March 26, 2018 Reference No. 11152783

Ms. Sarah Graves
Project Engineer
Utilities Department, City of Lawrence
PO Box 708
Lawrence, Kansas 66044

Dear Ms. Graves:

Re: Proposed Scope of Work and Cost Estimate
2018 Environmental Consulting Services
Farmland Nitrogen Plant Remediation
1608 North 1400 Road
Lawrence, Kansas 66046
Consent Order 10-E-94 BER
KDHE Project Code: C4-023-00009

1. Introduction

GHD Services Inc. (GHD) is pleased to provide this scope of services and the attached cost estimate in support of the remediation the City of Lawrence (the City) is performing at the former Farmland Nitrogen Plant (Farmland/Site). After a thorough qualifications review and interviewing process, the City selected GHD as their environmental consultant for the Site, which is being overseen by the Kansas Department of Health and Environment (KDHE) under Consent Order 10E-94 BER (the Order).

2. Project Understanding

Under the Order, the City agreed to be responsible for the required remediation, including the continued operation and maintenance of all active remediation systems, as well as all reporting requirements of the Resource Conservation and Recovery Act (RCRA) and National Pollutant Discharge Elimination System (NPDES) permits for the Site. Current active remediation systems include groundwater recovery wells, sumps, interceptor trenches, aboveground storage tanks (ASTs) and all other systems related to the hydraulic containment and land application of contaminated groundwater and/or surface water.

Based on our review of the documents provided by the City, GHD has concluded that a long-term comprehensive remediation plan must be multifaceted to be successful. The current plan is no longer a long-term viable alternative for the storage and disposition of collected groundwater containing ammonia, nitrate and nitrite (chemicals of concern (COCs)). The current system is generating water faster than it can be land applied, thus exceeding on-site storage capacity. Discharge to the Kansas River of the untreated groundwater is taking place under an emergency authorization that is due to expire in April 2018. The strategy GHD is proposing will replace the current strategy with multiple contingencies in the event one or

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more of the options should become inoperative, unavailable, or infeasible due to changing regulations, weather, land use practices or other unforeseen conditions. Our objective is to develop a strategy that will achieve regulatory closure and eventually restore the benefit of the Site as an economic resource.

This initial phase of work is planned to be implemented over an 8-month period from the point of authorization. A detailed time and materials cost estimate with a schedule outlining major project milestones and deliverables are attached.

Upon completion of this scope of work, GHD expects to have the Site reviewed, remediation alternatives identified, analyzed and prioritized, and multiple alternatives recommended to the State for approval. Interim actions, in addition to those already in place and under separate work authorizations, may be implemented as opportunities to initiate remedies present themselves (for example, field pilot testing of wetlands or soil composting).

3. Scope of Work

GHD has prepared the following scope of work to assist the City with complying with the terms of the Order and subsequent agreements and approvals by and between Kansas Department of Health and Environment (KDHE) and the City. We based the proposed scope on our review of the City's request for proposal (and other project information provided by the City) and subsequent clarifying discussions with the City's project staff.

This scope of services is planned to be implemented over a period of approximately 8 months.

3.1 Project Management, Meetings, Reporting, Document Review, and Quality Assurance of Technical Procedures

Travis Kogl, P.G., with GHD, will provide project management, including staffing and scheduling, budgeting, invoicing, and staff resources coordination.

David Hempleman, P.E., with GHD, will provide task management of day to day operations and assist Mr. Kogl in project management.

Mr. Kogl and Mr. Hempleman will provide project management activities as follows:

- Coordinate GHD staffing and scheduling, coordinate Consent Order and permit compliance activities with the City's staff, review and update budgets, prepare and submit monthly invoices and monthly status reports to the City.
- Serve as environmental technical liaison between the City and KDHE. Participate in status meetings between the City and KDHE as the City's technical environmental consultant.
- Represent the project as the City's environmental consultant at City Commission meetings. GHD assumes that we will attend two commission meetings during this scope of work.
- Perform a comprehensive review and organization of all project documents provided by the City.

- Perform technical quality audits of field sampling and data collection procedures.
- Perform quality assurance technical review and commentary on all related remediation reports prepared by the City, prior to their submittal to the State.
- For this scope, GHD assumes that we will participate/attend a total of eight meetings with the City and four meetings with KDHE.

3.2 DELETED 4-4-2018

3.3 Generate EQuIS Database, Develop Three-dimensional Visualization, Update Conceptual Site Model, and Data Gap Analysis

GHD will review and assemble an EQuIS™ database of available chemical data for the project and organize available stratigraphic and elevation data. Once assembled, GHD will develop, under the supervision of the Project's Professional Geologist Brian Sandberg, a three-dimensional visualization of the subsurface stratigraphy, which will include the general areas of nitrate and ammonia contamination in soil and groundwater.

The 3-D visualization will form the basis for updating the site conceptual model (SCM) to identify previously unnoticed potential contaminant source areas (i.e., data gaps). The updated SCM will be used to prepare preliminary designs for recommended remedial technologies and alternatives.

The assembled chemical database and stratigraphic data will be reviewed with the City to identify and address any data gaps. Once deemed complete, the draft version of the 3-D visualization will be prepared and presented to the City for their review and comment. Upon incorporating the City's input, GHD will present the visualization to KDHE during a project status meeting. Any remaining data gaps will be discussed and approaches to resolve the data gaps will be developed with input from KDHE.

This task may trigger the need to propose additional assessment activities. If so, a separate scope of work will be submitted for the City's consideration before proceeding with those activities.

3.4 Current Systems and Data Collection Evaluation/Optimization/Streamlining Support

The City has scheduled a contractor to clean and inspect both ASTs (AST #5 and AST #6) sometime during the last week of March 2018. The conditions of the tanks will be important in determining their continued future use as part of any remediation program of the Site. GHD will evaluate the inspection reports, and write an opinion memo describing our recommendation for their future use. Prior to finalizing the memo, GHD will incorporate the City's review comments.

GHD will review existing groundwater collection and storage systems and offer opinions in a memo to the City as to strategies that will maximize recovery of contaminated groundwater while minimizing recovery of less-impacted and non-impacted surface and groundwater. This will involve a thorough design review of

the collection trenches and surface drainage patterns. Prior to finalizing this opinion memo, GHD will incorporate the input of the City staff's review of the draft version.

3.5 Prepare Cost Benefit Analysis of Soil and Groundwater Alternatives

Engineering cost/benefit (C/B) analyses are performed to critically and objectively compare remediation technologies for all COCs based on: implementability, long-term and short-term effectiveness and reliability, and cost.

GHD will develop a comprehensive list of detailed remedial technologies that may be appropriate based on our experience with similar sites across North America. GHD will perform an initial qualitative screening of the comprehensive list to recommend up to five technologies which we believe will be most appropriate and likely to achieve the remedial goals in the most effective, least costly, shortest timeframe. The recommended list of technologies to be retained for detailed C/B analysis will be reviewed and discussed with KDHE prior to performing the analyses. Since the soil and groundwater are impacted with the same contaminants at comparatively similar concentrations, it is anticipated that the some of the same technologies may be recommended for both media – soil and groundwater.

Once KDHE agrees with the final list of recommended technologies for soil and groundwater, GHD will subject each technology to a rigorous quantitative C/B analysis. Results of the C/B analyses will be used to comparatively rank the technologies to each other and detailed in a summary report for KDHE.

The potential technologies to treat contaminated soil include, for example:

- in-situ and ex-situ denitrification,
- composting,
- phytoremediation,
- excavation with off-site land application as fertilizer at agronomic rates,
- excavation and off-site disposal in a landfill, and
- engineered wetlands.

The current combined flow rate of nitrate-containing groundwater from the two trenches and PW-9 is currently generating approximately 25 gpm, or approximately 13 million gallons per year. GHD will evaluate options for the treatment of groundwater, to include, for example:

- engineered wetlands,
- as a supplement to soil composting,
- continued/expanded land application program,
- discharge of untreated water to the City's sanitary sewer treatment plant, and

- construction of a truck or rail loading rack to facilitate alternative methods of transportation of nitrate-laden water for beneficial re-use.

David Hempleman, Project Professional Chemical Engineer, and Bob Januska, Project Professional Process Engineer, will perform and/or supervise other engineers to complete this task.

The C/B analysis report will be the final deliverable document under this scope of work, and is intended to satisfy the preliminary design (30% complete), which, upon KDHE approval, will be used to determine the next course of action for implementing permanent corrective actions for the Site.

3.6 Optional Contingency

At the City's request, GHD recommends an additional contingency task (equal to 10% of the estimated project total cost) to be included in the initial authorization. This Optional Contingency task will only be used under separate written authorization under this proposal from the City Project Manager to address mutually agreed, unforeseeable, out-of-scope issues that may arise, and which do not require a formal work authorization.

4. Assumptions and Limitations

GHD has prepared this proposed scope of work and estimated costs based on the review of most of the project documents provided by the City, and based on the following limitations and assumptions:

- According to the City's Request for Proposal (RFP), GHD is limiting the geographic area addressed by this scope of services to the areas identified as Area A and Area B on the northern part of the former Farmland site.
- The City and State agency will provide timely review, commentary and approvals of requests for input on all agency submittals or changes in scope, as needed.
- GHD assumes no additional field data will be necessary and is not proposing to perform any field sampling or testing under this scope of work. The City will continue to perform all routine sampling, operation and maintenance associated with ongoing compliance activities.
- GHD assumes that we will have unrestricted access to the Site to make any and all Site visits to observe and inspect all portions of the property and remediation activities as such visits relate to the scope of services.
- All topographic survey information is assumed complete and accurate and no additional topographic survey data or fieldwork will be necessary.
- Bench and field scale pilot testing are not proposed under this scope of work.
- GHD assumes the City will prepare all reports required under the Order and provide GHD a timely opportunity to review and comment on each report prior to submittal.
- Uncontrollable risk includes operation of new rural water supply well field immediately down gradient from the Site.

- All draft and final deliverables will be submitted in electronic PDF format.

5. Cost Estimate

GHD proposes to conduct the scope of work on a time-and-materials basis to be billed monthly at the unit rates on the attached fee schedule and in accordance with the terms of the pending Professional Services Agreement (PSA) between GHD and the City. The estimated costs (excluding the optional contingency task) to perform the scope of work are **$178,740**, and are summarized by task on the attached table.

6. Closing

GHD appreciates the opportunity to provide these services. Please approve this request by signing the where indicated and return it to me and retain a copy for your records.

If you have any questions or would like to discuss this scope and budget authorization request in more detail, please do not hesitate to contact me at (785) 783-8982.

Sincerely,

GHD

Travis Kogl

Travis Kogl, P.G.
Associate

TK/mk/01

Encl.

cc: Mike Staffileno, Principal, GHD

Cost Estimate - April - November 2018
City of Lawrence - Farmloand Nitrogen Plant Remediation Project
Lawrence, Kansas

Task	unit rate	unit	Estimated Quantity	Estimated Cost
1. Project Management, Meetings, Reporting, Document Review, and Quality Assurance of Technical Procedures				
Project Manager	$ 195.00	hour	80	$ 15,600.00
Professional Chemical Engineer	$ 176.00	hour	80	$ 14,080.00
Professional Process Engineer	$ 220.00	hour	20	$ 4,400.00
Professional Geologist	$ 176.00	hour	20	$ 3,520.00
Project Assistant	$ 65.00	hour	16	$ 1,040.00
Travel Expenses Allowance	$ 5,000.00	NTE	1	$ 5,000.00
Task 1 Subtotal				**$ 43,640.00**
2. DELETED 4.4.2018				
3. Generate EQuIS Database, Develop Three-dimensional Visualization, Update Conceptual Site Model, and Data Gap Analysis				
Project Manager	$ 195.00	hour	10	$ 1,950.00
Professional Geologist	$ 176.00	hour	20	$ 3,520.00
Project Geologist	$ 127.00	hour	40	$ 5,080.00
Project Assistant	$ 65.00	hour	40	$ 2,600.00
Database Analyst	$ 142.00	hour	40	$ 5,680.00
CADD/GIS/Modeler, Senior	$ 131.00	hour	20	$ 2,620.00
CADD/GIS/Modeler, Junior	$ 111.00	hour	60	$ 6,660.00
Task 3 Subtotal				**$ 28,110.00**
4. Current Systems and Data Collection Evaluation/Optimization/Streamlining Support				
Project Manager	$ 195.00	hour	16	$ 3,120.00
Professional Chemical Engineer	$ 176.00	hour	50	$ 8,800.00
Professional Process Engineer	$ 220.00	hour	40	$ 8,800.00
Project Engineer	$ 127.00	hour	50	$ 6,350.00
Project Assistant	$ 65.00	hour	8	$ 520.00
CADD/GIS/Modeler, Senior	$ 131.00	hour	20	$ 2,620.00
Task 4 Subtotal				**$ 30,210.00**

Cost Estimate - April - November 2018
City of Lawrence - Farmloand Nitrogen Plant Remediation Project
Lawrence, Kansas

5. Prepare Cost/Benefit Analyses of Soil and Groundwater Alternatives					
Project Manager	$ 195.00	hour	20	$	3,900.00
Professional Chemical Engineer	$ 176.00	hour	70	$	12,320.00
Professional Process Engineer	$ 220.00	hour	70	$	15,400.00
Professional Geologist	$ 176.00	hour	40	$	7,040.00
Project Engineer	$ 127.00	hour	80	$	10,160.00
Project Geologist	$ 127.00	hour	80	$	10,160.00
Project Assistant	$ 65.00	hour	20	$	1,300.00
CADD/GIS/Modeler, Senior	$ 131.00	hour	20	$	2,620.00
CADD/GIS/Modeler, Junior	$ 111.00	hour	80	$	8,880.00
Travel Expenses Allowance	$ 5,000.00	NTE	1	$	5,000.00
Task 5 Subtotal				**$**	**76,780.00**
Project Total				**$**	**178,740.00**
Optional Contingency, estimated at 10% of total project cost				**$**	**17,874.00**
Estimated Total Project Cost				**$**	**196,614.00**

2018 GHD Project Schedule April - November 2018
City of Lawrence - Farmloand Nitrogen Plant Remediation Project
Lawrence, Kansas

Task	Subtask	April	May	June	July	August	September	October	November
1. Project Management, Meetings, Reporting, Document Review, and Quality Assurance of Technical Procedures	Project comencement: April 15, 2018								
	Monthly budget, **invoice**, resource allocation; **monthly projectn status report**s								
	City project status meetings, monthly (8)								
	KDHE project status meetings (4)								
2. Stakeholder Engagement	Preparation with the City								
	Participating at Stakeholder/Gatekeeper meetings (4)								
	Participating at Public/City Council Meetings (2)								
3. Generate EQuIS Database, Develop Three-dimensional Visualization, Update Conceptual Site Model, and Data Gap Analysis	Database Generation								
	Data Gap analysis								
	(Data Gap assessment, if needed)								
	3-D Visual development								
	Present 3-D Visualization to the City								
	Present 3-D Visualization to KDHE								
4. Current Systems and Data Collection Evaluation/Optimization/Streamlining Support	Evaluate tank inspection results								
	Submit Technical Evaluation Memo (to City) - Tanks' Evaluation Memo								
	Evaluate interception trenches, existing ponds, alluial pumping wells, and surface storm water drainage patterns								
	Submit Technical Evaluation Memo (to City) - Current Systems Evaluation								
5. Prepare Cost/Benefit Analyses of Soil and Groundwater Alternatives	Prepare initial list of detailed technologies and assembled remedial alternatives								
	Submit comprehensive list of five or more technologies and alternatives to the City - recommend five for detailed C/B analysis								
	Submit comprehensive list of five or more technologies and alternatives to the KDHE - recommend five for detailed Cost/Benefit analysis								
	KDHE review								
	Receive KDHE comment/approval of five alternatives for detailed analysis								
	Perform detail C/B Analysis of five technologies/alternatives								
	Submit prioritized C/B Analysis of five alternatives to KDHE								
	KDHE review/approval								
3.6 Optional Contingency, estimated at 10% of total project cost	Contingency- out of scope services,interim actions, as needed and agreed								
	Project End: November 15, 2018								

Notes:
Bold text indicates deliverable submitted
Data gap assessment
Review time shaded
City Decision needed
KDHE Decision needed
Contingency

2017/2018 USA Fee Schedule

Principals: $217.00 - $245.00

Associates: $179.00 - $226.00

Specialist: $187.00 - $226.00

Engineers:

- Level A $117.00
- Level B $127.00
- Level C $139.00 - $159.00
- Level D $165.00 - $176.00
- Level E $183.00 - $193.00
- Level F $213.00 - $223.00

Geologists/Hydrogeologists:

- Level A $117.00
- Level B $127.00
- Level C $139.00 - $159.00
- Level D $165.00 - $176.00
- Level E $183.00 - $193.00
- Level F $213.00 - $223.00

Environmental Chemists/Scientists/Planners:

- Level A $112.00
- Level B $122.00
- Level C $133.00 - $143.00
- Level D $154.00 - $164.00
- Level E $181.00 - $191.00
- Level F $213.00 - $223.00

Industrial Hygienists/Safety Professionals:

- Level A $112.00
- Level B $122.00
- Level C $133.00 - $148.00
- Level D $159.00 - $169.00
- Level E $183.00 - $193.00
- Level F $213.00 - $223.00

Information Technologists:

- Level A $112.00
- Level B $122.00
- Level C $133.00 - $143.00
- Level D $154.00 - $164.00
- Level E $181.00 - $191.00
- Level F $213.00 - $223.00

Database Analysts:

- Level A $96.00
- Level B $106.00
- Level C $122.00 - $142.00
- Level D $157.00 - $177.00
- Level E $192.00 - $202.00
- Level F $205.00 - $222.00

Technicians/Technologists:

- Level A $83.00
- Level B $101.00
- Level C $116.00
- Level D $128.00 - $148.00
- Level E $158.00 - $168.00
- Level F $196.00 - $211.00

Draft/CADD:

- Level A $78.00
- Level B $88.00
- Level C $99.00
- Level D $111.00
- Level E $121.00
- Level F $131.00

Technical Apprentices: $83.00 - $93.00

Administrative Support: $65.00