

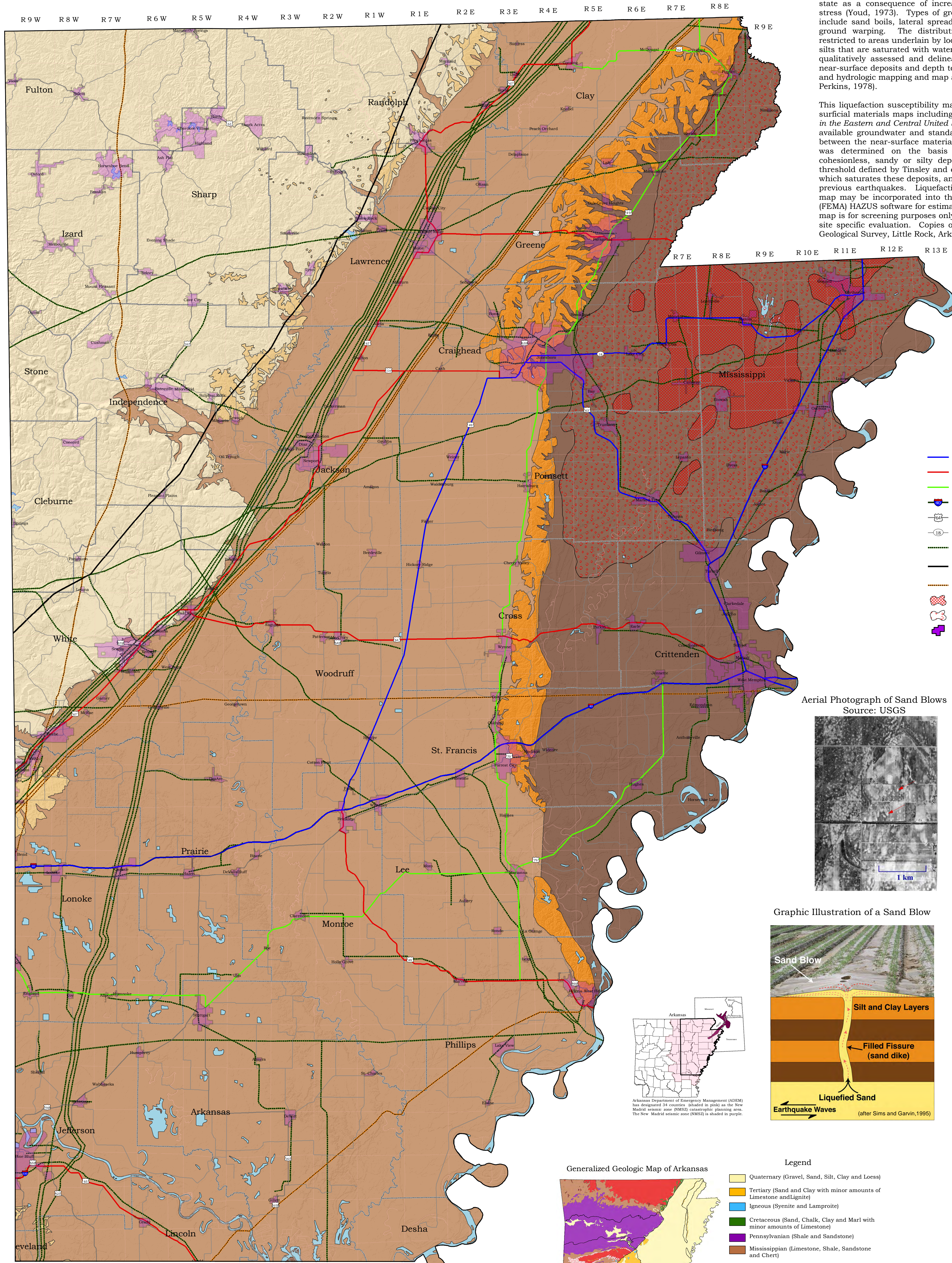


# Liquefaction Susceptibility Map Of Northeast Arkansas

## About the Map

Earthquake-induced ground failures such as liquefaction have historically brought loss of life and damage to property and infrastructure. Liquefaction is the transformation of a granular material from a solid state into a liquefied state as a consequence of increased pore-pressure and decreased effective stress (Youd, 1973). Types of ground failure resulting from liquefaction can include sand boils, lateral spreads, ground settlement, ground cracking and ground warping. The distribution of liquefaction is not random but is restricted to areas underlain by loose, cohesionless (unconsolidated) sands and silts that are saturated with water. Areas of liquefaction susceptibility can be qualitatively assessed and delineated on the basis of physical properties of near-surface deposits and depth to groundwater through geologic, geomorphic, and hydrologic mapping and map analysis (Tinsley and Holzer, 1990; Youd and Perkins, 1978).

This liquefaction susceptibility map was developed from existing geologic and surficial materials maps including the USGS I-2789: *Map of Surficial Deposits in the Eastern and Central United States* (Fullerton, D.S., et al, 2003), as well as available groundwater and standard penetration (SPT) data. The correlation between the near-surface materials and their relative susceptibility to liquefy was determined on the basis of three factors: (1) presence of loose, cohesionless, sandy or silty deposits within 50 feet of the surface (depth threshold defined by Tinsley and others in 1985), (2) presence of groundwater which saturates these deposits, and (3) historical records of liquefaction during previous earthquakes. Liquefaction susceptibility values obtained from this map may be incorporated into the Federal Emergency Management Agency's (FEMA) HAZUS software for estimating potential losses from earthquakes. This map is for screening purposes only and is not intended to be a substitute for a site specific evaluation. Copies of this map are available from the Arkansas Geological Survey, Little Rock, Arkansas.



LIQUEFACTION SUSCEPTIBILITY CLASSIFICATION		
HAZUS Number	Susceptibility	Unit On Map
5	Very High	Yes
4	High	Yes
3	Moderate	Yes
2	Low	Yes
1	Very Low	Yes
0	None	No
W	Water	Yes

- ### Symbols
- Primary Route (Blue line)
  - Secondary Route (Red line)
  - Tertiary Route (Green line)
  - Interstate (Blue shield)
  - US Highways (Blue shield)
  - State Highways (Black shield)
  - Gas Pipeline (Dashed line)
  - Oil Pipeline (Black line)
  - Product Pipeline (Dotted line)
  - Sand Blow Area (Coverage greater than 25%) (Red hatched)
  - Sand Blow Area (Coverage 1% to 25%) (Orange hatched)
  - Incorporated Areas (Purple outline)

### References

Fullerton, D.S., Bush, C.A., and Pennell, J.N., 2003, Map of surficial deposits and materials in the Eastern and Central United States (east of 102° west longitude): U.S. Geological Survey Geologic Investigations Series Map I-2789, 1 sheet, scale 1:2,500,000; pamphlet, 48 p., <http://pubs.usgs.gov/imap/i-2789/>.

Rhea, Susan, and Wheeler, R.L., 1995, Map showing synopsis of seismotectonic features in the vicinity of New Madrid, Missouri: U.S. Geological Survey Miscellaneous Investigations Series Map I-2521, 1 sheet, scale 1:250,000.

Sims, J.D. and Garvin, C.D., 1995, Recurrent liquefaction at Soda Lake, California, induced by the 1989 Loma Prieta earthquake, and 1990 and 1991 aftershocks: Implications for paleoseismicity studies, *Seismological Society of America Bulletin*, v. 85, p. 51-65.

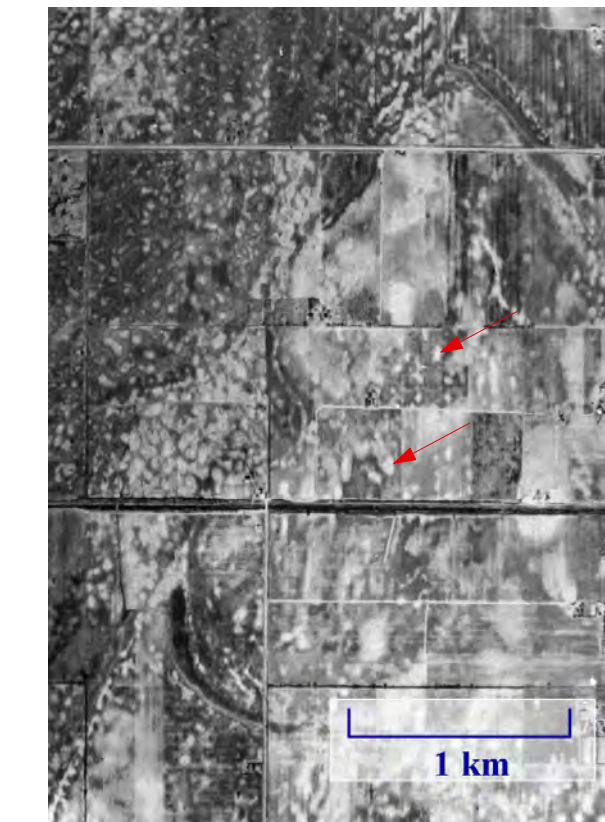
Tinsley, J.C., and Holzer, T.L., 1990, Liquefaction in the Monterey Bay region: U.S. Geological Survey Open-file Report 90-334, pp. 642-643.

Tinsley, J.C., Youd, T.L., Perkins, D.M., and Chen, A.T.F., 1985, Evaluating Liquefaction Potential, in Ziony, J.L., ed., *Evaluating earthquake hazards in the Los Angeles Region - an earth-science perspective*: U.S. Geological Survey Professional Paper 1360, p. 263-316.

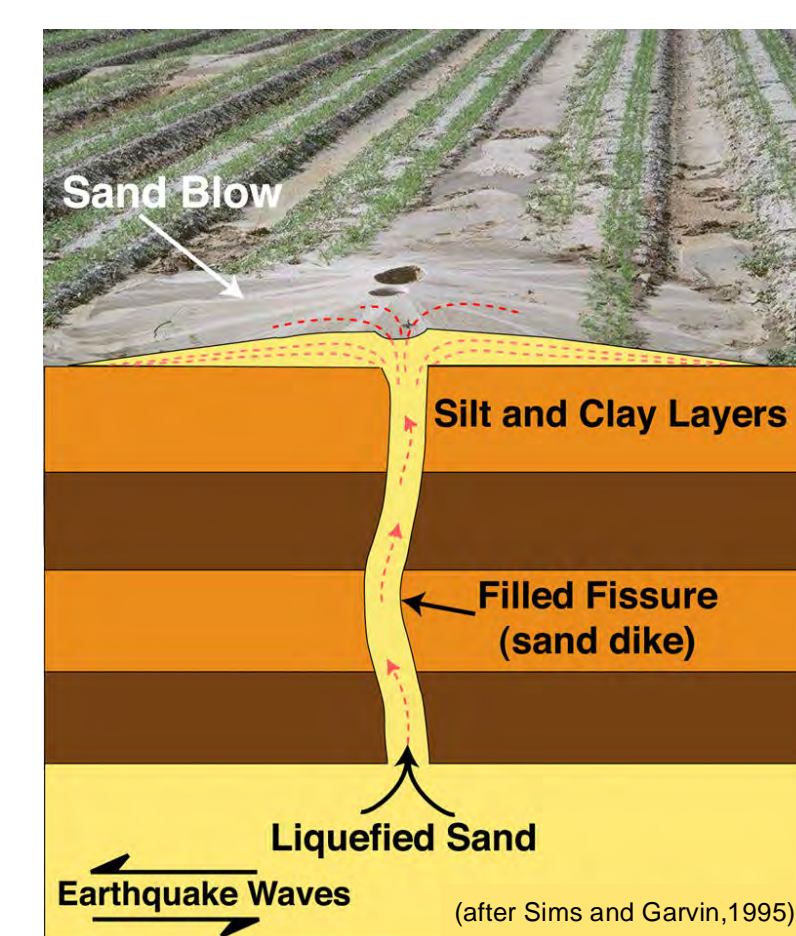
Youd, T.L., 1973, Liquefaction, flow, and associated ground failure: U.S. Geological Survey Circular 688, 12 pp.

Youd, T.L. and Perkins, D.M., 1978, Mapping of Liquefaction Induced Ground Failure Potential: *Journal of Geotechnical Engineering Division, American Society of Civil Engineers*, Vol. 104, No. 4, pp.433-446.

Aerial Photograph of Sand Blows  
Source: USGS



Graphic Illustration of a Sand Blow



### Disclaimer

Although this map was compiled from digital data that was successfully processed on a computer system using ESRI ArcGIS 9.x software at the Arkansas Geological Survey (AGS), no warranty, expressed or implied, is made by the AGS regarding the unity of the data on any other system, nor shall the act of distribution constitute any such warranty. The AGS does not guarantee this map or digital data to be free of errors nor assume liability for interpretations made from this map or digital data, or decisions based thereon.

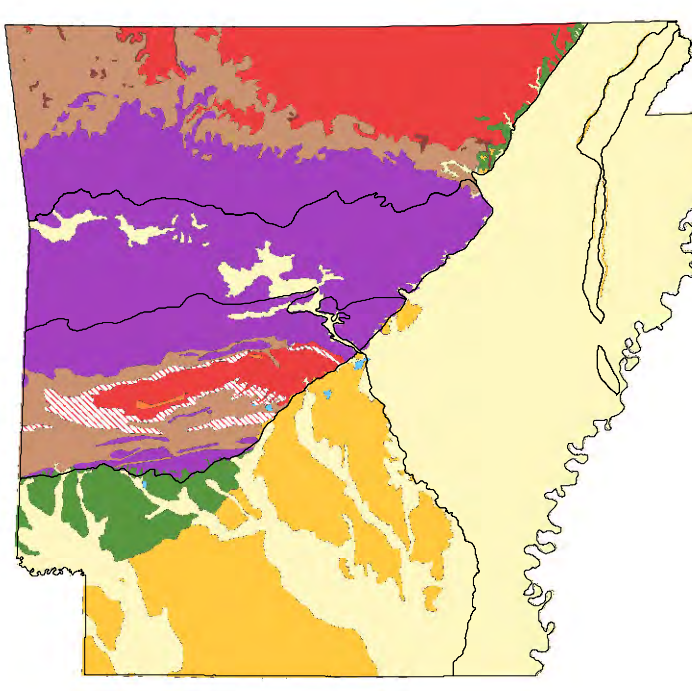
The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Arkansas Geological Survey.

The 5M Hillshade base used in the making of this map was acquired at the Spatial Analysis Laboratory, University of Arkansas, Monticello and some of the other Feature Class Data was acquired online at ([www.geostor.arkansas.gov](http://www.geostor.arkansas.gov)).

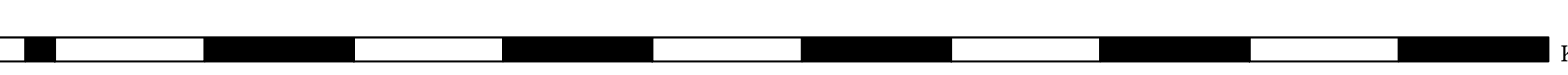
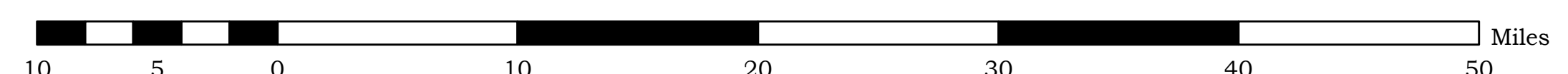
### Legend

- Quaternary (Gravel, Sand, Silt, Clay and Loess)
- Tertiary (Sand and Clay with minor amounts of Limestone and Lignite)
- Igneous (Syenite and Lamproite)
- Cretaceous (Sand, Chalk, Clay and Marl with minor amounts of Limestone)
- Pennsylvanian (Shale and Sandstone)
- Mississippian (Limestone, Shale, Sandstone and Chert)
- Silurian/Devonian (includes middle and upper division of Mississippian, Arkansas Novaculite)
- Silurian/Devonian (Limestone, Shale and Sandstone)
- Ordovician (Limestone, Dolostone, Sandstone and Chert)
- Cambrian (includes portion of Lower Ordovician Collier Shale)
- Water

### Generalized Geologic Map of Arkansas



Arkansas Department of Emergency Management (ADEM) has designated 34 counties (shaded in pink) as the New Madrid seismic zone (NMSZ) catastrophic planning area. The New Madrid seismic zone (NMSZ) is shaded in purple.



Scott M. Ausbrooks  
Erica Doerr  
2010

Printed Date: 2 July 2010  
Scale: 1 : 360,000  
Digital compilation: Jerry W. Clark