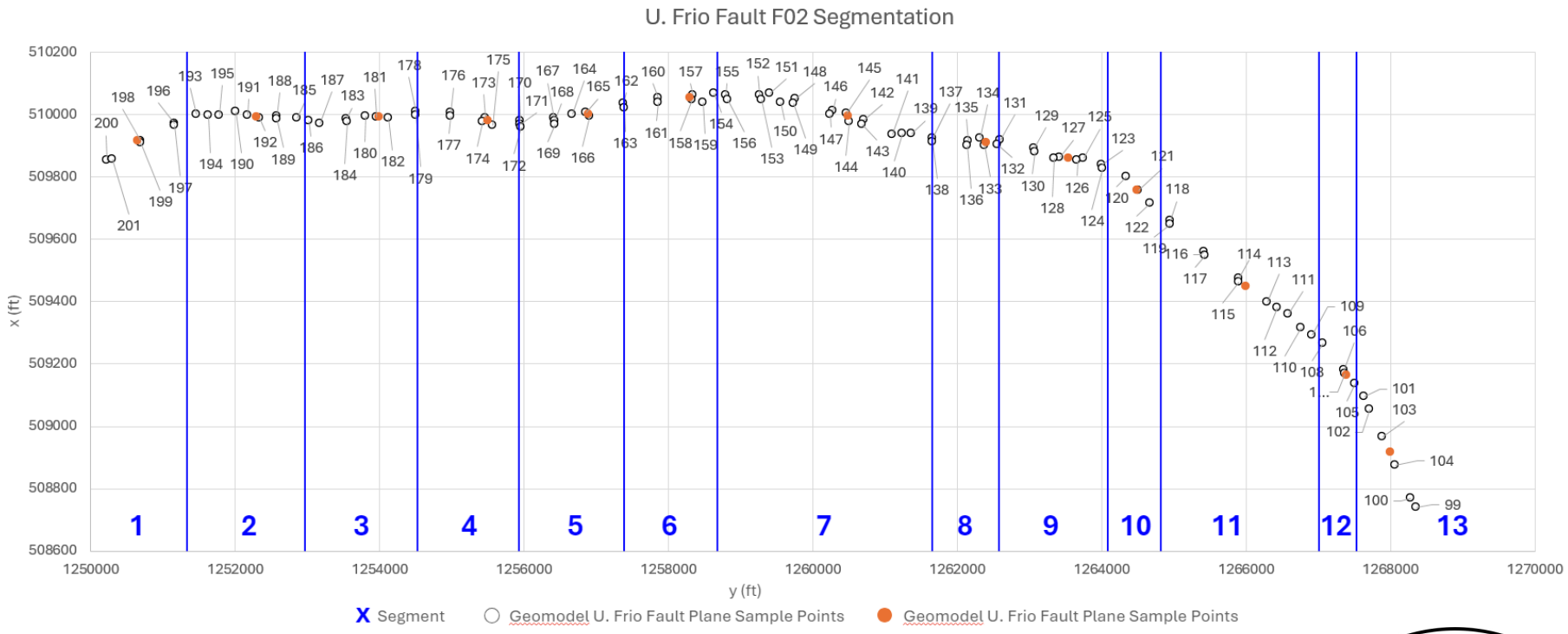




Figure 2.3.3-3 Fault F13 Divisions, 3 Segments Based on Similar Dip Azimuth Trends

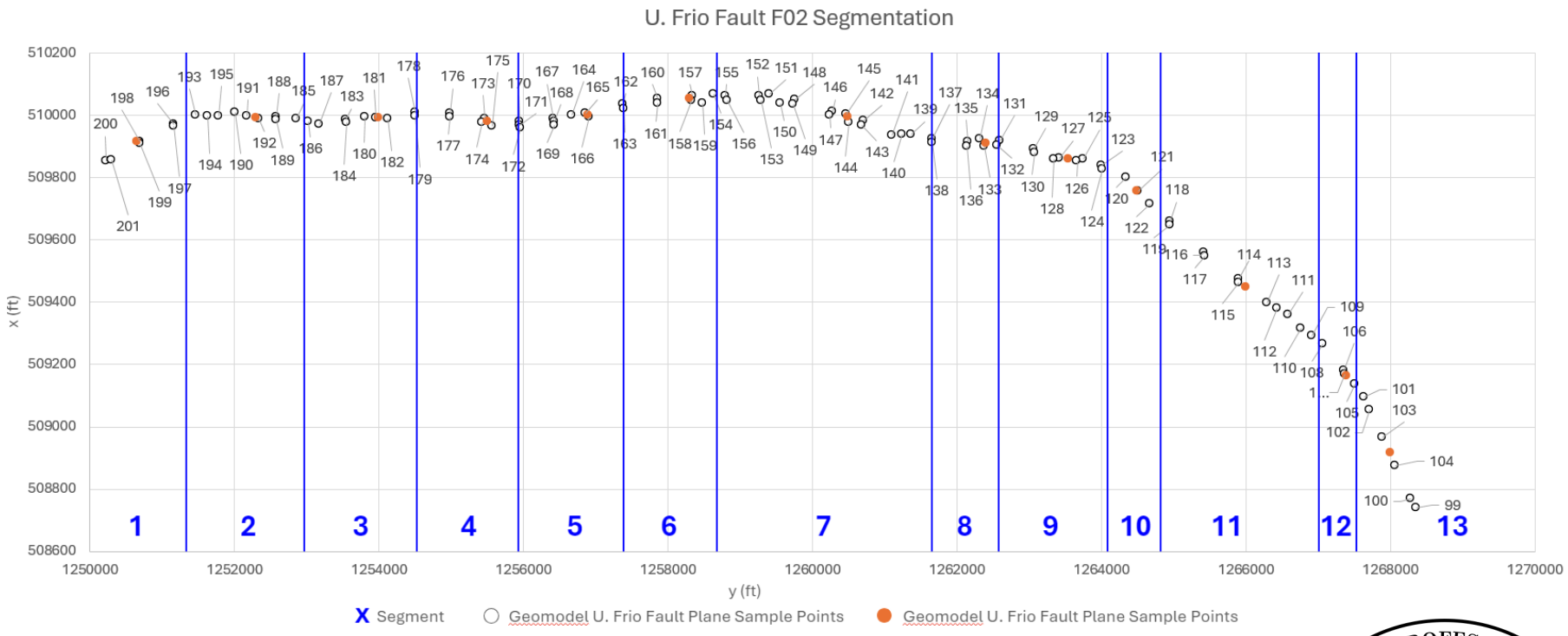




Figure 2.3.3-4 Fault F03 Divisions, 3 Segments Based on Similar Dip Azimuth Trends

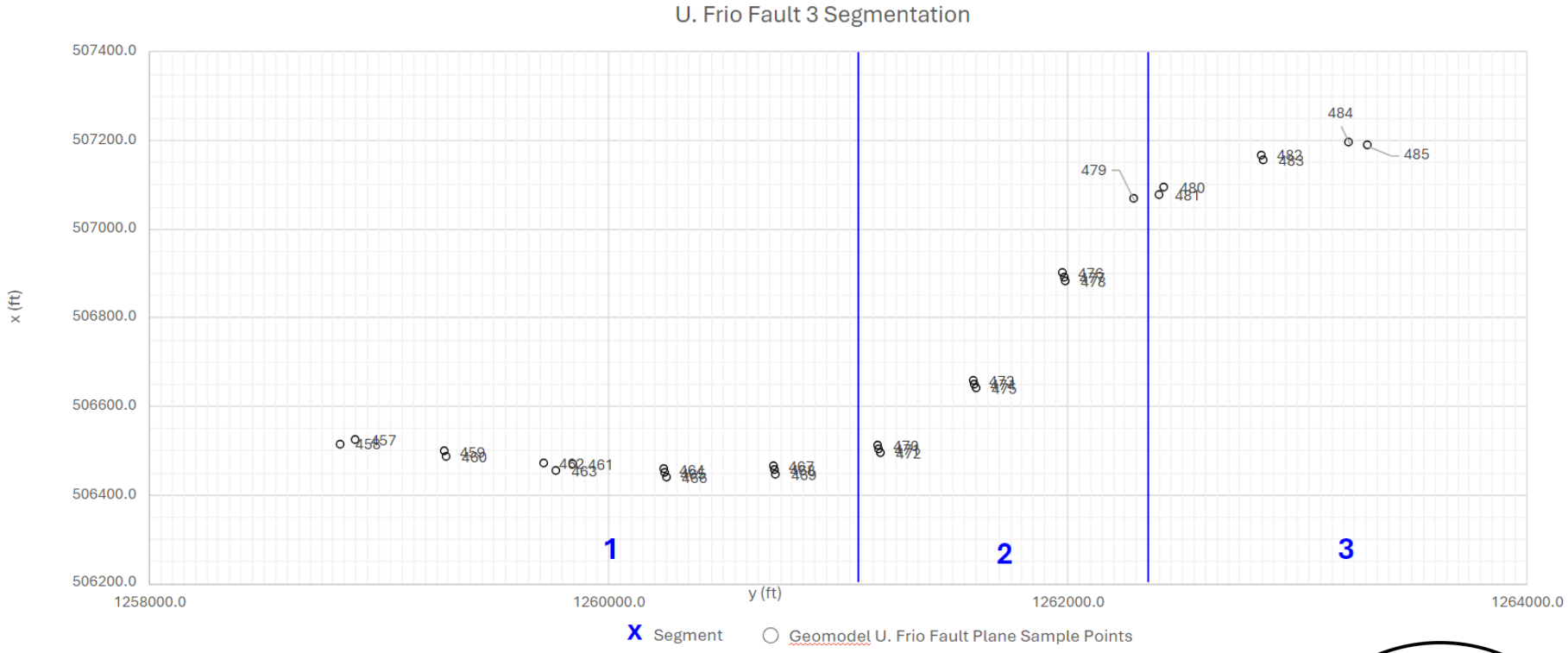
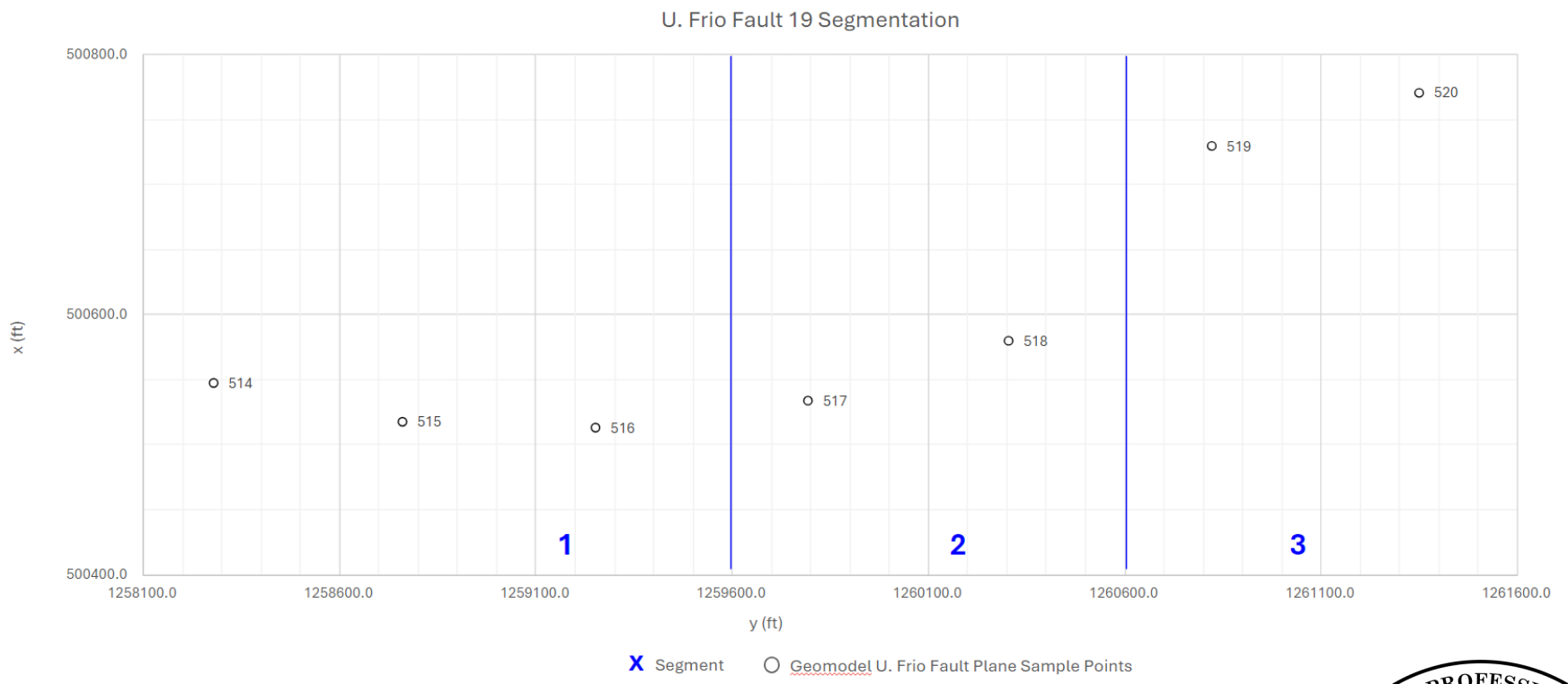
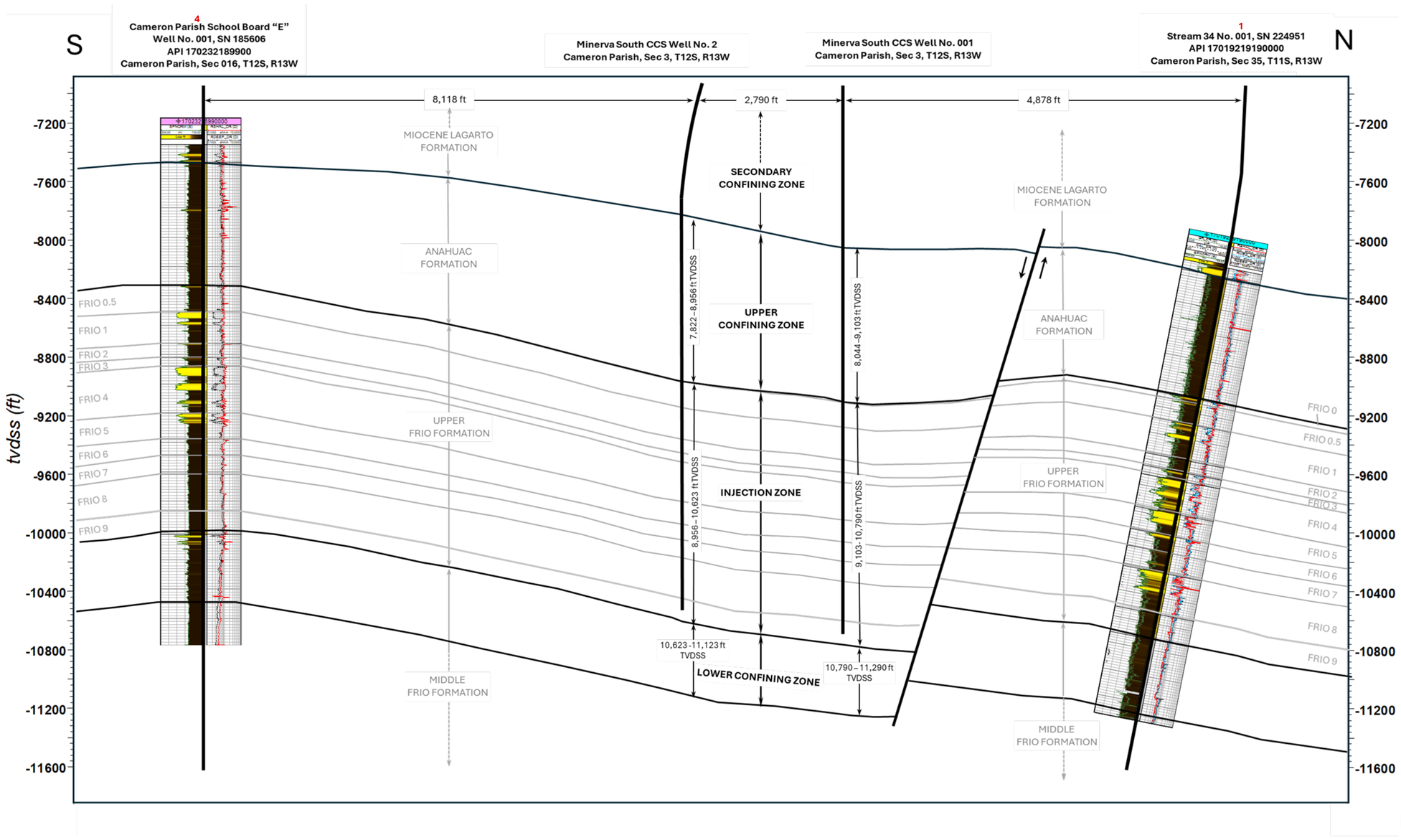




Figure 2.3.3-5 Fault F19 Divisions, 3 Segments Based on Similar Dip Azimuth Trends







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FIGURE 2.4.2-1
Regulatory Zones Type Section

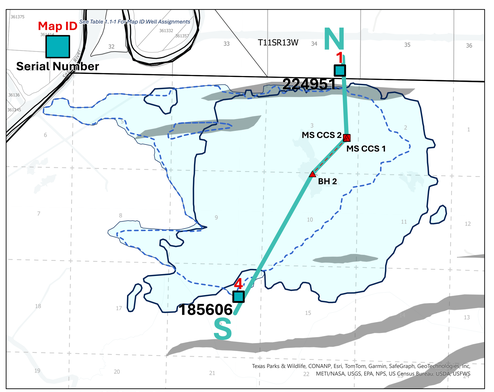
PROJECT MINERVA

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CAMERON PARISH, LA

PROJECT ID: R06-LA-0002

LDENR APPL NOS: 45031 & 45032

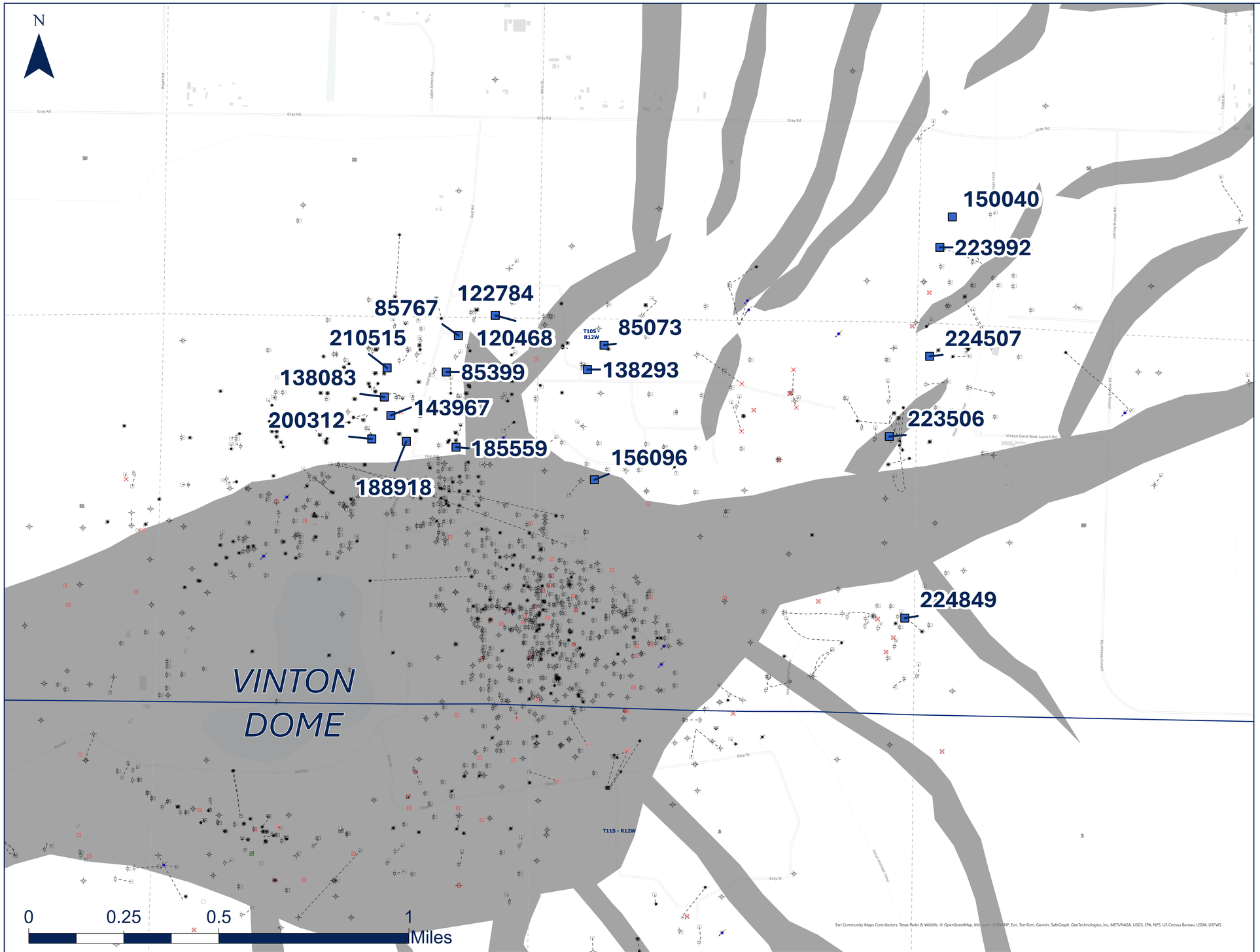


Note: See Table 2.2.1-1 For Tabulated Data on Regulatory Zones

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FIGURE 2.4.2-2
Anahuac and Frio Core Samples Collected near Vinton Dome

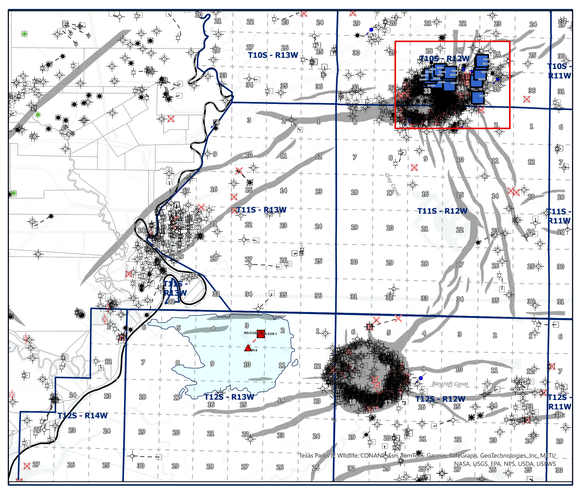
MAP LEGEND

- Top Upper Frio Faults
- PLSS Townships & Ranges
- PLSS Sections
- SONRIS Parishes
- TXRRC Abstracts
- Cored Well
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Serial Number



Note: See Table 2.5.2-1 For Information about Collected Cores

MAP DETAILS

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SPATIAL REFERENCE

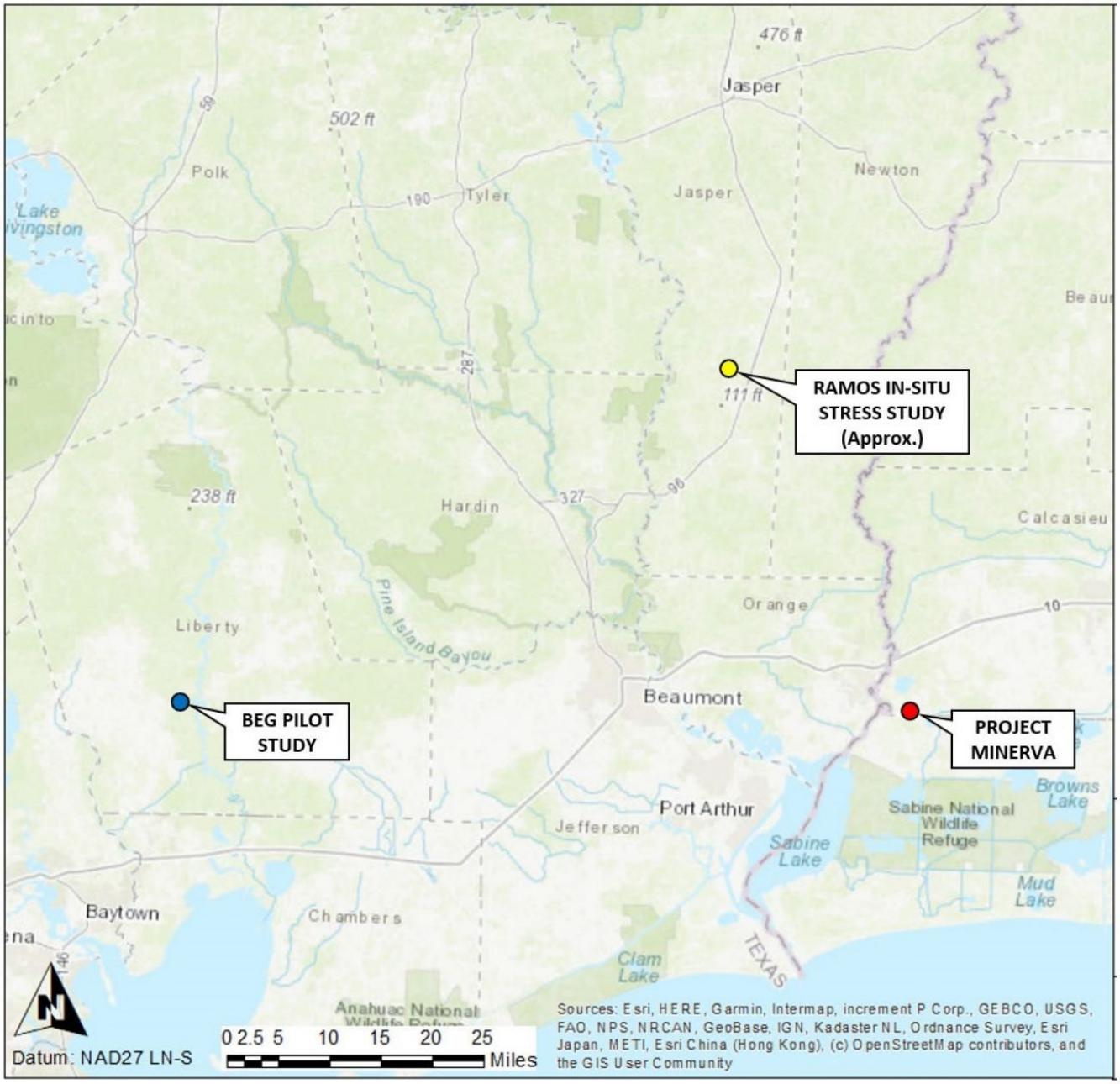
PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

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Figure 2.5.1-1 Locations of BEG Pilot and Ramos Studies



Havorka et al., (2008) and Ramos et al.,(1994)

Figure 2.5.1-2 Determination of Direction of Maximum Horizontal Stress

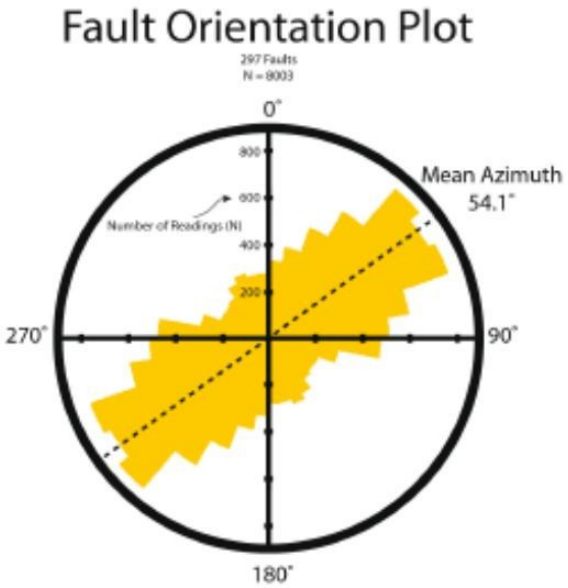


Figure 24. Regional fault strike rose diagram. Fault orientation plot of 297 faults mapped on the LM2 horizon. Each fault is broken into segments at 500' lateral intervals and the average strike is measured to reduce the bias of smaller faults, resulting in 8003 measurements. Mean azimuth of the fault segments is 54.1°.

(Nicholson, 2012)

Figure 2.5.1-3 Young's Modules and Poisson's Ratio Values

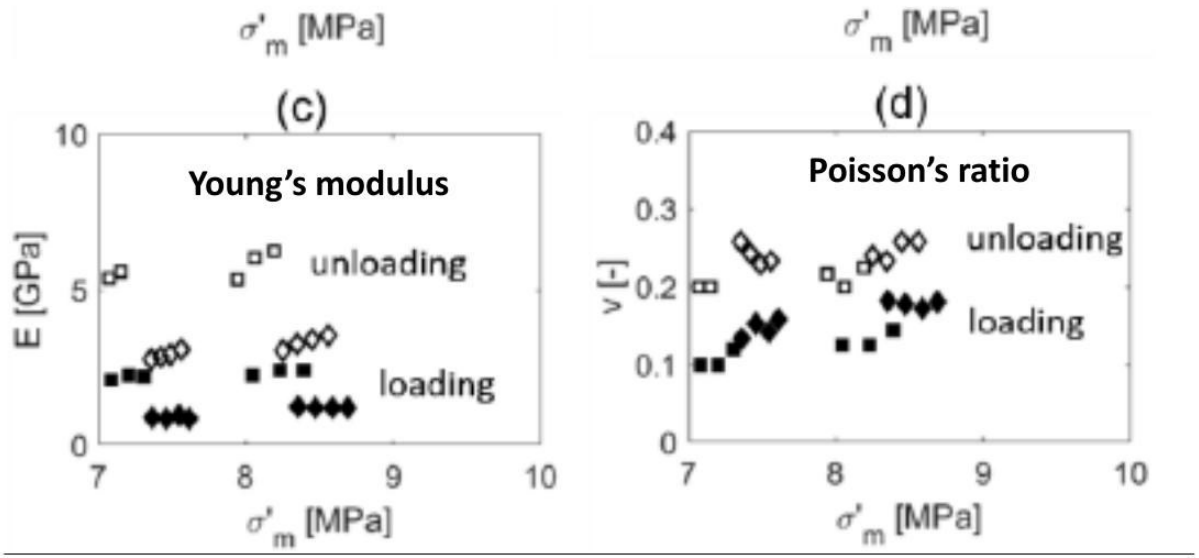


Fig. 3. Summary of all experiments: (a-b) Isotropic path; (c-d) Deviatoric path; (e-f) Uniaxial strain path. In each stage, all the solid markers represent the data during loading, while all the empty markers represent the data during unloading.

(Zheng et al., 2019)

Figure 2.5.1-4 Definitions of Poro-Elastic and Thermo-Elastic Coefficient used in REVEAL

The poro-elastic stress coefficient is defined as:

$$A_P = \alpha_P \frac{E}{(1-\upsilon)} \text{ and } \alpha_P = \frac{\left(1-\frac{c_g}{c_b}\right)(1-2\upsilon)}{E}$$

E is Young's modulus

υ is Poisson's ratio

α_p is the linear poro-elastic expansion coefficient

c_g is the matrix grain compressibility

c_b is the bulk matrix compressibility

$\beta = \left(1-\frac{c_g}{c_b}\right)$ is known as Biot's poro-elastic coefficient, which for consolidated rock is sometimes estimated (Raymer) from porosity.

$$\beta = 1-(1-\phi)^{3.8}$$

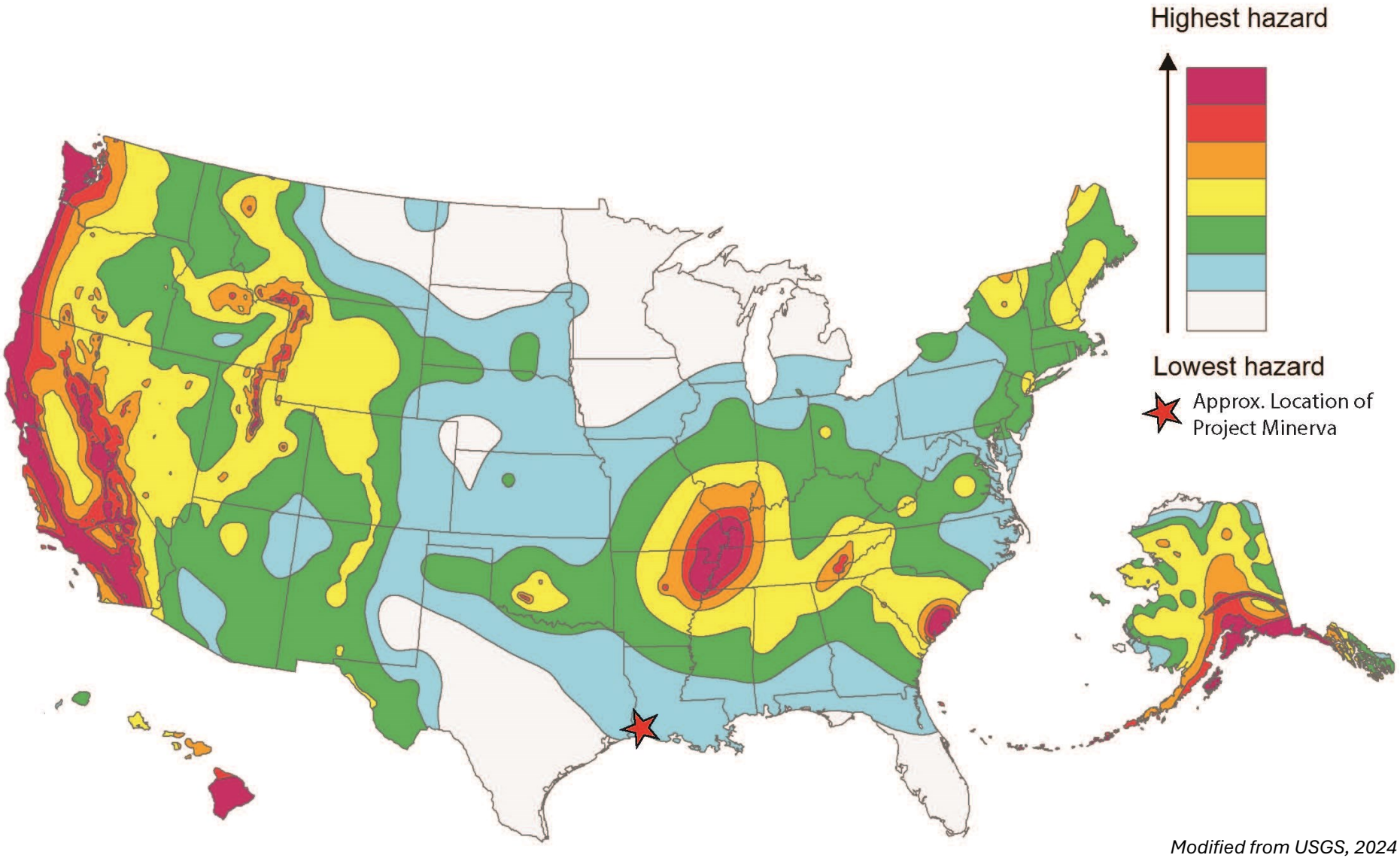
The thermo-elastic stress coefficient is defined as:

$$A_T = \alpha_T \frac{E}{(1-\upsilon)}$$

α_T is the linear thermal expansion coefficient

(p. 372 of the Reveal Manual, IPMV12

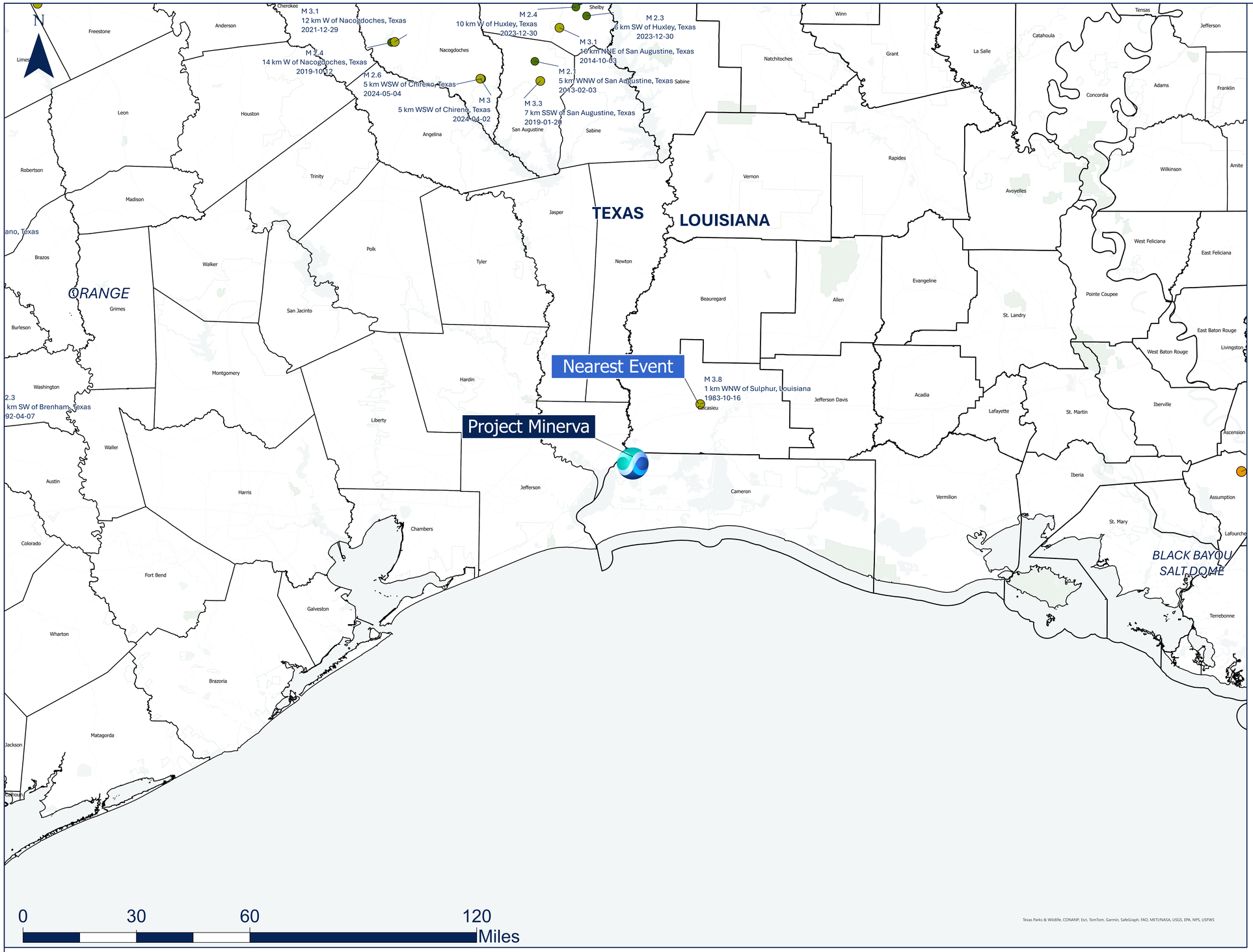
Figure 2.6.2-1 USGS Earthquake Hazards Program's US Seismic Risk Map



Modified from USGS, 2024

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Minerva South CCS Well Nos. 001 & 002	
Project: **Minerva**	Project ID: **R06-LA-0002**
Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**



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FIGURE 2.6.2-2
Seismic Events Within 115-mile Radius of Project Minerva

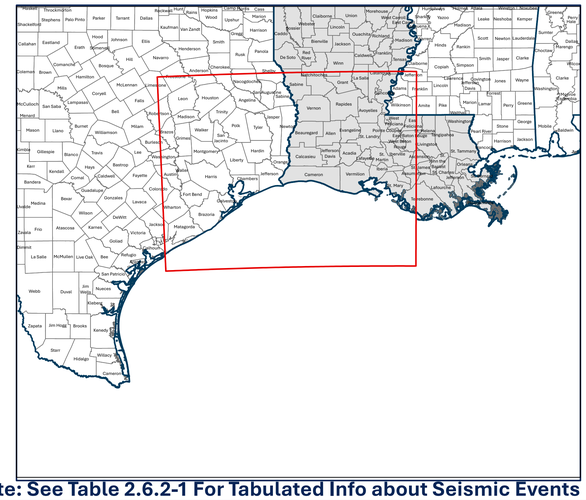
MAP LEGEND

Earthquake Magnitude

- 1-2
- 2-3
- 3-4
- 4-5
- >5

Project Minerva Location

County/Parish Boundary



Note: See Table 2.6.2-1 For Tabulated Info about Seismic Events

MAP DETAILS

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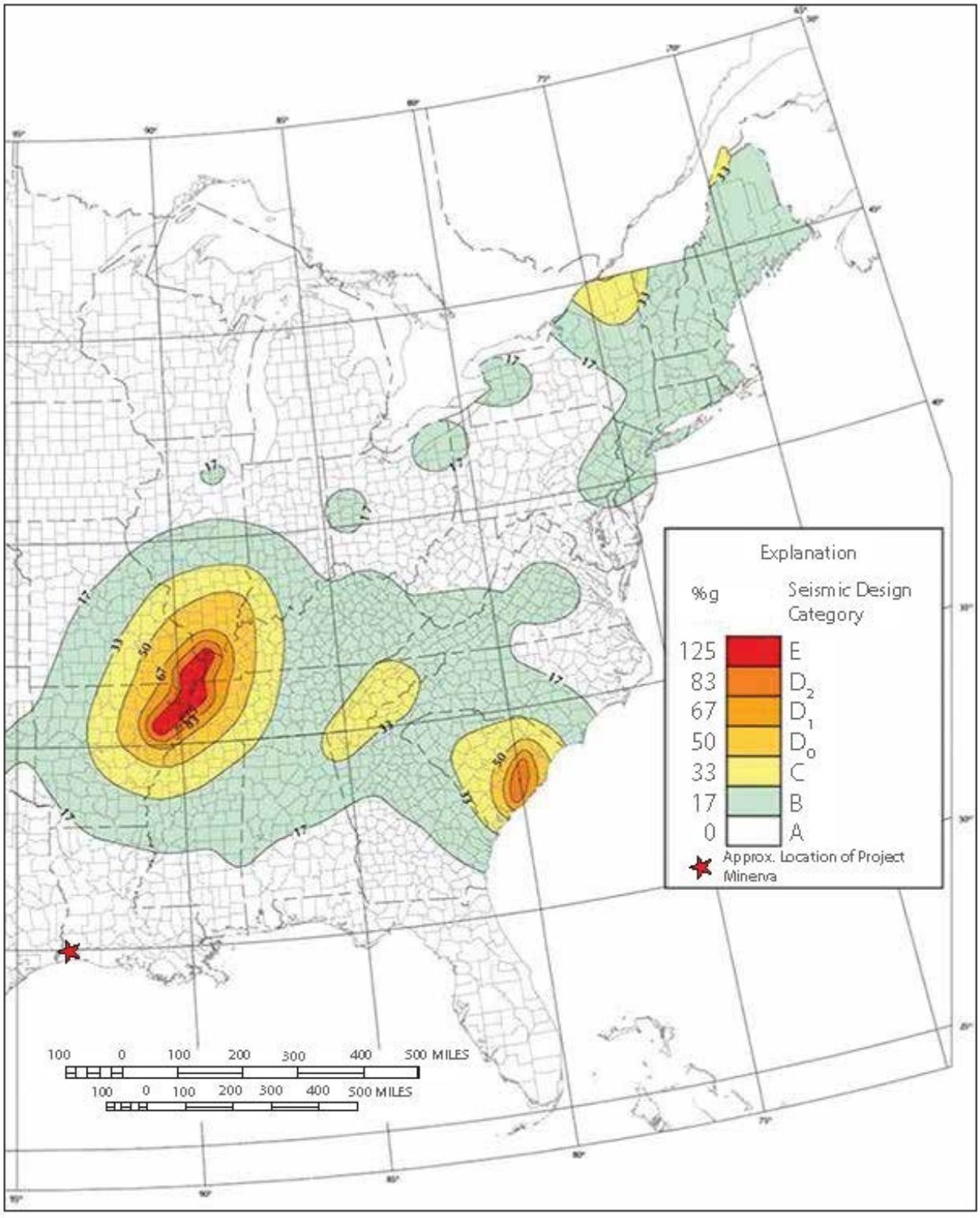
SPATIAL REFERENCE

PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

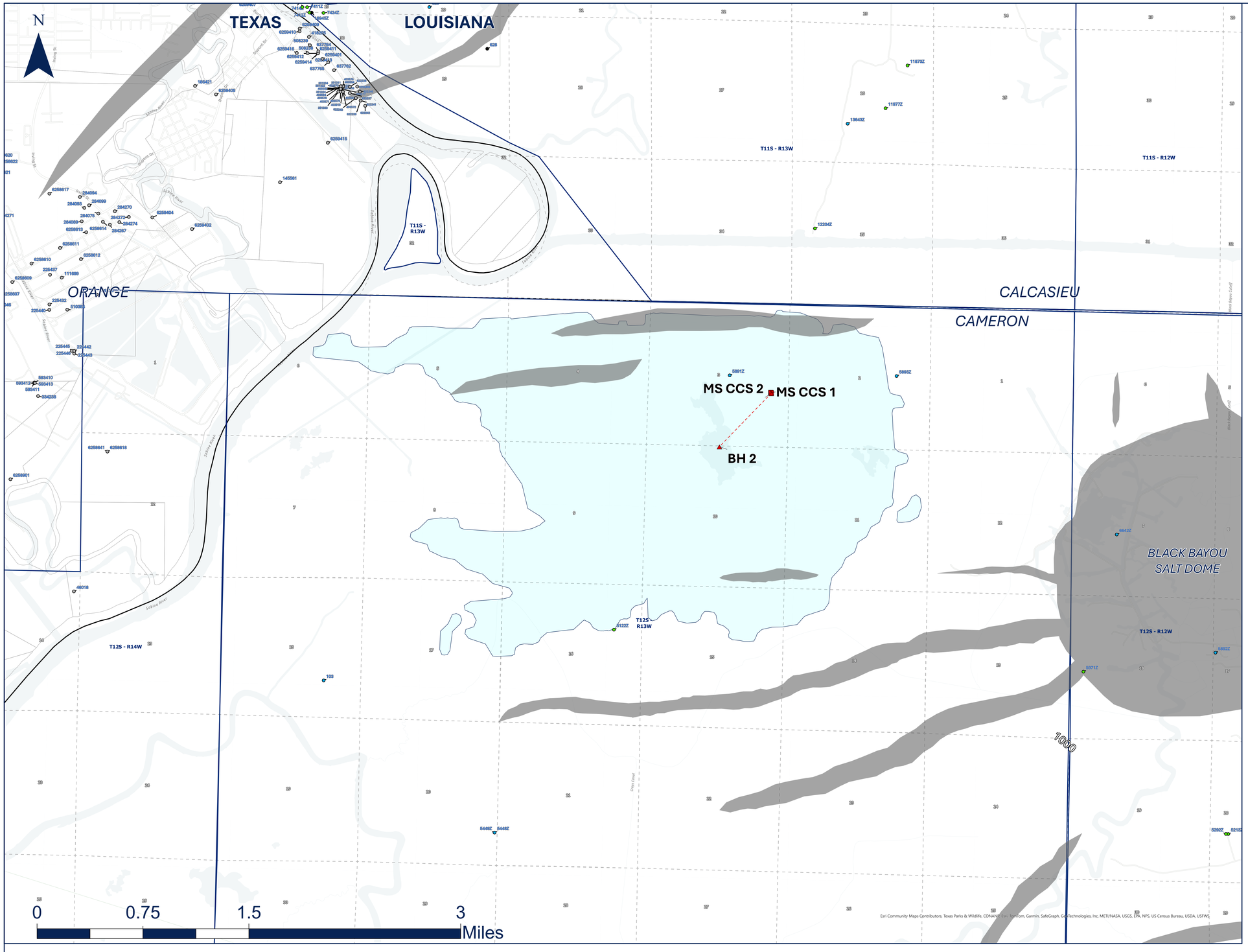
WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

Figure 2.6.3-1 FEMA Earthquake Hazards Map of the Eastern US



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Minerva South CCS Well Nos. 001 & 002	
Project: **Minerva**	Project ID: **R06-LA-0002**
Location: **Cameron Parish, LA**	LDENR Appl Nos: **45031 & 45032**



GCS

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FIGURE 2.7.1-1
Water Well Data within 2-mile Radius of Project Minerva

MAP LEGEND

- Top Upper Frio Faults
- Delineated Area of Review
- PLSS Sections
- PLSS Townships & Ranges
- SONRIS Parishes
- TXRRC Abstracts
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory

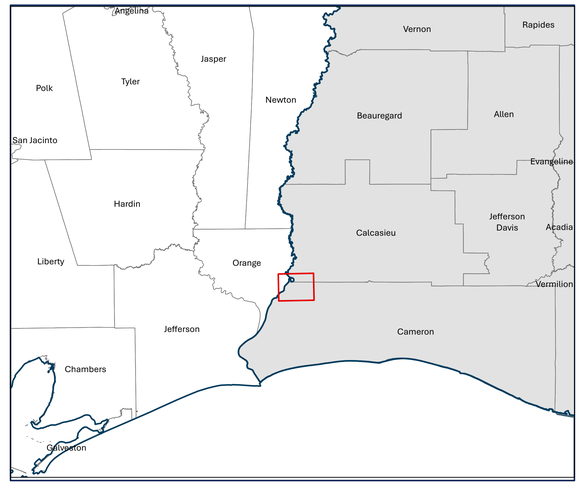
Water Well Status

- Status Not Available
- Abandoned
- Active
- Destroyed
- Excavated
- Inactive
- Plugged and Abandoned

Water Well Label

Well Number

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Note: See Table 7.1-1 for all Well Data associated with control points

MAP DETAILS

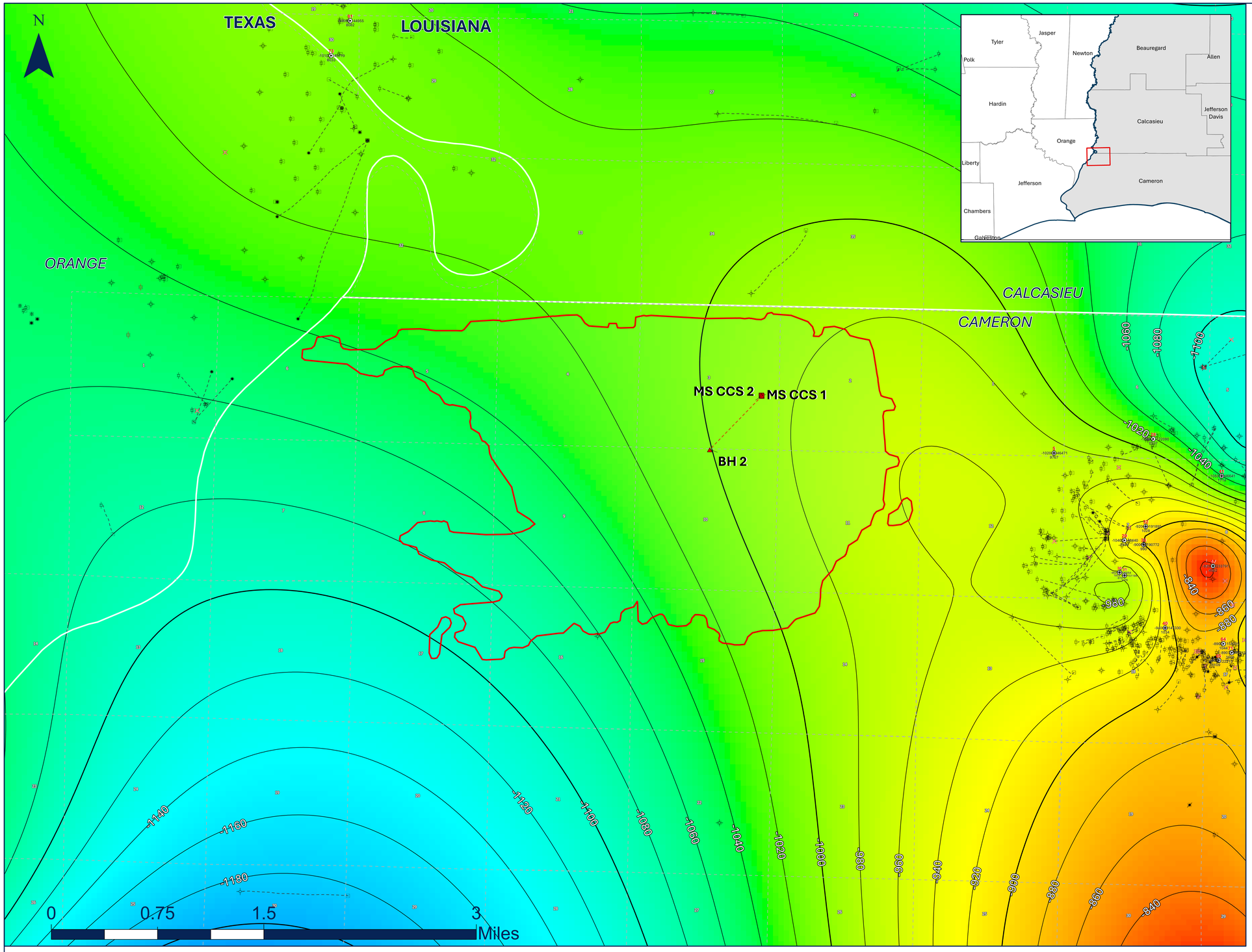
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SPATIAL REFERENCE

PCS	NAD 1927 State Plane Louisiana South (FIPS 1702)
GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032



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FIGURE 2.7.2-1
USDW Well Location and Structure Map

MAP LEGEND

- Delineated Area of Review
- SONRIS Parishes
- PLSS Sections
- USDW Structure Control Point
- Injector Bottom Hole
- Injector Well Pad
- Injector Schematic Well Trajectory
- Surface Location
- Well Trajectory

Well Status

- Other
- ACTIVE-INJECTION
- ACTIVE-PRODUCING
- APPROVAL TO CONSTRUCT INJECTION WELL
- BAD DATA
- COMPLETED
- DRILLED
- DRY & PLUGGED
- INACTIVE
- ORPHAN
- PERMIT EXPIRED
- PERMITTED
- PLUGGED & ABANDONED
- PLUGGED BACK
- REVERTED
- SHUT_IN
- TEMPORARILY ABANDONED
- UNABLE TO LOCATE

Structure Contour Interval (ft)

- 100 ft Contour
- 20 ft Contour

Elevation Depth (ft) TVDss

-299.027 to -1437.84

Control Point Labels

Map ID
Structure Depth (ft TVDSS) ● Serial Number
Total Depth (TVDSS)

MAP DETAILS

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APPROVED BY	K GARRETT	**DATE**	8/21/2024
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SPATIAL REFERENCE

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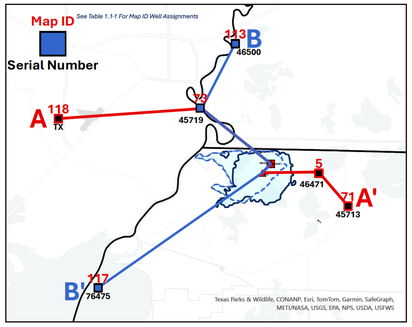
Note: See Table 1.1-1 for all Well Data associated with control points

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FIGURE 2.7.2-2

North-South USDW Cross Section (B-B')



MAP DETAILS

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APPROVED BY	K GARRETT	**DATE**	8/21/2024
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SPATIAL REFERENCE

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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
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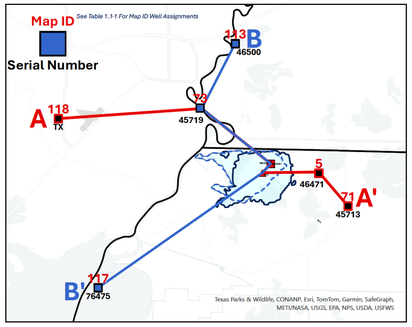
Note: See Table 1.1-1 for Map ID Well Assignments

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FIGURE 2.7.2-3

West-East USDW Cross Section (A-A')



MAP DETAILS

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APPROVED BY	K GARRETT	**DATE**	8/21/2024
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GCS	GCS North American 1927
DATUM	North American 1927
PROJECTION	Lambert Conformal Conic

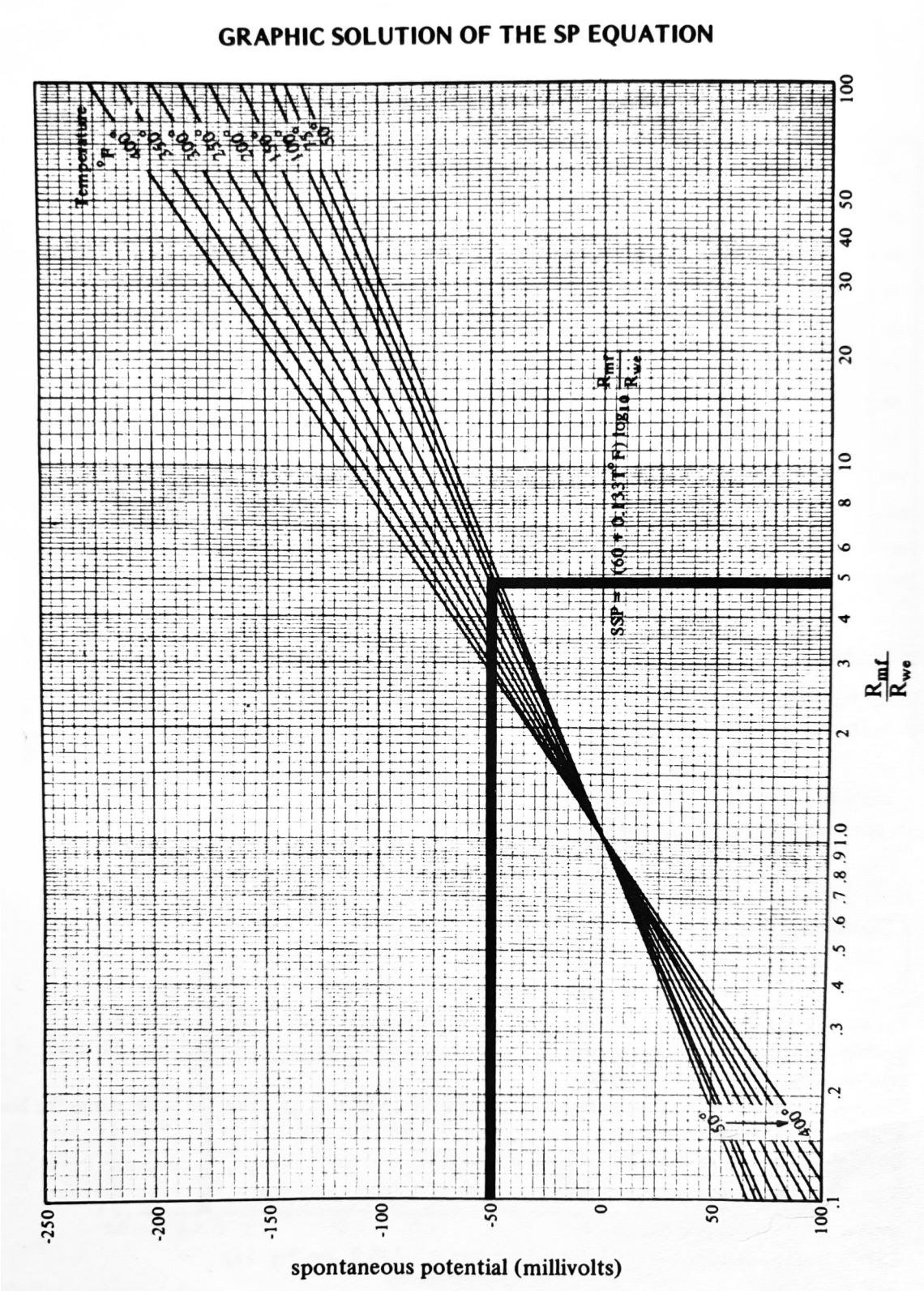
PROJECT MINERVA DETAILS

WELLS	Minerva South CCS Well Nos. 001 and 002
LOCATION	Cameron Parish, Louisiana
EPA PROJECT ID	R06-LA-0002
LDENR APPL NOS	45031 & 45032

Note: See Table 1.1-1 for Map ID Well Assignments

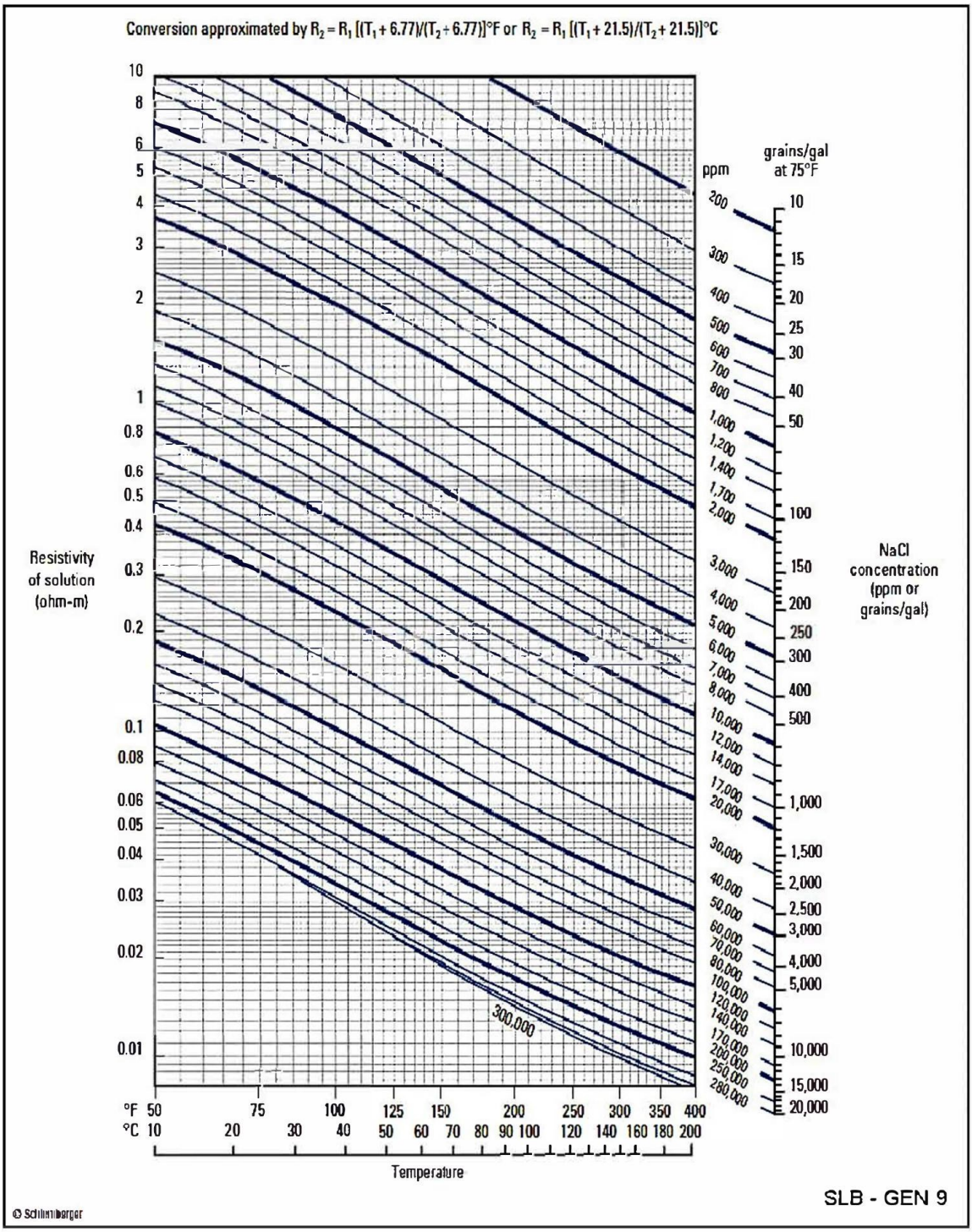
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Figure 2.7.2-4 Graphic Solution of the Spontaneous Potential Equation



(Schlumberger, 1987)

Figure 2.7.2-5 Resistivity Nomograph for NaCl Solutions



(Schlumberger, 1979)

Figure 2.8.2-1 CO_2 Solubility Model—Partition Between REVEAL and PHREEQC

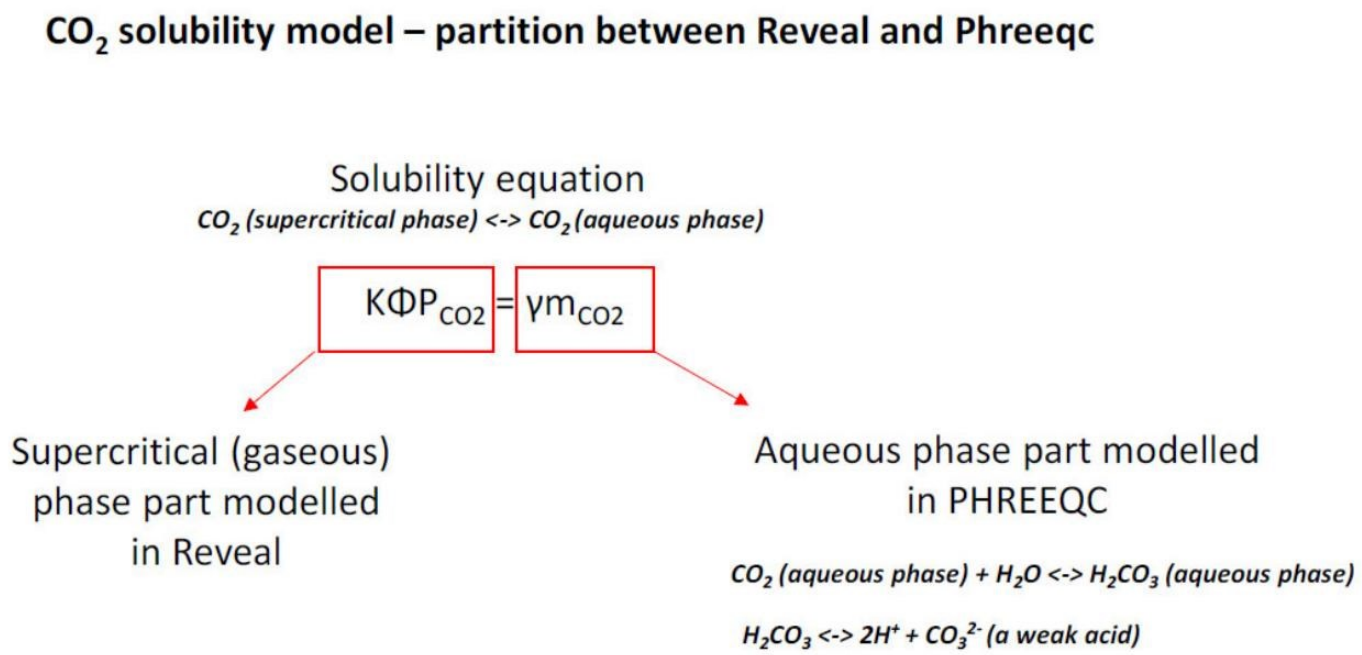
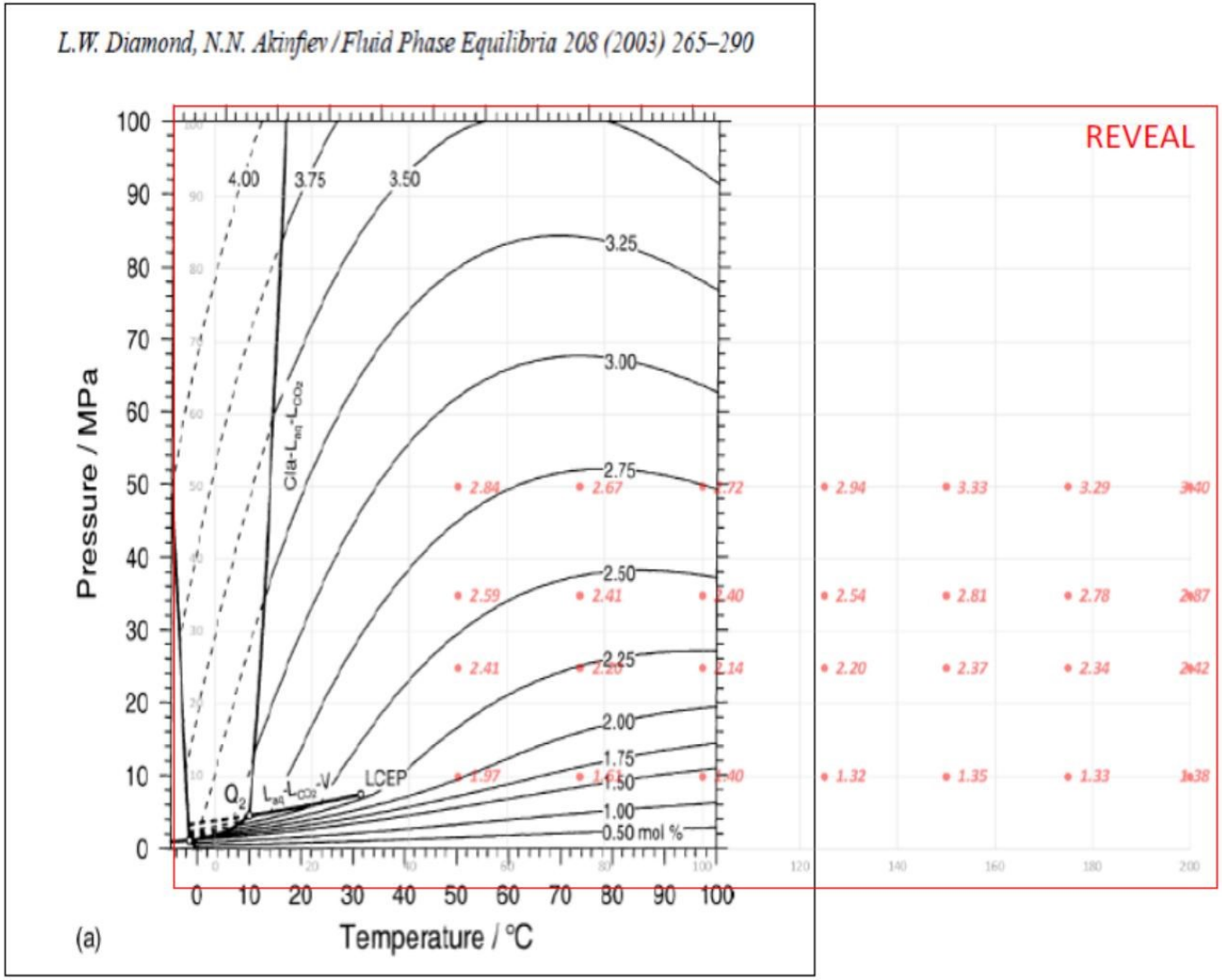
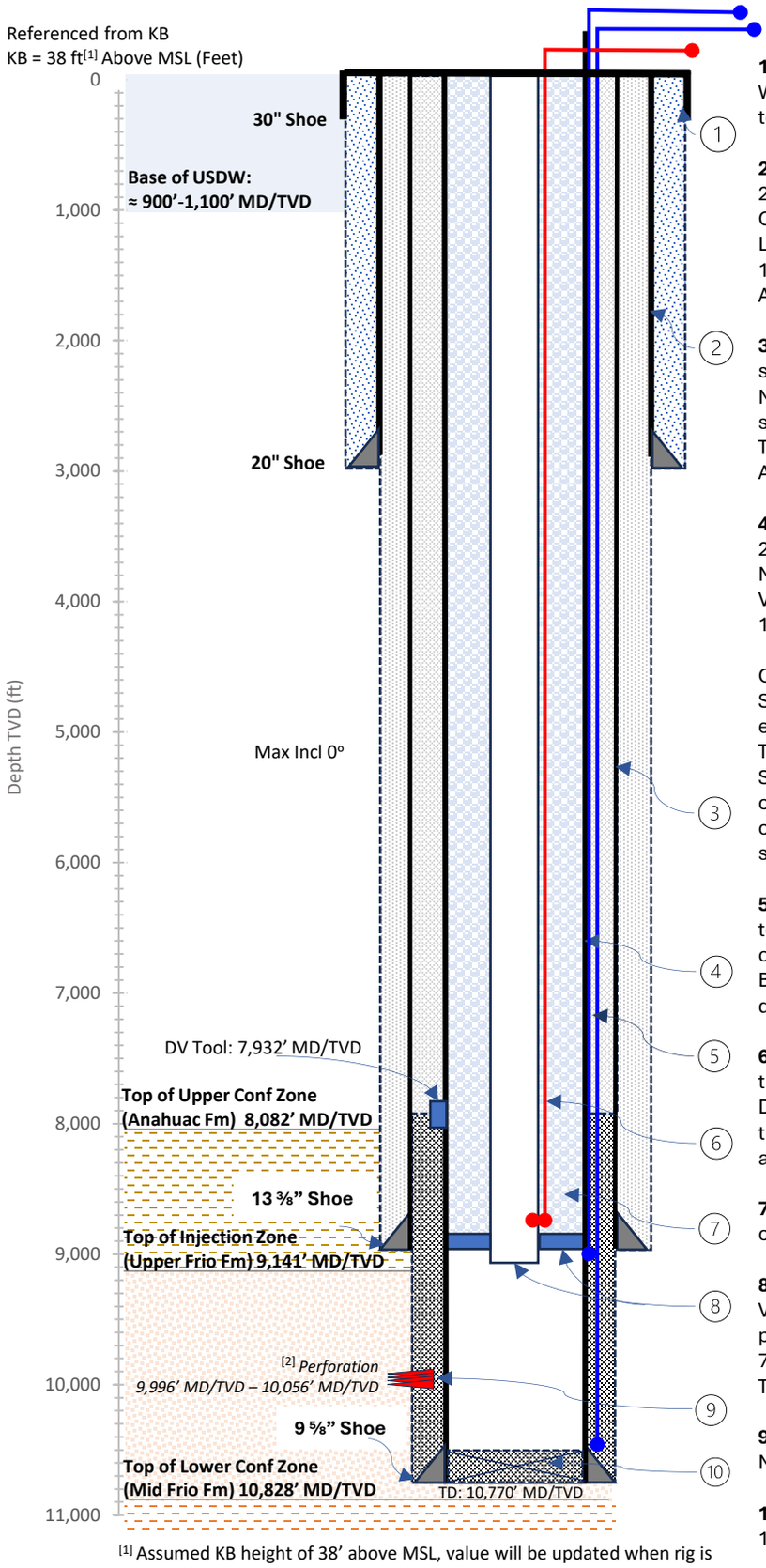


Figure 2.8.2-2 Comparison of CO_2 Solubility Data from Diamond, 2004 and REVEAL—Zero Salinity



(Modified from Diamond, 2004)

Figure 5-1 Proposed Wellbore Schematic for Minerva South CCS Well No. 001



[1] Assumed KB height of 38' above MSL, value will be updated when rig is selected

1. 30" Conductor Pipe: 1.0" WT, 28" ID, 310.3 lb/ft, X-56 Welded, plain-end, beveled conductor with drive shoe driven to refusal at 150' MD/TVD

2. 20" Surface Casing: 133 lb/ft, L-80, ER at 3,000' MD/TVD
26" Hole, expected MW 9.00 ppg WBM
Cemented with Type-1 cement up to the surface
Lead slurry 11.80 ppg (2,616 sacks, 2.71 cuft/sack); Tail slurry 14.8 ppg (1,421 sacks, 1.33 cuft/sack)
Assumed 100% excess volume.

3. 13 ⅜" Intermediate Casing: 13 ⅜", 68 lb/ft, L-80 BTC from section TD to surface. 17 ½" Hole at 8,991' MD/TVD. Expected MW 10.00 ppg WBM. Cemented with Class H cement up to surface. Lead slurry 12.80 ppg (3,356 sacks; 2.10 cuft/sack); Tail slurry 14.8 ppg (1,433 sacks; 1.33 cuft/sack)
Assumed 50% excess volume in open hole section.

4. 9 ⅝" Injection Casing: 9 ⅝", 53.5 lb/ft, 25CRW-125 VAM-21, Prem Connection from 10,770' MD/TVD (Well TD) to 7,932' MD/TVD (150' above Top of Confining Zone) & 53.5 lb/ft, L-80 VAM-21, Premium connection from 7,932' MD/TVD to surface. 12 ¼" Hole to 10,770' MD/TVD. Expected MW 13.50 ppg WBM.

Cemented in two stages:
Stage #1: CO_2 corrosion-resistant cement slurry (PermaSet or equivalent) 14.8 ppg (1,013 sacks; 1.12 cuft/sack). Expected TOC at 7,932' MD/TVD. (DV tool). Assumed 20% excess.
Stage #2: 14.3 ppg (2,055 sacks; 1.24 cuft/sack) Class H cement lead slurry + 14.8 ppg (100 sacks; 1.12 cuft/sack) CO_2 corrosion-resistant cement tail slurry. Cement up to the surface. No volume excess is assumed.

5. DTS/DAS Fiber Optic Cable: Downhole cable with a 150 °C temperature rating, 2 single-mode fiber acrylate clamped outside the 9 ⅝" casing from surface to TD.
Back-up fiber optic cable will be set up from surface to the depth of the 13 ⅜" casing shoe.

6. TEC (Electrical Line): Downhole cable attached outside of the tubing, with pressure/temperature gauge carriers. Downhole measurements in two locations – annulus and tubing; minimum pressure and temperature ratings of 10k psi and 150° C.

7. Packer Fluid: 8.5 ppg $CaCl_2$ inhibited brine with corrosion control (98% MgO, magnesium oxide).

8. Tubing and Packer: 4 ½" Tubing, 15.1 lb/ft, 25CRW-125, VAM-21. End of tail at 9,100' MD/TVD; Removable Production packer at 9,050' MD/TVD; if required a SCSSV 4 ½" with a 7.403" OD, 3.688" ID at base of USDW ≈ 1,100' MD/TVD; Tubing hanger at ground level.

9. Perforation Interval: From 10,056' MD/TVD to 9,996' MD/TVD. Oriented perforation system.

10. Plug back TD: From 10,770' MD/TVD (Shoe Depth) to 10,690' MD/TVD (Float Collar). Shoe Track

LEGEND

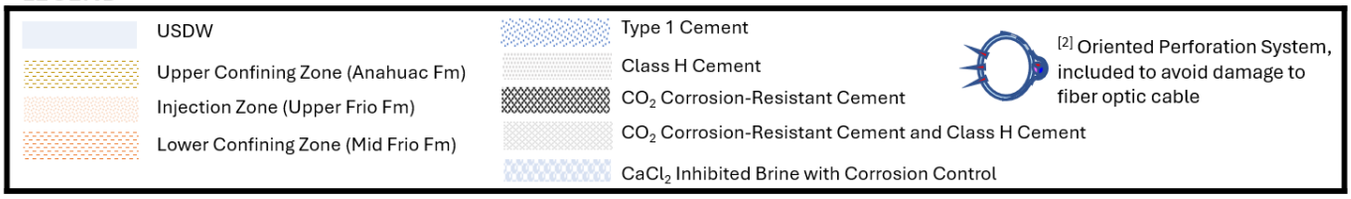
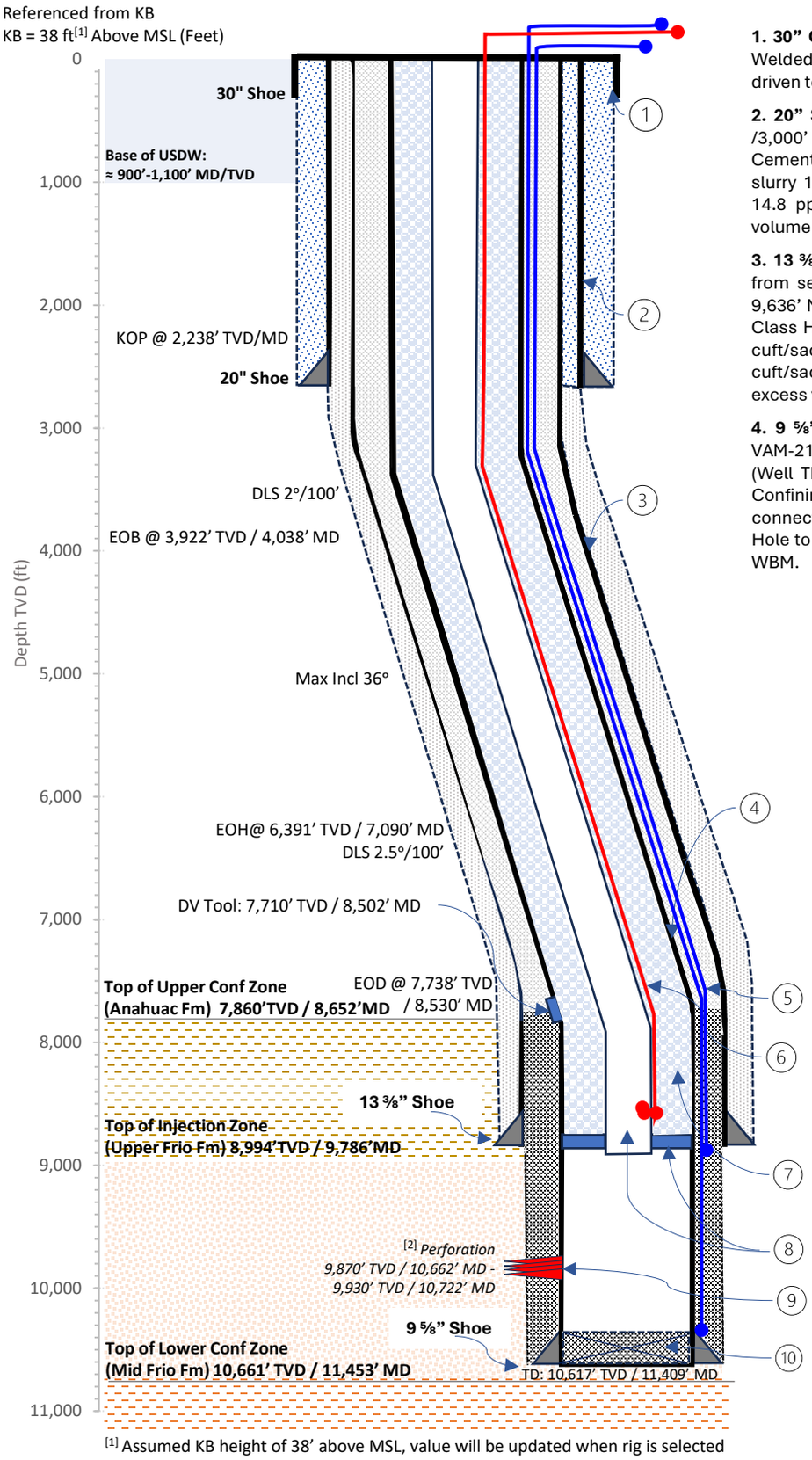


Figure 5-2 Proposed Wellbore Schematic for Minerva South CCS Well No. 002



[1] Assumed KB height of 38' above MSL, value will be updated when rig is selected

1. 30" Conductor Pipe: 1.0" WT, 28" ID, 310.3 lb/ft, X-56 Welded, plain-end, beveled conductor with drive shoe driven to refusal at 150' MD/TVD.

2. 20" Surface Casing: 133 lb/ft, L-80, ER at 2,991' TVD /3,000' MD. 26" Hole, expected MW 9.00 ppg WBM. Cemented with Type-1 cement up to the surface. Lead slurry 11.80 ppg (2,616 sacks; 2.71 cuft/sack); Tail slurry 14.8 ppg (1,421 sacks; 1.33 cuft/sack). Assumed 100% volume excess.

3. 13 ⅜" Intermediate Casing: 13 ⅜", 68 lb/ft, L-80 BTC from section TD to surface. 17 ½" Hole at 8,844' TVD / 9,636' MD. Expected MW 10.00 ppg WBM. Cemented with Class H cement. Lead slurry 12.80 ppg (3,609 sacks; 2.10 cuft/sack) + Tail slurry 14.8 ppg (1,538 sacks; 1.33 cuft/sack). Cement up to the surface. Assumed 50% excess volume in open hole section.

4. 9 ⅝" Injection Casing: 9 ⅝", 53.5 lb/ft, 25CRW-125 VAM-21, Prem Connection from 10,617' TVD / 11,409' MD (Well TD) to 7,710' TVD / 8,502' MD (150' above Top of Confining Zone) & 53.5 lb/ft, L-80 VAM-21, Premium connection from 7,710' TVD / 8,502' MD to surface. 12 ¼" Hole to 10,617' TVD / 11,409' MD. Expected MW 13.50 ppg WBM.

Cemented in two stages:
Stage #1: CO_2 corrosion-resistant cement slurry (PermaSet or equivalent) 14.8 ppg (1,029 sacks; 1.12 cuft/sack). Expected TOC at 7,710' TVD / 8,502' MD. (DV tool). Assumed 20% excess volume in open hole section.
Stage #2: 14.3 ppg (2,209 sacks; 1.24 cuft/sack) Class H cement lead slurry + 14.8 ppg (100 sacks; 1.12 cuft/sack) CO_2 corrosion-resistant cement tail slurry. Cement up to the surface. No excess volume was considered.

5. DTS/DAS Fiber Optic Cable: Downhole cable with a 150 °C temperature rating, 2 single-mode fiber acrylate clamped outside the 9 ⅝" casing from surface to TD.
Back-up fiber optic cable will be set up from surface to the depth of the 13 ⅜" casing shoe.

6. TEC (Electrical Cables): Downhole cable attached outside of the tubing, with pressure/temperature gauge carriers. Downhole measurements in two locations – annulus and tubing; minimum pressure and temperature ratings of 10k psi and 150° C.

7. Packer Fluid: 8.5 ppg $CaCl_2$ inhibited brine with corrosion control (98% MgO, magnesium oxide).

8. Tubing and Packer: 4 ½" Tubing, 15.1 lb/ft, 25CRW-125, VAM-21, End of tail at 8,938' TVD / 9,730' MD; Removable Production packer at 8,888' TVD / 9,680' MD; if required a SCSSV 4 ½" with a 7.403" OD, 3.688" ID at base of USDW ≈ 1,100' MD/TVD; Tubing hanger at ground level.

9. Perforation Interval: From 9,870' TVD / 10,662' MD to 9,930' TVD / 10,722' MD. Oriented perforation system.

10. Plug back TD: From 11,409' MD / 10,617' TVD (Shoe Depth) to 11,329' MD / 10,537' TVD (Float Collar). Shoe Track

LEGEND

- USDW
- Upper Confining Zone (Anahuac Fm)
- Injection Zone (Upper Frio Fm)
- Lower Confining Zone (Mid Frio Fm)
- Type 1 Cement
- Class H Cement
- CO_2 Corrosion-Resistant Cement
- CO_2 Corrosion-Resistant Cement and Class H Cement
- $CaCl_2$ Inhibited Brine with Corrosion Control
- [2] Oriented Perforation System, included to avoid damage to fiber optic cable

Figure 5-3 Proposed Injector Well Head System for MS CCS 1 and MS CCS 2

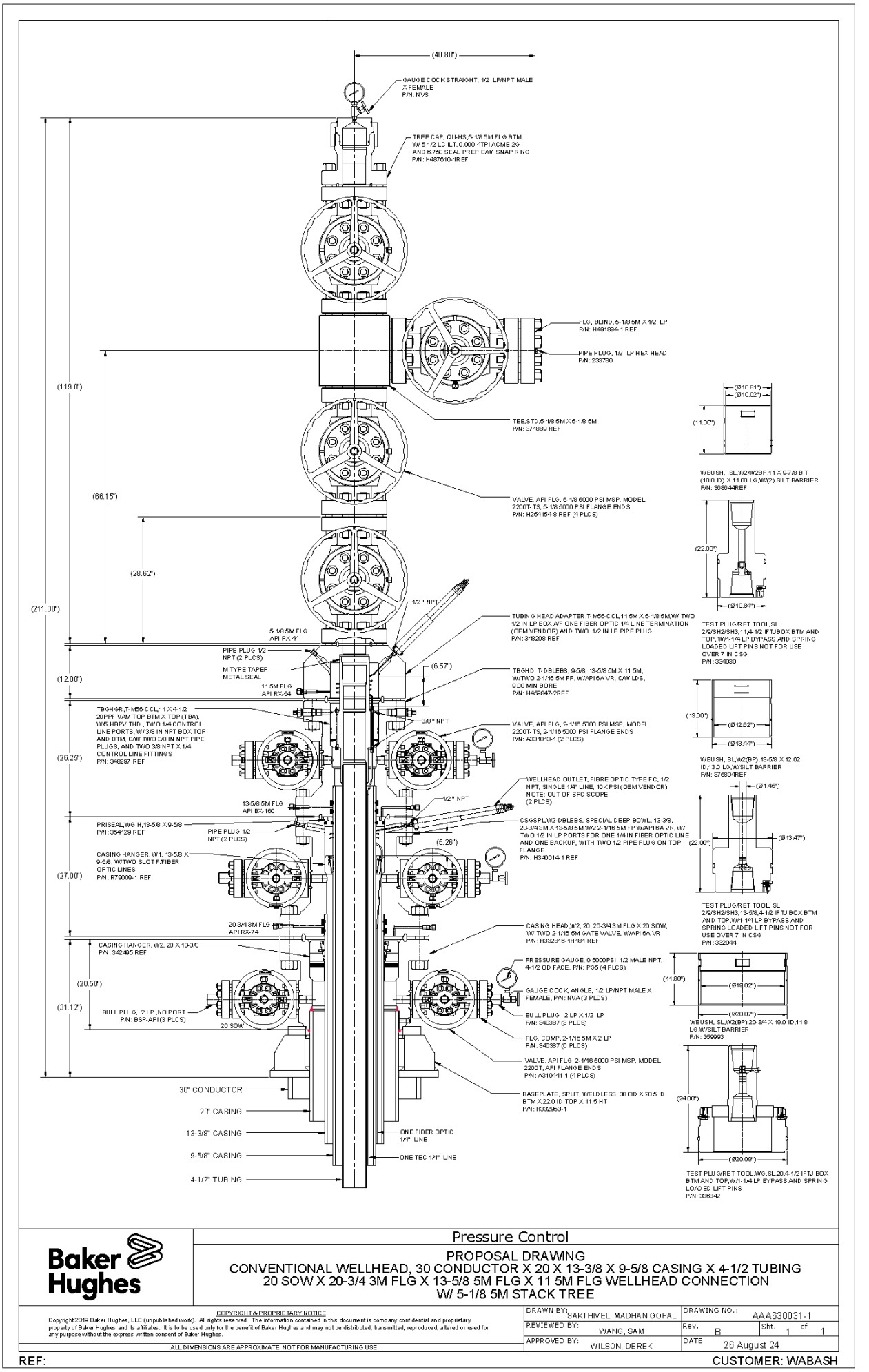


Figure 5.3.3-1 Triaxial Envelope of 20” Casing for MS CCS 1

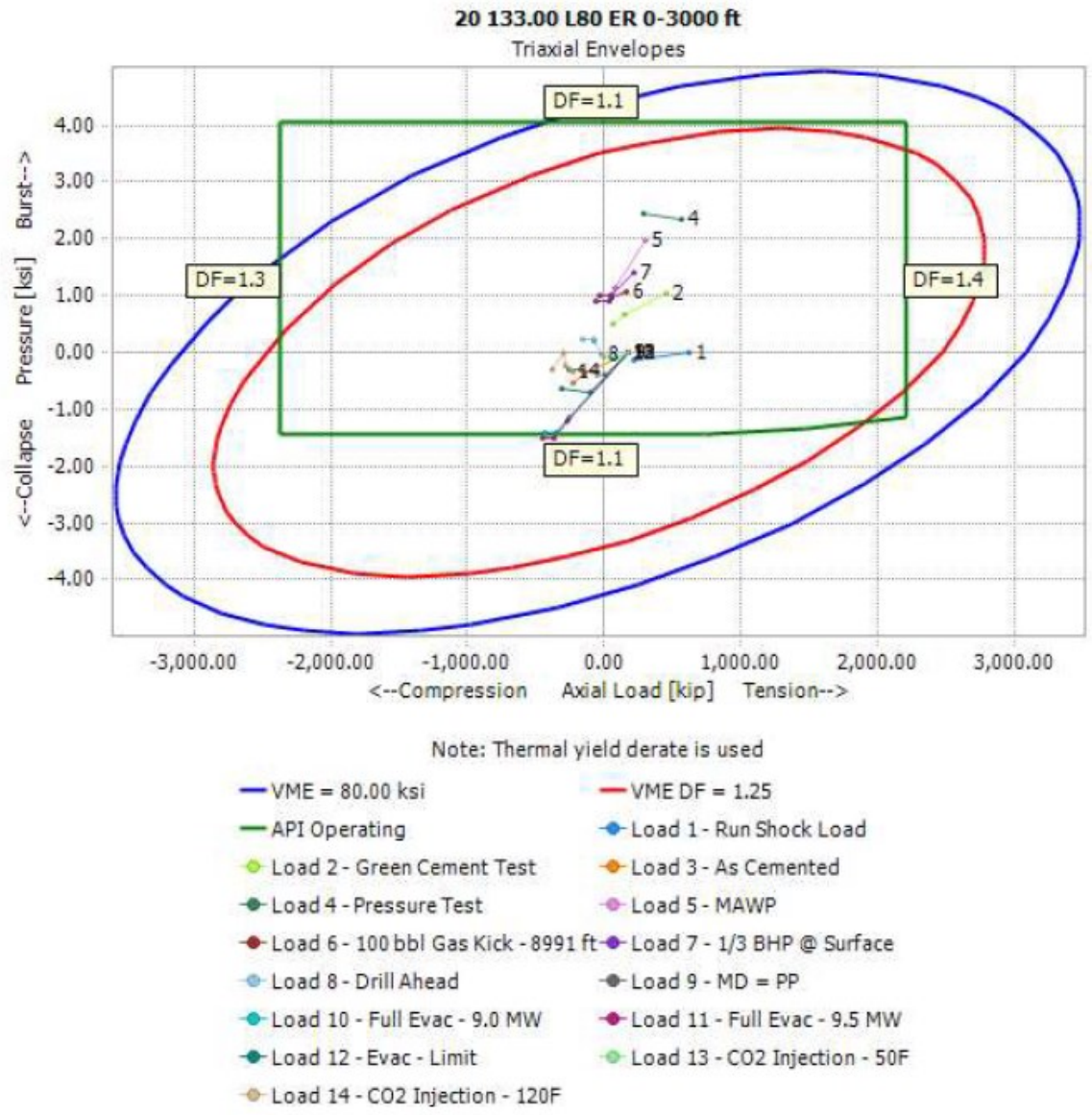


Figure 5.3.3-2 Triaxial Envelope of 20” Casing for MS CCS 2

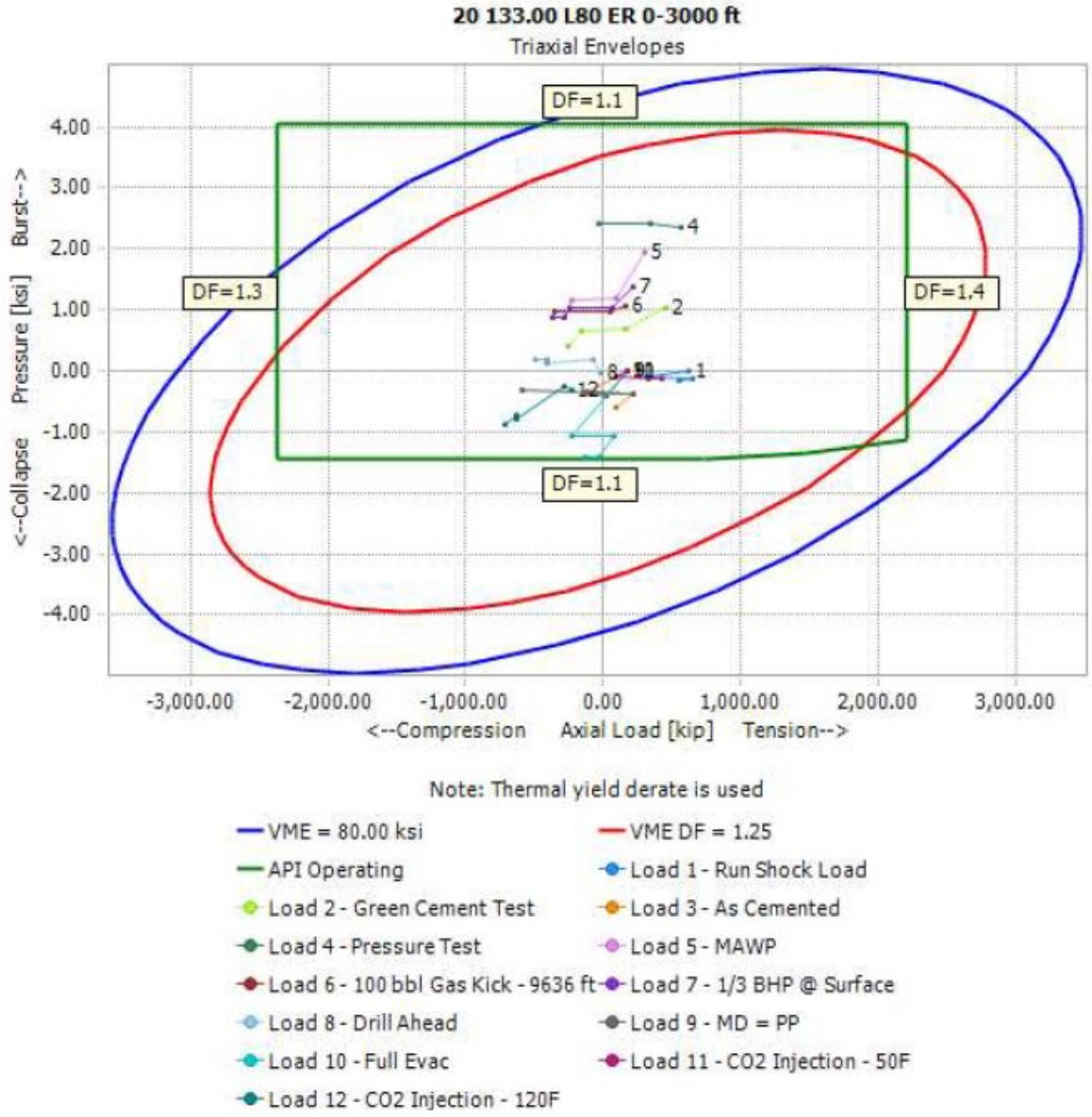


Figure 5.3.3-3 Triaxial Envelope of 13 ⅜" Casing for MS CCS 1

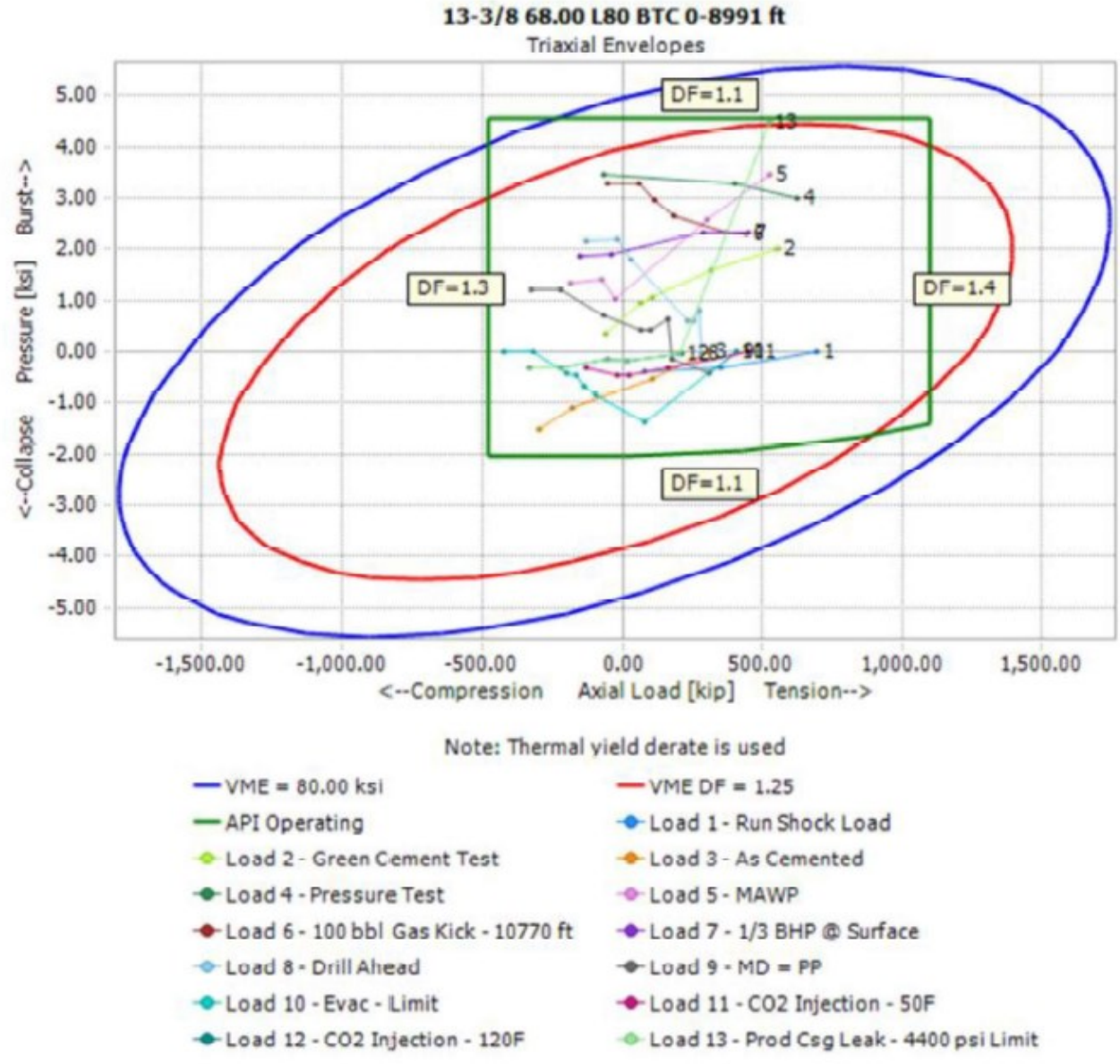


Figure 5.3.3-4 Triaxial Envelope of 13 ⅜" Casing for MS CCS 2

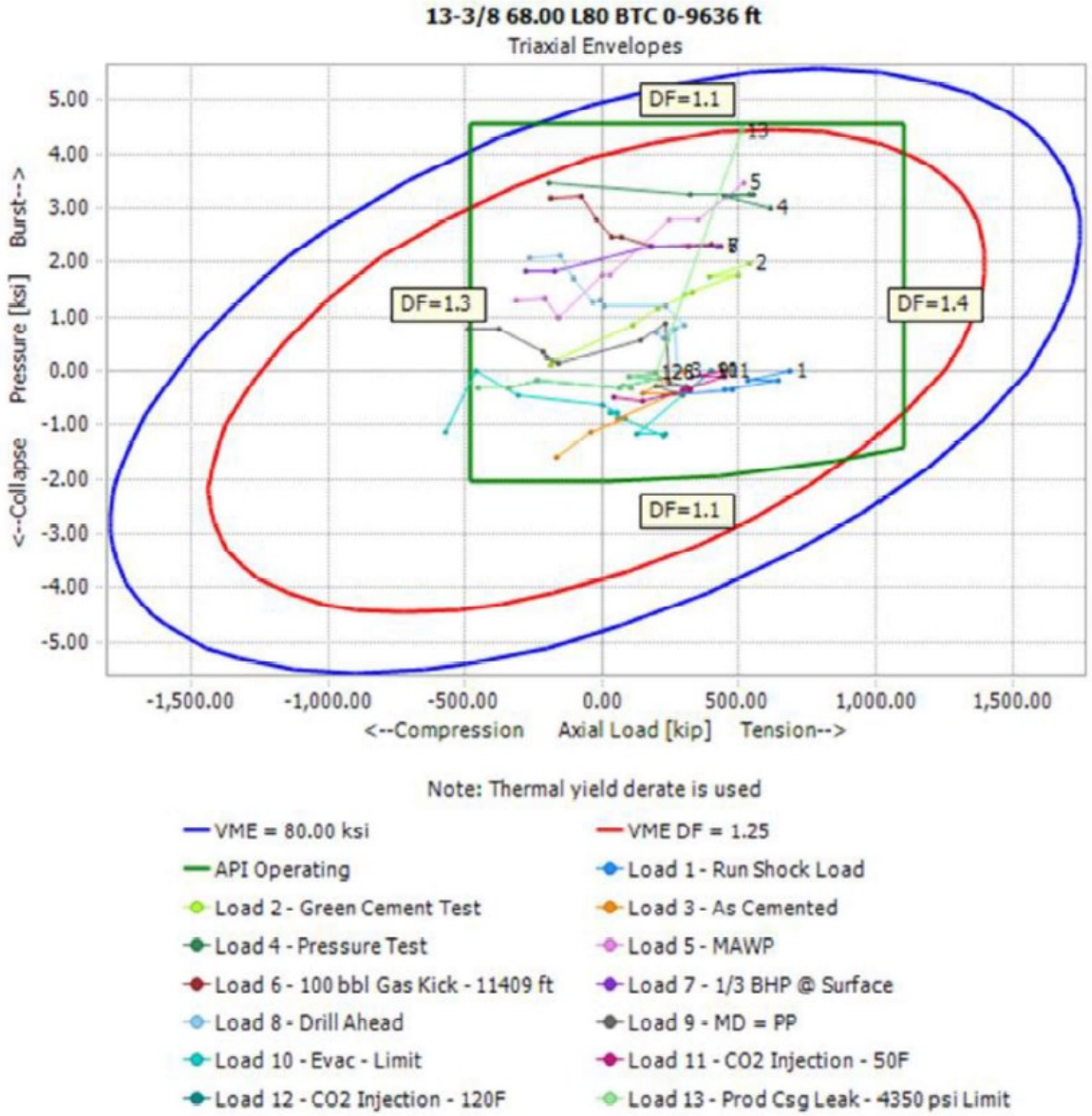


Figure 5.3.3-5 Triaxial Envelope of 9 ⅝" Casing (Stage 2) for MS CCS 1

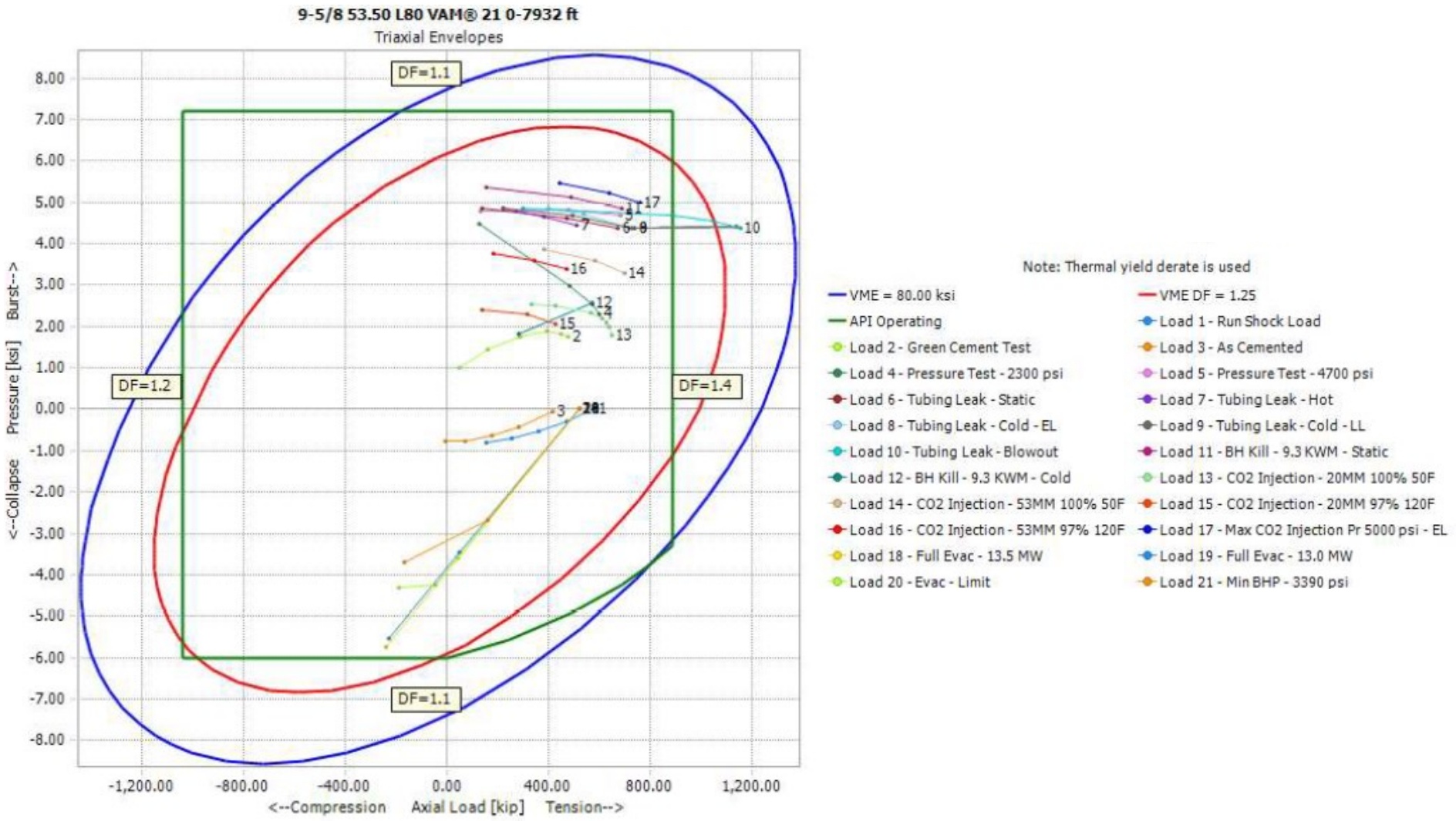


Figure 5.3.3-6 Triaxial Envelope of 9 ⅝" Casing (Stage 2) for MS CCS 2

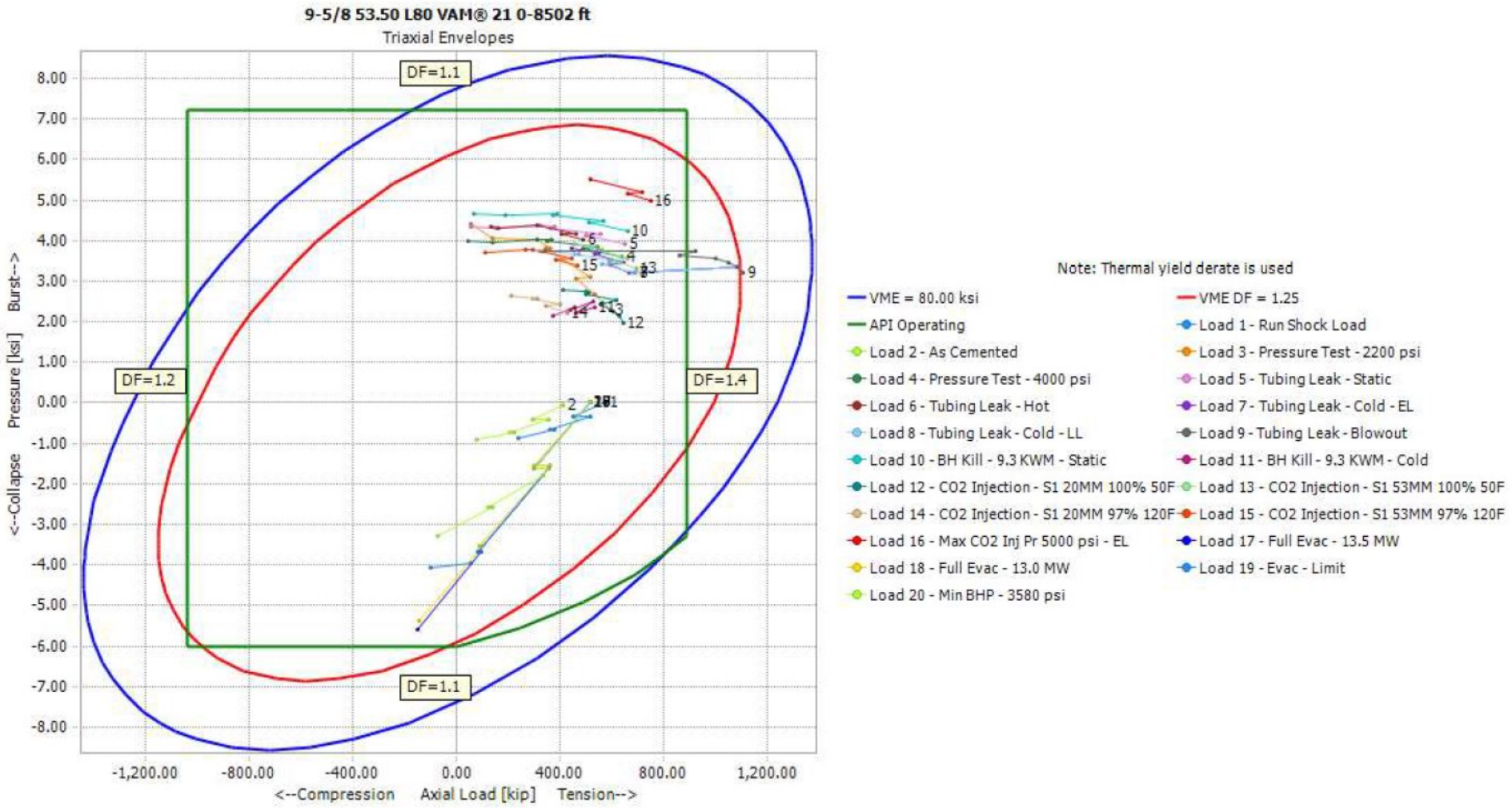


Figure 5.3.3-7 Triaxial Envelope of 9 ⅝" Casing (Stage 1) for MS CCS 1

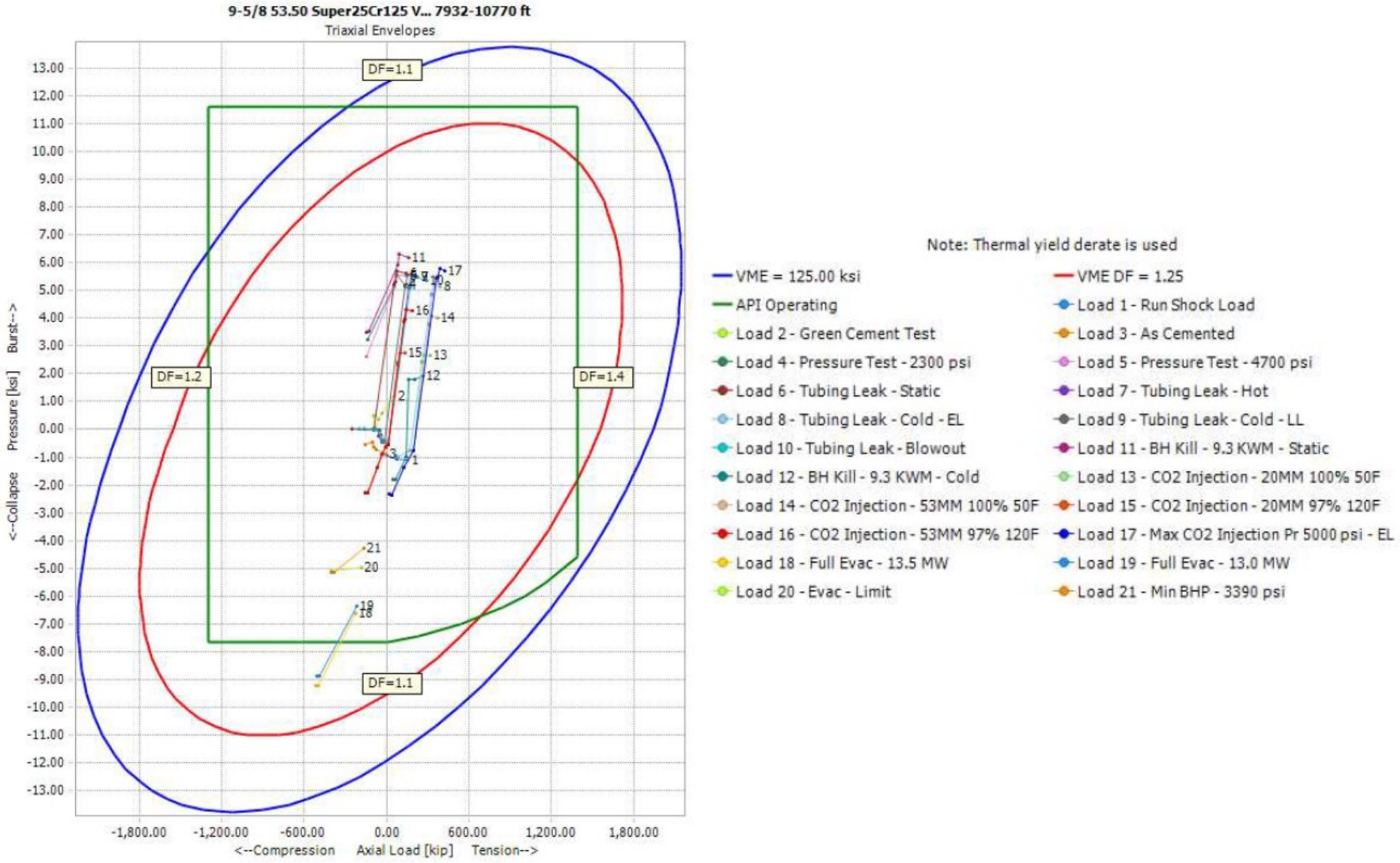


Figure 5.3.3-8 Triaxial Envelope of 9 ⅝" Casing (Stage 1) for MS CCS 2

