CITY OF BRISTOL INTEGRATED WASTE MANAGEMENT FACILITY LANDFILL GAS SYSTEM AND DEWATERING SYSTEM IMPROVEMENTS

WORK ORDER

1. BACKGROUND

SCS Engineers identified 7 vertical landfill gas (LFG) extraction wells in the southern end of the Quarry Landfill that had been shut off from vacuum in early June 2020. SCS installed a series of temporary 4-inch LFG lateral pipes to connect these 7 LFG wells to vacuum in late June. SCS had previously discussed options with the City of Bristol (City) and Ingenco for introducing a second LFG collection header into the Quarry Landfill in close proximity to condensate sump CPS-1. SCS and the City had performed field reconnaissance and reviewed drone photos to identify a ravine in which the City and SCS could position a second LFG header into the Quarry Landfill adjacent to CPS-1.

During a conference call on 12/17/20, the City informed SCS of ongoing landfill gas emissions/odors identified in the southeast portion of the Quarry Landfill that need to be addressed by immediate abatement and control measures. These conditions warrant repairs and improvements to the existing LFG system and dewatering system infrastructure, and additional LFG extraction and dewatering efforts to enhance the effectiveness of the LFG control system. The City discussed the layout drawing of the area of concern as well as a drone video of the most recent conditions. SCS discussed an approach to target LFG extraction in the area of concern, dewatering efforts in the southeast corner of the Quarry, and an additional LFG header into the Quarry. During a follow up conference call with the City on 12/29/20, SCS discussed multiple approaches to accomplish enhanced system performance, one of which involved a 12" LFG main header into the Quarry and another (which the City selected) involved two 6" LFG header pipes extending into the Quarry above condensate sump CPS-1. The scope of services is discussed below.

2. SCOPE OF SERVICES TO BE PERFORMED:

TASK 1 – PLANNING, LAYOUT, CONSULTING, AND CQA

SCS will prepare a detailed LFG System layout drawing with detail drawings and/or sketches for the proposed LFG horizontal collector, 12" sump with pump at the low point in the southeast portion of the landfill, dewatering piping and tie-in connection details. The layout drawing and detail drawings will also include the proposed 12" and 6" LFG header into the Quarry and tie-in connections adjacent to sump CPS-1. SCS will notify VDEQ-SWRO of pending LFG system improvements, repairs, and maintenance activities and provide drawings, details, and updates accordingly. SCS will coordinate with the City and VDEQ-SWRO with respect to notifications with regards to this LFG project, as appropriate.

SCS will prepare a materials inventory list of pipe quantities and stone specifications and proposed volumes. The materials inventory shall include other miscellaneous items required such as pumps, wellheads, pipe anchor brackets, etc. This task will also include part-time on-site CQA of two

workdays per week during field work. SCS anticipates construction activities to be completed within three work weeks. Our CQA services include the following:

- SCS will maintain a part-time presence at the site during LFG header pipe and horizontal collector installation to periodically observe system construction activities and to verify general compliance with plans and documents.

- Monitor and document the pressure testing of the completed LFG header. Provide guidance during testing.

- Telephone calls among the SCS Project Director, SCS-FS Project Manager, SCS on-site personnel, and the City to answer questions, resolve issues, and coordinate interpretations of the plans and specifications. SCS on-site staff will handle some of these issues in person.

- Prepare sketches or outline approaches required to address field conditions impacting the LFG system.

- Maintain files for correspondence, reports, photographs, requests for information or clarification, and other construction project related documentation, and forward to the City and others, as appropriate.

- Conduct a final walk-through inspection of the project, document the substantial completion inspection, and provide a punch-list for completion by field crews prior to demobilization. Distribute final close-out meeting minutes.

TASK 2 – HORIZONTAL COLLECTOR INSTALLATION

SCS will coordinate with the City for the ordering of LFG pipe, pipe fittings, and non-calcareous stone aggregate required for LFG system enhancements to be accomplished under this task. SCS Field Services OM&M (SCS-FS) will mobilize on-site in late January 2021 to begin welding 4" perforated LFG collection pipe to serve as the horizontal collector. SCS-FS will excavate a 24" wide trench approximately 800 feet total to a minimum of 36" depth per the planning and layout documents The center of the horizontal collector will feature a 12" sump with pneumatic pump at the low point. This 12" sump will be discussed in more detail under Task 4. The two ends of the horizontal collector will tie-in to this sump at the central low point on the southeast end of the Quarry Landfill. SCS-FS will connect the two ends of the horizontal collector to the existing 4" temporary LFG header as shown on the attached drawing. SCS-FS will complete backfilling of the horizontal collector trench using non-calcareous VDOT No. 4 river rock (or suitable equivalent) and waste overburden.

TASK 3 – SUPPLEMENTAL QUARRY HEADER PIPES INSTALLATION

Under this Task, SCS will work in conjunction with the City to install a 12-inch LFG header along the rim of the Quarry. SCS has been informed that Ingenco has approximately 600 feet of 12-inch HDPE pipe available on-site which will be made available for these improvements. The City will clear brush to allow the 12-inch header to traverse around the mulching area near the Quarry rim as shown in the attached photo and drawing. Subsequent to the tie-in connection to the existing 12-inch main header with the 12-inch tee, SCS will install a 12-inch isolation valve and close it (isolating the piping under construction) to allow Ingenco to continue collecting LFG during field activities associated with these improvements. All proposed piping and valves will be installed abovegrade.

The area where the proposed supplemental LFG header will traverse down through a steep ravine into the Quarry Landfill is heavily vegetated with small brush and trees. The City will clear this brush prior to installation. SCS will install a 12-inch tee at the terminus of the proposed 12-inch header along the Quarry rim. There will be a 12-inch blind flange installed for future expansion along the southern section of the Quarry Landfill. The 12-inch header will extend into the ravine before reducing into two 6-inch headers near the westernmost steep portion and descent into the Quarry. SCS plans to weld the 6-inch header in the Quarry and weld the 12-inch header above the Quarry rim. SCS will rely on City-operated equipment (e.g. winch) to pull the 6-inch header from the Quarry Landfill floor up through the ravine to make the tie-in connection with the proposed 12-inch header.

SCS will disconnect the 12-inch flange adjacent to CPS-1 in the Quarry Landfill where the 4-inch temporary LFG header connects into the existing 12-inch header and install two 12-inch flanged tees with a 6-inch flanged branch in a vertical position. SCS will connect the two 6-inch LFG headers extending down from the ravine to the two 6-inch flange branches off the 12-inch tees. SCS will reconnect the 12-inch flange reducer from the 4-inch temporary header to the new dual 12-inch tees. SCS will install a 4-inch butterfly isolation valve to enable O&M personnel to isolate this area during future well raising and other system maintenance and construction activities.

TASK 4 – DEWATERING SYSTEM IMPROVEMENTS

SCS will configure supplemental 2-inch airline and 4-inch condensate forcemain into the Quarry Cell following the same alignment down the ravine as the proposed LFG header. SCS will make tie-in connections to the existing airline and condensate forcemain near the compressor station.

SCS understands the City will procure a new pump for condensate sump CPS-1. SCS will assist the City with the installation of the new pump in CPS-1, connect the airline appurtenances to the new pump as well as the condensate forcemain appurtenances to the discharge line of the new pump.

This task includes the installation of a 12-inch sump with pump at the low point near the southeast corner of the Quarry Landfill to increase dewatering quantities and assist with liquid removal efforts. SCS will excavate a minimum 10-foot pit to accommodate the sump. Once the sump is installed in the pit, SCS will backfill around the sump with VDOT No. 4 stone to the 4-inch inlet and outlet branches. SCS will connect both ends of the horizontal collector to the inlet and outlet of this sump. Note: there will likely be leachate in the excavation pit, so field personnel should exercise caution. Also, to prevent the sump from floating, it will be advised to fill the sump with water prior to lowering it into the trench (or other suitable ballast methodology). SCS expects the City will consider the corrosive nature and other characteristics of leachate when selecting the pump.

SCS will install replacement 2-inch airline from CPS-1 along the quarry wall buffer to connect to the proposed southeast sump pump. SCS will connect the discharge line and appurtenances from the proposed southeast sump pump to new 4-inch forcemain to the adjacent quarry wall. City-operated equipment (e.g. winch) will pull the forcemain to the quarry rim where the forcemain will discharge landfill liquids to a temporary, abovegrade storage tank. The City will be responsible for periodically transferring liquids from the storage tank to an appropriate discharge point.

SCS will connect the 2-inch discharge line from the U-trap off the southern leachate cleanouts LFG header to the proposed southeast sump. SCS will also connect the terminus of the southern quarry temporary LFG header to the proposed sump.

TASK 5 – MATERIALS & REIMBURSABLE EXPENSES (EQUIPMENT, MILEAGE, PER DIEM)

This task addresses certain materials and reimbursable expenses involved in the improvements, repairs, and maintenance activities affiliated with the horizontal collector, supplemental Quarry Cell header, and dewatering system improvements. The activities outlined in Tasks 2-4 are anticipated to occur over an approximate 3 week period. These materials and reimbursable expenses include vehicle usage and mileage, per diem, and other minor direct costs such as computer, phone, and miscellaneous incidental costs.

TASK 6 – HEAVY EQUIPMENT AND SUPPLIES

This task addresses the heavy equipment and miscellaneous supplies involved in the improvements, repairs, and maintenance activities affiliated with the horizontal collector, supplemental Quarry Cell header, and dewatering system improvements. The activities outlined in Tasks 2-4 are anticipated to occur over an approximate 3 week period. These materials include the fusion equipment required: electrofusion machine, 4-inch butt fusion equipment, and rental of a 12-inch fusion machine (pitbull); freight, miscellaneous fittings and supplies required to complete the tasks.

ASSUMPTIONS

- It is our understanding that select materials and equipment necessary to complete horizontal collector installation, supplemental LFG quarry headers, and dewatering system improvements outlined under Tasks 2, 3, and 4 must be provided by SCS. Our budget includes the cost associated with renting a 12" HDPE pipe fusion machine in Task 6. The City will procure stone aggregate to complete the horizontal collector installation under Task 2. The City will also provide the track hoe excavator necessary to conduct certain excavation activities.

- SCS will use approximately 600 feet of existing 12-inch HDPE piping from Ingenco's stockpile for the LFG header construction. However, additional 12-inch and 6-inch HDPE pipe will be required to complete Task 3. Total HDPE pipe quantities to complete Tasks 2-4 will be determined under the Task 1 scope, but SCS assumes the City will purchase all HDPE pipe and HDPE fittings in the materials inventory.

- The City will secure the new 6-inch LFG header to the chain link fence along the Quarry wall using pipe clamps similar to the existing LFG header. The City has equipment to access the Quarry wall and secure the 6-inch LFG header to the chain link fence.

- The City will be responsible for all brush clearing associated with the proposed route of the LFG header (and air and forcemain piping) in advance of SCS personnel mobilization. If the City's progress on this task delays SCS, causing additional mobilizations, this will increase the overall cost of efforts under this Work Order.

- The City will provide a winch (or other suitable technique) to pull the 6-inch LFG headers up the Quarry wall into position to make the tie-in to the 12-inch LFG header. The City will be responsible for the operation of the winch to secure the 6-inch headers. SCS will complete HDPE fusion activities.

- The City will be responsible for applying soil cover over the 6-inch and/or 12-inch header above the rim of the Quarry wall to anchor the supplemental header pipe.

- The City will install a temporary poly tank for landfill liquids discharged from the proposed sump pump installed in the southeast end of the quarry landfill. SCS will complete fusion welding and convey forcemain piping to the quarry wall. City personnel and equipment must pull the 4-inch forcemain up the quarry wall and secure the 4-inch forcemain to the chain link fence.

- The City will install a booster pump in the temporary poly tank to discharge liquids. SCS assumes the City is responsible for the pumping and piping infrastructure and efforts required to transfer landfill liquids from this temporary poly tank.

3. WORK ORDER SCHEDULE

SCS is prepared to begin procurement of materials and work for the task listed above upon authorization from the City of Bristol. Field activities associated with the proposed LFG system improvements, repairs, and maintenance would commence subsequent to the procurement and delivery of LFG pipe and materials by the City.

4. COMPENSATION

Compensation shall be as indicated below.

☒ SCS will be compensated for time and materials (T&M) expenses in accordance with SCS' rate schedule in effect at the time of performance, provided that total compensation will not exceed $87,500 without the authorization of the City of Bristol.

• Task 1 – Engineering Design, Consulting, and CQA	$15,000
• Task 2 – Horizontal Collector Installation	$15,000
• Task 3 – LFG System Expansion New Quarry Headers	$15,000
• Task 4 – Dewatering System Improvements	$15,000
• Task 5 – Equipment, Mileage, Per Diem	$15,000
• Task 6 – Heavy Equipment and Supplies	$15,000

Total Amount of this Work Order = $90,000

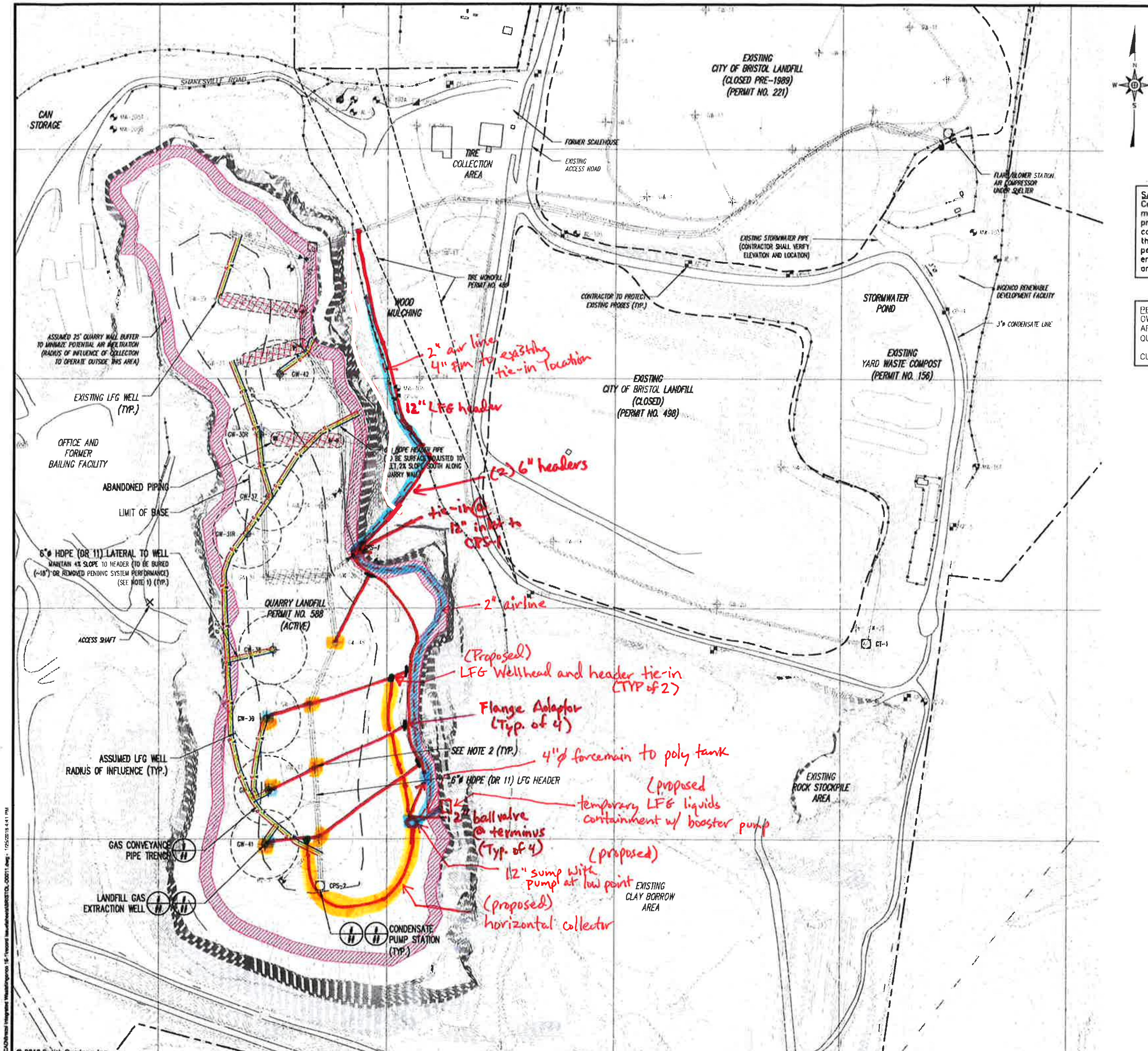
Any work added to the Scope of Services to be performed shall be compensated at SCS' standard fee schedule in effect at the time of performance. **Exhibit 1** provides a cost breakdown for completion of the activities described above.

SCS ENGINEERS	CITY OF BRISTOL
By: _____	By: _____
Print Name: Robert E. Dick, PE	Print Name: _____
Title: Sr. Vice President	Title: _____
Date: _____	Date: _____

BUDGETARY FEE ESTIMATE
CITY OF BRISTOL - INTEGRATED WASTE MANAGEMENT FACILITY
LANDFILL GAS SYSTEM & DEWATERING SYSTEM IMPROVEMENTS

		TASK 1 (Labor Only)		**TASK 2 (Labor Only)**		**TASK 3 (Labor Only)**		**TASK 4 (Labor Only)**		**TASK 5 Materials**	**TASK 6 Materials**		
SCS ENGINEERS, PC	Rate	PLANNING, LAYOUT, CONSULTING, & CQA		HORIZONTAL COLLECTOR INSTALLATION		LFG SYSTEM EXPANSION NEW QUARRY HEADERS		DEWATERING SYSTEM IMPROVEMENTS		EQUIPMENT, MILEAGE, & PER DIEM TASKS 1-4	HEAVY EQUIPMENT & SUPPLIES TASKS 1-4	**TOTAL**	
LABOR CATEGORY	$/hr	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost			Hours	Cost
Project Director I	$ 225	8	$ 1,800		$ -		$ -		$ -		$ -	8	$ 1,800
Project Superintendent	$ 140	6	$ 840	37	$ 5,180	37	$ 5,180	37	$ 5,180		4 $ 560	121	$ 16,940
Project Manager	$ 155	60	$ 9,300	7	$ 1,085	7	$ 1,085	7	$ 1,085		4 $ 620	85	$ 13,175
Project Coordinator	$ 130	2	$ 260		$ -		$ -		$ -		$ -	2	$ 260
Staff Professional	$ 100	28	$ 2,800		$ -		$ -		$ -		$ -	28	$ 2,800
Senior Technician	$ 95		$ -	49	$ 4,655	49	$ 4,655	49	$ 4,655		4 $ 380	151	$ 14,345
LFG Technician	$ 85		$ -	48	$ 4,080	48	$ 4,080	48	$ 4,080		$ -	144	$ 12,240
TOTAL LABOR		104	$ 15,000	141	$ 15,000	141	$ 15,000	141	$ 15,000		12 $ 1,560	539	$ 61,560
OTHER DIRECT COSTS													
Auto/Mileage										$ 7,000			$ 7,000
Per Diem										$ 7,725			$ 7,725
Telephone										$ 100			$ 100
Postage/Freight											$ 2,000		$ 2,000
Misc. Supplies											$ 2,730		$ 2,730
Fusion Equipment/Pitbull rental											$ 5,000		$ 5,000
Track hoe Excavator Rental													$ -
Computer										$ 175			$ 175
TOTAL ESTIMATED ODC's BY TASK										$ 15,000	$ 9,731		$ 24,730
Administrative (15%)											$ 3,710		$ 3,710
TOTAL		**$ 15,000**		**$ 15,000**		**15,000**		**15,000**		**15,000**	**$ 15,000**		**$ 90,000**

Notes: 1) SCS assumes this task is billed on a time and materials (T&M) basis.
2) Under Tasks 2, 3, and 4, SCS has budgeted five 9-hour days on-site for a Senior Technician and one LFG Technician and four 9-hour days for a Project Superintendent for each task.
3) Under Task 3, SCS will weld 12" and 6" LFG collection piping and make the tie-in connections to the existing LFG header piping. City personnel will be responsible for transport and positioning the new 12" LFG header down the ravine towards the Quarry from the top rim, and securing the header to the Quarry wall fence.
4) SCS assumes the City will be responsible for providing an excavator and our budgetary costs exclude this heavy equipment. Any additional heavy equipment rental or apparatus required to complete Tasks 2-4 is considered outside our scope of services.
5) SCS intends to prepare a materials inventory list for the City under Task 1. For budgetary purposes, SCS assumes the City will procure all stone, LFG and dewatering piping and fittings as required for Tasks 2-4.
6) This work order is for welding HDPE pipe, installation of LFG System and dewatering system components, secure all fittings, valves, etc., and complete major LFG header tie-ins per sketch. SCS is not responsible for brush clearing, movement and placement/positioning of pipe, operation of the winch, or accessing the Quarry wall to secure the 6" header to the chain link fence lining the Quarry wall. SCS understands the City will perform this work.



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RECORD ISSUE
NOT FOR CONSTRUCTION

SAFETY NOTE:
Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

PERMITS NOTE:
OWNER TO SECURE AND COORDINATE ALL PERMITS AND APPROVAL WITH VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY AND/OR ANY OTHER LOCAL AGENCIES.

CURRENT AIR PERMIT NO. SWR011184

LEGEND

Symbol	Description
	EXISTING CONTOUR (SEE REFERENCE 1)
	EXISTING FENCE LINE
	EXISTING WASTE LIMITS
	EXISTING LFG HEADER
	EXISTING LATERAL PIPE
	EXISTING AIR LINE
	EXISTING CONDENSATE LINE
	EXISTING PERFORATED HORIZONTAL COLLECTOR PIPE
	EXISTING LIMITS OF BASE
	ABANDONED PIPING
	WELLHEAD – HORIZONTAL COLLECTOR
	WELLHEAD – VERTICAL EXTRACTION WELL
	PERIMETER GAS MIGRATION DETECTION PROBE
	PERIMETER GAS MIGRATION DETECTION PROBE
	COMPLIANCE GROUNDWATER MONITORING WELL
	SIDEWALL GAS MONITORING POINT
	QUARRY WALL BUFFER
	PROPOSED LFG HEADER
	PROPOSED COMPRESSED AIR LINE
	PROPOSED CONDENSATE LINE
CT-1	CONDENSATE TRAP
CPS-1	CONDENSATE PUMP STATION
	PROPOSED ISOLATION VALVE
GW-34	NEW WELLHEAD – VERTICAL EXTRACTION WELL

GENERAL NOTES

1. ALL GAS PIPING IS SHOWN FOR GENERAL ARRANGEMENT. FIELD ADJUSTMENT SHALL BE CONDUCTED AS DIRECTED BY THE ENGINEER TO MAINTAIN MINIMUM 2% SLOPE AND PROVIDE CONDENSATE DRAINAGE TO SYSTEM LOW POINTS.
2. ALL HDPE PIPE IS DR 17 UNLESS OTHERWISE NOTED.
3. ALL EXISTING PIPING AND FEATURES ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR BEFORE FINAL INSTALLATION. ANY DEVIATIONS SHALL BE REPORTED TO ENGINEER.
4. ALL DISTURBED AREAS OUTSIDE OF THE QUARRY LANDFILL SHALL BE REVEGETATED AS DIRECTED BY THE OWNER.

NOTES

1. MINIMUM SOIL COVER OVER THE TOP PIPE SHALL BE 18" PER THE REQUEST OF OWNER.
2. PHASE 3 LANDFILL GAS EXTRACTION WELL LOCATIONS ARE APPROXIMATE.

REFERENCES

1. OVERALL SITE BASE TOPOGRAPHY FROM 2015 AERIAL SURVEY.
2. COORDINATE SYSTEM IS VIRGINIA STATE PLANE GRID, SOUTH ZONE.
3. EXISTING FEATURES (EXISTING PIPING, WELLHEADS, EXISTING WASTE LIMITS) FROM DRAWING "SITE LAYOUT" PREPARED BY JOYCE ENGINEERING, INC., DATED 5/14/08.
4. APPROXIMATE LIMITS OF BASE GRADES FROM DRAWING "BASE GRADING PLAN" PREPARED BY STS CONSULTANTS, LTD., DATED 9/19/94.
5. MONITORING WELL LOCATIONS PROVIDED BY CITY OF BRISTOL VIA ELECTRONIC DRAWING ENTITLED "MONITORING WELL LOCATION MAP", DATED 12/1/00 AND REVISED 6/6/03.
6. PHASE 4 AS-BUILT LOCATIONS OF WELLS AND PIPING PROVIDED BY ROBERT LEONARD, 9/28/17.

0 100' 200' 300'

PREPARED FOR

INGENCO RENEWABLE DEVELOPMENT, INC.
2250 DABNEY ROAD
RICHMOND, VA 23230

PREPARED BY

SMITH+ GARDNER
ENGINEERS
14 N. Boylan Avenue, Raleigh NC 27603 | 919 828 0577

SEAL

COMMONWEALTH OF VIRGINIA
Stacey A. Smith
STACEY A. SMITH
Lic. No. 033254
1/25/2018
PROFESSIONAL ENGINEER

SEAL

REV	DATE	DESCRIPTION
5	1/17	RECORD ISSUE

PROJECT TITLE:

CITY OF BRISTOL LANDFILL
LANDFILL GAS COLLECTION CONTROL SYSTEM

DRAWING TITLE:

PHASE 4
WELLFIELD EXPANSION

DESIGNED: SAS	PROJECT NO.: BRISTOL 16-1
DRAWN: TRS	SCALE: AS SHOWN
APPROVED:	DATE: JULY 2016
FILENAME: BRISTOL-D0011	
SHEET NUMBER: 7	DRAWING NUMBER: S5