



5400 Glenwood Avenue, Suite 400
Raleigh, North Carolina 27612
tel: 919 325-3500

July 7, 2016

Richard P. Lovett, P.G.
Environmental Compliance Support Manager
City of Greensboro
Field Operations Department
401 Patton Ave.
Greensboro, NC 27406

Subject: Technical Approach
 Groundwater Assessment and Remediation
 Stevecoknits (Kitchen Building) property

Dear Mr. Lovett:

Having served the City of Greensboro on your environmental programs for nearly 3 decades, CDM Smith Inc. (CDM Smith) is pleased to provide this Technical Approach for assessment and remediation at the former Stevecoknits site (Site). This location is now the Kitchen Building and houses critical City services such as Water Resources, Fire and Police personnel. CDM Smith has reviewed available reports and correspondence related to the Site and based on the limited information, we have determined that a comprehensive site assessment is needed that could ultimately lead to groundwater remediation. CDM Smith also believes that a preliminary risk assessment for vapor intrusion is needed. CDM Smith has completed numerous groundwater and vapor intrusion assessment and remediation projects across the Country, including sites in Murphy, North Carolina and Fayetteville, North Carolina using proven and innovative technologies and we are well suited to assist the City with this site. **We bring a unique, full service, team and approach that not only encompasses the initial data collection and analysis efforts needed, but also designing and implementing the engineered remediation solutions that will be required to complete a comprehensive site assessment and voluntary cleanup.**

It is our understanding that the City would like to proceed with voluntary clean-up at the site. CDM Smith is a Registered Environmental Consultant (REC) in North Carolina and has a Registered Site Manager in the Raleigh office. In order to determine if the site remediation can be completed under the REC program, the City must first notify the Inactive Hazardous Waste Branch (IHWB) in writing and complete a Site Conditions Questionnaire. The IHWB will review the Site Conditions Questionnaire and make a determination on whether assessment and remediation will be managed directly by the IHWB or under the REC Program. CDM Smith will assist the City throughout the application and review process. The technical approach provided assumes that the site can be managed under the REC program.



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While CDM Smith is a global engineering firm backed by over 5,000 resources, we realize it is the people and not the firm that make a project like this a success. All work will be overseen and managed out of our Raleigh, North Carolina office by Mathew Colone, P.G.. Mr. Colone is an RSM in the REC program and a seasoned Project Manager with 20 years of experience in groundwater assessment and remediation. Investigation work will be performed by staff from our Raleigh, North Carolina and Atlanta, Georgia offices. Technical guidance and review will be performed by Tom Duffey, P.G. in our Atlanta, Georgia office. Mr. Duffey is an industry recognized leader in site assessment and remedial technologies bringing over 30 years of experience to the City. For a project of this complexity, there's simply no substitute for the "been there, done that" know-how of a seasoned leadership team like Mat and Tom. Biographies for Mat and Tom are provided at the end of this proposal.

Site Summary

Originally, soil contamination at the site was thought to be limited to petroleum hydrocarbons and Varsol associated with former above-ground storage tanks (AST) from a tank-farm fill station. Initial groundwater sampling results from a monitoring well in the area indicated levels of benzene above the North Carolina 2L Standard (NC2L). Additional monitoring wells were installed around the former tank farm area in 1998 as part of a site assessment. Samples from those wells indicated numerous Volatile Organic Compounds (VOCs) above the respective NC2L, including tetrachloroethene (PCE). Subsequent groundwater monitoring well installation and sampling across the entire site indicated that PCE was present above the NC2L and had migrated beyond the property limits to the south.

A review of site drawings from previous site assessments indicates that PCE was stored in ASTs north and east of the former fill station. The location in the building where the PCE was used is not known and could represent a second release location. The PCE in groundwater was likely attributed to leaking piping from the PCE AST to the former product transfer station. The ASTs and associated piping were presumably removed around 2002, when the former Stevecoknit building was torn down and the Kitchen Building was constructed thereafter. A review of the current building footprint compared to the original Stevecoknit building shows that the northern-most part of the Kitchen Building is located just east of the former PCE AST.

Technical Approach

Prior to commencing any intrusive activities at the site, CDM Smith proposes to inventory both the onsite and offsite wells and determine which of the original monitoring wells are still present and if present, what is the condition of the well and whether it can be sampled. CDM Smith will also conduct a review of the Kitchen Building construction documents for information on any vapor barriers or venting that could mitigate vapor intrusion. In addition, CDM Smith recommends that City consider reviewing any sales agreements or former occupant agreements, as well as the previous owners and the City's insurance policies for the property to provide guidance on financial liabilities or responsibilities.

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Initial Site Assessment

In order to assess current conditions at the site and determine immediate risk potential, CDM Smith would recommend completing a vapor assessment and a limited groundwater assessment. In order to assess immediate risk potential from vapor intrusion, current EPA and NCDEQ guidance on assessment from subsurface vapor intrusion would be followed. Site conditions including groundwater, soil, subsurface vapor, and building construction information are needed to assess the vapor intrusion potential.

In order to collect groundwater and soil data, CDM Smith proposes to install four monitoring wells in the overburden/surficial aquifer with a hollow-stem auger drill rig. Our approach would be to install one well upgradient of the former PCE AST, one in the presumed source area, and two down-gradient of the presumed source along the southern property line. During well installation, soil samples collected above the water table would be screened in the field with a PID and the "hottest" sample from each well submitted for laboratory analysis for VOC by EPA Method 8260. Following installation and development, groundwater samples collected from each well would be submitted for laboratory analysis for VOC by EPA Method 8260. In addition to facilitating vapor intrusion assessment, soil and groundwater data collected during the initial well installation would also be used to re-establish a baseline for site conditions. Proposed well locations are provided on **Figure 1**.

Concurrent with the initial well installation, CDM Smith would also collect 3 sub-slab vapor from inside the Kitchen building. One sample would be collected from the north-west corner of the building, nearest to the presumed source area. Two additional samples would be collected from other areas of the building in order to average measurements across the occupied space. Sub-slab samples would be sent to an analytical lab for VOC analysis by EPA Method TO-15. Proposed sub-slab vapor locations are provided on **Figure 1**.

Once all data is collected and available, CDM Smith would review the data, as well as the site conditions (including building construction) and determine if indoor vapor monitoring is necessary. If indoor vapor monitoring was needed, CDM Smith would collaborate with the City to develop an appropriate scope. Indoor vapor monitoring can be misleading due to potential sources of VOCs unrelated to the environmental releases. Additional source and detected VOC analysis would be required to determine if any VOC detected in the indoor samples matches the source VOC vapor from sub-slab samples.

Comprehensive Investigation

Following completion of the initial groundwater, soil, and vapor investigation, CDM Smith would then evaluate the site groundwater data and any available groundwater data that can be obtained from original existing wells and determine the need for offsite wells and additional onsite wells. The data

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would also be evaluated for placement-targeted bedrock investigation wells in order to determine vertical extent of contamination.

Assuming that offsite evaluation was needed, CDM Smith would then install a series of overburden/surficial aquifer wells down-gradient to re-establish a plume map. For the purpose of this proposal, CDM Smith assumes that there are existing monitoring wells from previous investigations offsite that could be utilized for data collection and thereby decreasing costs for offsite well installations. Groundwater data from the existing offsite wells would be supplemented by several temporary well or sampling points on offsite properties. The data would then be evaluated to determine if additional investigation is necessary.

Based on review of the existing reports, the R.W. McCollum site is located approximately 650 feet downgradient of the Site's southern boundary and has documented trichloroethene contamination in groundwater. A review of the offsite investigation would need to include analysis of the R.W. McCollum data and a determination would potentially be needed as to co-mingling of the plumes and where the City's responsibility ends.

Assuming that the plume is offsite and active remediation is needed, once plume limits have been established, CDM Smith would complete a Comprehensive Site Assessment.

Remedial Investigation

Following the site assessment, CDM Smith would evaluate if additional information is needed to complete a remedial investigation. The remedial investigation would evaluate the potential for source removal as well as soil geotechnical and geochemical and groundwater geochemical conditions. Evaluation should include hydraulic conductivity, grain size, surficial and bedrock aquifer transmissivity, and groundwater geochemistry. Groundwater geochemical analysis should include: Oxidation-reduction potential, dissolved oxygen, nitrate, sulfate, ferrous iron, carbon dioxide, alkalinity, ethene, ethane, and methane, metabolic acids, and bacterial analysis. The bacterial analysis would include a determination of Dehalococcoides populations as well as rDNA and functional gene (tceA, bcvA, vcrA) evaluations. Review of existing geotechnical and geochemical conditions would be used to make a determination on the most appropriate and cost-effective remedial option for the site.

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Brief Team Introductions

Mat Colone



Mr. Colone is a licensed geologist with 20 years of experience in hydrogeologic, environmental, and geotechnical projects including: Soil and groundwater assessment, remediation, and reporting; sediment sampling and characterization; hydrogeologic investigations and reporting; bedrock mapping; monitoring and production well design and installation; groundwater and surface water sampling and reporting; pump testing and analysis; drilling and geotechnical testing services; boring log and graphic presentation; and laboratory and fieldwork.

Mat is the senior geologist and project manager for the groundwater contamination and landfill gas assessment and remediation at the closed North Wake landfill located in an urban setting in Raleigh, North Carolina. A residential area has been developed around the landfill since its closure, which has resulted in increased public and regulatory awareness. Following extensive assessment and monitoring, a perimeter landfill gas collection system was installed. The perimeter system included installation of 80 landfill gas recovery wells and a 500-foot long, 30+ foot deep horizontal collector trench. The entire perimeter system was put under a vacuum to recovery and capture landfill gas that had migrated beyond the landfill. The system is monitored and adjusted, if necessary, monthly.

The groundwater assessment has included the use of extensive geologic mapping of fractures to assist in determining preferential flow pathways, fracture trace analysis, onsite screening of soil and groundwater samples using a portable gas chromatograph to expedite groundwater contaminant plume delineation, packer testing to determine vertical extent of groundwater contamination, installation of temporary and permanent groundwater monitoring wells to delineate the horizontal and vertical extent of migration, and design of groundwater remediation system through air sparging and vapor recovery. The air sparging system utilizes the active perimeter landfill gas migration collection system to collect vapor created by air sparging. A major component of the investigation has included regular collection of groundwater and surface water samples for laboratory analysis, statistical analysis, trend analysis and semi-annual reporting.

Mr. Colone is also involved with the Cumberland County, Cabarrus County, and Wake County Feltonville landfills Groundwater Assessment and Corrective Actions in Fayetteville, North Carolina, Concord, North Carolina, and Holly Springs, North Carolina. Initial assessment activities included piezometer and monitoring well installation, groundwater sampling and analysis, groundwater flow analysis, and geophysical investigations. Mr. Colone prepared groundwater assessment reports and coordinated all field activities. Following the assessments, responsibilities included completion of

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Assessment of Corrective Measures reports, Corrective Action reports, and implementing groundwater remedies for these sites.

Groundwater remediation activities at each of these sites consist of in situ remediation via enhanced anaerobic bioremediation and natural attenuation. Remediation included completion and submittal of underground injection control permits as necessary, design and placement of injection wells, and coordination of injection and field activities. In addition, Mr. Colone was responsible for injection design including selection of the injection amendment as well as designing proposed injection rates and volumes.

Tom Duffey



Mr. Duffey is a senior geologist with 30 years of experience in environmental and groundwater resource projects. His diversified experience in the groundwater field ranges from complex remedial activities at environmental sites to large-scale groundwater resource investigations. His expertise in subsurface assessment and hydrogeology crosses a broad range of technical applications including hydrogeologic assessment, predictive analysis, and modeling. This broad technical base provides him with a unique capability to provide comprehensive and efficient identification of project needs that are focused on the desired end product. Mr. Duffey is also experienced in communicating complex groundwater issues to clear, understandable terms to non-geologists.

Tom has also provided testimony as an expert witness at the state and federal levels as well as supporting litigious negotiations for regulatory compliance. In this technical capacity, he has demonstrated expertise in areas including environmental regulation and remediation. Tom has in-depth experience with a multitude of technological fields related to hydrogeology. These fields include remote sensing, hydrogeologic field testing, subsurface characterization and mapping, and computer simulation of groundwater movement and contaminant transport. He has consistently developed innovative techniques that provide site-specific solutions and streamline assessment and analysis projects.

Mr. Duffey routinely employs remote sensing techniques for subsurface characterization as a cost-effective alternative/compliment to direct, intrusive subsurface exploration. These remote sensing techniques routinely include geophysical surveys and aerial photograph analysis to support subsurface investigation projects having various objectives. Mr. Duffey actively practices with surface geophysical exploration techniques including earth resistivity, terrain conductivity, and magnetometry. Each of these



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techniques can be used to define subsurface conditions based on data collected from land surface. He also has expertise in interpreting downhole geophysical data and is well-versed with methods including resistivity, spontaneous potential, natural gamma, thermal, neutron, and caliper logging. He also routinely uses immediately available map products and aerial photography, coupled with field reconnaissance, to locate and map geologic and hydrogeologic features pertinent to hydrogeologic projects.

Mr. Duffey also has comprehensive experience using most direct, subsurface characterization and mapping techniques. He has worked with geologic sampling methods including direct push, standard penetration testing, undisturbed sampling, and continuous rock/soil coring. He is also considered a technical specialist for borehole/well construction technology and is experienced with auguring, rotary techniques (air and fluid), reverse circulation, dual wall, sonic, and cable tool. Tom's expertise with these methods/technologies, coupled with his thorough understanding of project needs and end data use, ensure that subsurface characterization and mapping efforts are completed in a cost-effective, technically superior manner.

CDM Smith appreciates the opportunity to provide the City of Greensboro with a technical proposal for this project and we look forward to working with you. If you have any questions or require any additional information, please do not hesitate to contact me at (919) 325-3516 or by email to IrbyKC@cdmsmith.com. We stand behind our record of success and are happy to provide references upon request.

Sincerely,

A handwritten signature in blue ink that reads "Kevin C. Irby". The signature is stylized and fluid.

Kevin C. Irby
Vice President
CDM Smith Inc.

A handwritten signature in blue ink that reads "Mathew F. Colone". The signature is stylized and fluid.

Mathew F. Colone, P.G.
Project Manager
CDM Smith Inc.

cc: Tom Duffey, CDM Smith Inc.





Figure 1
 City of Greensboro - Kitchen Building
 Former Steveconk Site
 Initial Investigation
 Proposed Monitoring Locations

-  Approximate proposed initial groundwater monitoring well location
-  Approximate proposed sub-slab sampling location