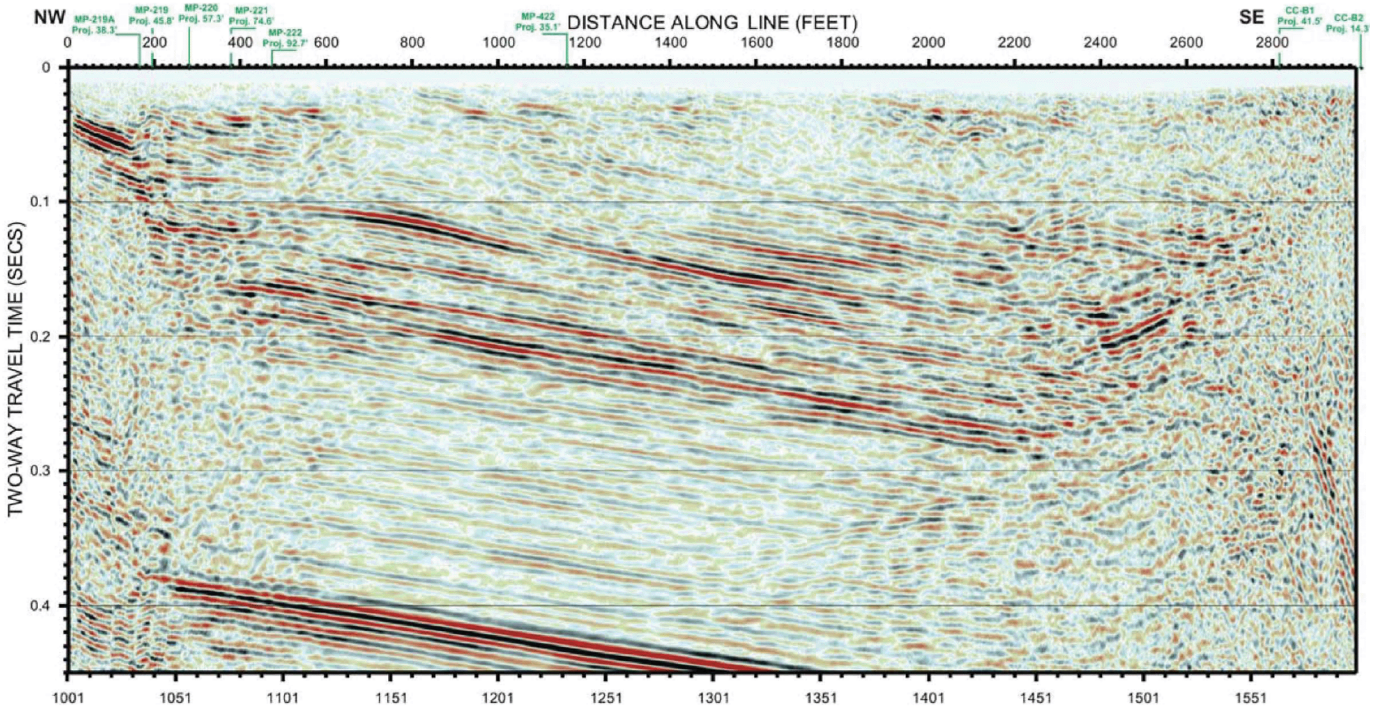
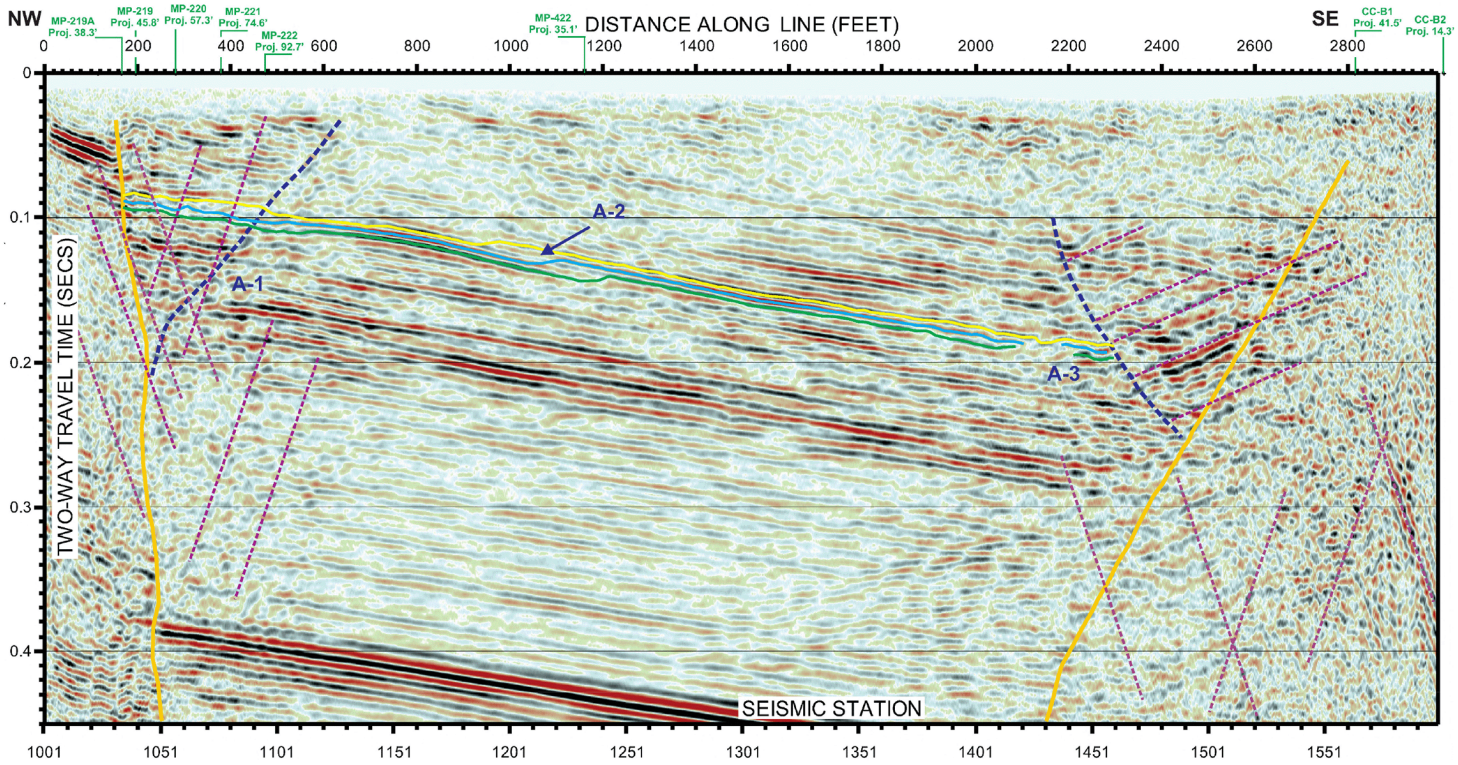


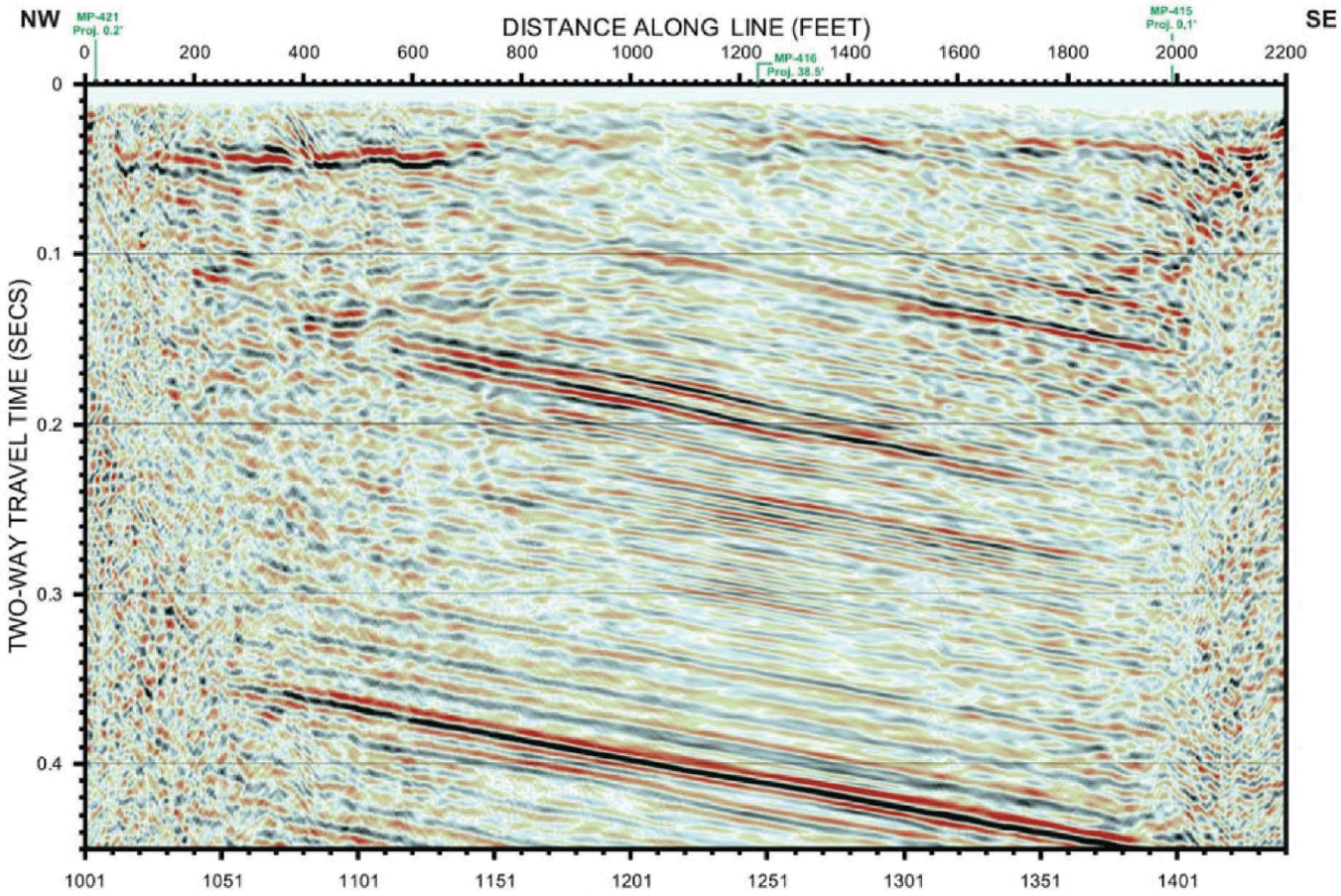
Notes: Seismic reflection profile SRL-1 (Reference 2.5.1-214).

Figure 2.5.1-36. (Sheet 1 of 5) Seismic Reflection SRL-1—Without Interpretation



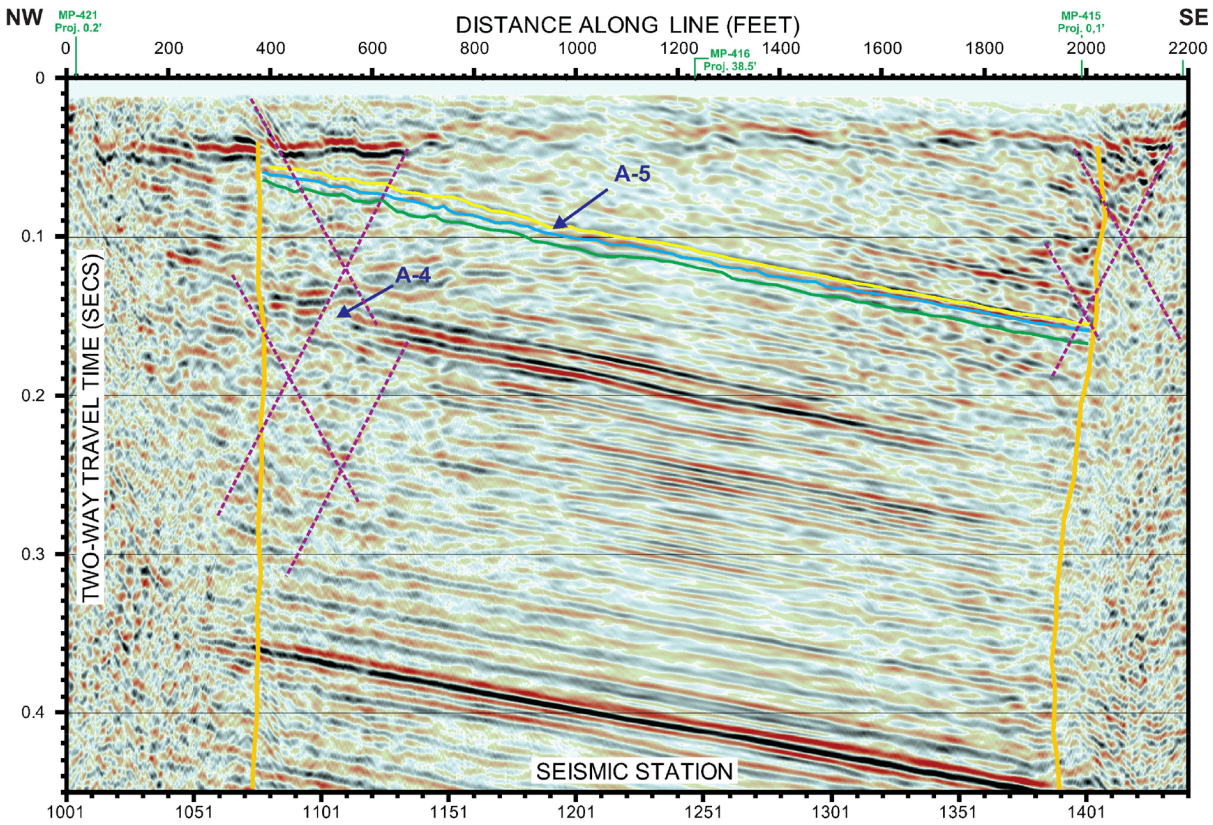
Notes: Seismic reflection profile SRL-1 (Reference 2.5.1-214).

Figure 2.5.1-36. (Sheet 2 of 5) Seismic Reflection SRL-1—With Interpretation



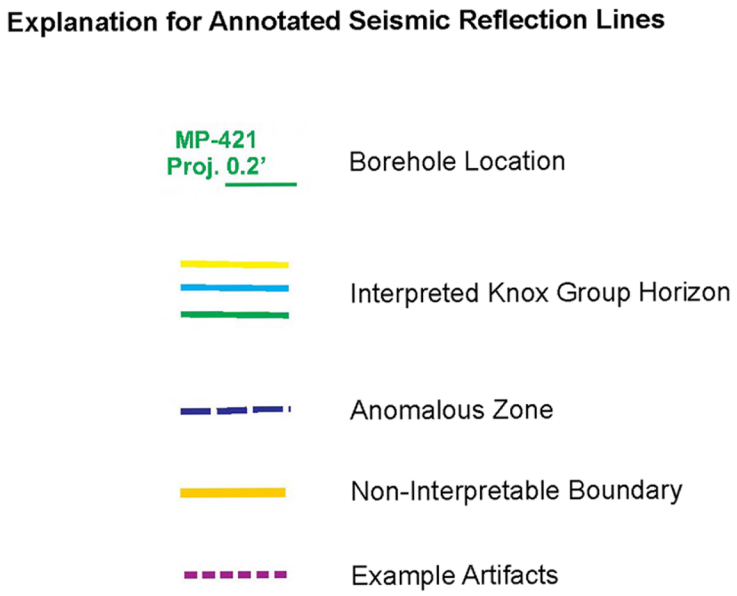
Note: Seismic reflection profile SRL-2 (Reference 2.5.1-214).

Figure 2.5.1-36. (Sheet 3 of 5) Seismic Reflection SRL-2—Without Interpretation



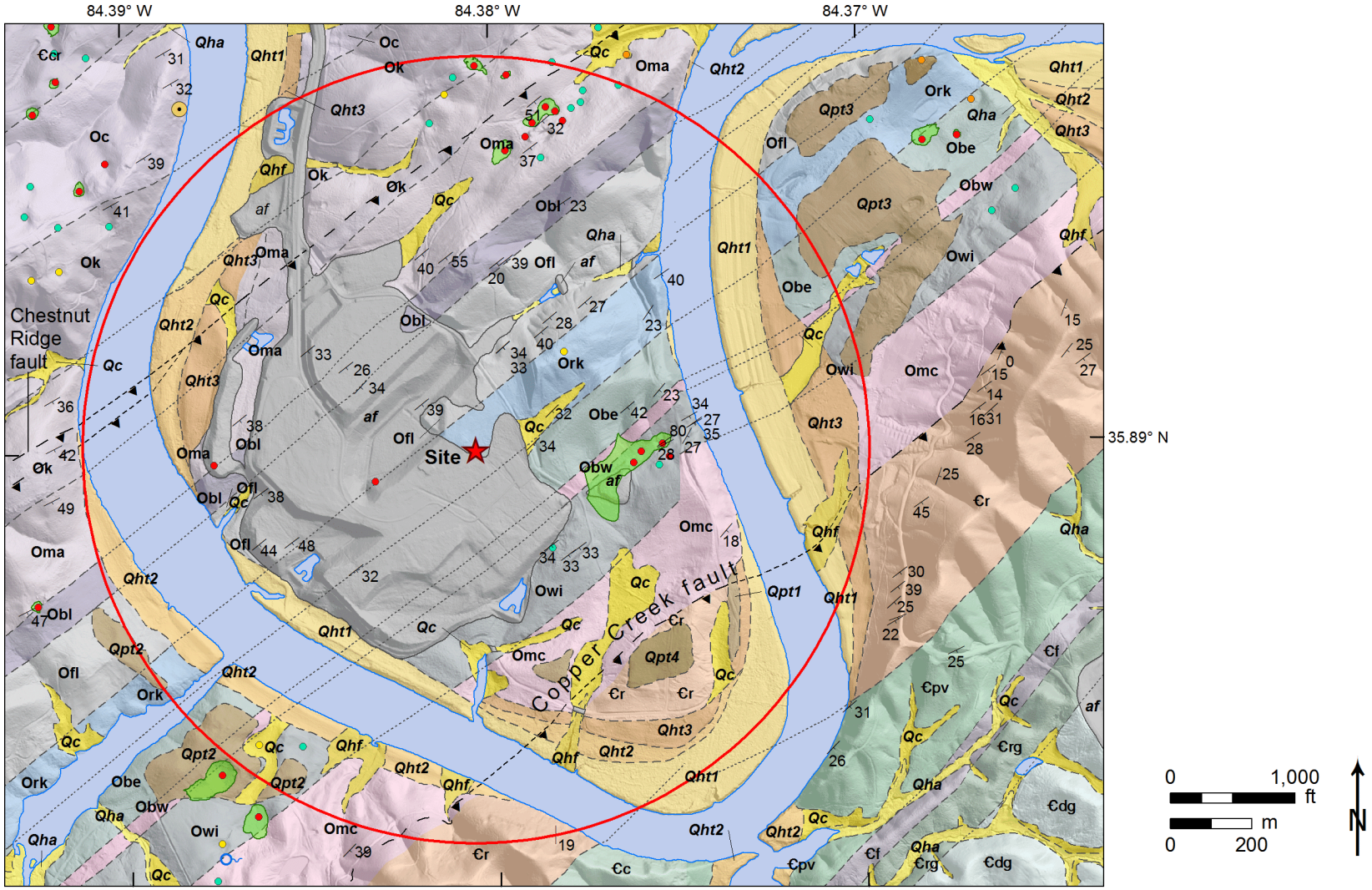
Note: Seismic reflection profile SRL-2 (Reference 2.5.1-214).

Figure 2.5.1-36. (Sheet 4 of 5) Seismic Reflection SRL-2—With Interpretation



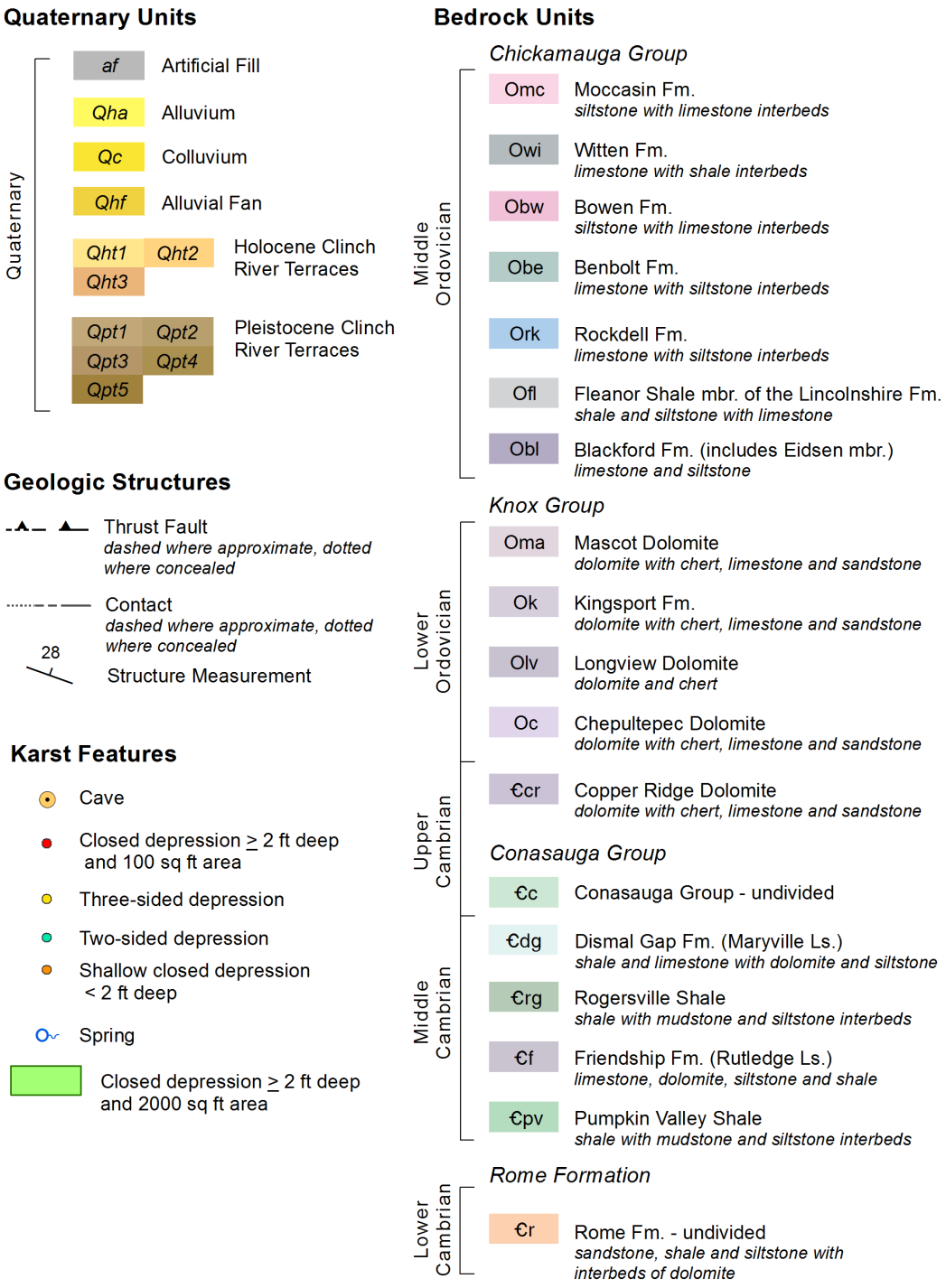
Notes:
Borehole locations are presented if projected less than 100 ft from the line unless noted.
Explanation for seismic reflection lines (Reference 2.5.1-214)

Figure 2.5.1-36. (Sheet 5 of 5) Explanation for Seismic Line Figures



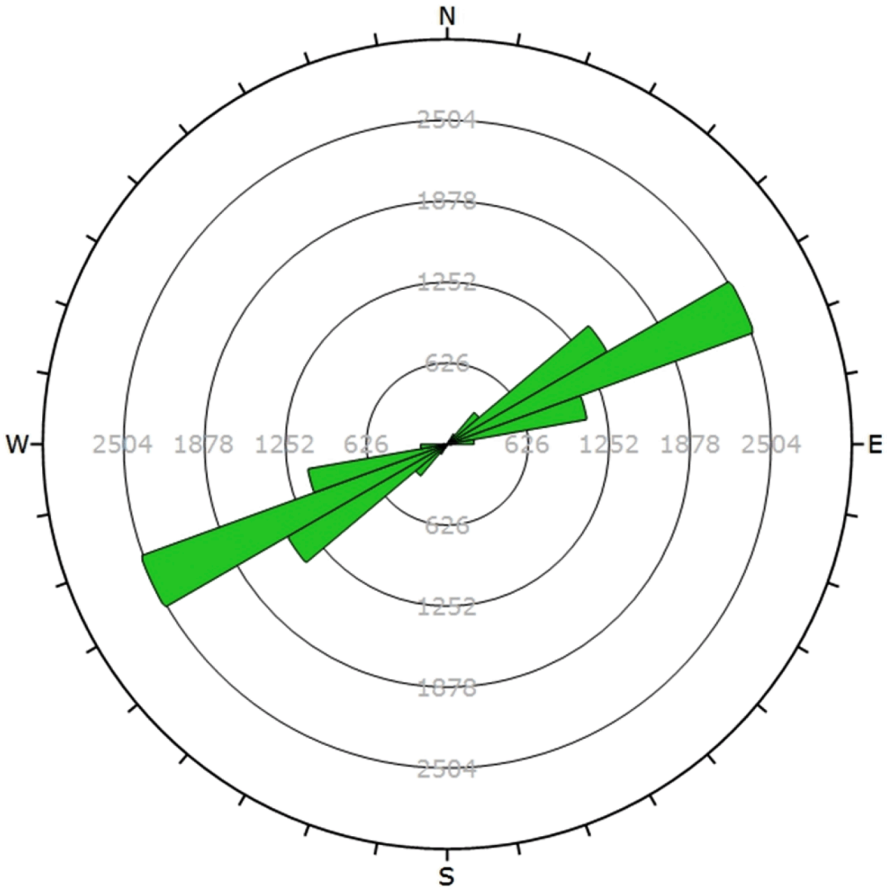
Note: Simplified geologic map of the Clinch River Nuclear site area.

Figure 2.5.1-37. (Sheet 1 of 2) Site Location Geologic Map



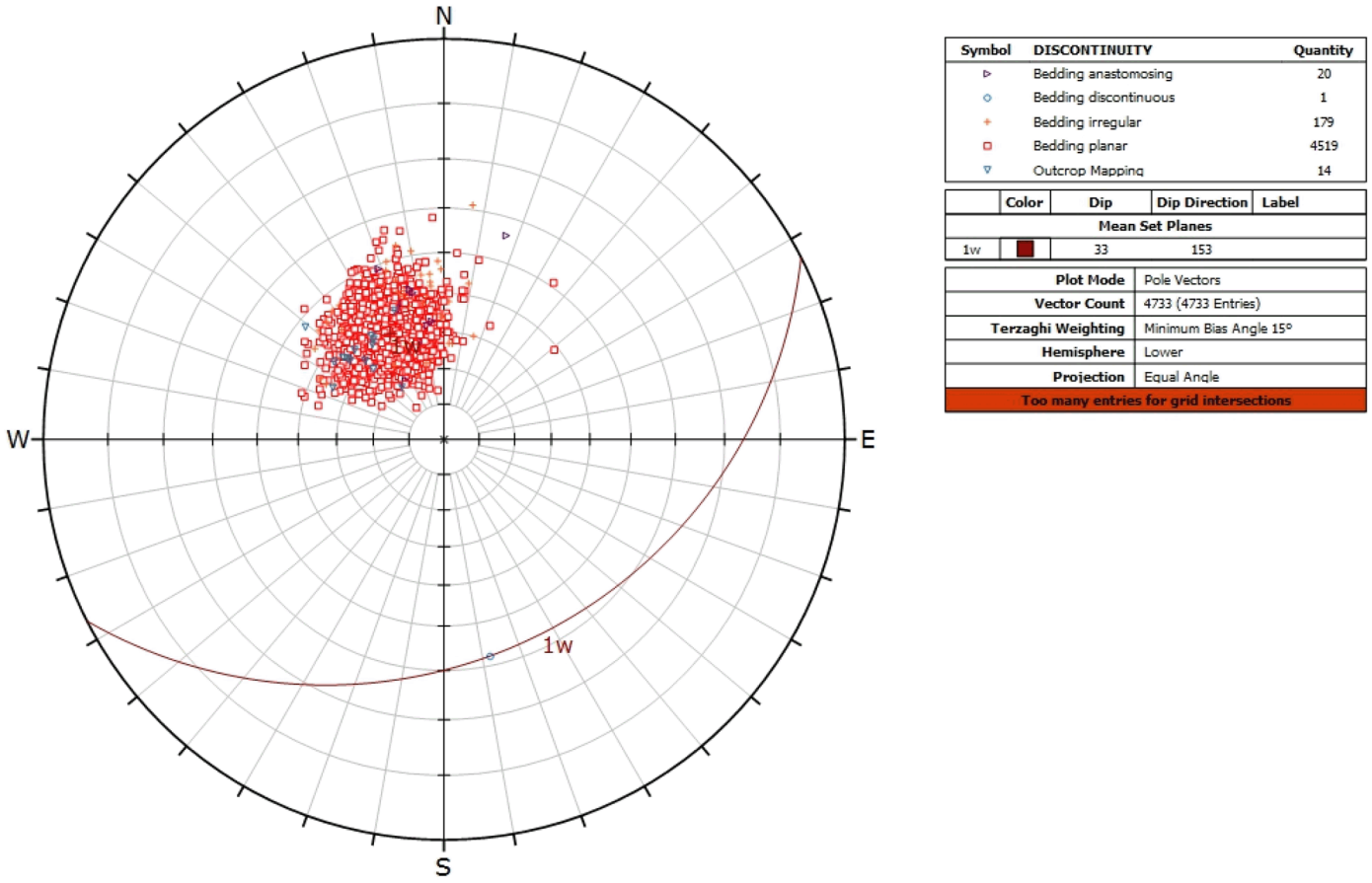
Note: Explanation for geologic map shown in (A) (Reference 2.5.1-214)

Figure 2.5.1-37. (Sheet 2 of 2) Site Location Geologic Map



Plot Mode	Rosette
Plot Data	Apparent Strike
Face Normal Trend	0.0
Face Normal Plunge	90.0
Terzaghi Weighting	Minimum Bias Angle 15°
Bin Size	10°
Outer Circle	3130 planes per arc
Planes Plotted	5699
Minimum Angle To Plot	0.0°
Maximum Angle To Plot	90.0°
Too many entries for grid intersections	

Figure 2.5.1-38. (Sheet 1 of 11) Acoustic Televiewer Data and Outcrop Mapping—Strike of Bedding

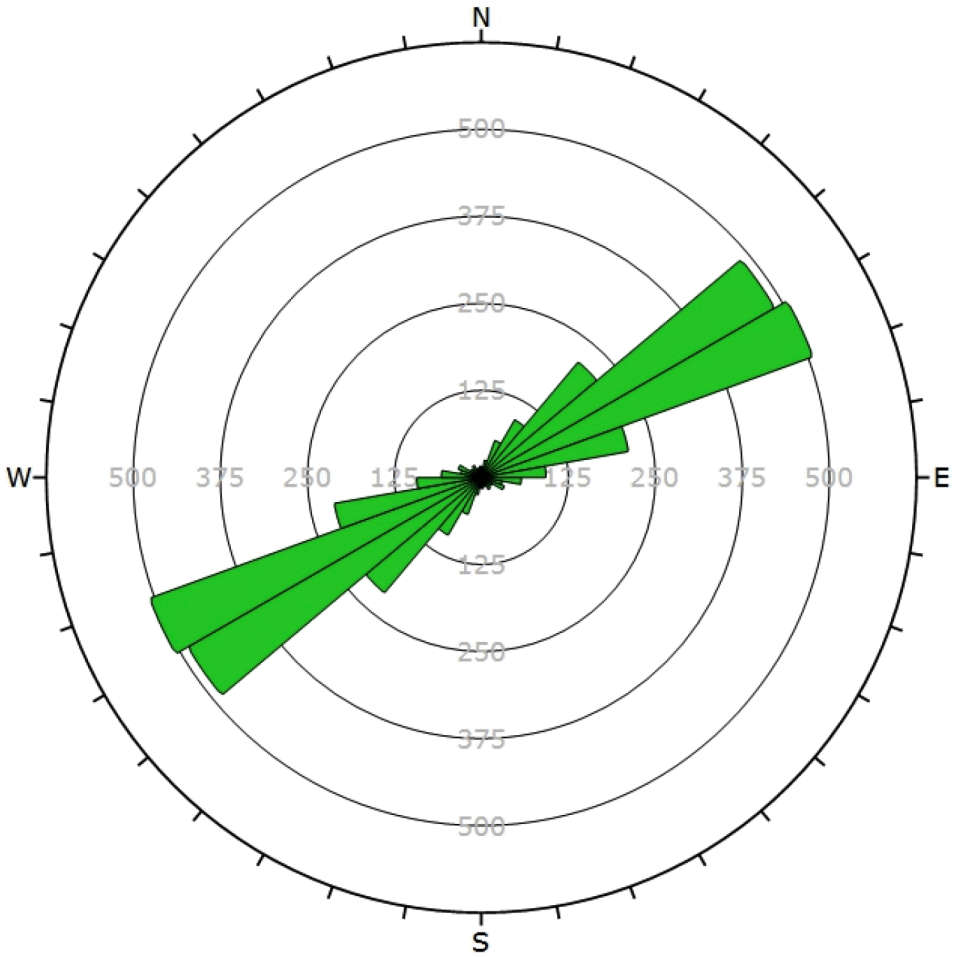


Symbol	DISCONTINUITY	Quantity
▷	Bedding anastomosing	20
○	Bedding discontinuous	1
+	Bedding irregular	179
□	Bedding planar	4519
▽	Outcrop Mapping	14

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		33	153	

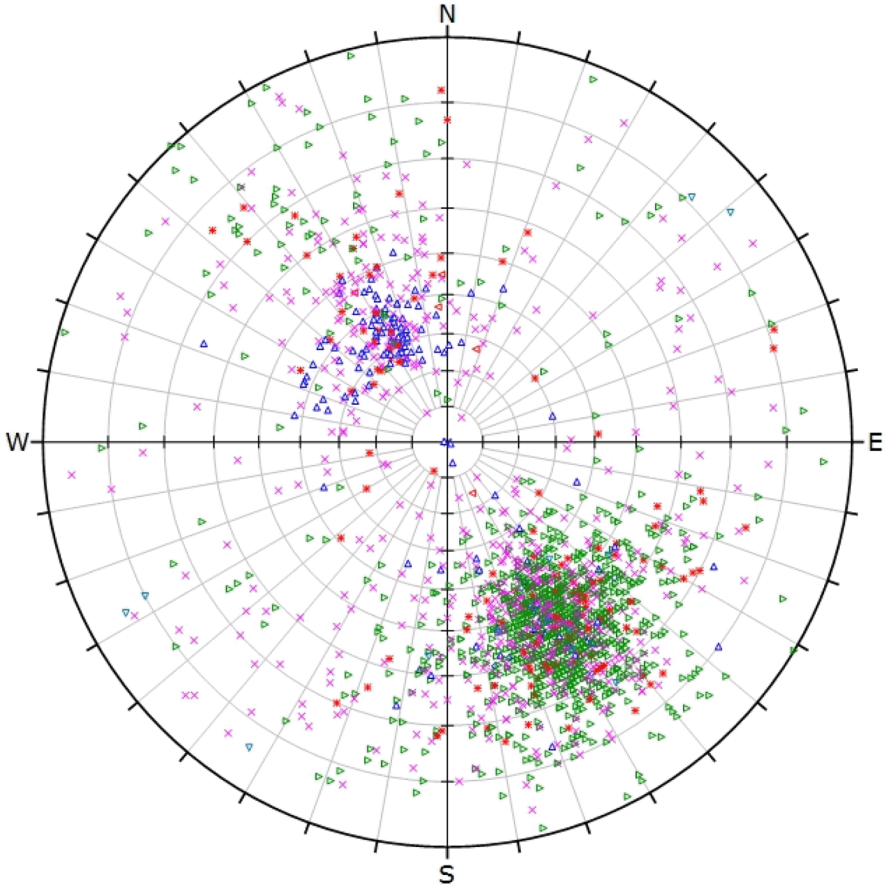
Plot Mode	Pole Vectors
Vector Count	4733 (4733 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle
Too many entries for grid intersections	

Figure 2.5.1-38. (Sheet 2 of 11) Acoustic Televiewer Data and Outcrop Mapping—Strike and Dip of Bedding Planes



Plot Mode	Rosette
Plot Data	Apparent Strike
Face Normal Trend	0.0
Face Normal Plunge	90.0
Bin Size	10°
Outer Circle	625 planes per arc
Planes Plotted	1916
Minimum Angle To Plot	0.0°
Maximum Angle To Plot	90.0°

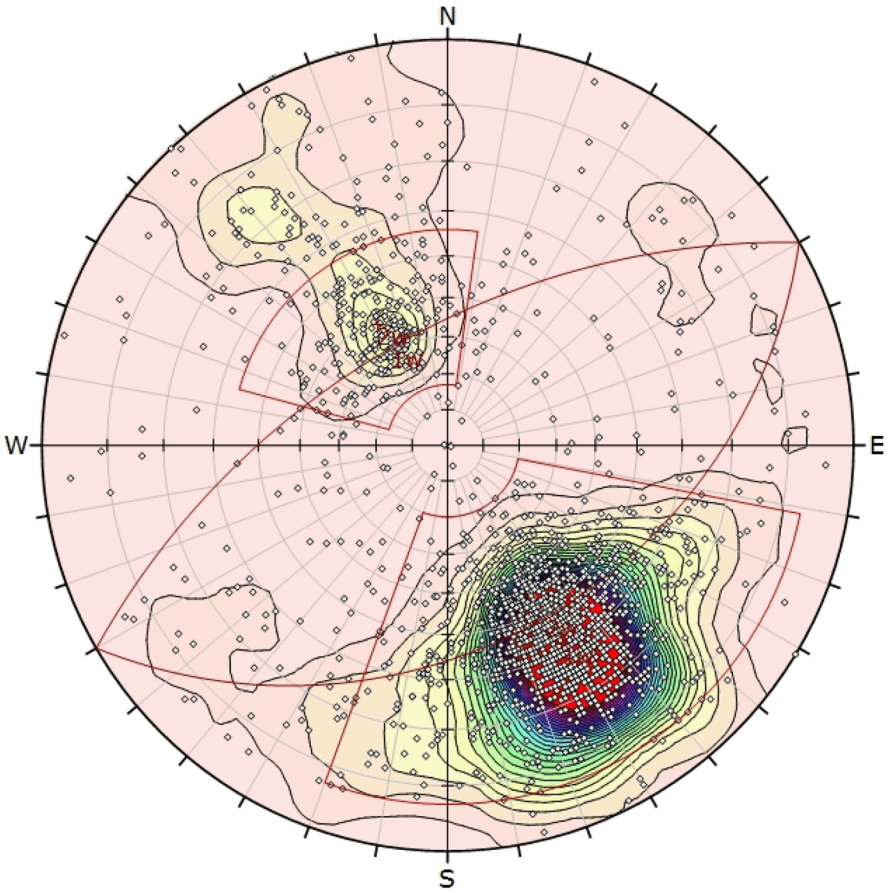
Figure 2.5.1-38. (Sheet 3 of 11) Acoustic Televiewer Data and Outcrop Mapping—Strike of Fractures



Symbol	DISCONTINUITY	Quantity
▷	Joint discontinuous hairline	972
◇	Joint discontinuous open	5
✱	Joint irregular hairline	135
◁	Joint irregular open	8
×	Joint planar hairline	644
△	Joint planar open	139
▽	Outcrop Mapping	13

Plot Mode	Pole Vectors
Vector Count	1916 (1916 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 4 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of all Fractures



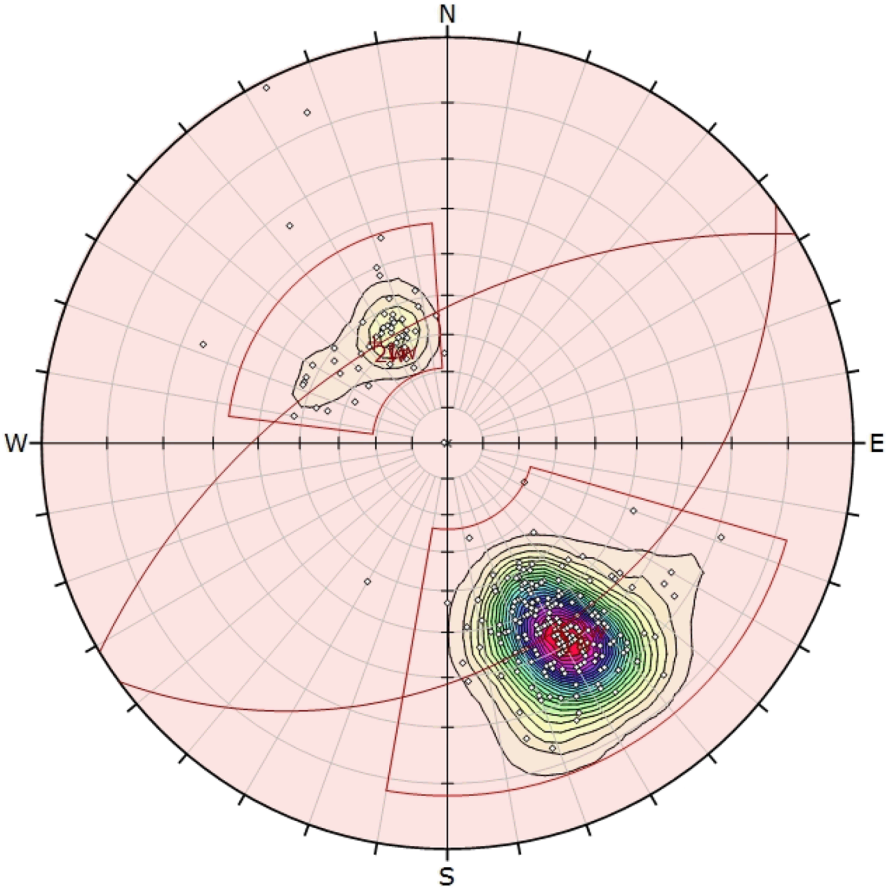
Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 1.00
	1.00 - 2.00
	2.00 - 3.00
	3.00 - 4.00
	4.00 - 5.00
	5.00 - 6.00
	6.00 - 7.00
	7.00 - 8.00
	8.00 - 9.00
	9.00 <
Maximum Density	18.82%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		59	330	
2w		38	150	

Plot Mode	Pole Vectors
Vector Count	1916 (1916 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 5 of 11) Acoustic Televiewer Data and Outcrop Mapping—Strike and Dip of Primary Fracture Sets

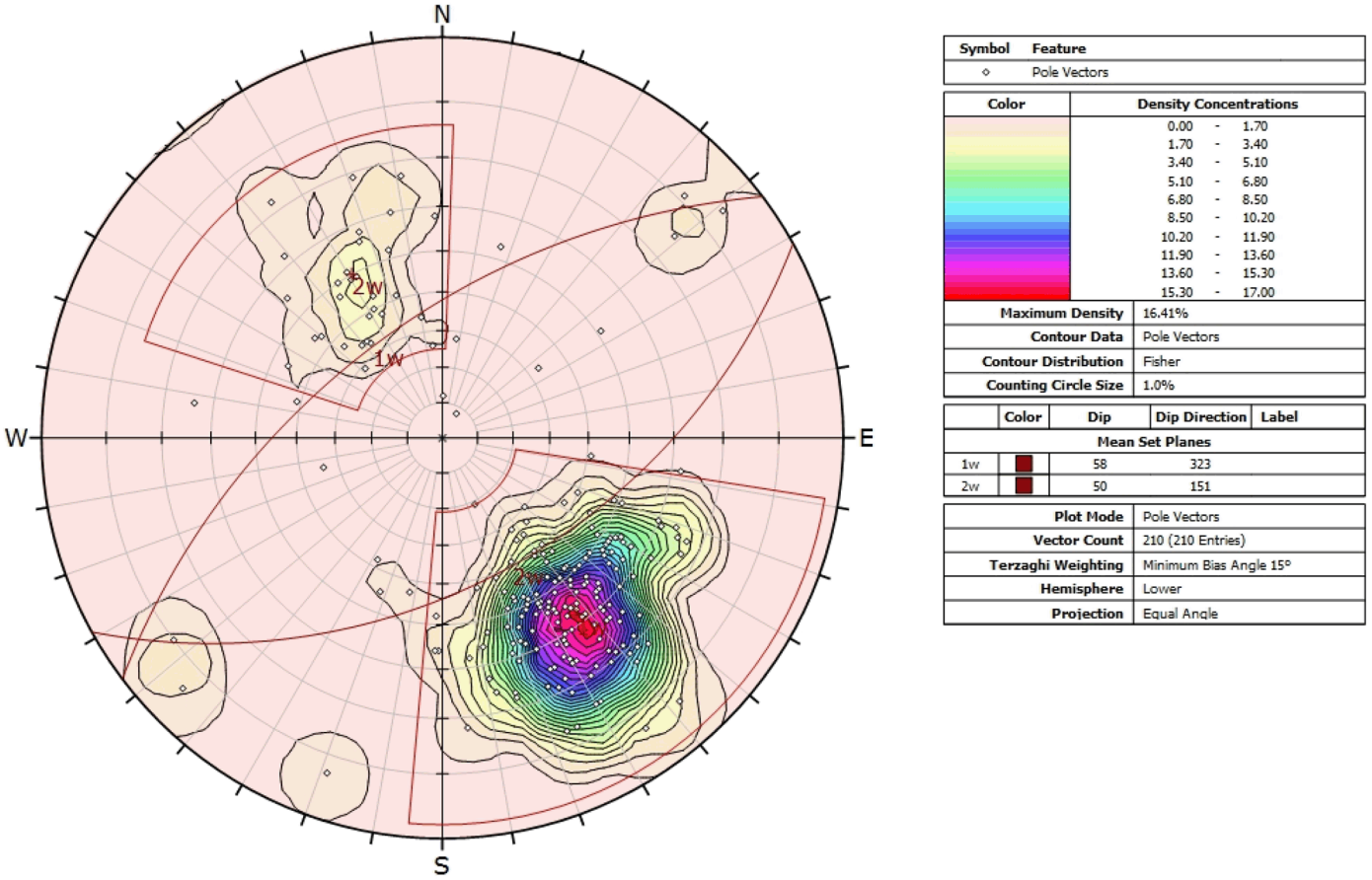


Color	Density Concentrations
	0.00 - 3.10
	3.10 - 6.20
	6.20 - 9.30
	9.30 - 12.40
	12.40 - 15.50
	15.50 - 18.60
	18.60 - 21.70
	21.70 - 24.80
	24.80 - 27.90
	27.90 - 31.00
Maximum Density	30.96%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		57	329	
2w		34	144	

Plot Mode	Pole Vectors
Vector Count	270 (270 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 6 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of Fractures in the Benbolt Formation



Symbol	Feature
◇	Pole Vectors

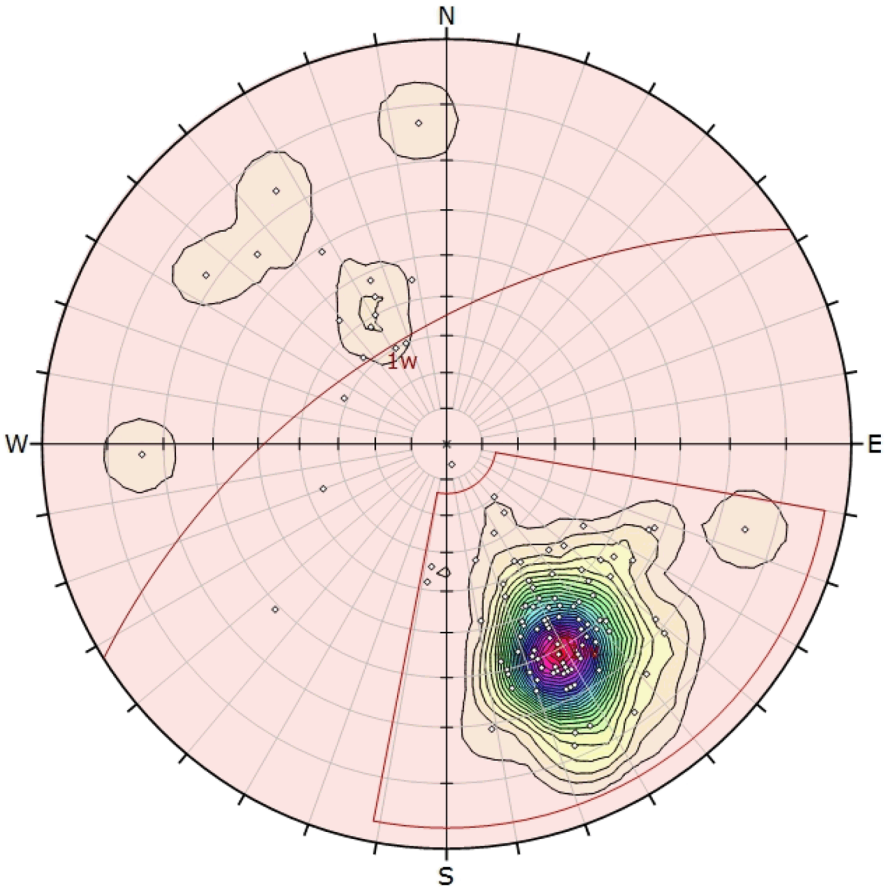
Color	Density Concentrations
	0.00 - 1.70
	1.70 - 3.40
	3.40 - 5.10
	5.10 - 6.80
	6.80 - 8.50
	8.50 - 10.20
	10.20 - 11.90
	11.90 - 13.60
	13.60 - 15.30
	15.30 - 17.00

Maximum Density	16.41%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		58	323	
2w		50	151	

Plot Mode	Pole Vectors
Vector Count	210 (210 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 7 of 11) Acoustic Televiewer and Outcrop Mapping—Orientation of Fractures in the Blackford Formation



Symbol	Feature
◇	Pole Vectors

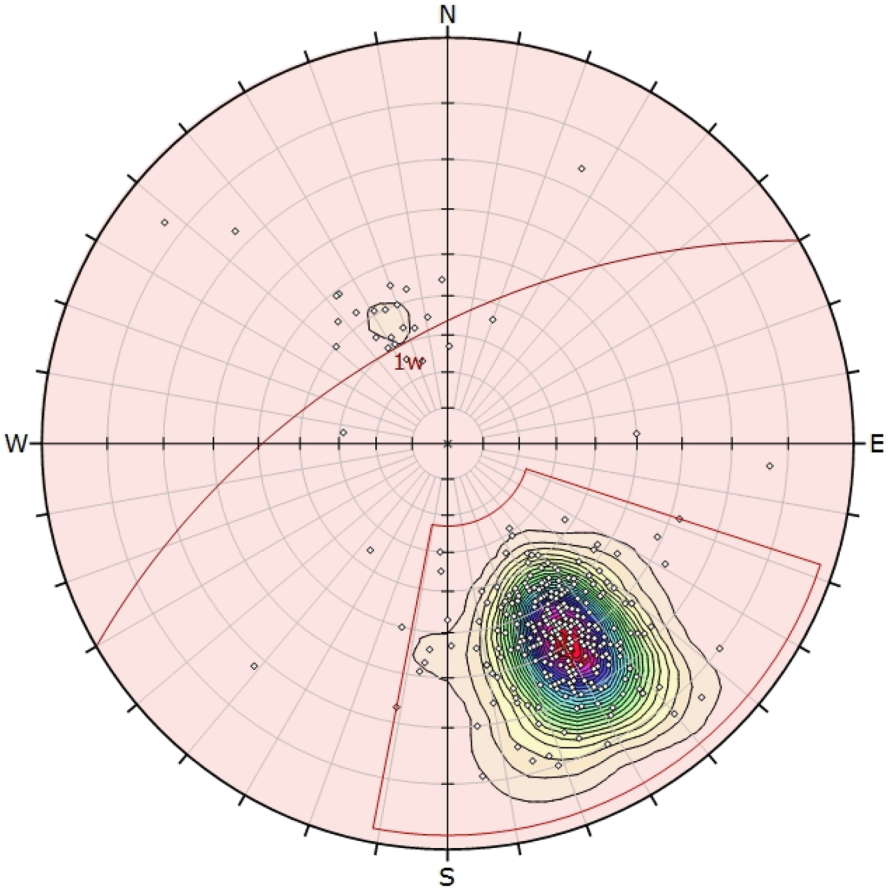
Color	Density Concentrations
	0.00 - 3.10
	3.10 - 6.20
	6.20 - 9.30
	9.30 - 12.40
	12.40 - 15.50
	15.50 - 18.60
	18.60 - 21.70
	21.70 - 24.80
	24.80 - 27.90
	27.90 - 31.00

Maximum Density	30.33%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		59	328	

Plot Mode	Pole Vectors
Vector Count	117 (117 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 8 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of Fractures in the Eidson Formation



Symbol	Feature
◇	Pole Vectors

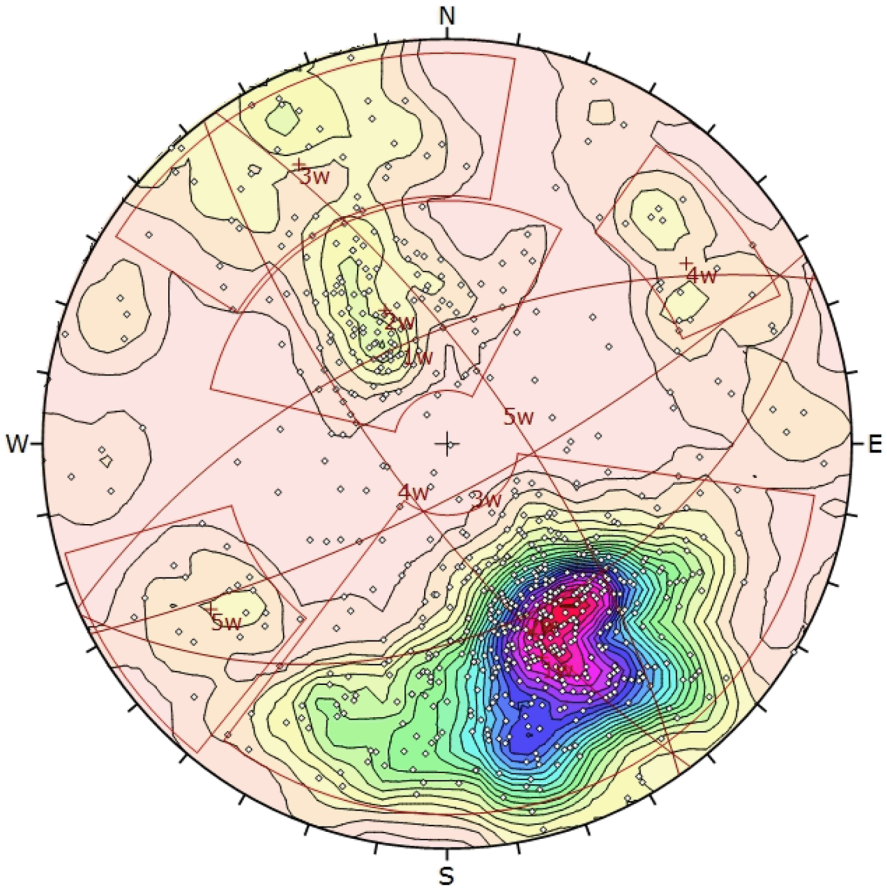
Color	Density Concentrations
	0.00 - 3.30
	3.30 - 6.60
	6.60 - 9.90
	9.90 - 13.20
	13.20 - 16.50
	16.50 - 19.80
	19.80 - 23.10
	23.10 - 26.40
	26.40 - 29.70
	29.70 - 33.00

Maximum Density	32.67%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		60	330	

Plot Mode	Pole Vectors
Vector Count	333 (333 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 9 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of Fractures in the Fleanor Shale



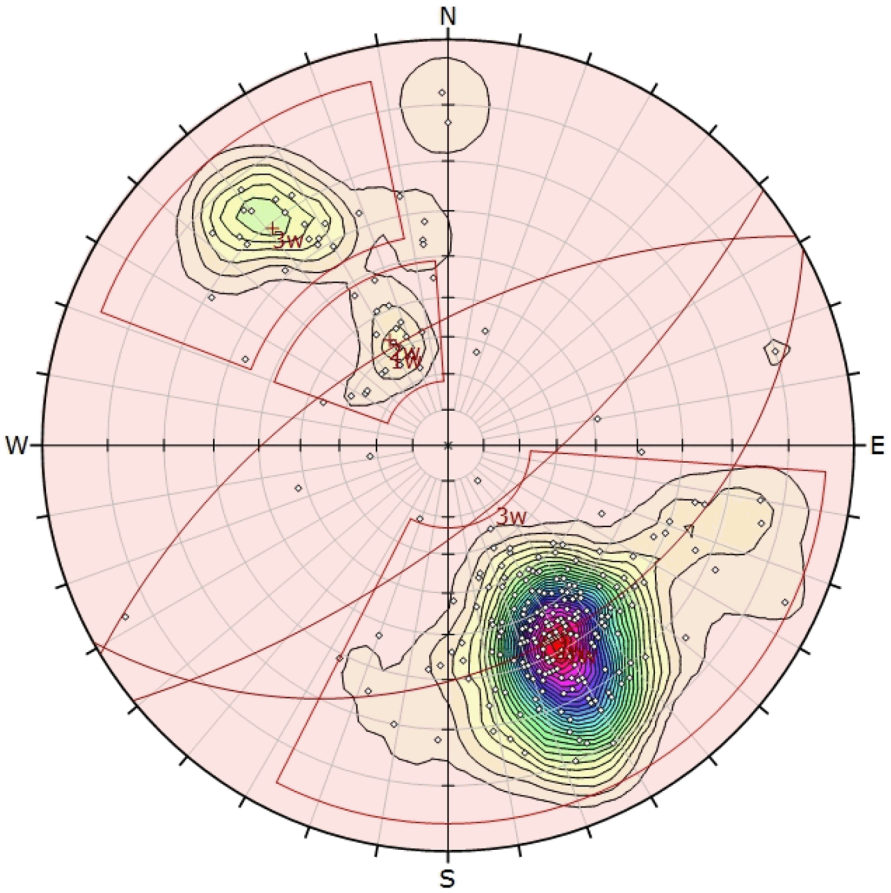
Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 0.80
	0.80 - 1.60
	1.60 - 2.40
	2.40 - 3.20
	3.20 - 4.00
	4.00 - 4.80
	4.80 - 5.60
	5.60 - 6.40
	6.40 - 7.20
	7.20 - 8.00
Maximum Density	7.72%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		60	336	
2w		40	155	
3w		76	152	
4w		73	233	
5w		71	55	

Plot Mode	Pole Vectors
Vector Count	699 (699 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 10 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of Fractures in the Newala Limestone



Symbol	Feature
◇	Pole Vectors

Color	Density Concentrations
	0.00 - 2.00
	2.00 - 4.00
	4.00 - 6.00
	6.00 - 8.00
	8.00 - 10.00
	10.00 - 12.00
	12.00 - 14.00
	14.00 - 16.00
	16.00 - 18.00
	18.00 - 20.00

Maximum Density	19.73%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1w		59	329	
2w		33	151	
3w		69	141	

Plot Mode	Pole Vectors
Vector Count	262 (262 Entries)
Terzaghi Weighting	Minimum Bias Angle 15°
Hemisphere	Lower
Projection	Equal Angle

Figure 2.5.1-38. (Sheet 11 of 11) Acoustic Televiewer Data and Outcrop Mapping—Orientation of Fractures in the Rockdell Formation

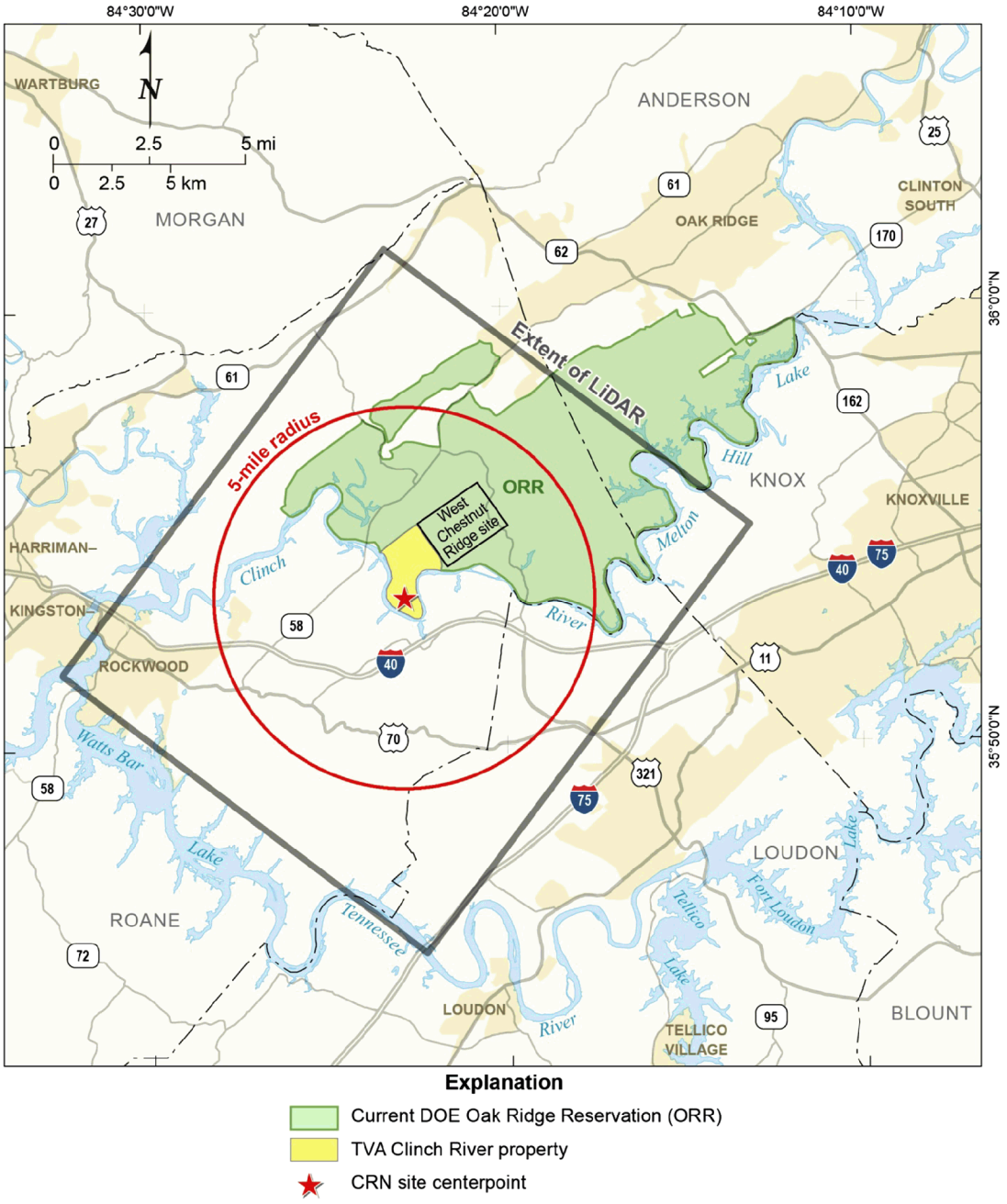
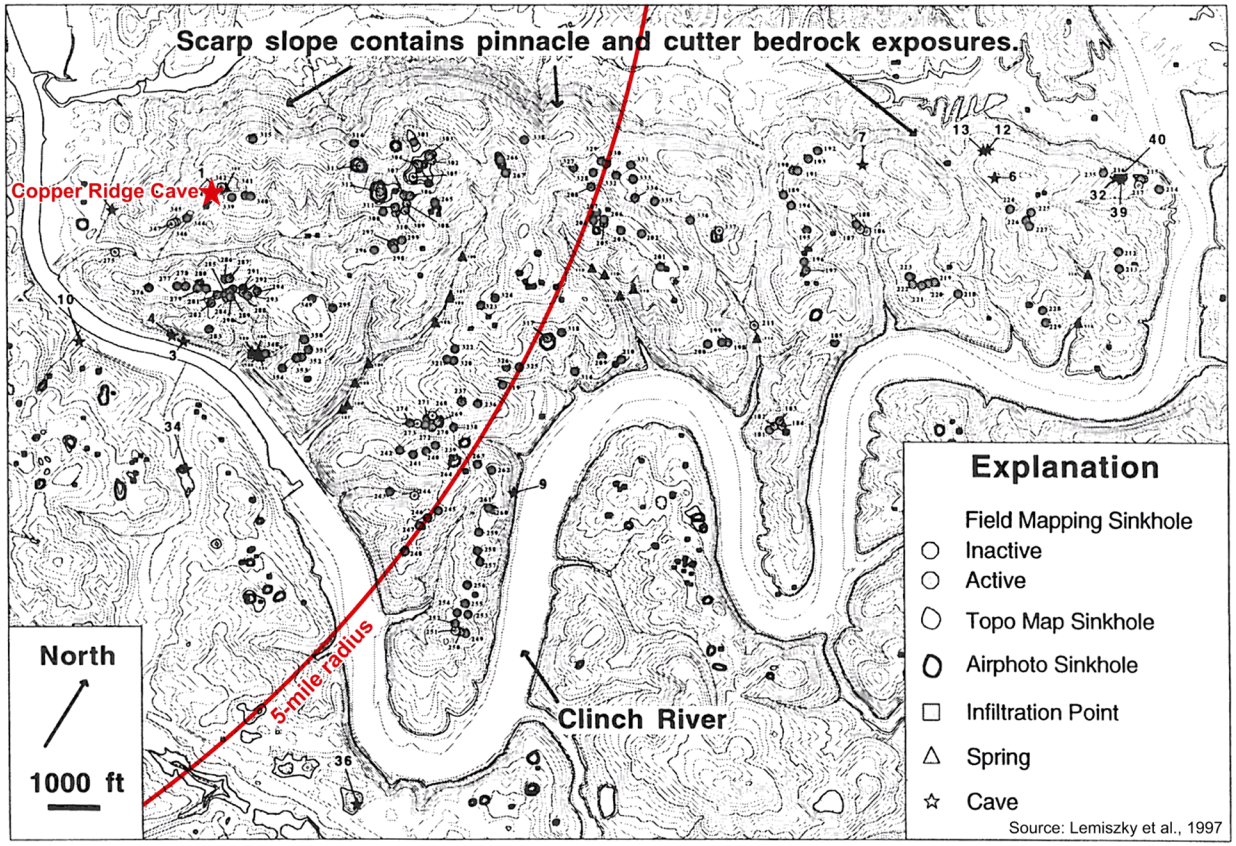
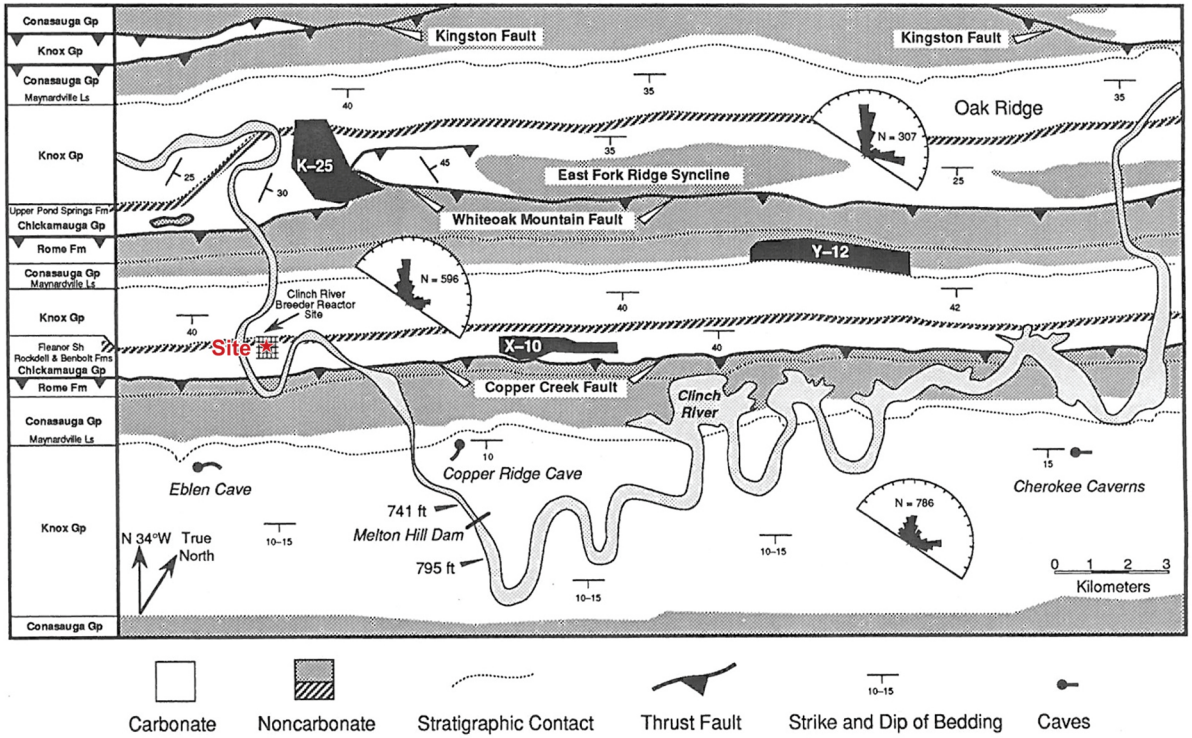


Figure 2.5.1-39. Site Area Map



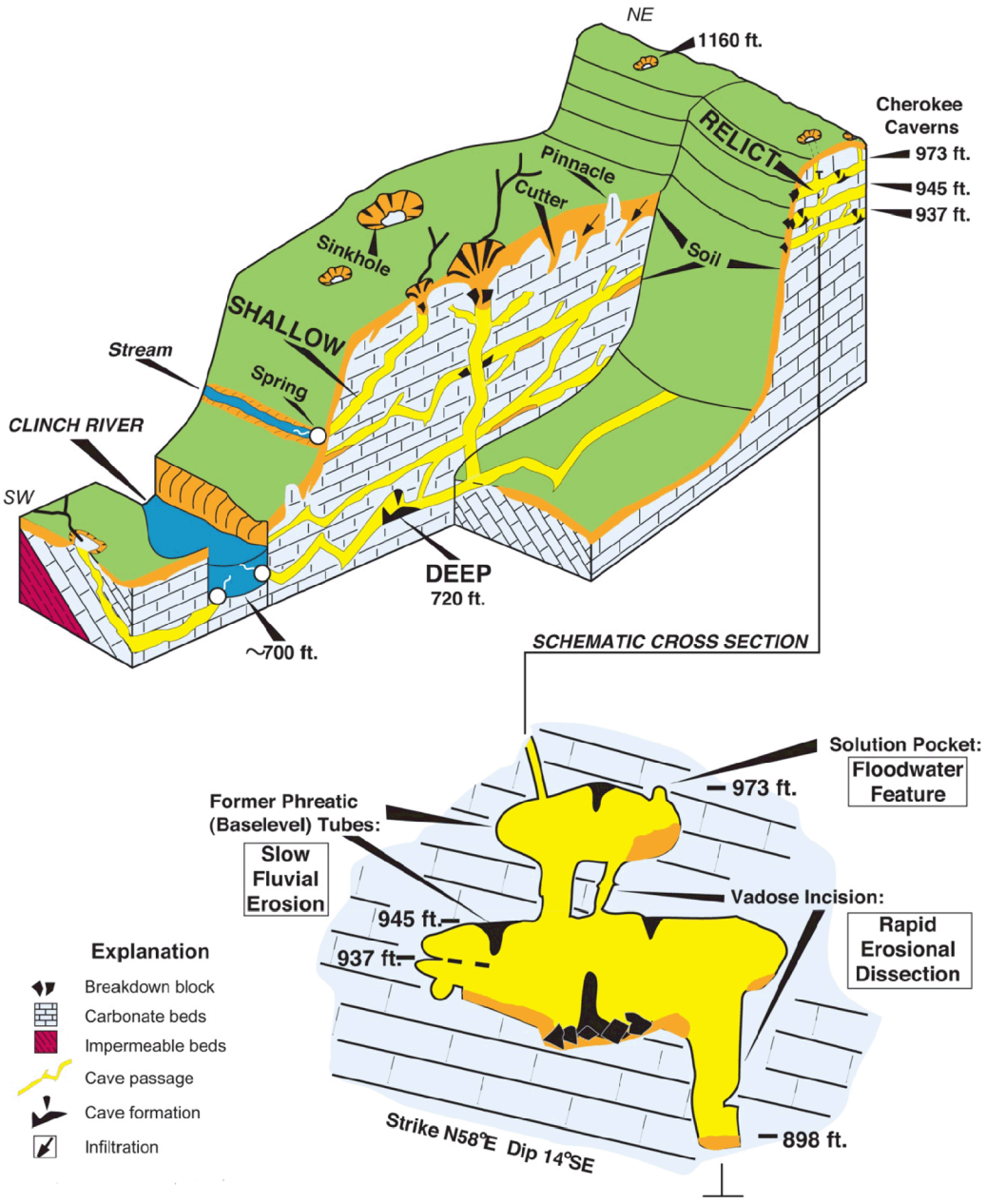
Source: Reference 2.5.1-239

Figure 2.5.1-40. Karst Features near Copper Ridge Cave



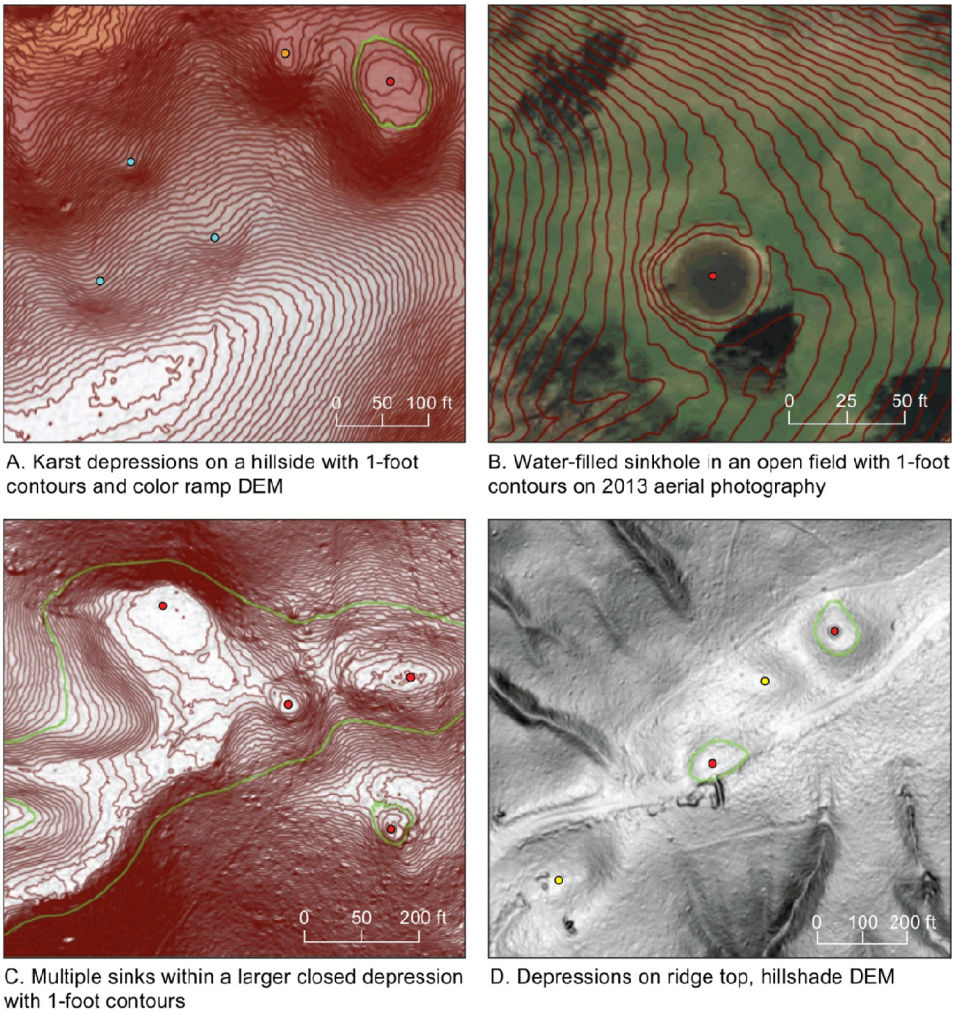
Source: Reference 2.5.1-240

Figure 2.5.1-41. Generalized Geologic Map of the Oak Ridge Area



Source: Reference 2.5.1-240

Figure 2.5.1-42. Conceptual Model for Karst Systems in the Oak Ridge Area



A. Karst depressions on a hillside with 1-foot contours and color ramp DEM

B. Water-filled sinkhole in an open field with 1-foot contours on 2013 aerial photography

C. Multiple sinks within a larger closed depression with 1-foot contours

D. Depressions on ridge top, hillshade DEM

Figure 2.5.1-43. Examples of Karst Depressions Mapped from LiDAR Data

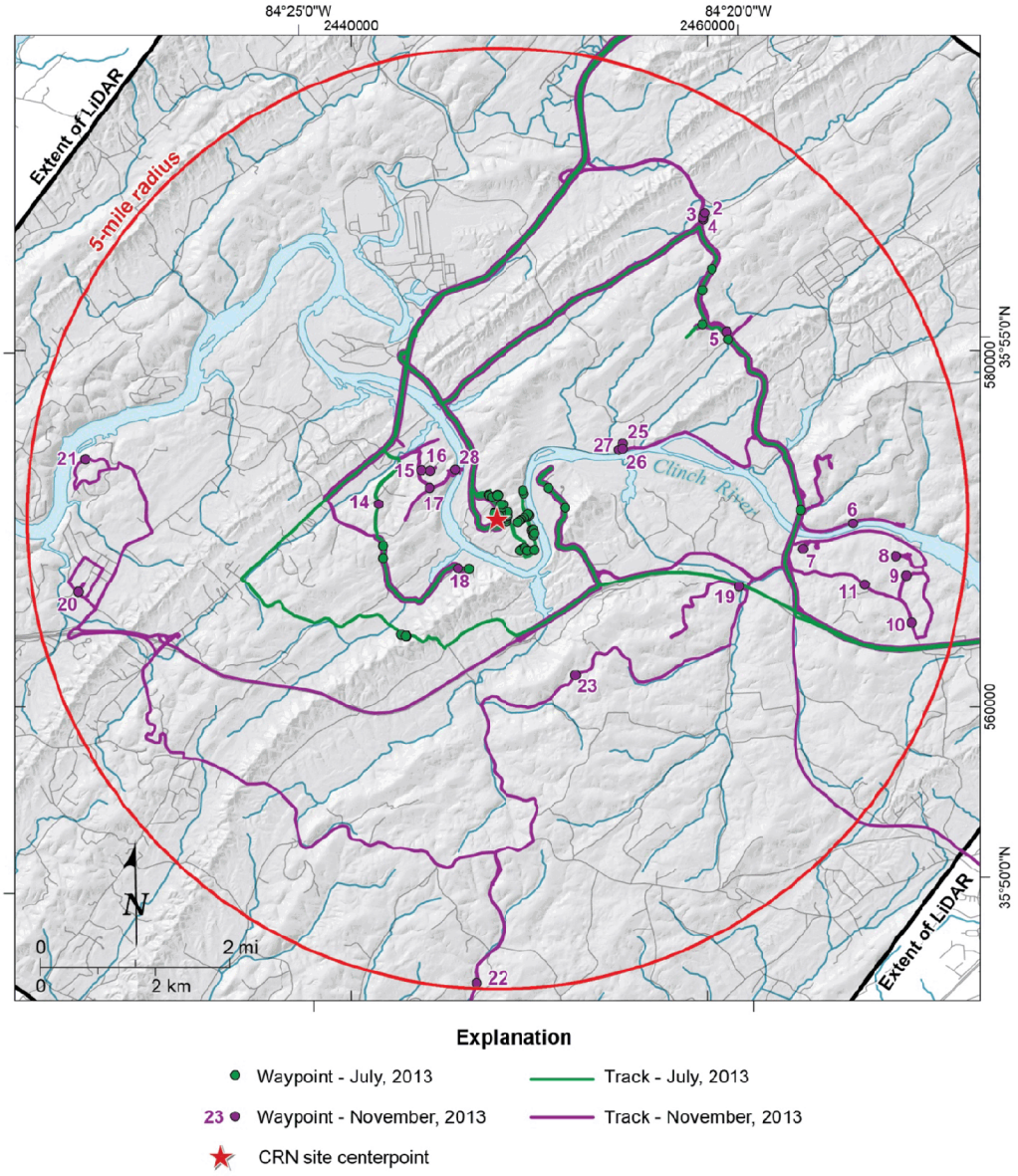


Figure 2.5.1-44. Location of Karst Field Reconnaissance



A. Pond in depression, Knox Group

B. Gentle depression, Knox Group

C. Active swallet, Witten Formation

D. Flat floor of depression, Witten Formation

Figure 2.5.1-45. Field Photographs of Karst Depressions

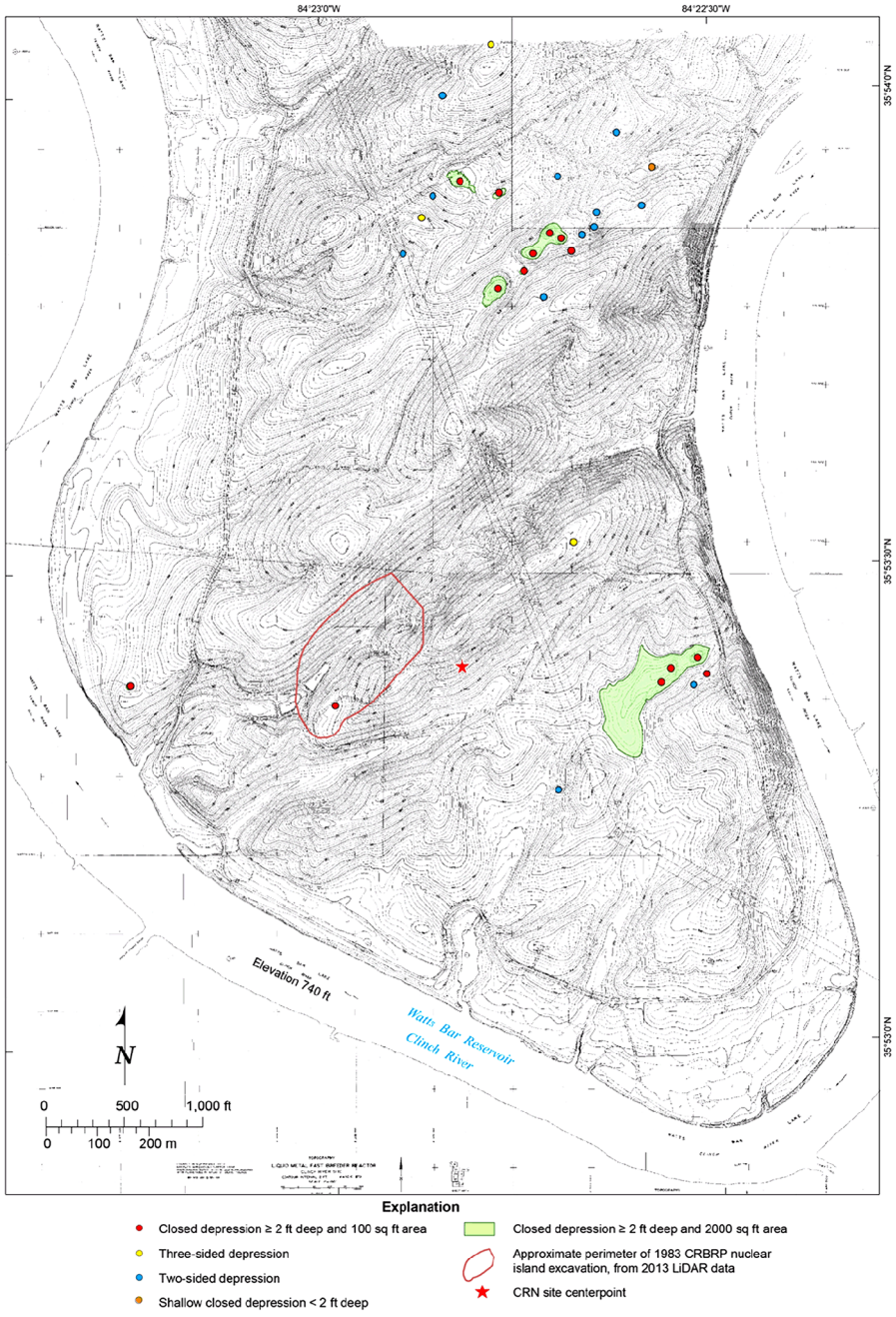


Figure 2.5.1-46. Surface Karst Features and Site Topography Associated with CRBRP Investigations (1973)

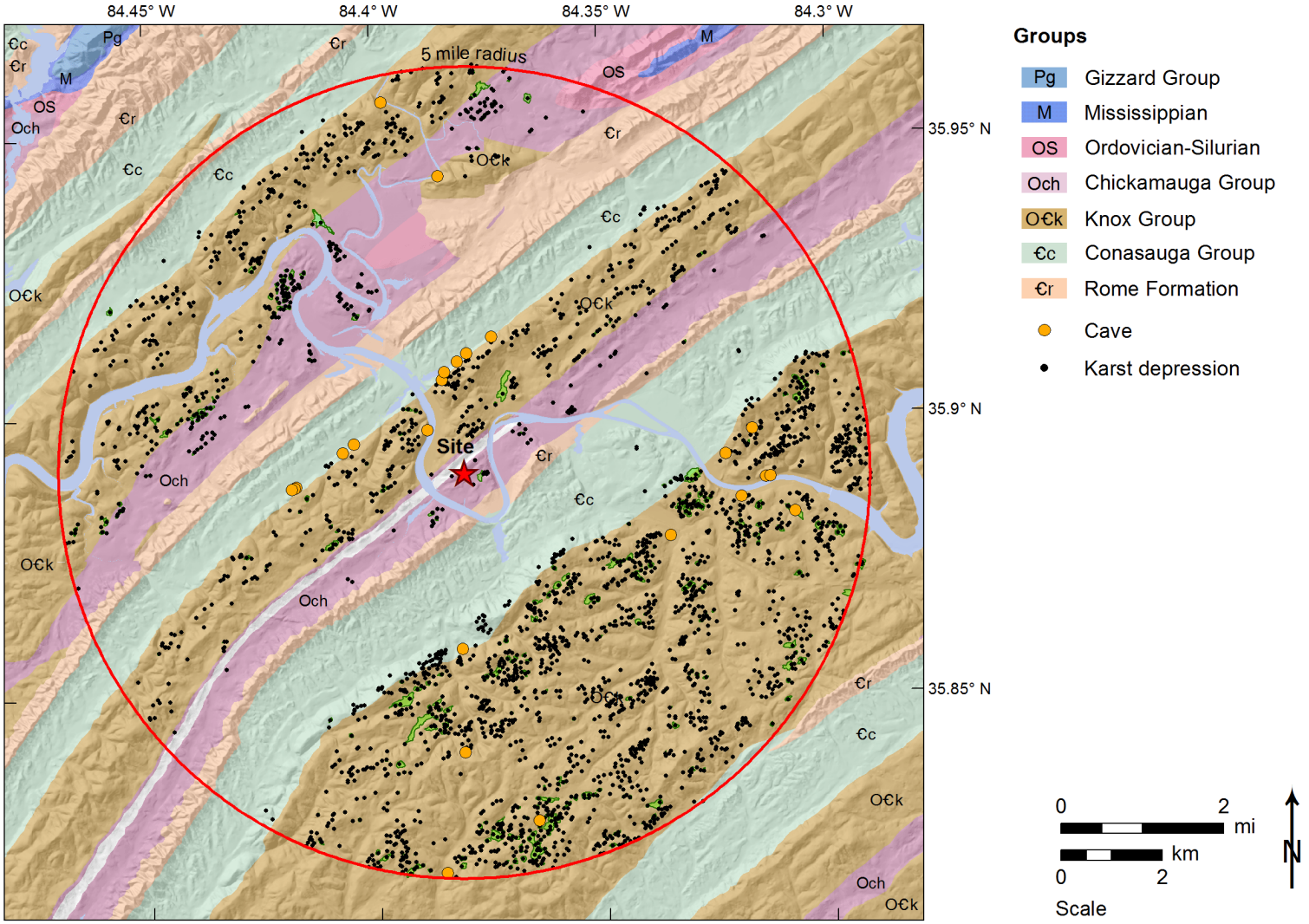


Figure 2.5.1-47. Distribution of Mapped Karst Features in the Site Area



A. Small stream passage, 3 ft-high, with alluvial deposits on floor



B. Large stream passage, 16 ft-wide, following bedding dip



C. Solution enlargement at the intersection of joint and bedding plane



D. Ceiling collapse along bedding plane.

Figure 2.5.1-48. Field Photographs of Cave Features

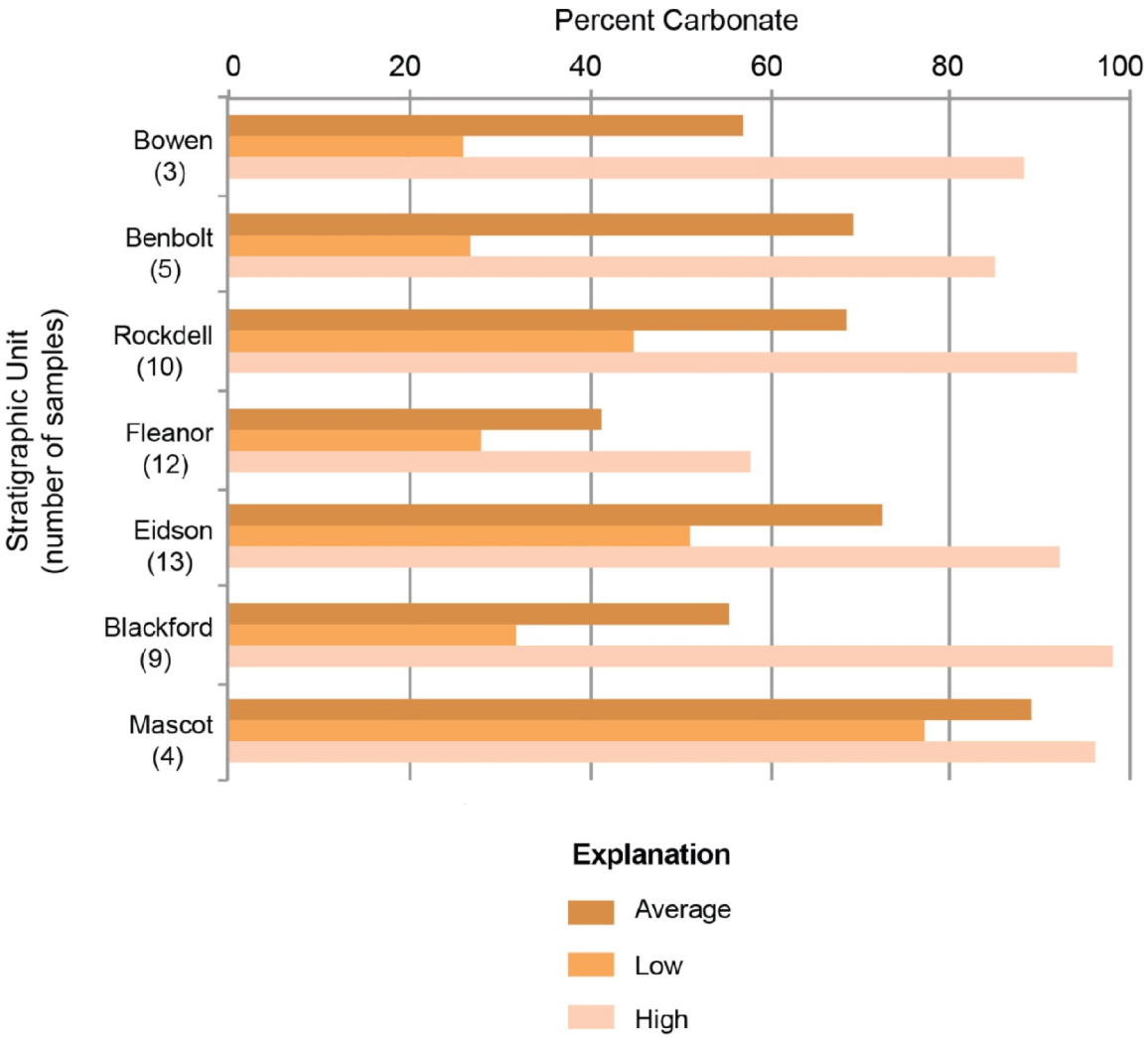
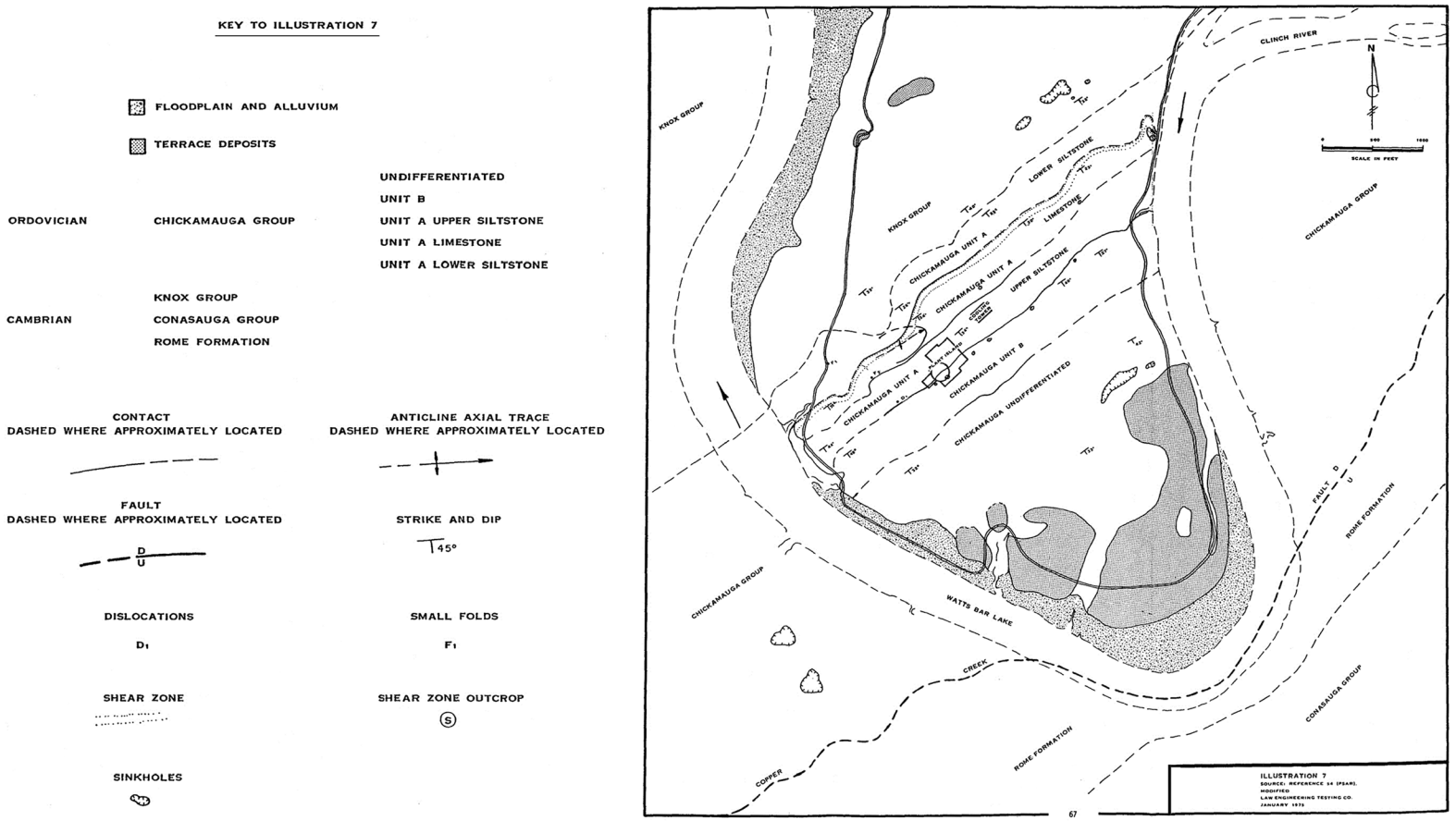
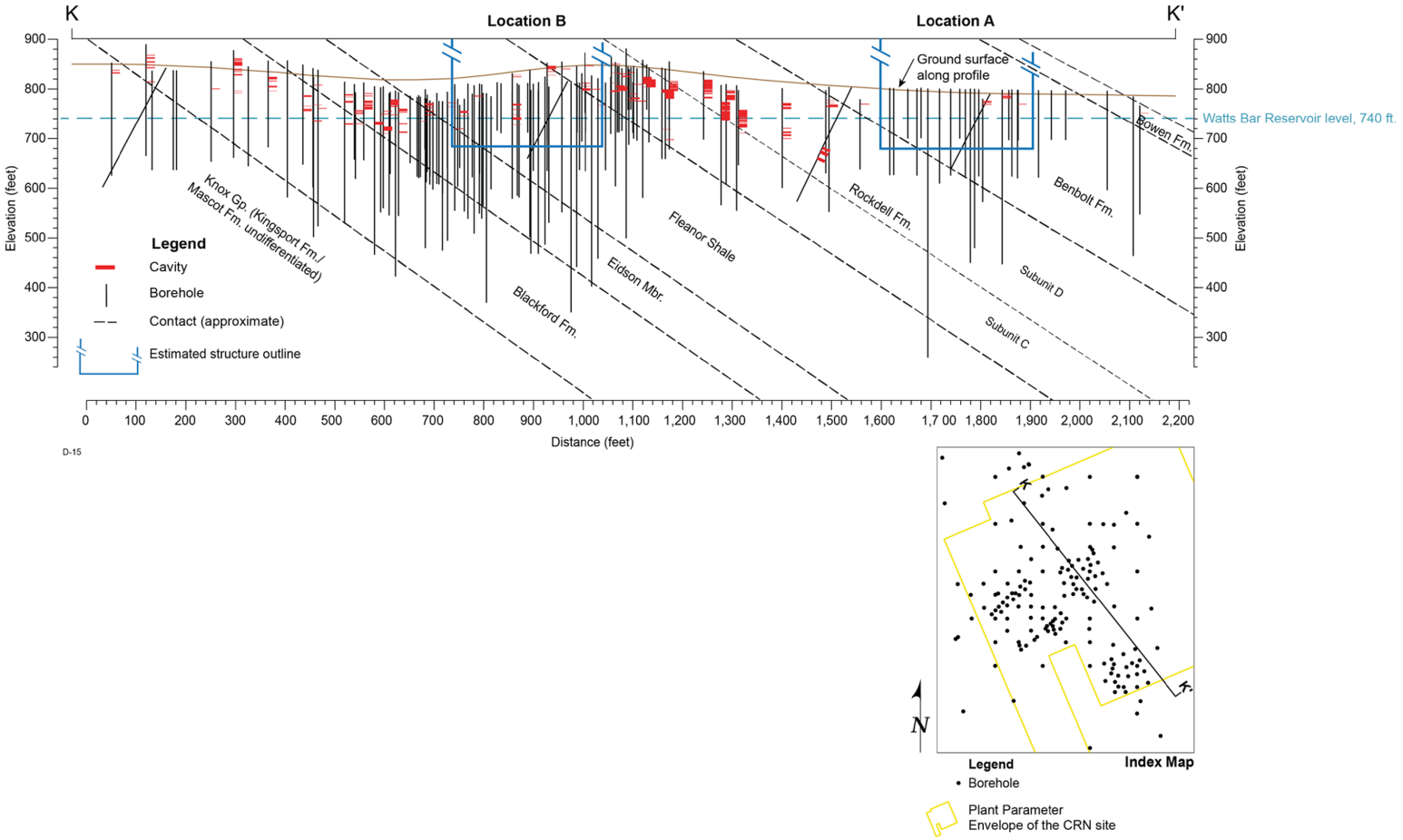


Figure 2.5.1-49. Carbonate Content of Rock Core Samples by Stratigraphic Unit



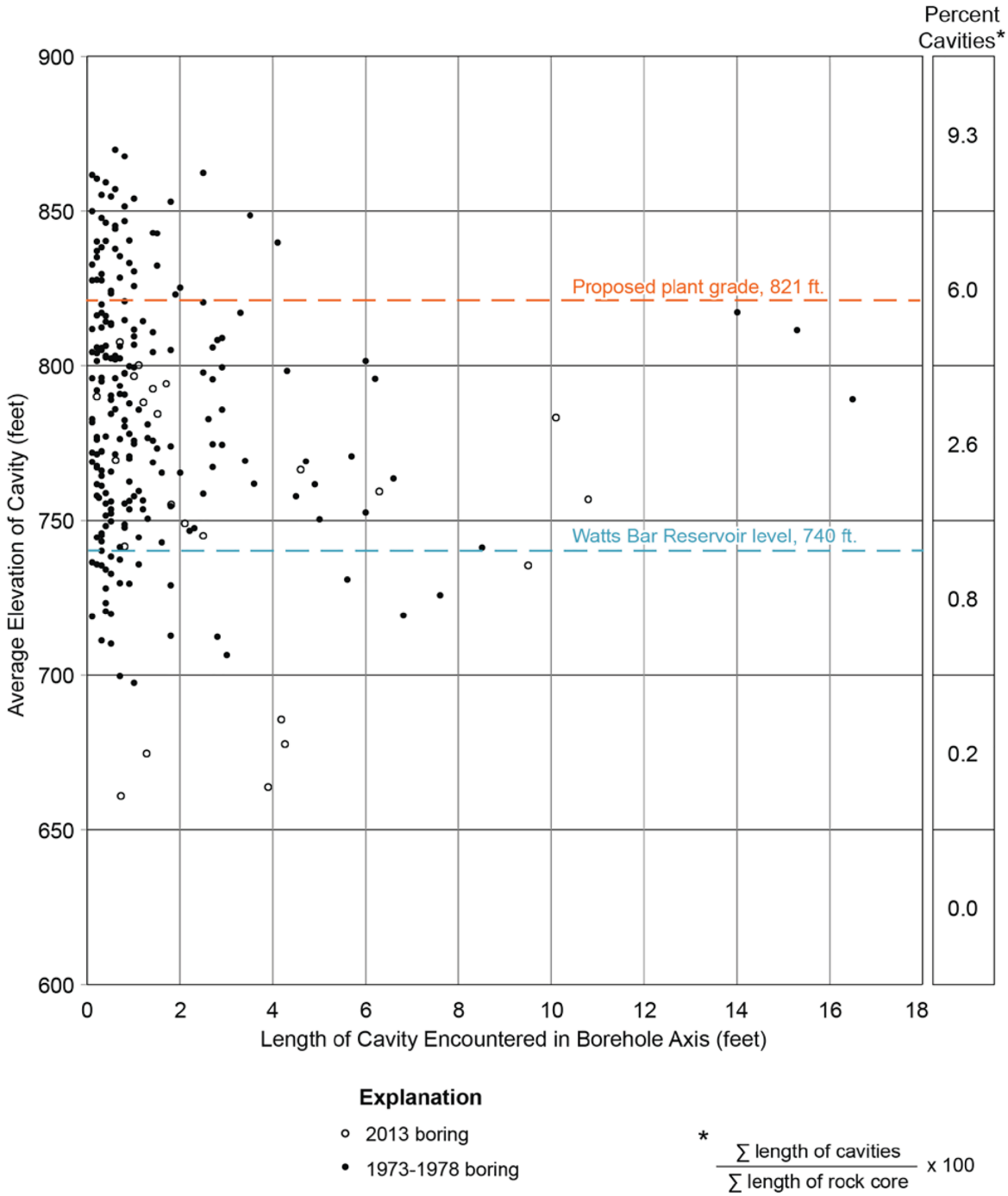
Source: Page 216 of Reference 2.5.1-238

Figure 2.5.1-50. Clinch River Breeder Reactor Project Geologic Map



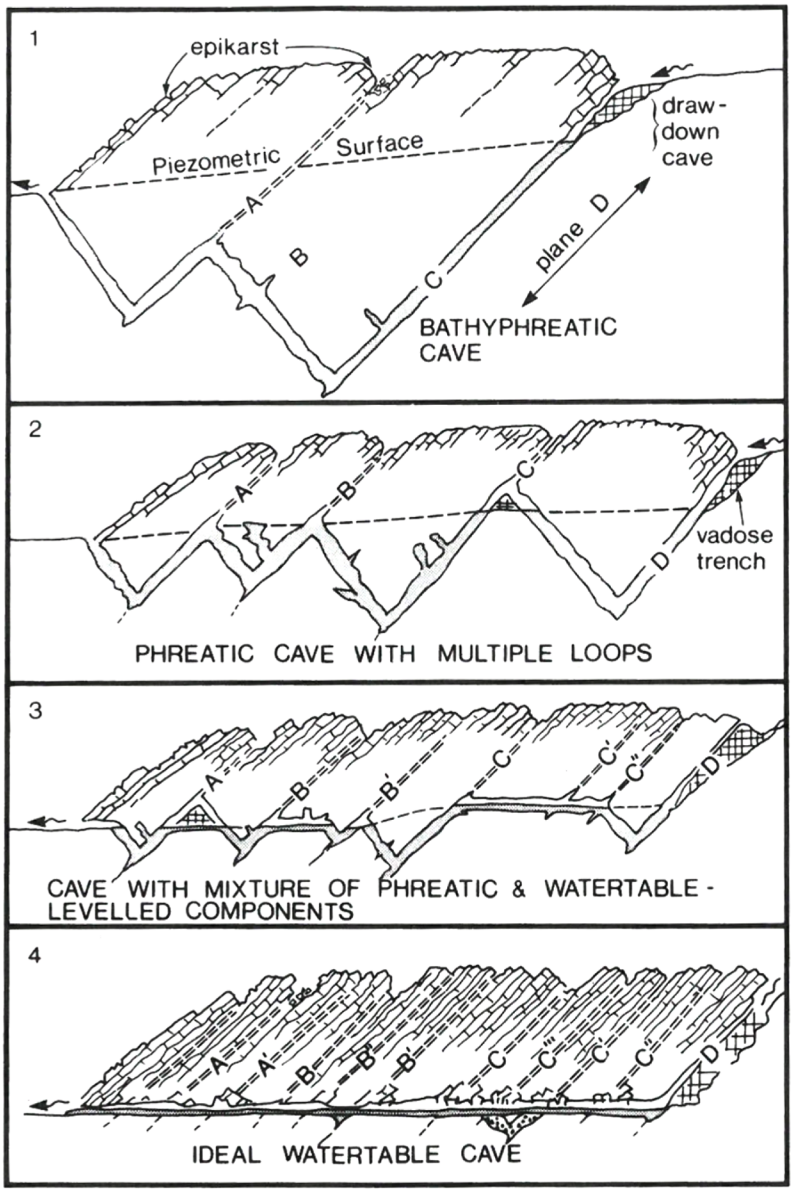
Notes:
1. Boreholes are projected on to a vertical plane oriented perpendicular to bedding strike of N52°E.
2. Borehole data are compiled from the CRBRP (Reference 2.5.1-100) and the CRN investigation (Reference 2.5.1-214).

Figure 2.5.1-51. Cross-Section Distribution of Cavities in Rock Core



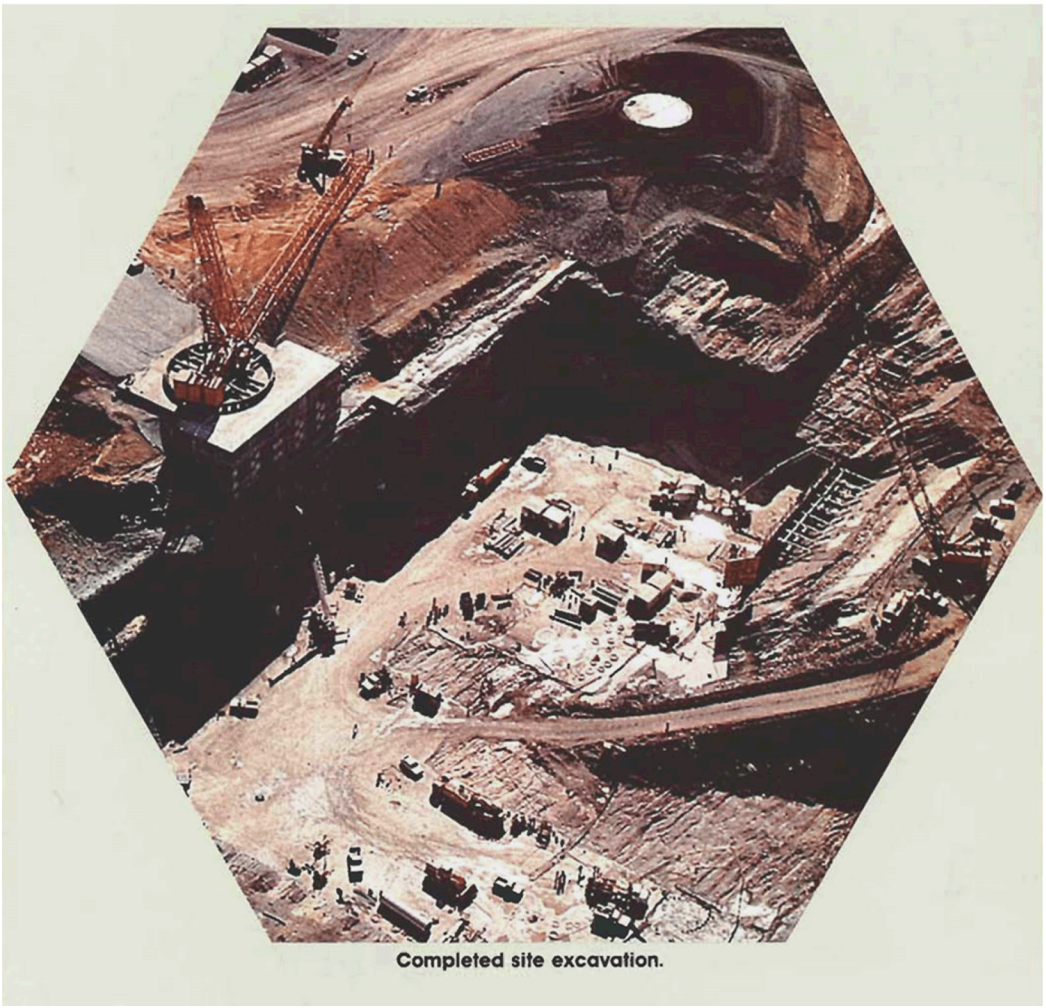
Sources: Reference 2.5.1-100, Reference 2.5.1-214

Figure 2.5.1-52. Cavity Size and Elevation in Borings



Source: Reference 2.5.1-7

Figure 2.5.1-53. Model Showing Types of Phreatic and Water Table Caves

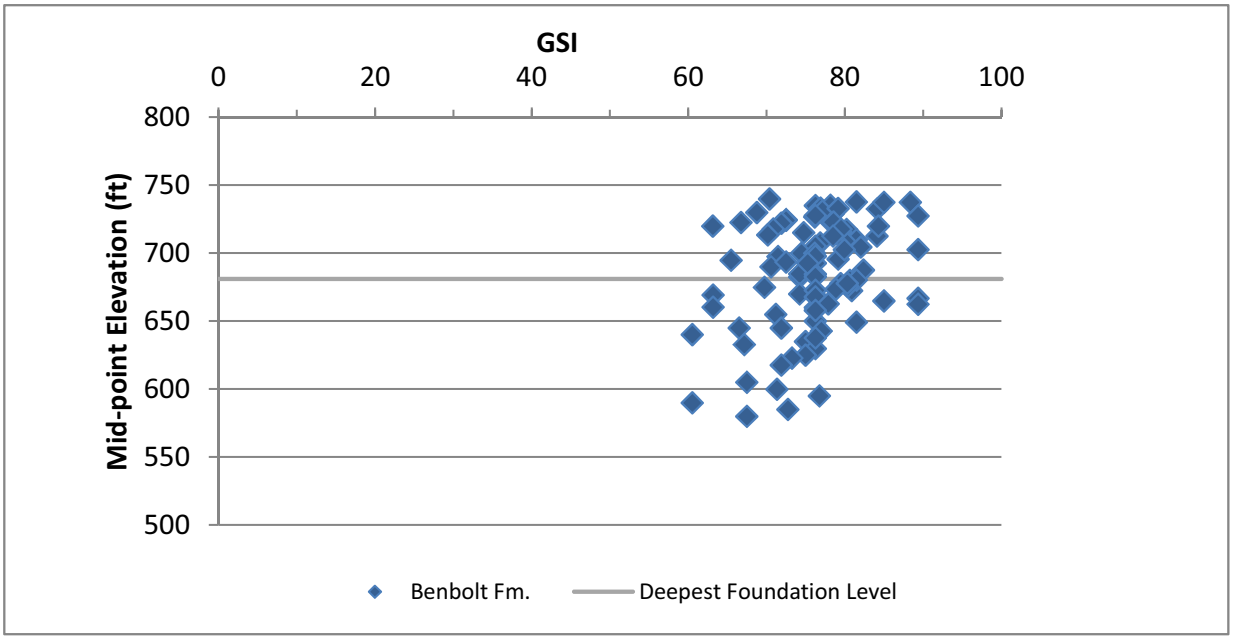


Source: Reference 2.5.1-246
Oblique view south.

Figure 2.5.1-54. Photograph of Completed Clinch River Breeder Reactor Project Excavation, 1983



Figure 2.5.1-55. Dissolution of Limestone Interbeds in the Blackford Formation



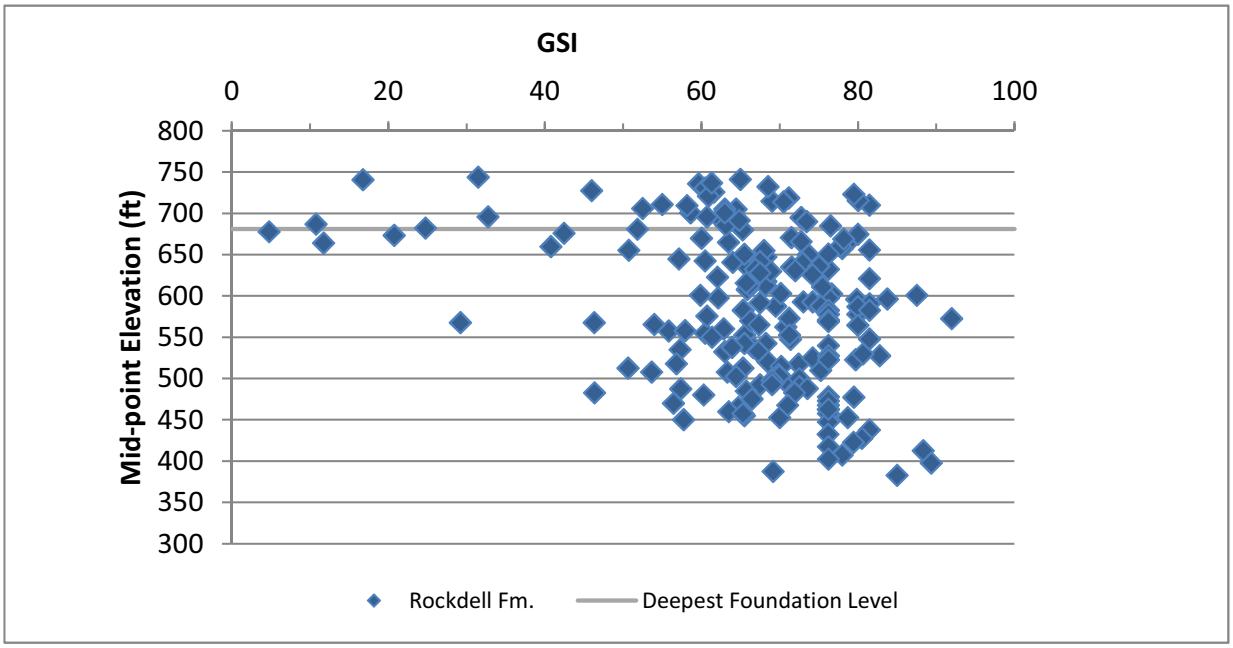
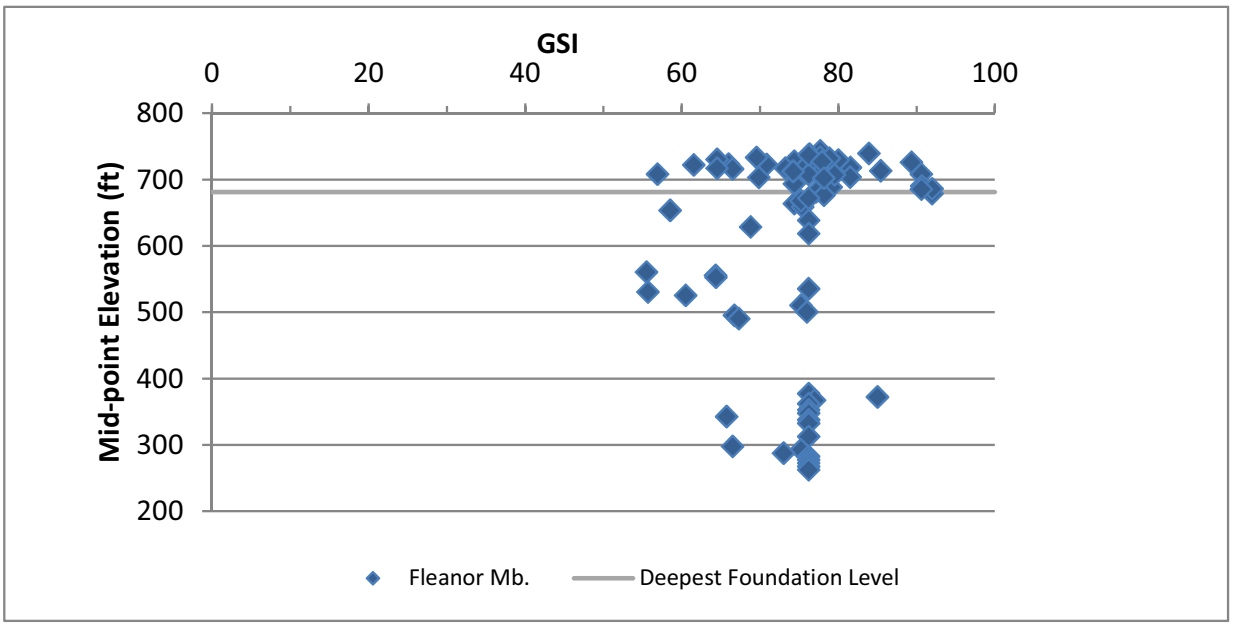


Figure 2.5.1-56. (Sheet 1 of 3) Scatter Plots of Geological Strength Index per Bedrock Unit



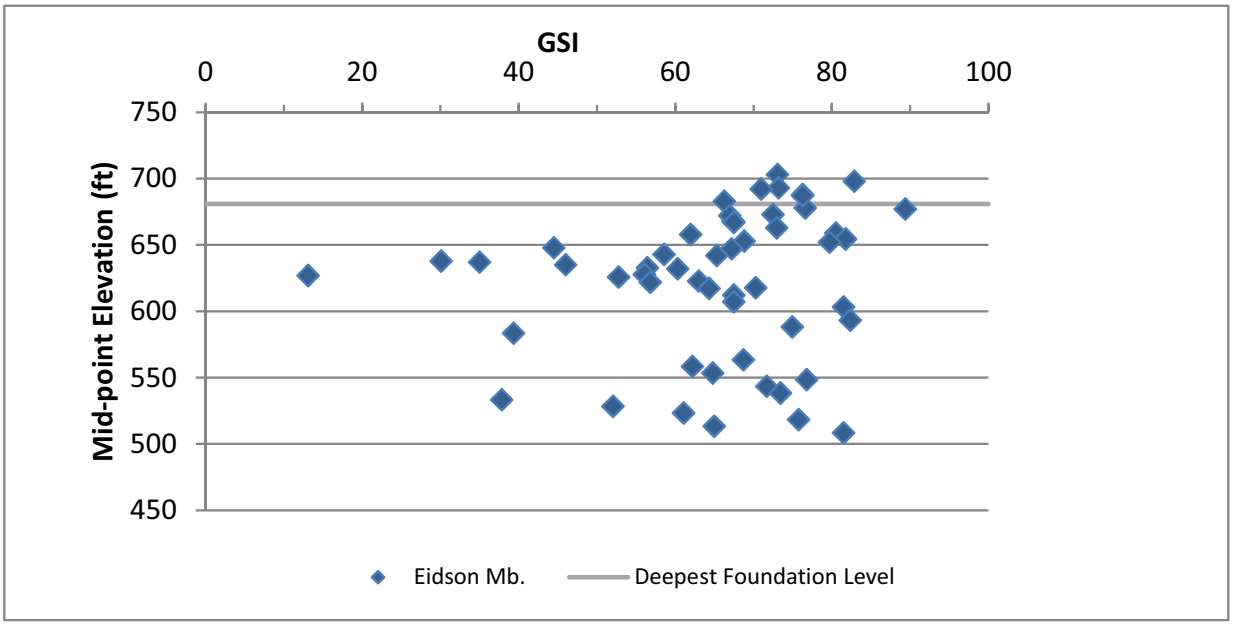
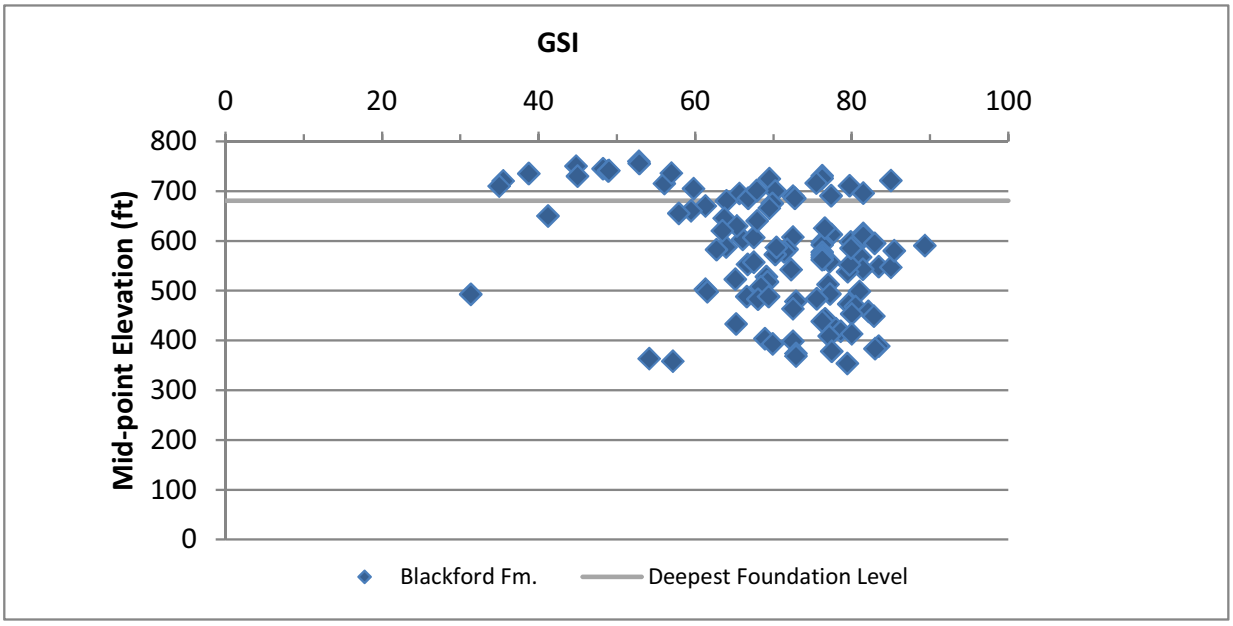


Figure 2.5.1-56. (Sheet 2 of 3) Scatter plots of Geological Strenth Index per Bedrock Unit



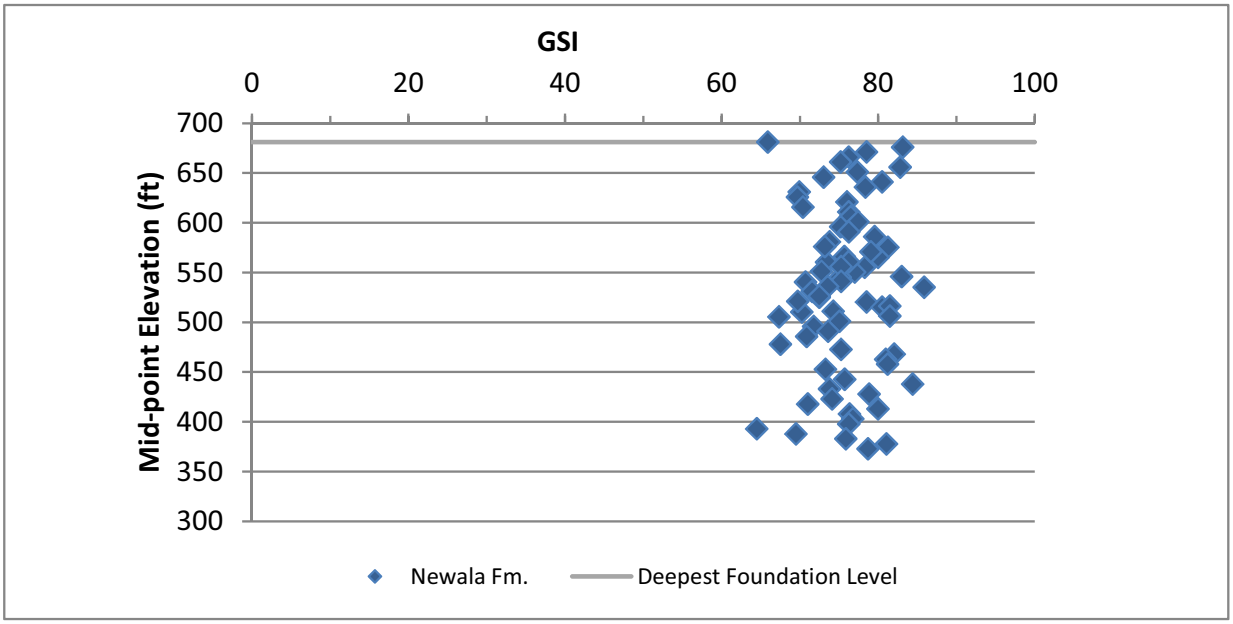
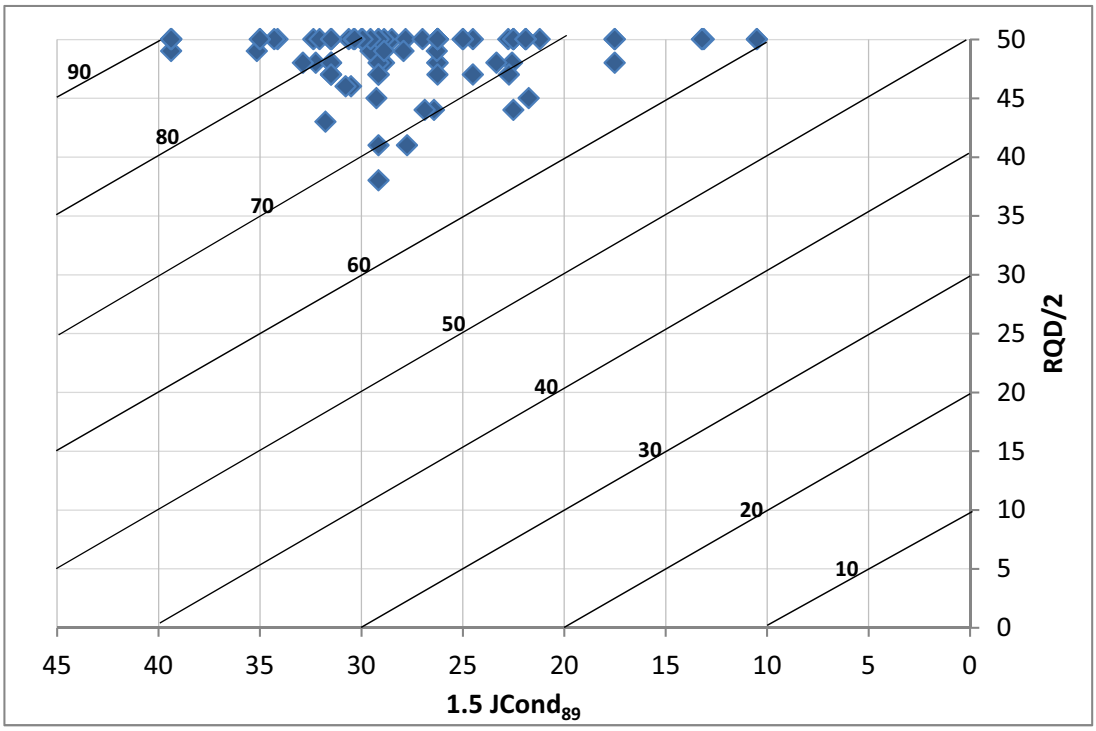
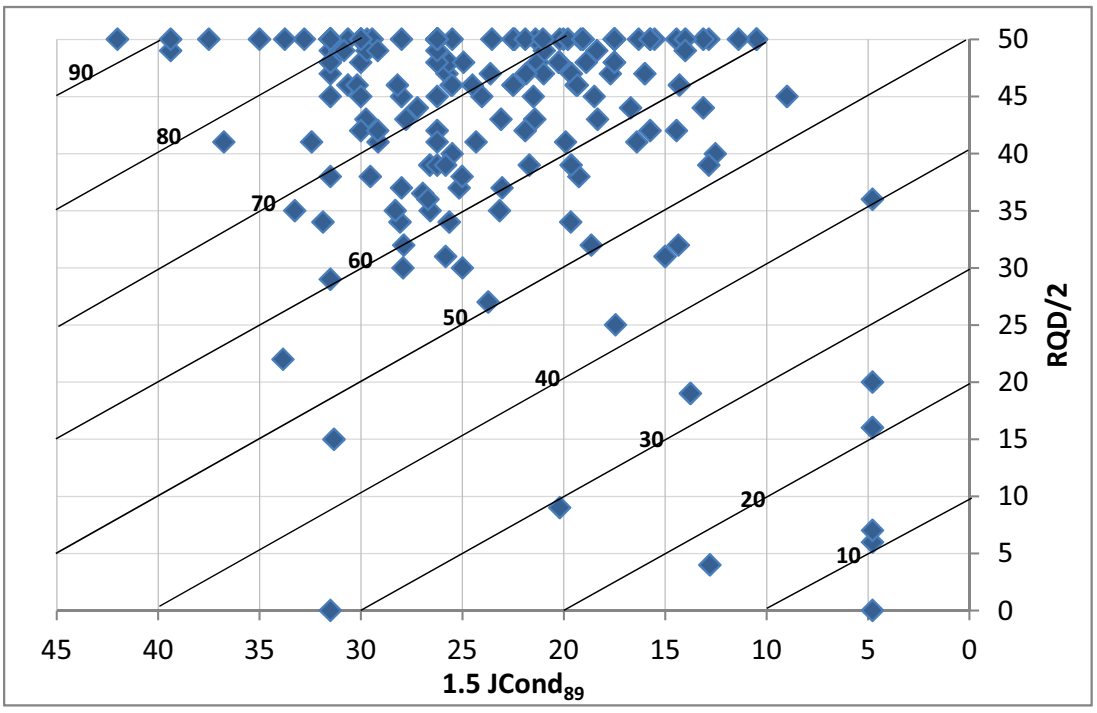


Figure 2.5.1-56. (Sheet 3 of 3) Scatter Plots of Geological Strength Index per Bedrock Unit



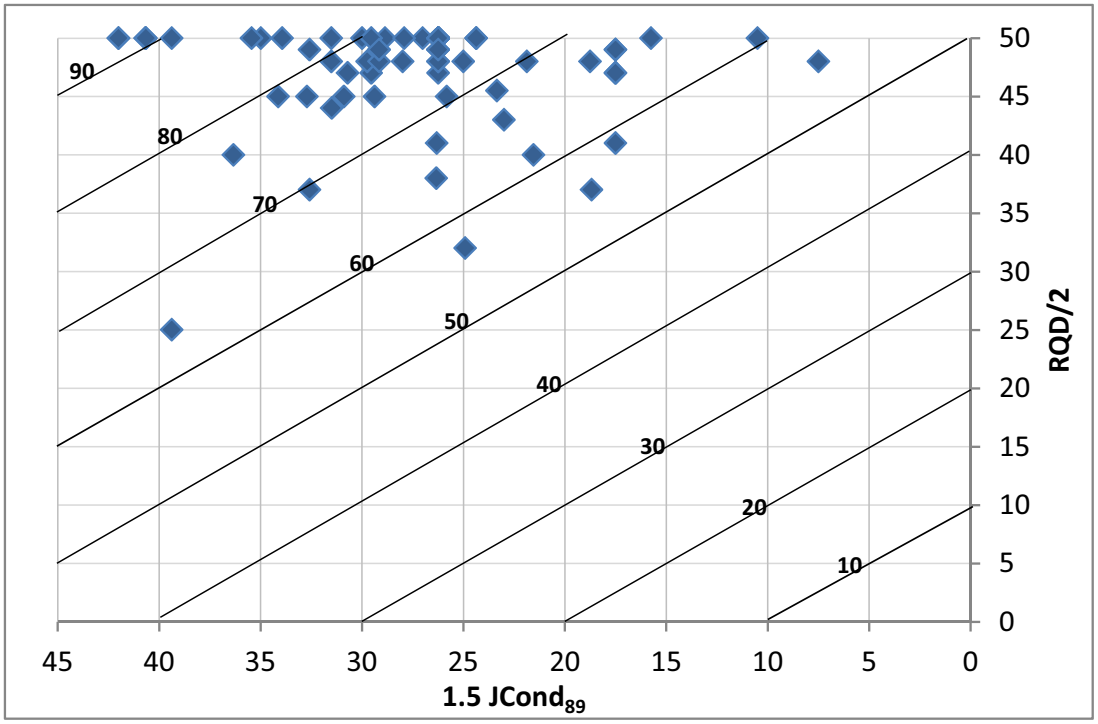
Benbolt Formation



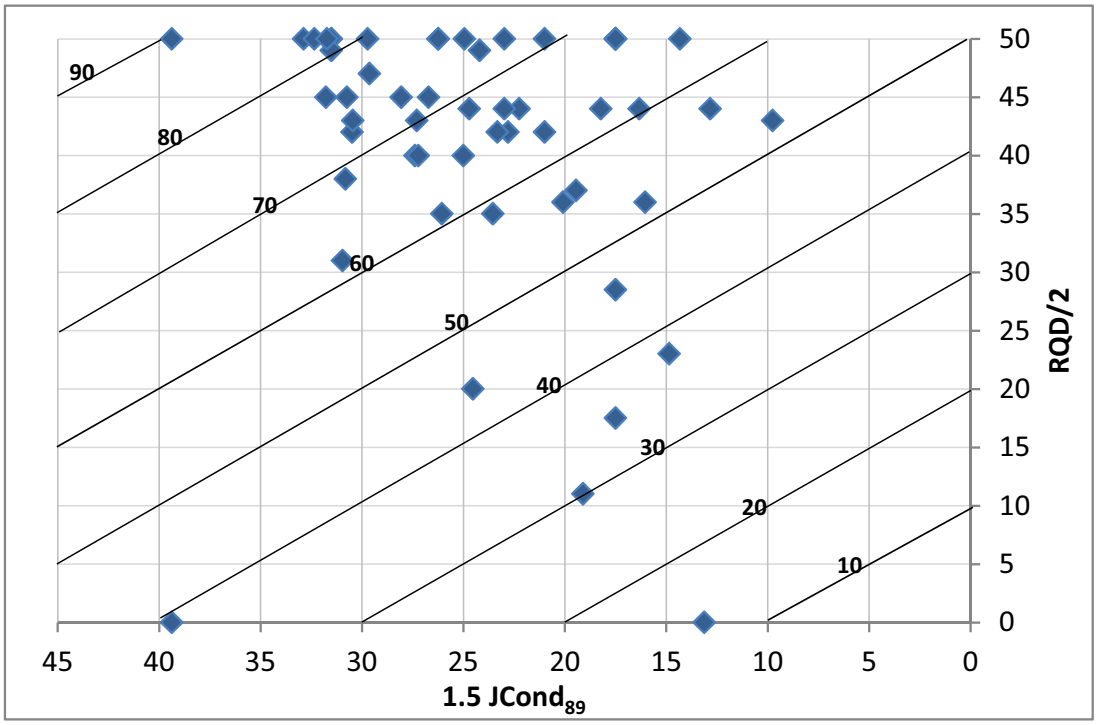
Rockdell Formation

Note: $JCond_{89}$ = Joint Condition Rating; GSI = Geological Strength Index; RQD = Rock Quality Designation

Figure 2.5.1-57. (Sheet 1 of 3) Portion of GSI Chart Showing 1.5 $JCond_{89}$ Against RQD/2 and GSI per Bedrock Unit (Extended to Show RQD/2 > 40)

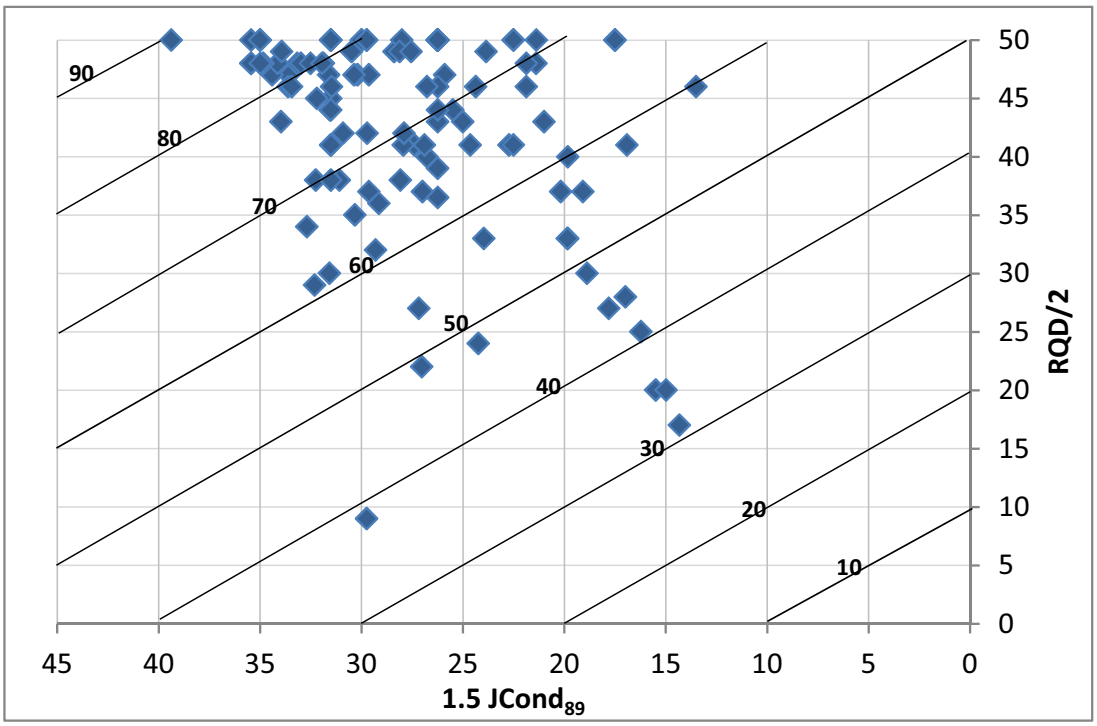


Fleanor Member

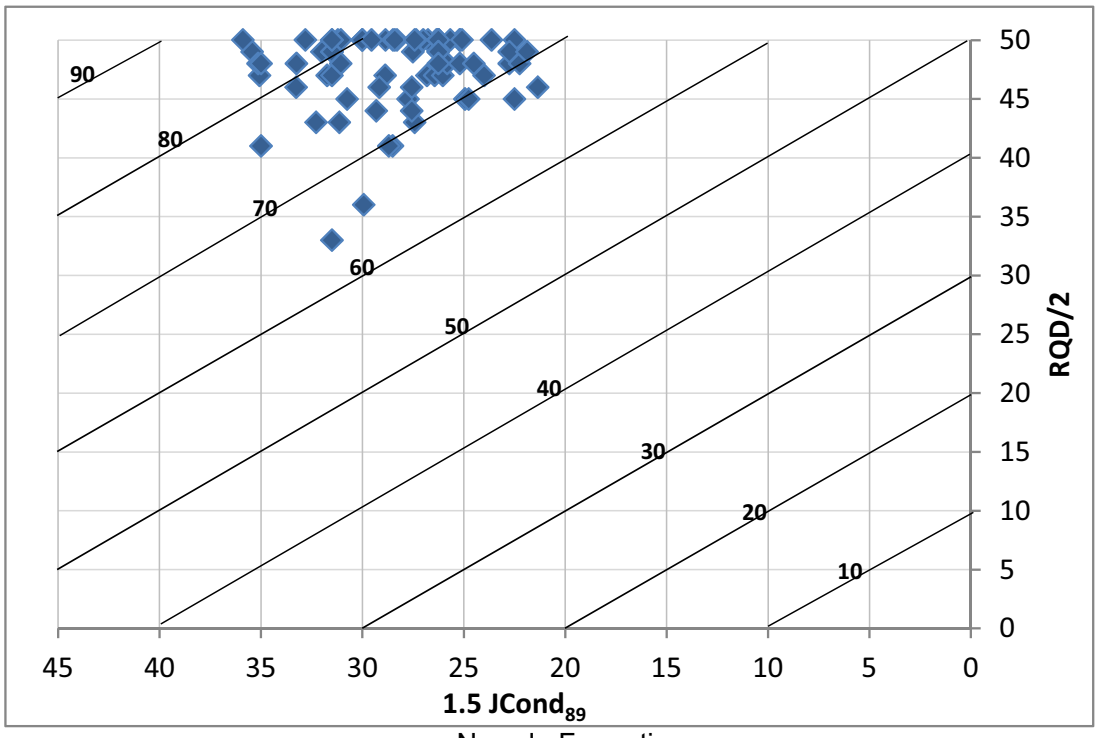


Eidson Member

Figure 2.5.1-57. (Sheet 2 of 3) Portion of GSI Chart Showing 1.5 $JCond_{89}$ Against RQD/2 and GSI per Bedrock Unit (Extended to Show RQD/2 > 40)

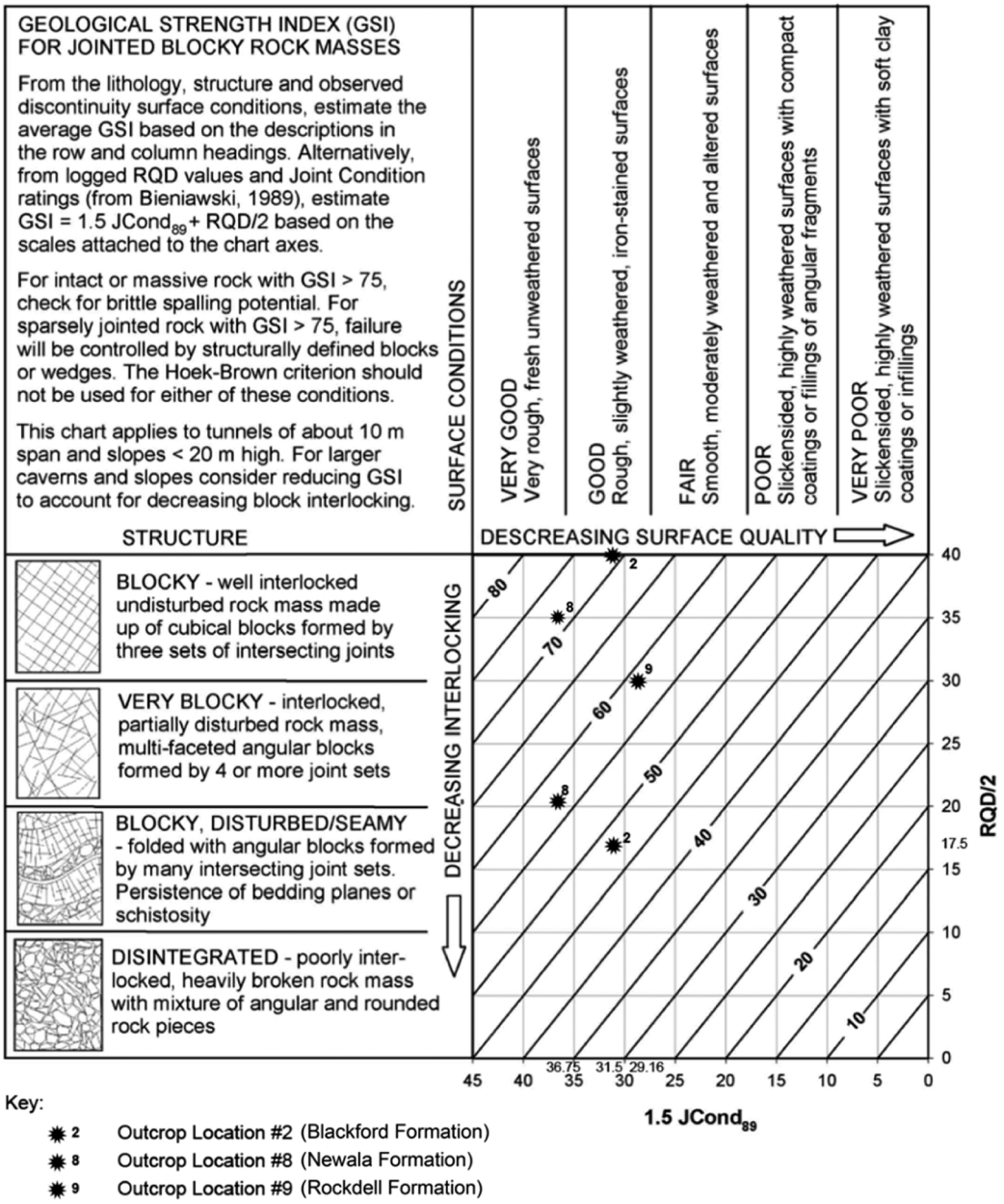


Blackford Formation



Newala Formation

Figure 2.5.1-57. (Sheet 3 of 3) Portion of GSI Chart Showing 1.5 $JCond_{89}$ Against RQD/2 and GSI per Bedrock Unit (Extended to Show RQD/2 > 40)



Note: $JCond_{89}$ = Joint Condition Rating; RQD = Rock Quality Designation
Source: Reference 2.5.1-265

Figure 2.5.1-58. Estimates of Geological Strength Index at Outcrop Locations 2, 8, and 9

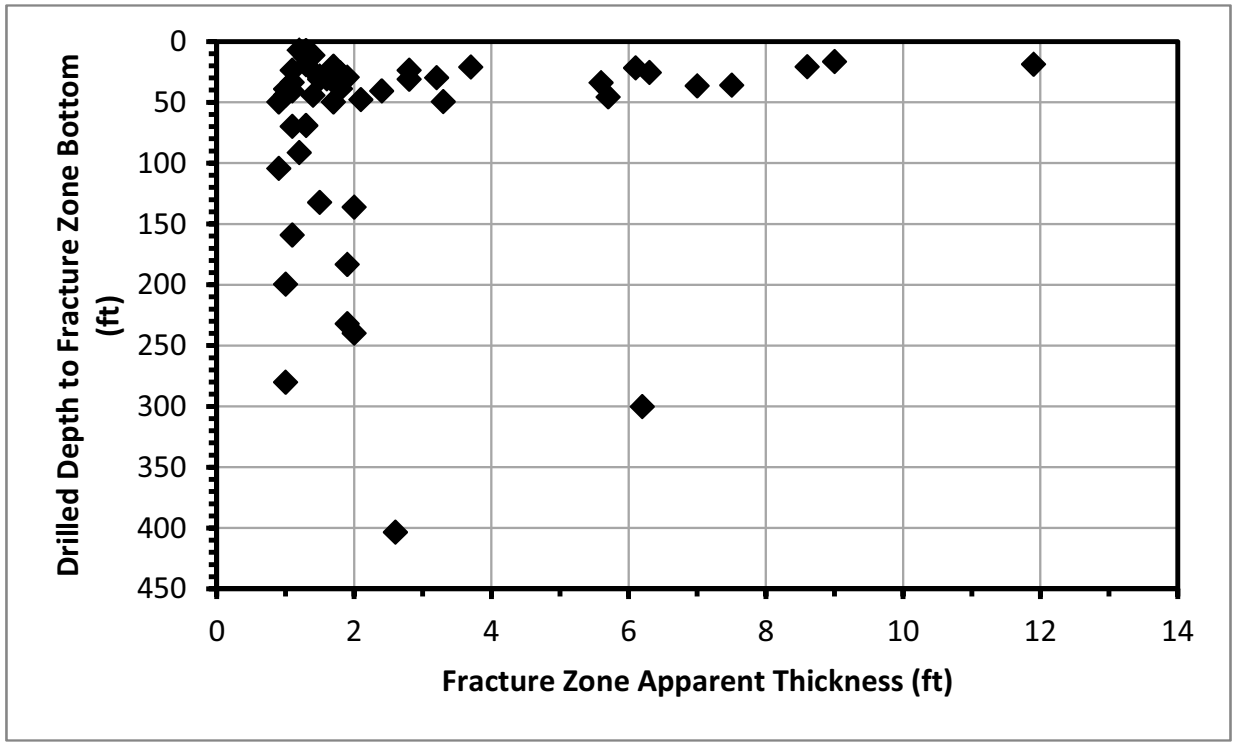


Figure 2.5.1-59. (Sheet 1 of 2) Scatter Plot of Fracture Zone Apparent Thickness—Against Drilled Depth to Fracture Zone Bottom (Using the 100- and 200-Series Borings)

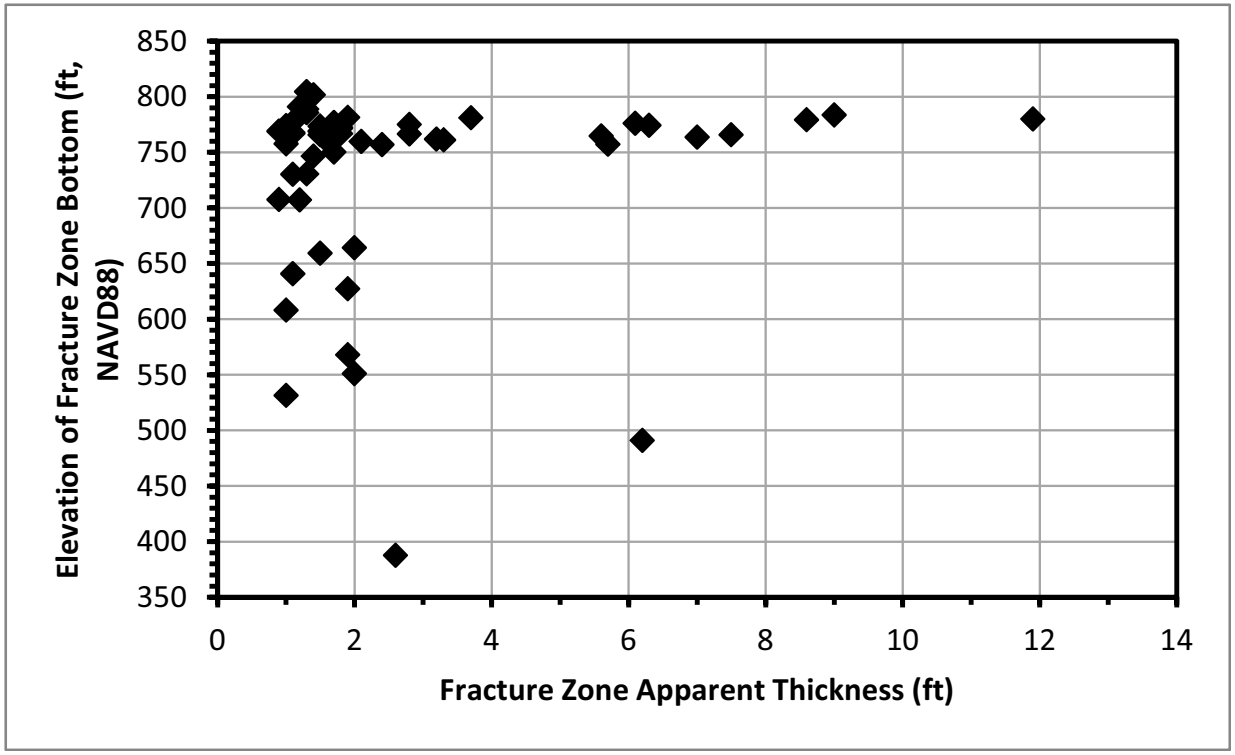


Figure 2.5.1-59. (Sheet 2 of 2) Scatter Plot of Fracture Zone Apparent Thickness—Against Elevation of Fracture Zone Bottom (Using the 100- and 200-Series Borings)

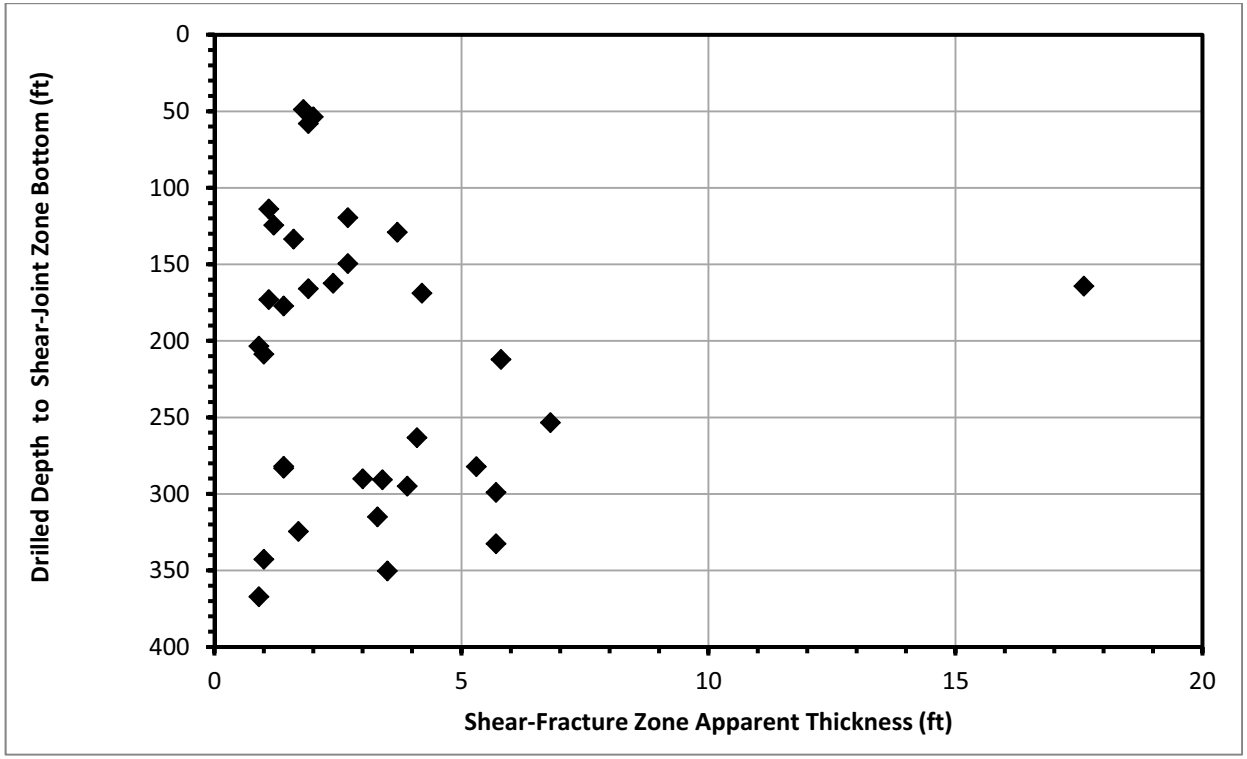


Figure 2.5.1-60. (Sheet 1 of 2) Scatter Plot of Shear-Fracture Zone Apparent Thickness—Against Drilled Depth to Shear-Fracture Zone Bottom (Using 100- and 200-Series Borings)

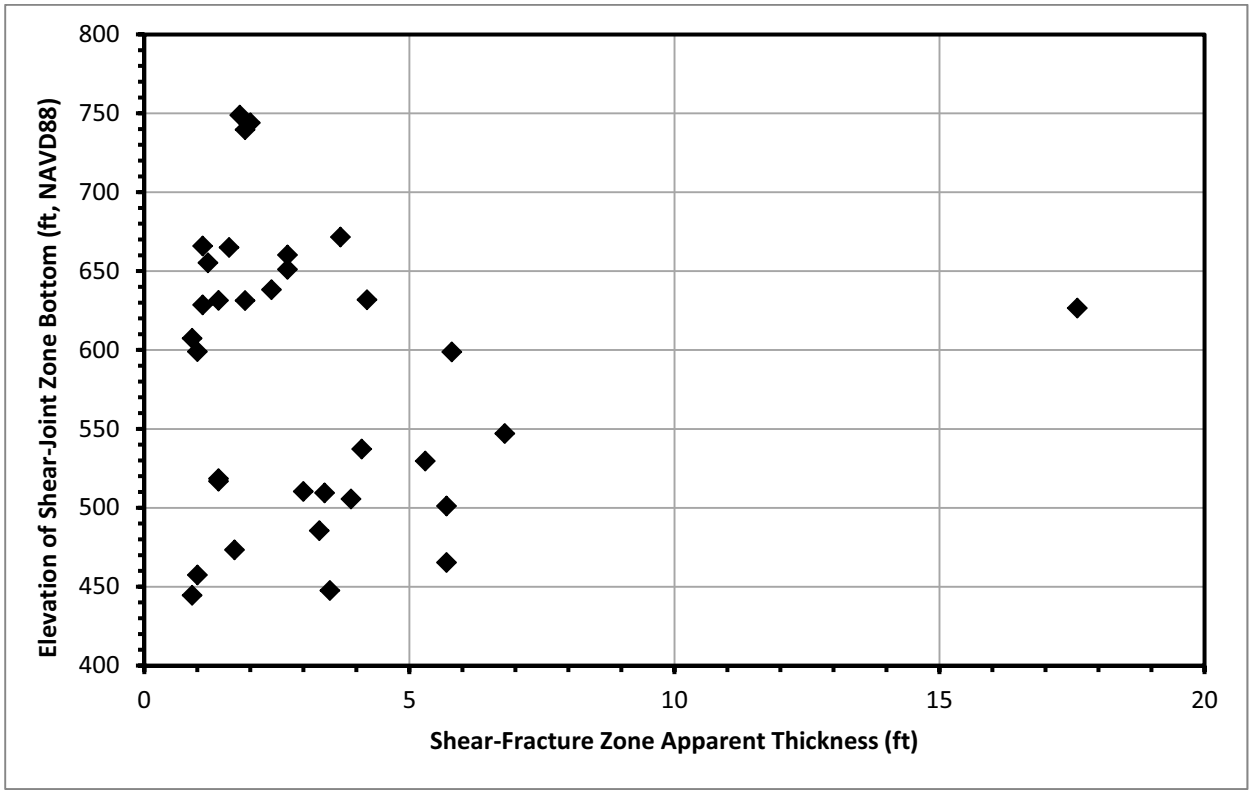
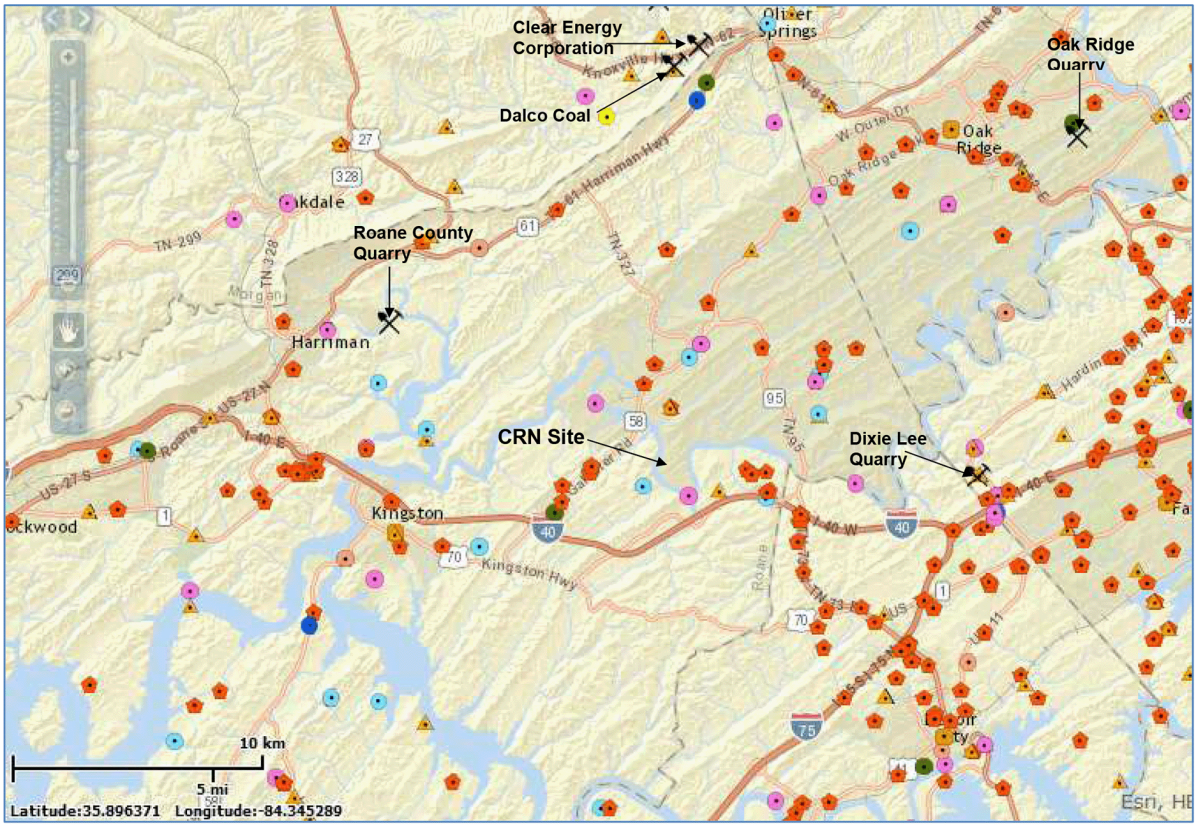


Figure 2.5.1-60. (Sheet 2 of 2) Scatter Plot of Shear-Fracture Zone Apparent Thickness—Against Elevation of Shear-Fracture Zone Bottom (Using 100- and 200-Series Borings)



Notes:
Source: Reference 2.5.1-273.

The symbols shown on this map represent water resource permits for various applications such as construction, water treatment plants, individual wells, hydrostatic purposes etc. See the legend to this figure on the next sheet.

Mine locations are shown as ⚒ and include the following on the map:

Roane County Quarry: Crushed and Broken Limestone

Dixie Lee Quarry: Crushed and Broken Limestone

Oak Ridge Quarry: Crushed and Broken Limestone

Clear Energy Corporation (formerly Dalco of Tennessee LLC.): Bituminous Coal and Lignite, Surface.

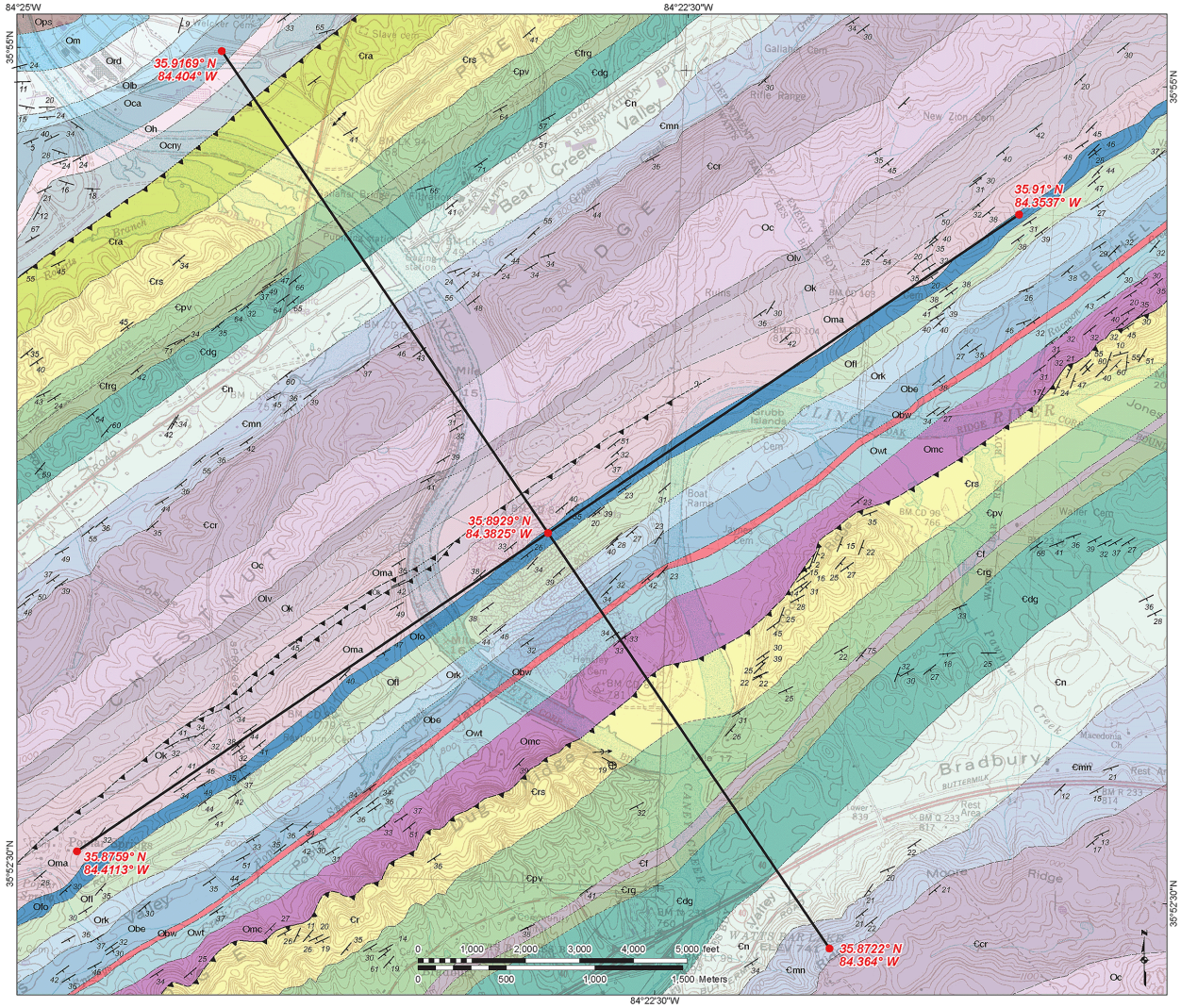
Dalco Coal of Tennessee, LLC. Bituminous Coal and Lignite, Underground.

Figure 2.5.1-61. (Sheet 1 of 2) Map showing the Water Resource Permit Application Sites Within Approximately 10 Miles of the Clinch River Nuclear Site



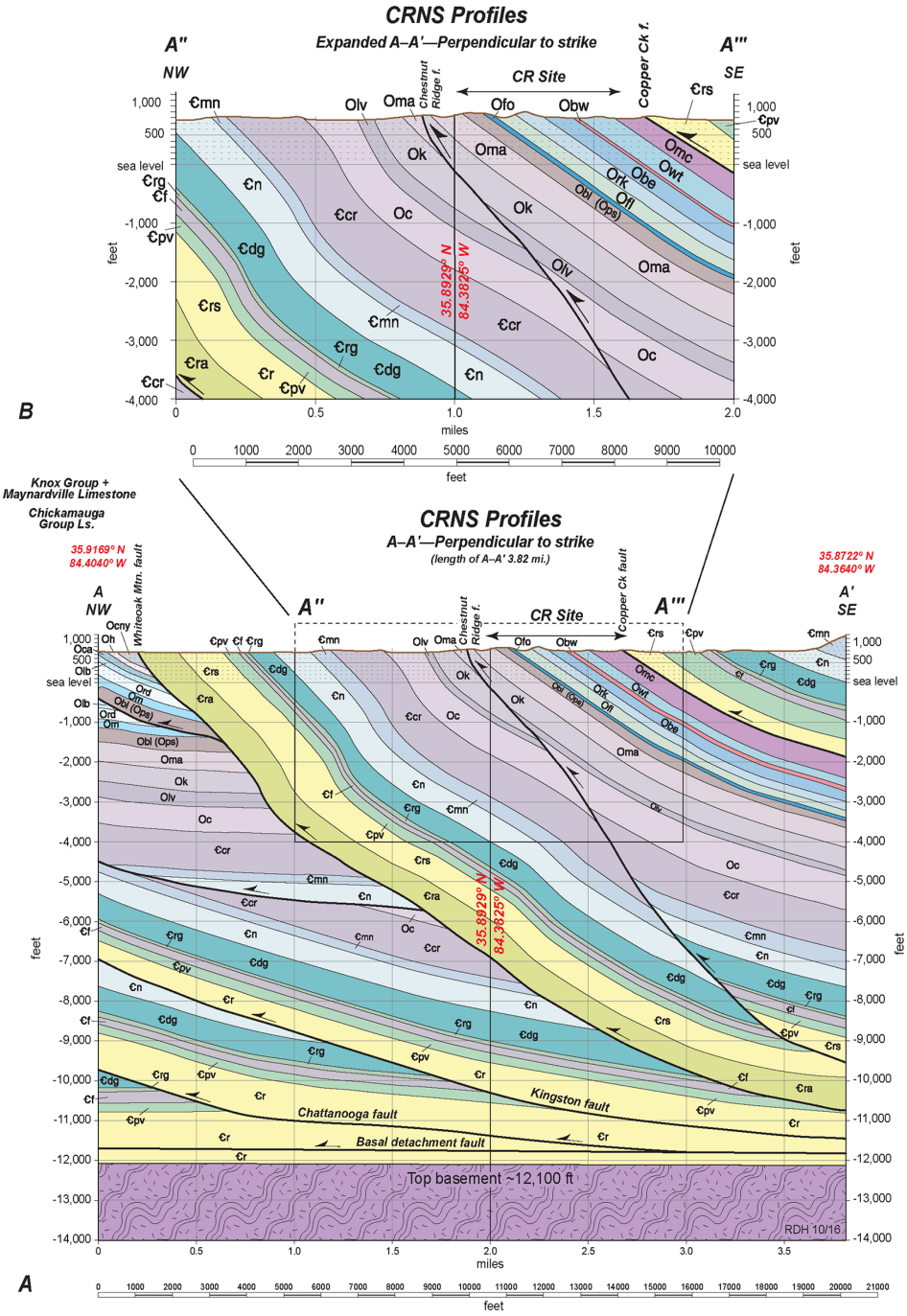
Notes:
Source: Reference 2.5.1-273.

Figure 2.5.1-61. (Sheet 2 of 2) Map Showing the Water Resource Permit Application Sites Within Approximately 10 Miles of the Clinch River Nuclear Site



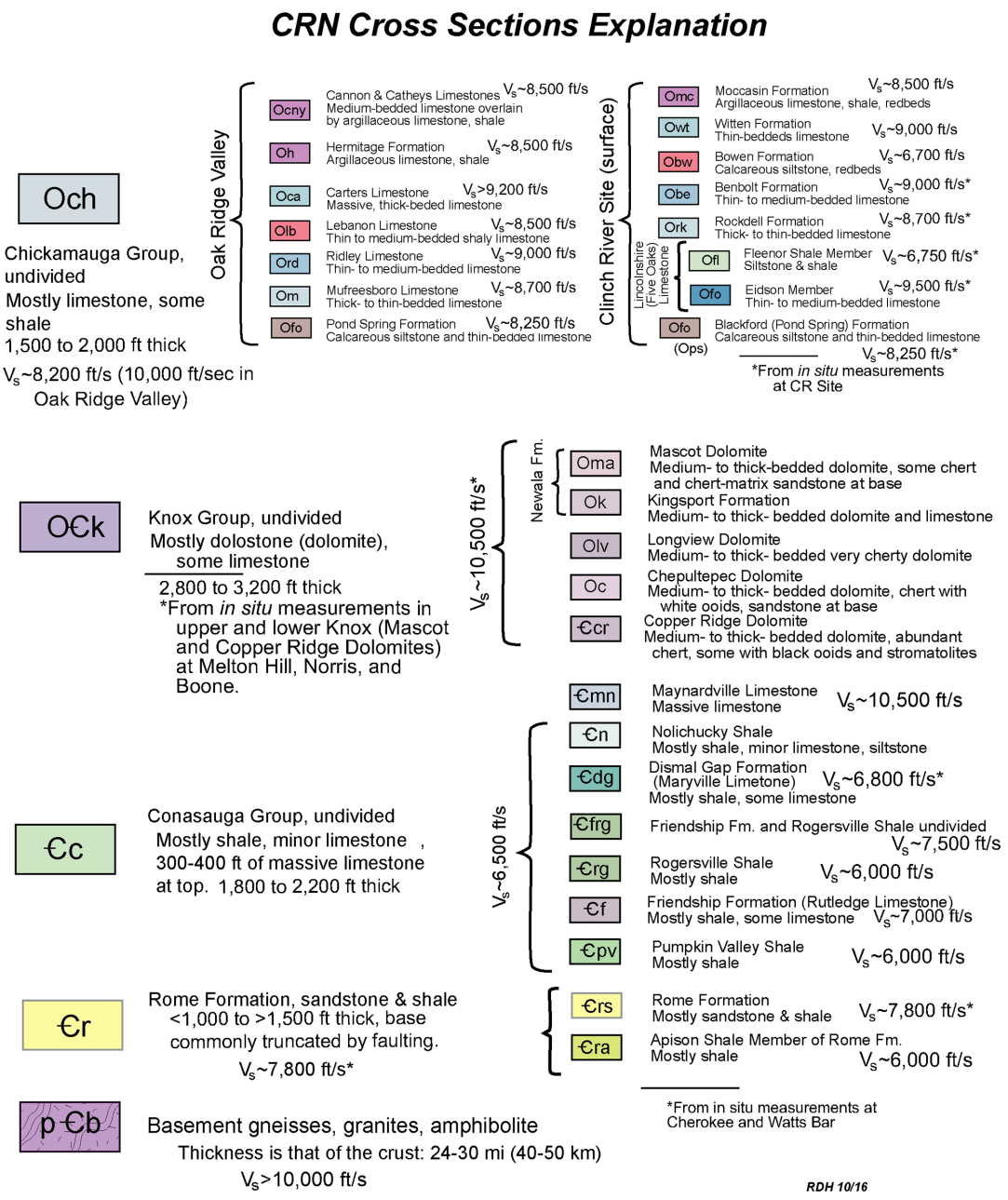
Note: Source: Reference 2.5.1-273.

Figure 2.5.1-62. Map Showing the Location of Geologic Cross-Section A-A' to Basement



Note:
A. Across-strike geologic cross-section A-A' with an expanded section, the location of which is indicated in the rectangle in the center of the diagram.
B. Upper part of Figure A with additional detail. Location of section line is indicated in the geologic map on Figure 2.5.1-62.

Figure 2.5.1-63. (Sheet 1 of 2) Geologic Cross-Section A-A' Ground Surface to Basement



Note: Explanation of symbols used to identify the different geologic units in Figures 2.5.1-62 and 2.5.1-63.

Figure 2.5.1-63. (Sheet 2 of 2) Geologic Cross-Section A-A' Ground Surface to Basement