



Monitoring & Maintenance Engineering, Inc.

PHOSter Performance Update

Downtown Chevron

UST060306

Russellville, Alabama

Site Description:

This site is situated in the East Gulf Coastal Plain just southwest of the boundary with the Highland Rim Physiographic Region of Alabama. Site soils are predominately sandy clay. The groundwater elevation varies between five and eight feet below grade and the hydraulic gradient is to the south. About 80 percent of the site is paved in concrete with the store located on the highest point.

The regulated compounds of concern for this site include BTEX and MTBE, with benzene being of primary concern. The SSTLs were revised in May of 2017, based on a change in the site use designation.

PHOSter System

The PHOSter application is through a twelve point injector layout as shown in Figure 1. This system was built with independent triethyl phosphate (10% dilution) injection, independent nitrous oxide injection, as well as the standard independent air injection system (See P&ID Figure 2). Injection well screens were set to a depth of eighteen feet or refusal due to shallow bedrock.

Start-up

The PHOSter system was mobilized to the site, connected to the electrical service and the site piping on October 13, 2013. By the following monthly visit it was apparent that the system was causing vapor intrusion into the store and the system was shut-down. The Client installed a vapor recovery and treatment system and the PHOSter system was restarted on March 13, 2014.

Remediation Progress

Over the four years of operation, chemicals of concern have been reduced by 100% of the mass above the SSTL. Over the course of the project, the system used a total of 57,935 kWh (includes vapor recovery and treatment) or approximately \$ 7,000 worth of electricity. SMME added 900 pounds of nitrous oxide (a biologically available gaseous form of nitrogen for amino acid formation and enzyme production) and 12 gallons of triethyl-phosphate (used for energy storage and enzyme production) under the facility's UIC permit. Using bio-sparge injection rates, SMME provided 53,000 pounds of oxygen, via 15 million cubic feet of air, to bacteria as their primary energy source for cell division and metabolism. The final sampling is expected in July of 2018, allowing system removal by August.

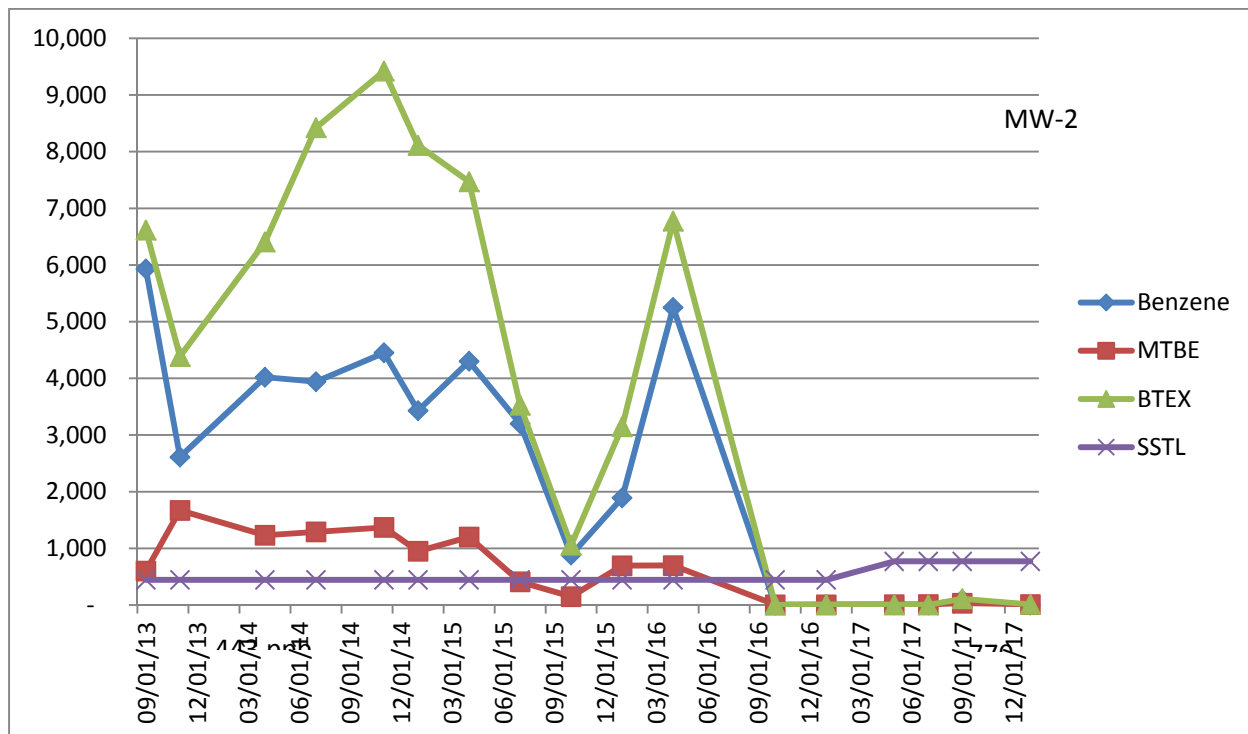
145 Merrill Avenue; Decatur, Georgia 30030

Phone: 404 371-9332 Mobile: 404 229-3096

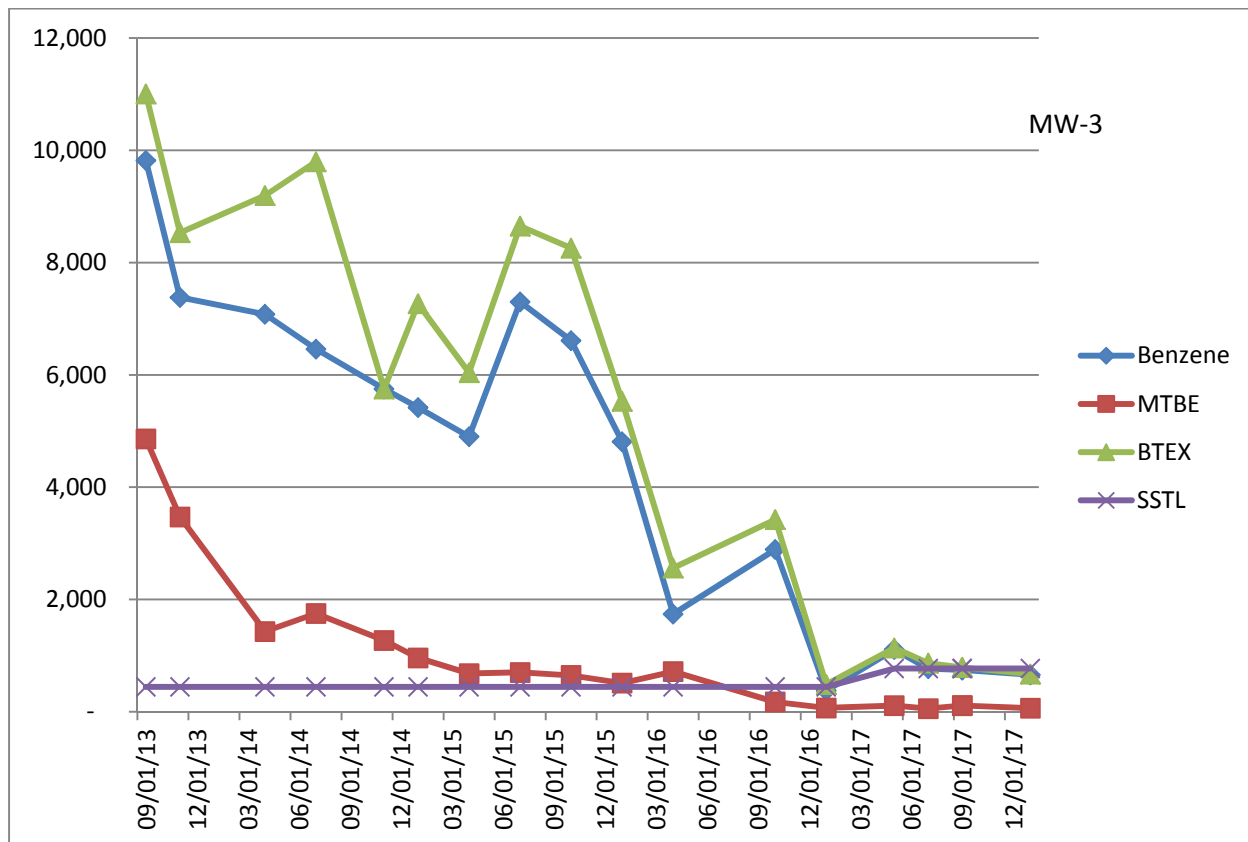
e-mail: ricksmmme@gmail.com

Website: www.bioremediationsmme.com

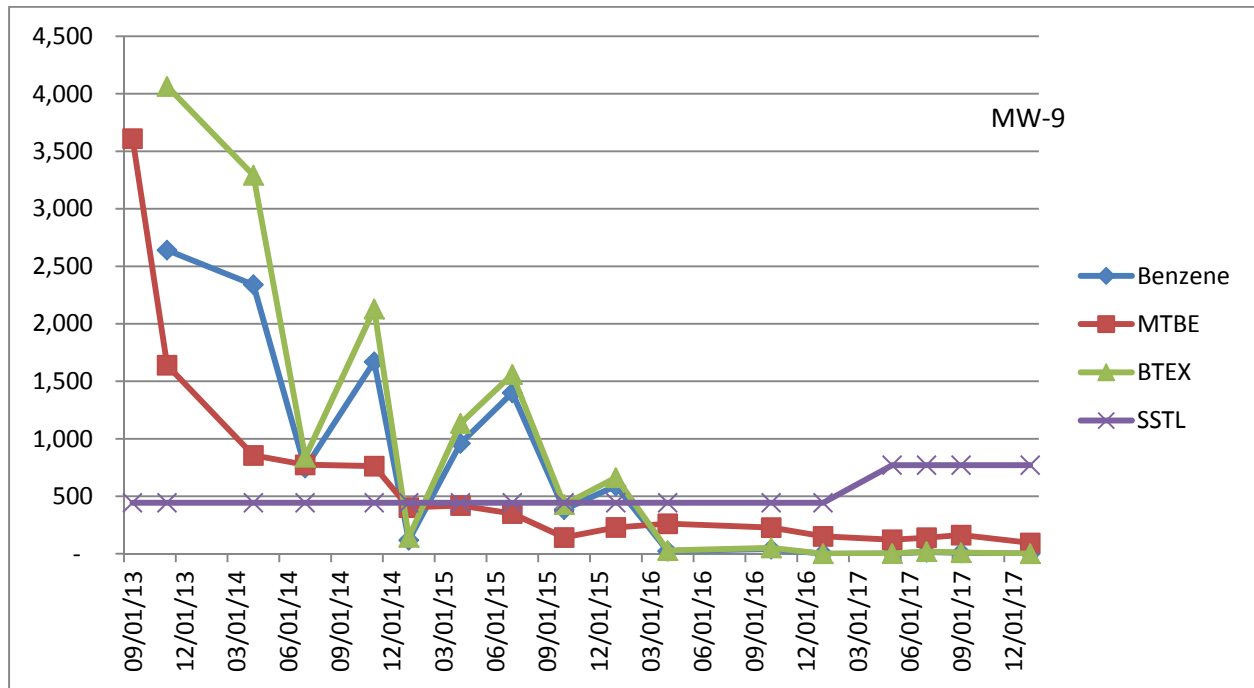
FIGURES



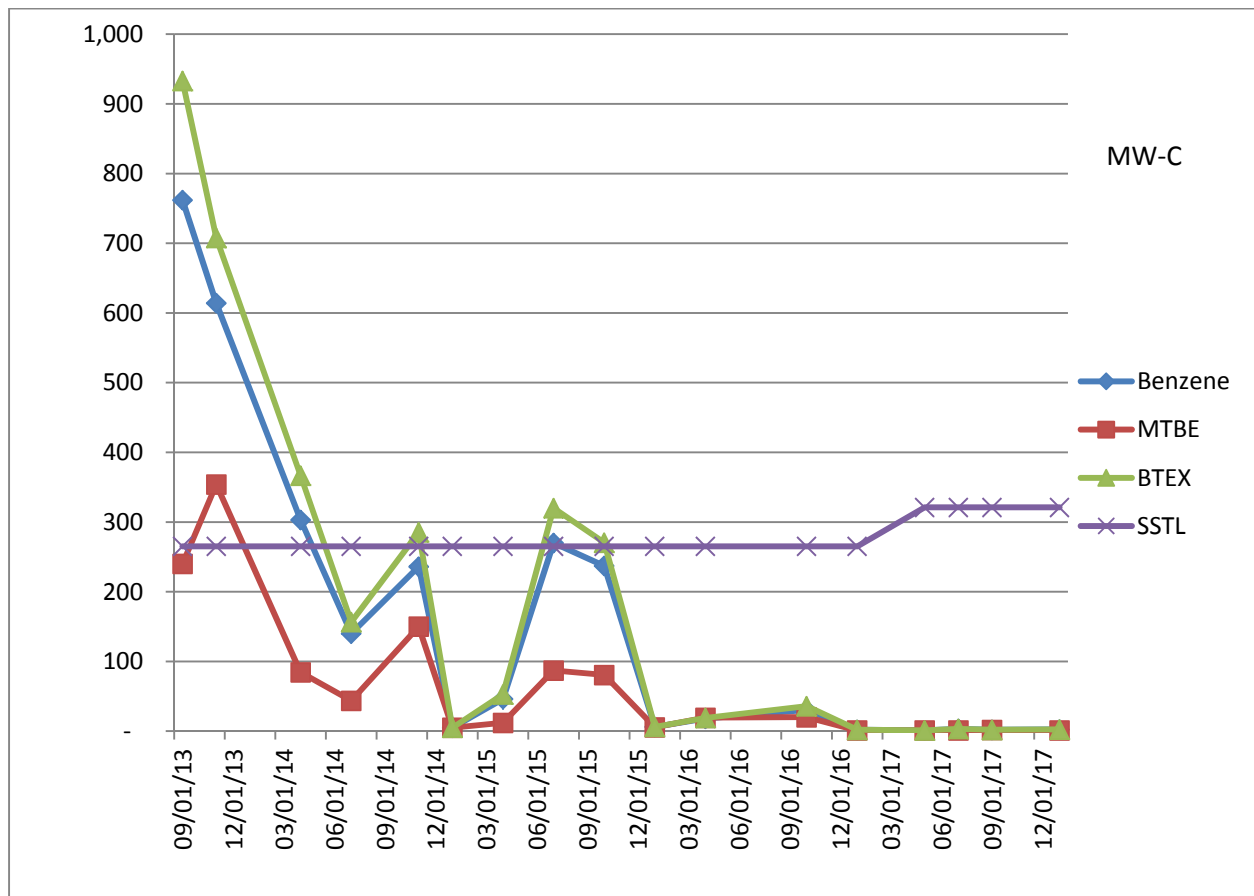
MW-2 is in the downgradient end of the hot area. The final spike was the last desorption which followed a seasonal fluctuation in the water table.



MW-3 is located near the apparent source area and is key to this remediation.



MW-9 is screened at the bottom of the surficial aquifer.



MW-C is situated at the down- and side-gradient end of the plume.

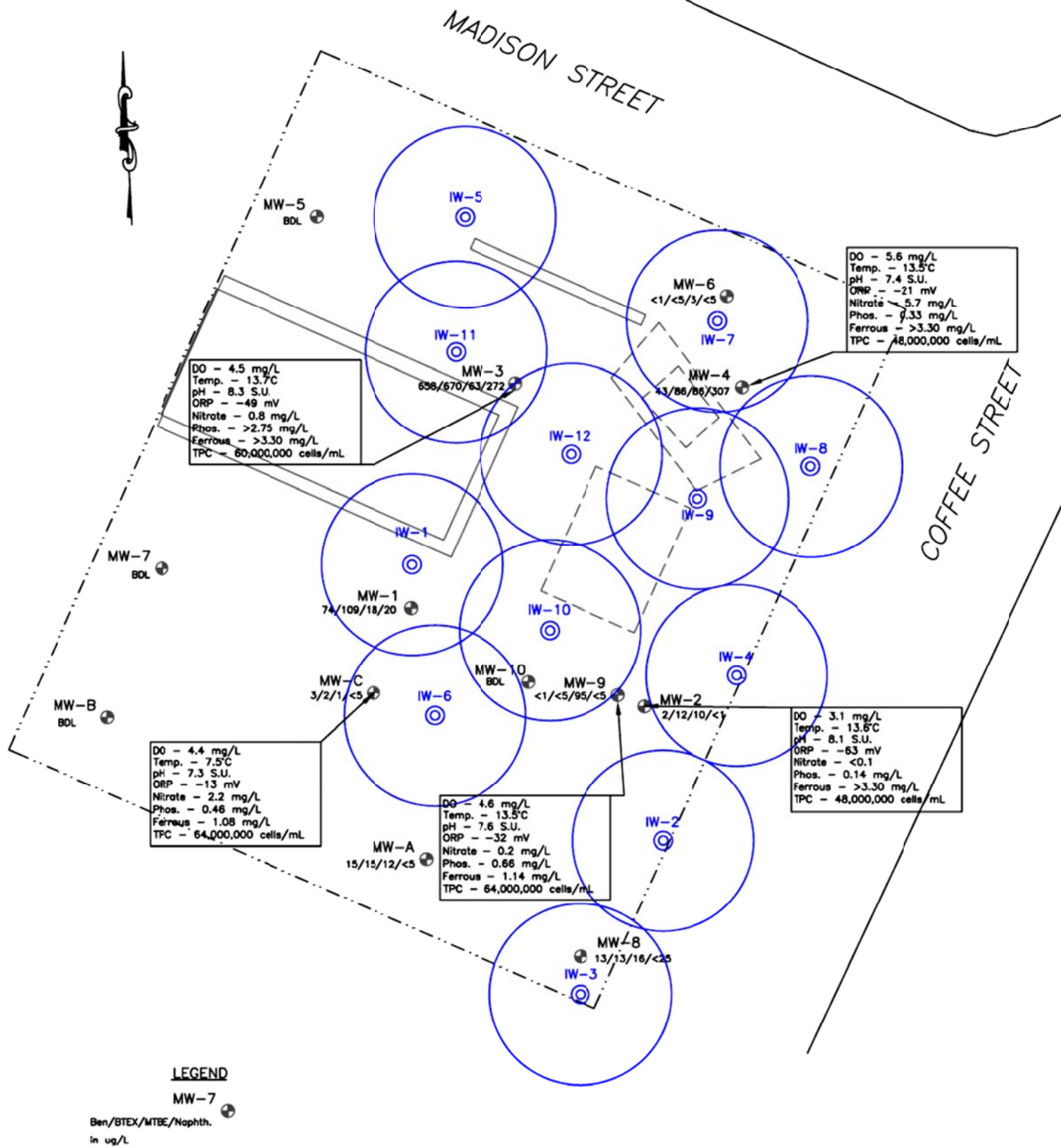


Figure 1
 Biologic Sampling Results
 Downtown Chevron
 Russellville, Alabama
 for
 CDG Engineers & Associates, Inc.
 February 6, 2018

Smith Monitoring & Maintenance Engineering, Inc.
 145 Merrill Avenue
 Decatur, Georgia
 (404) 229-3096

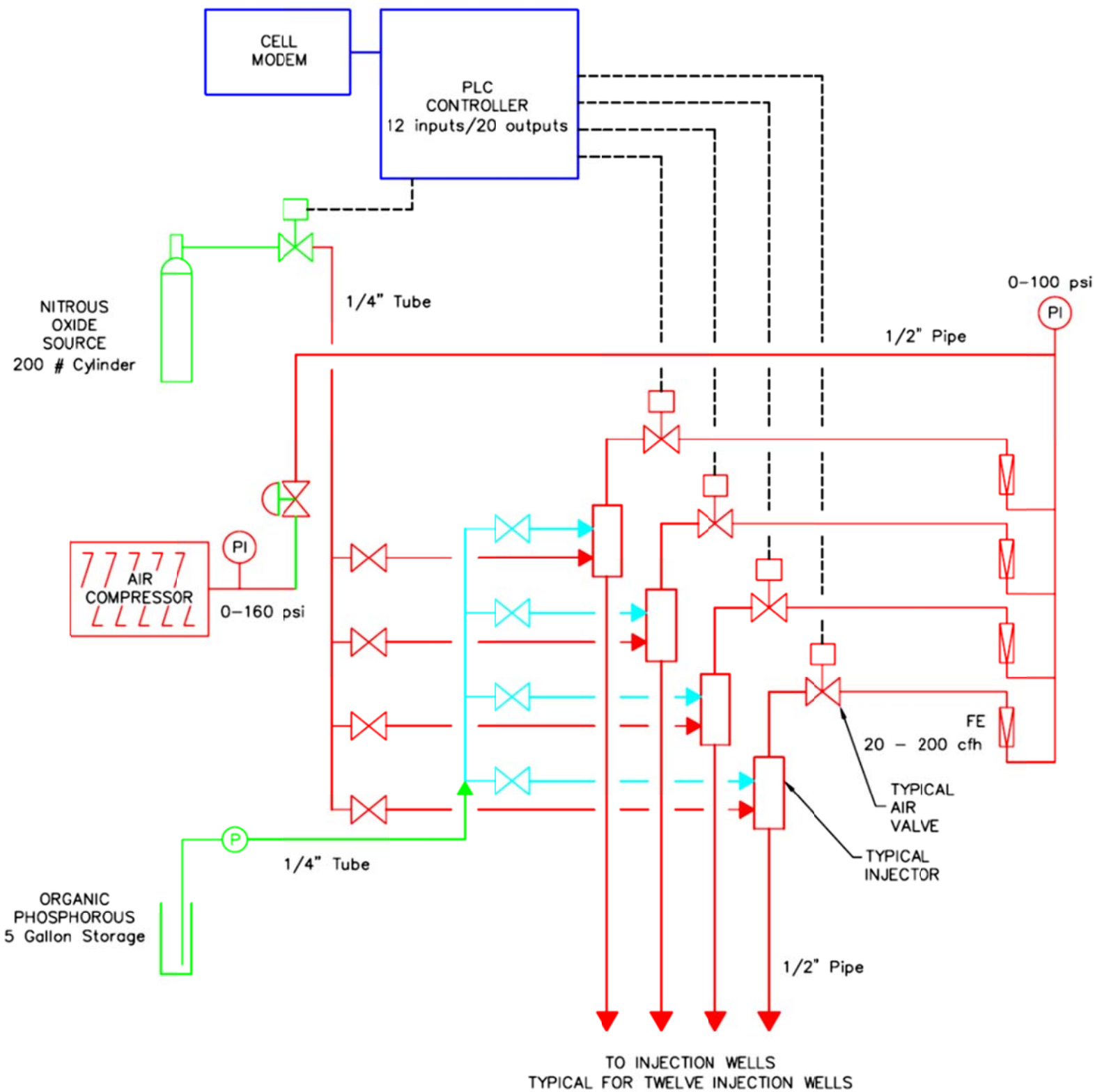


FIGURE 2
 PHOSter (BTEX)
 PROCESS DIAGRAM

TYPICAL P&ID FOR BTEX REDUCTION
 ATLANTA, GEORGIA

NOT TO SCALE NOVEMBER 2016