PowerSouth Energy Cooperative

Charles R. Lowman Power Plant Leroy, AL

Location Restrictions-Unit 1 Bottom Ash Pond

Issued October 2018

CDG Engineers and Associates, Inc.
1840 East Three Notch St.
Andalusia, AL 36421
| cdge.com

REPORT
Location Restrictions Report
Unit 1 Bottom Ash Pond
Charles R. Lowman Power Plant

October 2018

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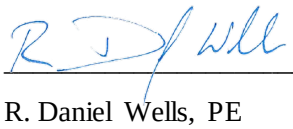
CERTIFICATION PAGE

"I hereby certify that, in my professional judgment, the components of this document and associated work satisfy the applicable requirements set forth in 40 CFR 257.60-.64, Subpart D, and are consistent with generally accepted professional consulting principles and practices. The information submitted herein, to the best of my knowledge and belief, is true accurate, and complete.

This document has been prepared based on available site assessment data and has been prepared for the Charles R. Lowman Power Plant in Leroy, Washington County, Alabama. The recommended action should not be construed to apply to any other site.



10/8/2018

R. Daniel Wells, PE

Date

Alabama Registration No. 27032-E

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Appendix A – Figures

1.0 Statement of Purpose

The following information is presented to satisfy the requirements of *40 CFR 257.60-.64, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfill and Surface Impoundments* for Unit 1 Bottom Ash Pond at the Charles R. Lowman Power Plant.

2.0 Location Restrictions

2.1 Placement Above Uppermost Aquifer (40 CFR 257.60)

CDG has reviewed historical construction drawings for the Unit 1 Bottom Ash Pond and has performed hydrogeologic investigation activities to determine the vertical separation to the uppermost aquifer beneath the facility.

The design details for the Unit 1 Bottom Ash Pond indicate that the construction based-grade elevation for the unit was 10-13 feet above mean sea level. Subsurface data collected during recent construction activities conducted within the Unit 1 Bottom Ash Pond support a bottom elevation between 10-15 feet AMSL for the waste management unit. Under 40 CFR 257.60(a), the required separation between the base of the impoundments and the season high water level within the uppermost aquifer is no less than 5 feet.

As part of the hydrogeologic investigation activities conducted at the Lowman Facility beginning in December 2013, a network of groundwater piezometers was installed to determine the depth and seasonal fluctuations within the uppermost aquifer beneath the facility. A detailed discussion of these activities is provided in the 2017 Annual Groundwater Monitoring Report (CDG, January 2018). The locations of the piezometers/ monitoring wells are illustrated in the attached drawing, *Site Map with Well Locations*.

Following piezometer installation groundwater elevations were recorded over the period from December 2013 through March 2018 to evaluate seasonal high water levels. Based on a comparison between the observed groundwater elevations and the design details of the CCR waste management units it is evident that the existing Unit 1 Bottom Ash Pond does not meet the separation requirement under 40 CFR 257.60(a) for placement above the uppermost aquifer.

2.2 Wetlands (40 CFR 257.61)

In accordance with the requirements of 40 CFR 257.61 CDG has conducted a review of the location, existing site conditions, and operational procedures of the regulated CCR units at the Charles R. Lowman facility.

A site visit was conducted by CDG personnel on August 8, 2018 for the purpose of making a field wetlands determination. The wetlands determination was made in accordance with the guidelines established in the Field Guide for Wetland Delineation (USACE, 1987) and in the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (USACE, 2010).

During the August 8 site activities, it was observed that the Unit 1 Bottom Ash Pond is located within an upland area adjacent to the flood plain of the Tombigbee River. A large portion of the floodplain is occupied by seasonally flooded deciduous broad-leaved forested palustrine wetlands (PFO1C) along with other minor areas of seasonally flooded wetlands. The CCR management units are separated from these wetlands by earthen berms which appear to be well constructed and maintained. The berm slopes

were observed to be protected from erosion by either vegetation or the placement of rip-rap. The berms appear to be designed and constructed in a manner that would prevent the catastrophic release of CCR waste into the adjacent wetland areas. There were no visible signs of seepage from the berms. A more detailed analysis of the design and structural integrity of the berms has been previously completed as required by regulations.

The Unit 1 Bottom Ash Pond is not considered a jurisdictional waterbody due to its permitted use as a process waste management unit. Discharges of treated process water from the unit are regulated under the terms of an individual National Pollutant Discharge Elimination System (NPDES) permit.

In evaluating the Unit 1 Bottom Ash Pond's potential effect on the continued existence of protected species, a desktop assessment of threatened and endangered species and critical habitats potentially occurring within and adjacent to the study area was conducted. The USFWS IPaC Resource List revealed 6 species. The species listed include the T-Wood Stork, T-Black Pine Snake, C-Gopher Tortoise, T-Atlantic Sturgeon, T-Inflated Heelsplitter, E-Southern clubshell. There are no critical habitats currently identified within the defined study area.

Based on the results of the desktop survey of the overall site and the Unit 1 Bottom Ash Pond's use as a permitted waste management unit, it is our professional opinion that the Unit 1 Bottom Ash Pond does not contain habitat supportive of the listed species discussed above. Additionally, it is our opinion that the continued use of the CCR management unit within the Survey Area will have no adverse impacts to the listed species.

Based on the observed conditions at the Charles R. Lowman facility, it can be successfully demonstrated that the CCR management units meet the location restriction requirements related to wetlands as specified under 257.61(a).

2.3 Fault Areas (40 CFR 257.62)

Federal regulations state that existing CCR surface impoundments must not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time, unless it is demonstrated that an alternative setback distance will prevent damage to the structural integrity of the CCR unit. CDG reviewed available surface fault location data provided by the Geological Survey of Alabama in order to determine the location of the Unit 1 Bottom Ash Pond relative to mapped faulting.

Based on the noted data, the pond is located approximately 2.5 miles from the nearest mapped surface fault. Therefore, the plant conforms to the location requirement associated with fault areas. A *Site Fault Map* indicating the location of the pond relative to mapped faulting is attached.

2.4 Seismic Impact Zones (40 CFR 257.63)

Federal Regulations state that existing CCR surface impoundments must not be located in seismic impact zones unless it is demonstrated that all structural components are designed to resist the maximum horizontal acceleration in lithified earth material for the site. A seismic impact zone is defined as an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 50 years.

Digital GIS data provided by the United States Geological Survey (PGA, 2% in 50 years; dated 2014) indicates that the Unit 1 Bottom Ash Pond is located in an area of low seismicity with a peak ground

acceleration of approximately 0.06g. Therefore, the pond is not located in a seismic impact zone. The *Peak Ground Acceleration Map* is attached.

2.5 Unstable Areas (40 CFR 257.64)

Federal Regulations state that existing CCR surface impoundments must not be located in an unstable area unless it is demonstrated that recognized and generally accepted, good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted. An unstable area is defined as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

The Charles R. Lowman Power Plant is located adjacent to the Tombigbee River. As is typical with rivers flowing over relatively flat topography, the Tombigbee exhibits a meandering course with sediment deposition occurring on the inside of channel bends and lateral erosion present on the outside banks of the channel. Further, dredging in the river can lead to instability along the channel banks.

In order to evaluate the potential instability of the area on which the Unit 1 Bottom Ash Pond is located, CDG reviewed historical documents associated with stabilization of the riverbank and evaluation of foundation conditions. Additionally, geologic information was evaluated to determine the potential for karst activity at the site.

2.5.1 Riverbank Stabilization

Based on a report entitled Lowman Slope Stability Construction and Monitoring (dated June 2008; Black & Veatch), significant ground movements have occurred along the east and west banks of the Tombigbee River, including the areas of the Lowman Power Plant and the Boise Cascade Paper Mill plant. The report indicates riverbank movements have been known to occur since the 1960s.

Relatively recent movements at the Charles R. Lowman Power Plant were documented at the prior position of the coal unloader cell located approximately 2,000 feet north of the Unit 1 Ash Pond. The documented movement, between 1988 and 2004, was on the order of 4 feet (lateral) with settlement of between 1 to 2 inches. Mooring cells experienced lateral movements of between 2 and 24 inches and settlements ranging from 0.5 to 2 inches. The evaluation indicated that the movement resulted from near-shore dredging at the coal unloader cell and artesian water pressure creating failure planes within a relatively deep (approximate elevations from -45’ to -65’) cohesive soil layer.

Due to the documented movement, it was determined that future soil displacements may present a risk to the plant. On the recommendation of the Black & Veatch assessment, drilled shaft stability piers were installed through the upper, unstable soils into the underlying rock to stabilize the riverbank. The monitoring program instituted following construction of the drilled shafts indicates that the riverbank has been stable since the installation of the piers.

The coal unloader cell has been relocated south of its original position to within approximately 500 feet of the Unit 1 Ash Pond. However, the unloading point was extended well out into the river channel. The Black & Veatch report indicates that movements occur after dredging and when a large differential pressure exists between the river level and the underlying artesian zone. Near-shore dredging does not occur at the relocated coal unloader cell. Therefore, ground movements associated with dredging are not expected in the Unit 1 Ash Pond.

2.5.2 Geologic Conditions

Available geologic information (digital GIS data) provided by the Geological Survey of Alabama indicate that the Charles R. Lowman Power Plant site is located in the Coastal Plain Geologic Province. Soils of the Coastal Plain appear to have been deposited in an ancient marine environment and the rock, where present, is relatively low-grade sedimentary (often limestone and sandstone). However, the site is directly underlain by more recent deposits termed alluvial, coastal and low terrace deposits. A *Site Geology Map* is attached.

Alluvial, coastal and low terrace deposits refer to relatively recent, water-deposited soil typically associated with existing rivers, streams, and other waterways. The Plant is located along the western bank of the Tombigbee River. Therefore, the soils at the site consist of terrace deposits resulting from meandering and flooding of the Tombigbee River.

Sinkholes occur in geologic formations containing soluble rock such as limestone. Circulating groundwater dissolves the limestone. As the rock dissolves, voids and caverns develop underground. Sinkholes form when the void propagates upward toward the ground surface resulting in subsidence or collapse of the overlying soil.

Based on digital GIS data provided by the Geological Survey of Alabama, documented sinkholes have formed approximately 1 to 2½ miles from the site. However, the sinkholes are located east of the Tombigbee River in the Miocene Series Undifferentiated geologic formation. A portion of the data has been reproduced as the attached *Documented Sinkhole Location Plan*.

The Unit 1 Bottom Ash Pond is underlain by terrace deposits associated with the Tombigbee River that are not typically associated with karst features. Additionally, sinkholes have not been documented in the area of the pond. Therefore, it is our opinion that the pond is not located in an unstable area associated with karst terrain.

2.5.3 Foundation Evaluation

CDG previously performed a stability analysis of the Unit 1 Bottom Ash Pond. Findings of the stability analysis are contained in a report entitled Report of Safety Factor Assessment Coal Combustion Residuals Impoundment Embankments, Charles R. Lowman Power Plant (dated October 17, 2016).

The scope of services associated with the stability analysis included a subsurface exploration, laboratory testing, and engineering evaluation to determine the stability of the pond embankments and foundation soils. The report states that the pond exhibits factors of safety that equal or exceed the required minimum values. Therefore, the soils underlying the pond do not represent a poor foundation condition.

Appendix A

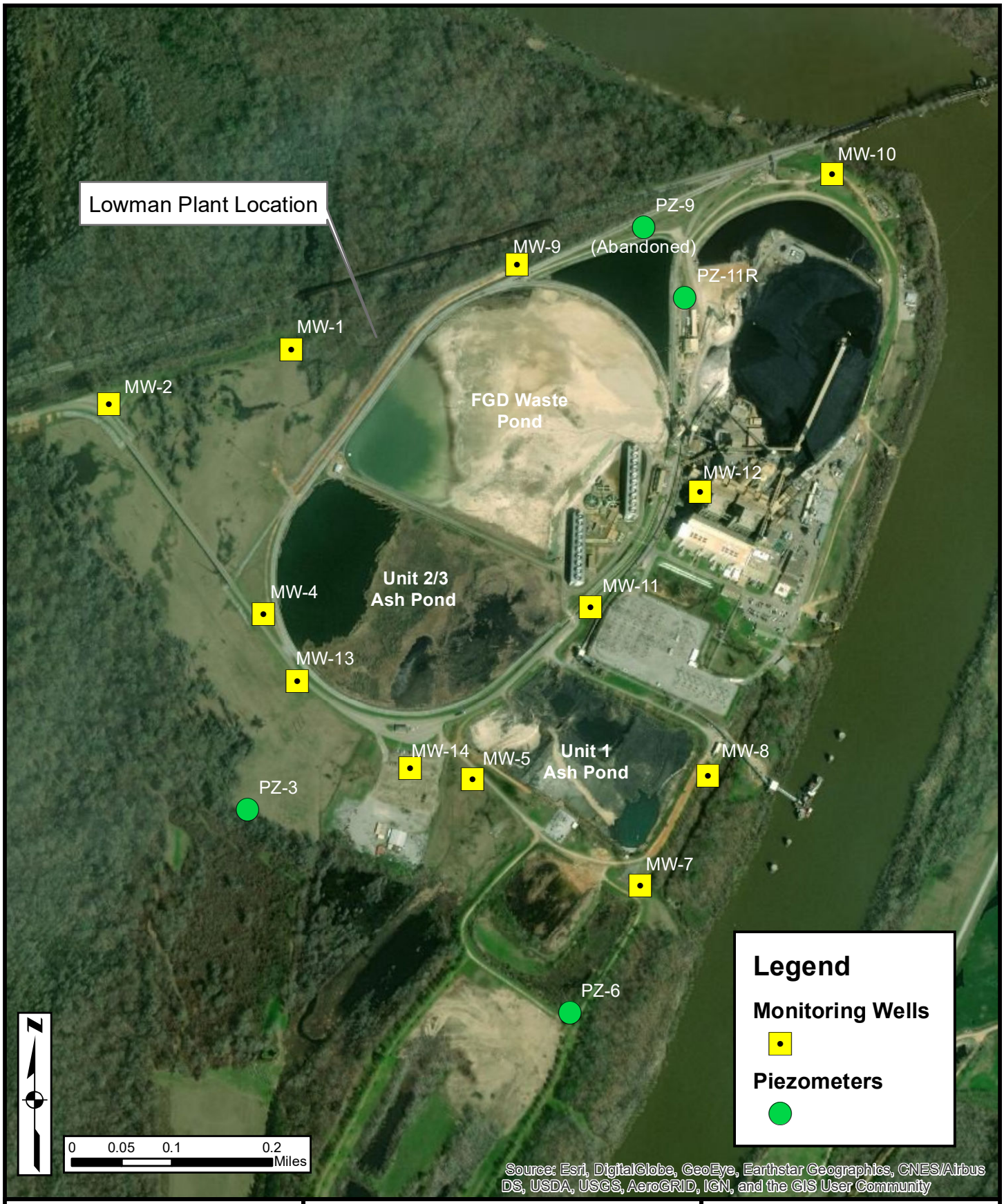
Site Map with Piezometer Locations

Site Fault Map

Peak Ground Acceleration Map

Site Geology Map

Documented Sinkhole Location Plan



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Site Map with Piezometer Locations

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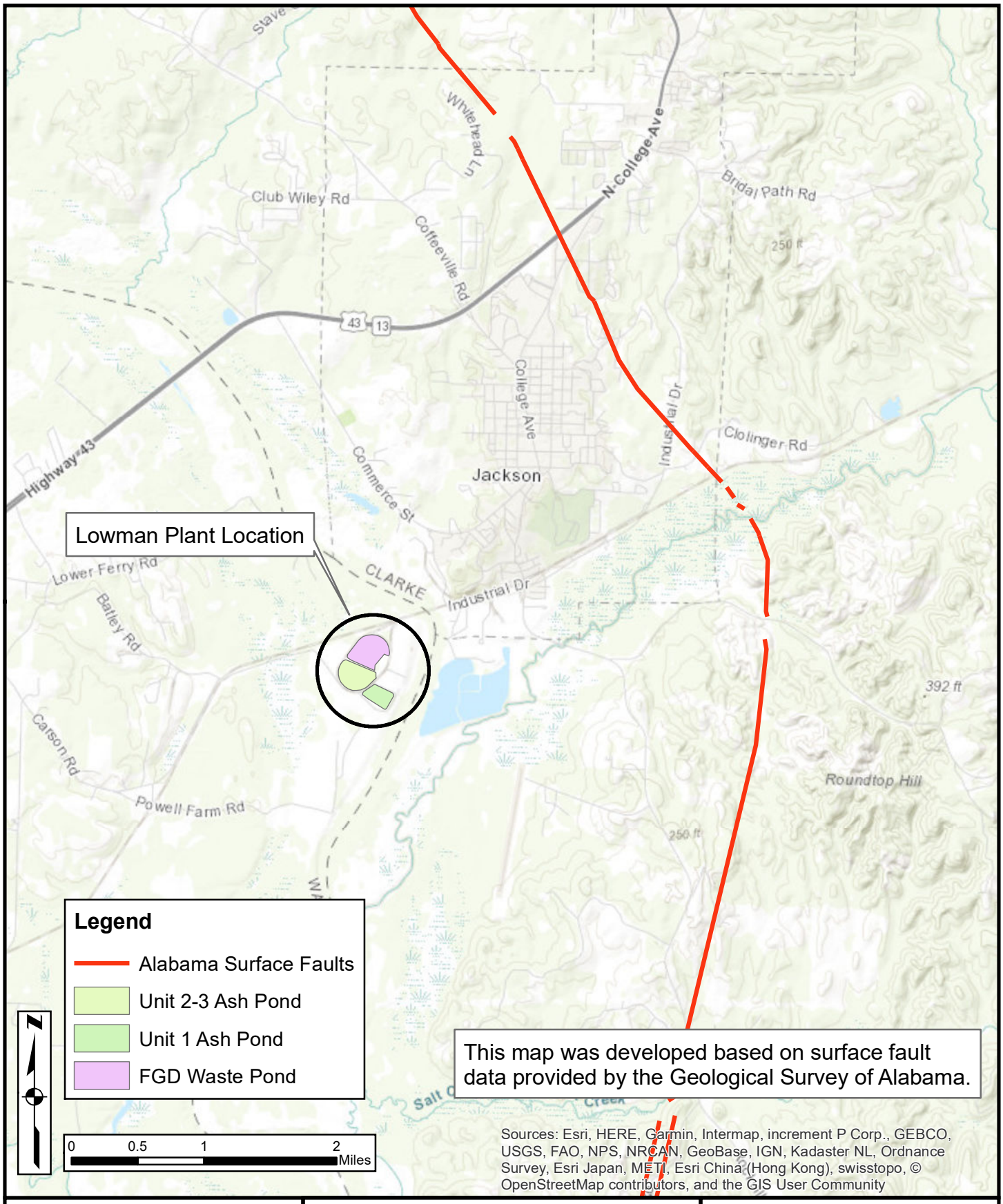

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Site Fault Map

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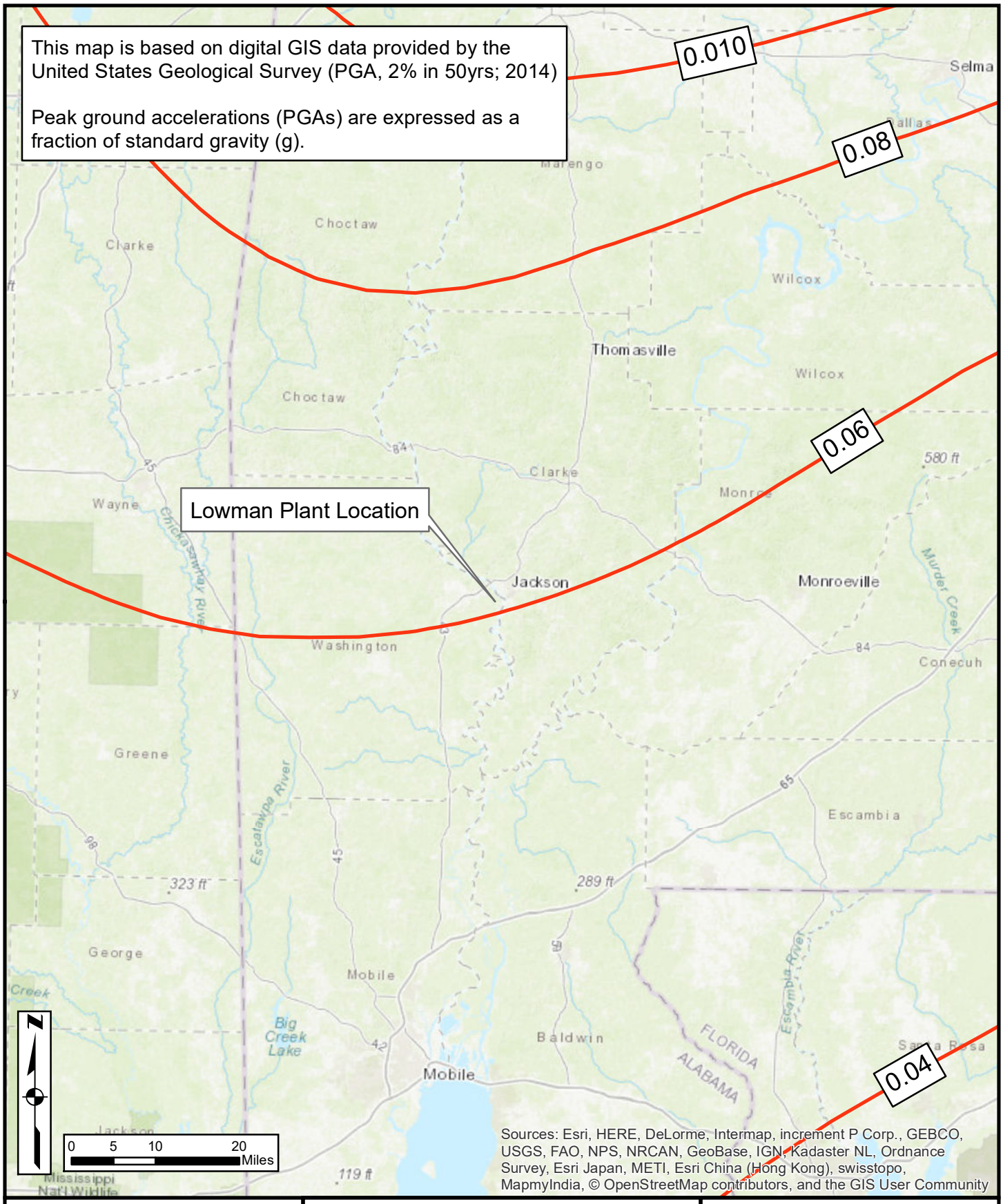

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Peak Ground Acceleration Map

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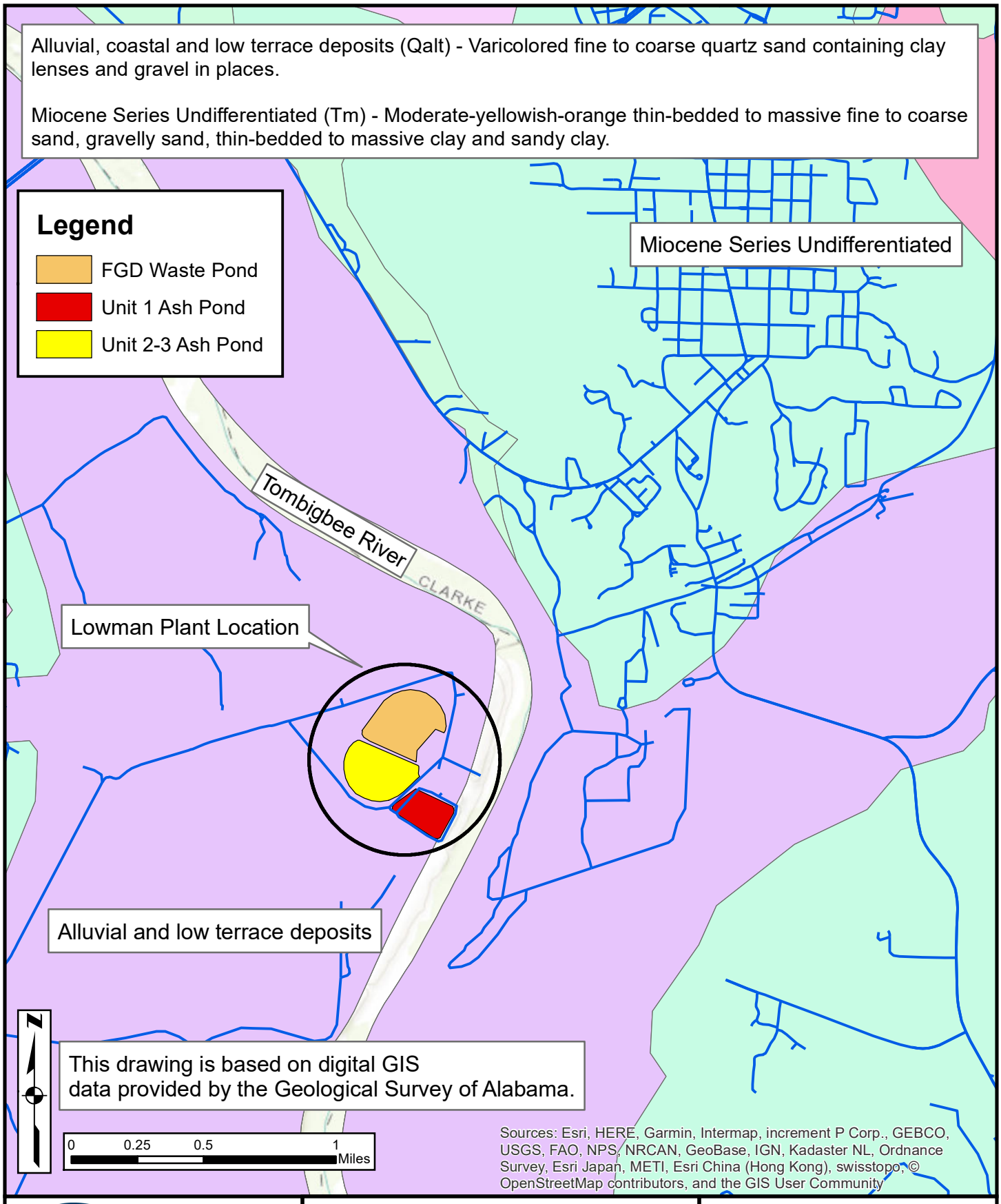

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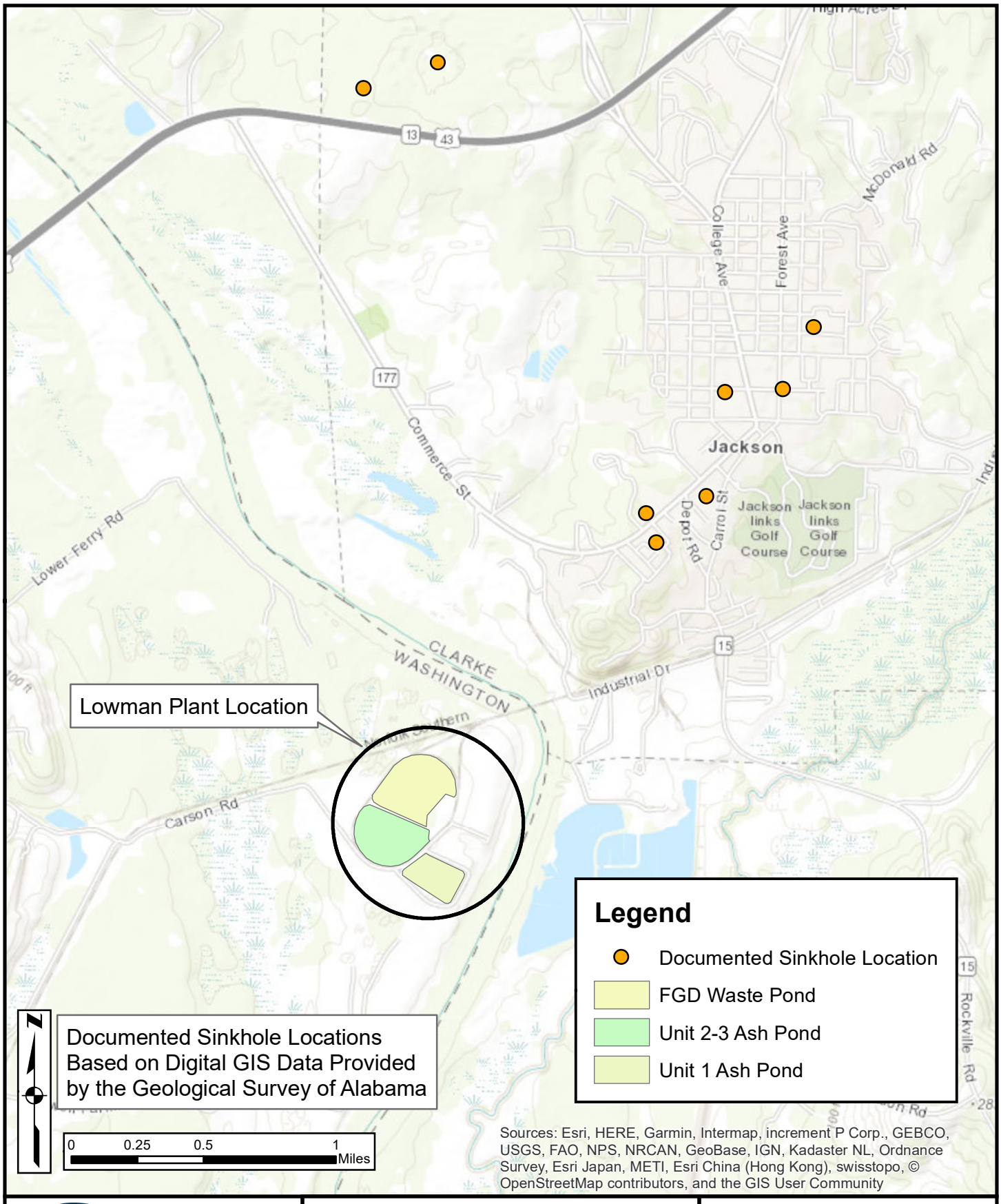

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