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## SANFORD MGP SITE

CLIENT	Progress Energy
LOCATION	Sanford, FL
VALUE	\$14 M
DATE	July 2009 - September 2010
SΔEETV	Zero OSHA Recordables



## In-situ stabilization (ISS)

The manufactured gas plant (MGP) remediation area included the location of the former Sanford Gasification Plant which was located south of Sixth Street; a number of properties downstream from the site and immediately adjacent to Cloud Branch Creek will be affected by the planned pilot test and subsequent remediation activities. Cloud Branch Creek which traverses the remediation work areas discharges to Lake Monroe past the confluence of Mill Creek located at the northern limit of OU3.

Soil remedial activities completed at the Sanford site included: the demolition of three abandoned structures, excavation of the first two feet (20,000 cubic yards)of unsaturated soils, DSM of 125,000 cubic yards saturated soils, extensive utility relocates as well as major improvements to Cloud Branch Creek in the form of the installation of nearly 1,000 feet of 7 feet x 7 feet and 11 feet x 7 feet culverts, realignment of the creek as well as 450 feet of open channel improvement of the creek located OU3 North terminating at the confluence of Mill Creek.

The DSM operations within the site were conducted using a 4000-series Manitowoc crane equipped with an attached Hain Platform. The crane/platform assembly is supplemented with a swivel-mounted, top-feeding Kelly Bar capable of reaching a depth of 75 feet bgs. Augers were attached to the bottom of the Kelly Bar. A 10-foot auger and a 12-foot auger were utilized on this project.

The appropriate amount of water was metered into an initial 5 cubic yard batch tank equipped with a highspeed, high-shear mixer. The reagents (Portland cement and ground granulated blast furnace slag) were transferred from the silos to the batch tank using the internal screw conveyor to deliver the specified volume of reagent.

The water was added to the mix tank first and the volume of water recorded. Each reagent was added separately to the mix tank. The scales on which the mix tank sets were tared before each reagent is added to verify that the correct amount of reagent has been added. NorthStar periodically tested each batch being prepared using a mud balance to insure the proper mix design is being met. The batch number,



volume of water used, and the weight of each reagent added were recorded on a Grout Log by the batch plant operator.

When the correct grout composition was achieved the blended grout was transferred to the auger. The batch plant was also equipped with a second storage tank to allow for temporary storage of a blended batch to allow for uninterrupted production of batches. A high speed mixer in this second tank was to ensure the blended batch does not separate. The pre-determined grout volume was pumped to the treatment area based on the soil density, reagent admixture ratio, and the work area dimensions (i.e. column diameter or panel dimensions).



The DSM Treatment was performed in a series of overlapping columns as per the schematic to the right. Columns along the perimeter of the DSM area had a 1 foot overlap in the area known as the triple treatment triangle, while the interior columns will have a neat-line overlap.

NorthStar used a TOPCON 3000 Series Total Survey Station during DSM operations. This instrument insured the proper overlaps of the columns, the locations of the columns, the vertical extent of the treatment, and the rate of advancement of the tool. Using the predetermined column locations, NorthStar placed stakes at the center point of each column slated for treatment for the day's production.

The crane operator set the auger tip immediately over the center stake insuring the proper location. Once the auger was set up at said location, DSM personnel verified the proper column designation and location. Prior to the initiation of the drilling/DSM operations, DSM personnel verified the key parameters for the column (i.e. total anticipated depth, grout volume needed, etc.). This information was recorded in the DSM Master QA/QC Log.

The grout mixing plant personnel was in constant radio contact with the crane operator and the QC personnel to insure proper grout volumes are dispensed and incorporated into the column. NorthStar's Quality Control Officer (QCO) communicated with the operator to verify that the Kelly bar is plum at the start of each column. The QCO verified vertical depth by surveying the elevation of the top of the Kelly bar (known length) when the auger is at the top of the mixing area and at the bottom of mixing area. When the terminating depth has been reached and the overall grout volume for the column injected, the auger was extracted and reintroduced to the same column to complete at least three mixing passes total per column to achieve a homogeneous mixture. The auger was then be moved to the next column unless the finished column is slated for sampling.

In situ treated material sampling was performed utilizing NorthStar's in situ sampler. Upon the completion of the DSM column slated for sampling, the in situ sampler depicted below was lifted by the excavator and advanced to the vertical midpoint of the column. Once the in situ sampler reached the sampling depth, the sampling chamber was opened using a hydraulic actuator. The sample would then enter the sampling chamber. Once the chamber is filled, it was be hydraulically closed and the in situ sampler was retrieved.



NorthStar's DSM Swell Management Plan was to incorporate the DSM swell into the site's final contours and grades. To the extent practical, all DSM swell was managed onsite and within the DSM treatment limits. NorthStar would begin grading the DSM to the site's final contours and grades before the DSM treated material has started to set. This allowed an on-going determination as to whether or not all of the DSM swell can be managed on-site and within the DSM treatment limits.

