E.1.A Quality Assurance and Surveillance Plan (QASP)
40 CFR 146.90

Rapides One CCS Site

Permit Number LA-0005

Facility Information

Facility name: Rapides One CCS Site

[redacted]

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Well locations: [redacted] Rapides Parish, Louisiana

[redacted]

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Signatures and Contact Information

Title and Approval Sheet

This Quality Assurance and Surveillance Plan (QASP) is approved for use and implementation at Rapides One CCS Site. The signatures below denote the approval of this document and intent to abide by the procedures outlined within it.

Signature Ronald T. Evans CEO	1-19-23 Date
Signature Robert Sutherland Senior VP of Operations	1-19-23 Date
Signature Robert Norris President – CapturePoint Solutions LLC	January 20, 2023 Date

Distribution List

The following project participants should receive the completed Quality Assurance and Surveillance Plan (QASP) and all future updates for the duration of the project. The CPS team that will be responsible for ensuring that all those on the distribution list will receive the most current copy of the approved Quality Assurance and Surveillance Plan are listed below.

<u>CapturePoint Solutions, LLC</u>
Tracy Evans – CEO
Robert Sutherland – VP of Operations, CapturePoint LLC
Robert Norris – President, CapturePoint Solutions LLC

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A. Project Management

A.1. Project/Task Organization

A.1. a/b. Key Individuals and Responsibilities

The project will be implemented by CapturePoint Solutions (CPS) and its subcontractors. The Testing and Monitoring Activities responsibilities will be shared between CPS and their designated subcontractor and the program will be broken into the following subcategories:

I) CO_2 Stream Analysis [40 CFR 146.90(a)]
II) Operational Parameter Monitoring [40 CFR 146.90(b)]
III) Corrosion Monitoring [40 CFR 146.90(c)]
IV) Monitoring Above Confining Zone [40 CFR 146.90(d)]
V) USDW Monitoring
VI) External Mechanical Integrity [40 CFR 146.90(e)]
VII) Pressure Falloff Testing [40 CFR 146.909(f)]
VIII) Pressure and Plume Front Tracking [40 CFR 146.90(g)

This project will establish key staffing positions and personnel that will ensure reliable operations as per this Quality Assurance and Surveillance Plan (QASP). Some positions will be dedicated full-time to the project while others will be as required per reviews of the AOR, maintenance and mechanical integrity evaluations of the injection well.

Once the project has commenced and key individuals have been identified, CapturePoint Solutions, LLC will develop and maintain a contact list that will include the names, phone numbers and email addresses of identified personnel and will keep this list updated.

The project will implement a procedure to communicate and document any deviation from facilities designs, policies, operational parameters, standard operating procedures, *etc*. This procedure aims to control major deviations in cost and will document any deviations from equipment selection, construction designs and or operational parameters.

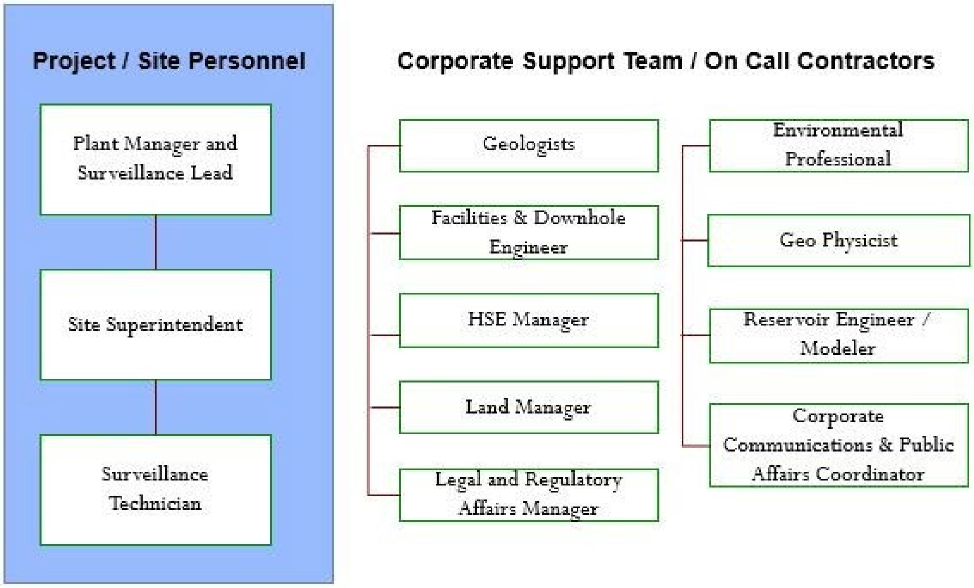
A.1.c. Independence from Project QA Manager and Data Gathering

The majority of the physical samples collected and data gathered as part of the MVA program is analyzed, processed, or witnessed by third parties independent and outside of the project management structure.

A.1.d. QA Project Plan Responsibility

CapturePoint Solutions, LLC will be responsible for maintaining and distributing official, approved QA Project Plan. CapturePoint Solutions, LLC will periodically review this QASP and consult with USEPA if/when changes to the plan are warranted.

FIGURE 1. ORGANIZATIONAL CHART FOR KEY PROJECT PERSONNEL



A.2. Problem Definition/Background

A.2.a. Reasoning

Operational monitoring is used to ensure safety with all procedures associated with fluid injection, monitor the response of storage unit, and the movement of the CO_2 plume. Key monitoring parameters include the pressure of injection well tubing & annulus, storage unit, first permeable unit above the confining zone, and the lowermost USDW. Other monitoring parameters include injection rate, total mass & volume injected, injection well temperature profile, and saturation. The verification component will provide information to evaluate if leakage of CO_2 through the caprock is occurring. This includes pulse neutron logging , pressure, and temperature monitoring and fluid analysis. The environmental monitoring components will determine if the injectate is being released into the shallow subsurface or biosphere. This monitoring includes pulse neutron logging and ground water monitoring.

Given the presence of multiple competent confining zones provides high level of confidence that the site is capable of accepting and permanently retaining the injected CO_2. The primary goal of the Project's Testing and Monitoring plan is to demonstrate that project activities are protective of human health and the environment. To help achieve this goal, this Quality Assurance Surveillance Plan (QASP) was developed to insure the quality standards of the testing and monitoring program meet the requirements of the U.S. Environmental Protection Agency's (USEPA) Underground Injection Control (UIC) Program for Class VI wells.

A.2.b. Reasons for Initiating the Project

The site selected for this GS project is located in a seismically stable portion of the Gulf Coast, contains thick, laterally extensive, highly porous and permeable formations and thick, regionally pervasive confining units. Given the significant storage capacity of the site and its central location to Hayneville and Gulf Coast CO_2 sources, CPS will like to develop it as a Class VI sequestration facility that can accept and retain industrial-scale volumes of CO_2 for permanent geologic sequestration to reduce atmospheric concentrations of CO_2. In order to demonstrate that this can be done safely and at commercial scale, a rigorous Testing and Monitoring plan along with QSAP is proposed to ensure the injected CO_2 is retained within the intended storage reservoir.

A.2.c. Regulatory Information, Applicable Criteria, Action Limits

The Class VI Rule requires owners or operators of Class VI wells to perform several types of activities during the lifetime of the project in order to ensure that the injection wells within the sequestration site maintain their mechanical integrity, that fluid migration and the extent of pressure elevation are within the limits described in the permit application, and that underground sources of drinking water (USDWs) are not endangered. These monitoring activities include mechanical integrity tests (MITs), injection well testing during operation, monitoring of ground water quality, tracking of the CO_2 plume and associated pressure front. This document details both the measurements that will be taken as well as the steps to ensure that the quality of all the data is such that the data can be used with confidence in making decisions during the life of the project.

A.3. Project/Task Description

Table 1. Overview of Testing and Monitoring Activities

Parameter	Location/ Method	Pre-Injection – Baseline	Operational Period 20 years	Alternative PISC Period 15 years	Analytical Technique	Purpose
T.1. CO_2 Stream Analysis	Sampling Station, Direct sampling	Two quarterly tests	Quarterly	N/A	Chemical analysis	Monitor injectate
T.2. Injection Rate & Volume	Wellhead, Flow meter	N/A	Continuous	N/A	N/A	Monitor rate & volume
T.3. Injection Pressure	Wellhead, Pressure gauge	N/A	Continuous	N/A	N/A	Monitor injection pressure
T.4. Annular Pressure	Wellhead, Pressure gauge	N/A	Continuous	N/A	N/A	Monitor annular pressure
T.5. Downhole Pressure & Temperature	Injection well, Downhole gauge	N/A	Continuous	Annual until reservoir pressure stabilizes and then every 5 years	Direct measurement	Monitor reservoir
T.6. Corrosion Monitoring	Flow-through station, Coupon	N/A	Quarterly	N/A	Chemical analysis	Monitor injectate & wellbore integrity
T.7. Mechanical Integrity	Injection wells and Monitoring well, Various	Prior to injection	Annually	N/A	See Testing & Monitoring Plan	Wellbore integrity
T.9. Pressure Fall-off Testing	Injection well, Pressure gauge	Prior to injection (initial Static Reservoir Pressures and transmissibility)	Annually the first two years and then every 5 years thereafter	N/A	Direct measurement	Wellbore integrity
T. 10. USDW	USDW Monitoring Well(s) Direct Sampling		2 years then quarterly thereafter	Annually	Chemical analysis	Groundwater quality monitoring
T.11. Above Confining Zone	Monitoring well, Direct Sampling	1 sample	Annually	Annually	Chemical analysis	First permeable reservoir above the confining zone. Geochemical and CO_2 detection monitoring
T.12. In-Zone Monitoring	Monitoring well, Continuous Pressure and Temperature Monitoring	Pre-Injection	Continuous	Continuous	Casing Conveyed DTS/DAS Fiber-Optic Sensors	Pressure Front and Plume Monitoring
	Saturation Log	Pre-Injection		Annually	Saturation Log	CO_2 Detection Monitoring

A.3. a/b. Summary of Work to be Performed

Refer to Table 6.1, Summary of Testing and Monitoring, for a high-level list of planned activities.

Characterization of confining layers, storage zones and other subsurface features
Characterization of the storage reservoirs, seals and subsurface features per 40 CFR 146.82 will be performed by experienced professionals in geoscience from internal employees and certified third-party industry consulting firms, drilling, coring and logging companies, and sample collection and analysis laboratories.

Construction materials for CO_2 distribution, monitoring and injection
The main flowline, surface equipment and well design will comply with industry standards for CO_2 material selection and operating conditions to guarantee mechanical integrity per 40 CFR 146.86 and 146.89 of the system during the life of the project and have been prepared by experienced professionals.

Monitoring and surveillance equipment selection
Censors, transducers and controllers will be connected to a central control system to monitor the operating conditions, set alarms for malfunction and establish safety protocols in case of abnormal conditions in the system. Data interfaces will be created for equipment that is not directly connected to the central control system to be integrated into the surveillance platform.

Leak detection
Monitoring programs for leak detection, corrosion and surveillance will be site-specific to ensure protection of safety, underground sources of drinking water (USDWs), and the environment. This will be done to ensure that mechanical integrity of storage, maximized operating time and extended life of assets occurs per 40 CFR 146.90. These plans are based on industry standards and best practices for carbon storage projects and the many years of experience from the development of CO_2 enhanced oil recovery projects.

Sample collection
Samples will be collected by trained and qualified personnel and put into appropriate sample containers. The sample containers will be marked with a sample number, date and time of sample collection, and who collected the sample. Samples will then be transported and shipped to designated third-party laboratories for analysis

Collection and analysis of samples will be conducted by certified/approved independent third-parties
As part of the quality assurance process, during surveillance, sample collection, sample analysis and data gathered will be processed, analyzed, validated and witnessed by independent third-parties outside of operator personnel where appropriate.

Operational parameters
Injection operations will be managed and conducted within limits in accordance with 40 CFR 146.88. Injection of the CO_2 stream into the target storage reservoirs will occur simultaneously into the [redacted]. Ultimate expected injection rates are planned to be no more than 75 mmcf/day per injection well. The project design includes two injection wells per injection reservoir, a monitoring well that is completed in all three injection zones, and a monitoring well completed in the Cockfield Sands above the uppermost confining zone.

Table 2. Summary of Testing and Monitoring.

Activity	Location(s)	Method	Analytical Technique	Lab/Custody	Purpose
Carbon dioxide source analysis	Source	Direct Sampling	Chromatograph	TBD	Baseline and Process Monitoring. Continuous on water content
Carbon dioxide stream analysis	Sampling Station (prior to injection)	Direct Sampling	Chromatograph	TBD	Quarterly Analysis
Injection rate and volume	Wellhead	Volumetric Flow Meters	Direct Continuous Measurement	None	Continuous Monitoring
Injection pressure		Pressure Gauge	Direct Continuous Measurement	None	
Annular pressure		Pressure Gauge	Direct Continuous Measurement	None	
Downhole pressure/ temperature	Injection Well(s)	Dual Pressure Gauges	Direct Continuous Measurement	Certified Wireline Companies	
Corrosion monitoring	Flow-through unit (prior to injection)	Coupon Degradation	ASTM G1-03 and/or NACE Standard RP0775-2005 Item No. 21017	Corrosion Specialist TBD	Material Failure
Mechanical integrity	Injection Well(s)	Pressure Gauges and Logs	40 CFR §146.87 (a)(4) and 40 CFR §146.89 (c)(2)	State Observer	Leakage Detection
Pressure Falloff Testing	Injection Well(s)	EPA Region 6 UIC Pressure Fall-off Testing Guideline – Third Revision (*August 8, 2002*)	EPA Region 6 UIC Pressure Fall-off Testing Guideline – Third Revision (*August 8, 2002*)	TBD	Monitor wellbore integrity and assess injectivity
USDW Monitoring	Groundwater Monitoring Wells	Water sampling	Standard laboratory water analyses	TBD	Document groundwater chemistry/quality
Above Confining Zone Monitoring	Monitoring Wells	Downhole pressure/temperature gauge	Direct continuous measurement	TBD	Monitor above-zone pressure
CO_2 plume tracking	Monitoring wells	Time-lapse Vertical Seismic Profiles (VSP)	Provided by vendor 2	TBD	Track CO_2 plume size and monitor changes in subsurface
Pressure front tracking	In-zone monitoring well	Pressure monitoring	Provided by vendor	N/A	Monitor pressure in the injection zone
Environmental monitoring	Selected sites in AoR	Soil gas sampling and surface water sampling	Standard laboratory analyses (Gas chromatography and water analyses)	TBD	Monitor environmental changes

Table 3. Instrumentation Summary.

Monitoring Location	Instrument Type	Monitoring Target (Formation or Other)	Data Collection Location(s)	Explanation
CO_2 Facility	Senior custody transfer orifice meter with flow computer	CO_2 stream Analysis	Facility Inlet	Continuous measurement of inlet temperature and pressure. Sampling ports for inlet stream compositional analysis.
Above Confining Zone Monitoring Well	Pressure Gauge	[redacted]	Wellhead and Bottom hole	Continuous wellhead and bottom hole pressure measurements
			Fluid Sample	Annual fluid sample
Injection Well(s)	Flow Meter, Pressure Gauge	[redacted]	Wellhead and Bottomhole	Continuous wellhead measurement and minimal bottom hole pressure measurements within the injection zones
In-Zone Monitoring Well	Casing Conveyed *DTS/**DAS Fiber Optic	[redacted]	Along Casing	Continuous pressure and temperature monitoring

*DTS – Distributed temperature sensing **DAS – Distributed acoustic sensing

A.3.c. Geographic Locations

[redacted]

FIGURE 2. MAP OF PROJECT AREA

[redacted]

A.3.d. Resource and Time Constraints

At the conclusion of the project, the availability of wells associated with that project (injection wells 1 through 6 and two monitoring wells) are potential resource constraints for CapturePoint Solutions, LLC. Thereafter, the status and availability of the wells for use by the CapturePoint Solutions, LLC project is less certain. No additional resources or time constraints have been identified for the testing and monitoring plan beyond project funding levels and the proposed timeline.

A.4. Quality Objectives and Criteria

A.4.a. Performance/Measurement Criteria

The overall Quality Assurance objective for monitoring is to develop and implement procedures for subsurface monitoring, field sampling, laboratory analysis, and reporting which will provide results that will meet the characterization and non-endangerment goals of this project. Groundwater monitoring will be conducted during the pre-injection, injection, and post-injection phases of the project. Shallow and deep groundwater monitoring wells will be used to gather water-quality samples and pressure data. All the groundwater analytical and field monitoring parameters for each interval are listed in Table 4 through Table 7. Table 8 details outputs and actionable limits. Tables 9 through 15 show gauge and logging specifications. The list of analysis may be reassessed periodically and adjusted to include or exclude analysis based on their effectiveness to the overall monitoring program goals.

Key Testing and Monitoring areas include:

- Shallow groundwater sampling and analysis
- Deep groundwater sampling and analysis
- Well logging
- Mechanical Integrity Testing (MIT)
- In-zone pressure and temperature monitoring
- Surface pressure and temperature monitoring
- CO_2 stream analysis
- Geophysical Monitoring

Table 4. Summary of Analytical and Field Parameters for Fluid Samples

Parameters	Analytical Methods[1]	Detection Limit/Range	Typical Precisions	QC Requirements
Cations: Al, Ba, Ca, Fe, K, Mg, Mn, Na, Si, Zn, Sr	ICP-AES, EPA Method 200.7 or similar	0.001 to 0.1 mg/L	±15%	Daily calibration; blanks, duplicates and matrix spikes at 10% or greater
Anions: CL^-, Br^-, F^-, SO_4^{2-}, PO_4^{3-}, NO_3^-	Ion chromatography, EPA Method 300.1, 4110B or similar	0.02 to 0.13 mg/L	±15%	Daily calibration; blanks, duplicates at 10% or greater frequency
Dissolved CO_2	Coulometric titration, ASTM D513-11	25 mg/L	±15%	Duplicate measurement, standards at 10% or greater frequency
Total dissolved solids	Gravimetric method, Standard methods 2540C	12 mg/L	±10%	Balance calibration, duplicate analysis
Alkalinity	APHA 2320B	4 mg/L	±3 mg/L	Duplicate analysis
pH (field)	pH electrode, EPA 150.2 D1293	2 to 12 pH units	±0.2 pH units	User calibration per manufacturer recommendation
Specific conductance (field)	APHA 2510	0 to 200 mS/cm	±1% of reading	User calibration per manufacturer recommendation
Temperature (field)	Thermocouple	-5 to 50 degrees C	± 0.2% degrees C	Factory calibration

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table 5. Summary of Analytical Parameters for CO_2 Stream.

Parameters	Analytical Methods[1]	Detection Limit/Range	Typical Precisions	QC Requirements
Oxygen, ppm	ISBT 4.0 (GC/DID) GC/TCD	1 uL/L to 5,000 uL/L (ppm by volume) 0.1% to 100%	±10% of reading 5 to 10% relative across range	Daily standard within 10% of calibration, secondary standard after calibration Daily standard, duplicate analysis within 10% of each other
Nitrogen, ppm	ISBT 4.0 GC/DID	1 uL/L to 5,000 uL/L (ppm by volume)	±10% of reading	Daily standard within 10% of calibration, secondary standard after calibration
Carbon monoxide	ISBT 5.0 Colorimetric	1 uL/L to 100 uL/L (ppm by volume)	±20% of reading	Duplicate analysis
Oxides of nitrogen, ppm	ISBT 7.0 Colorimetric	0.2 uL/L to 5 uL/L (ppm by volume)	±20% of reading	Duplicate analysis
Total hydrocarbons	ISBT 10.0 THA (FID)	1 uL/L to 10,000 uL/L (ppm by volume)	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration

Parameters	Analytical Methods[1]	Detection Limit/Range	Typical Precisions	QC Requirements
Methane	ISBT 10.1 (GC/FID)	0.1 uL/L to 1,000 uL/L (ppm by volume) dilution dependent	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration
Acetaldehyde	ISBT 11.0 (GC/FID)	0.1 uL/L to 100 uL/L (ppm by volume) dilution dependent	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration
Sulfur dioxide, ppm	ISBT 14.0 (GC/SCD)	0.01 uL/L to 50 uL/L (ppm by volume) dilution dependent	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration
Hydrogen sulfide	ISBT 14.0 (GC/SCD)	0.01 uL/L to 50 uL/L (ppm by volume) dilution dependent	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration
Ethanol	ISBT 11.0 (GC/FID)	0.1 uL/L to 100 uL/L (ppm by volume) dilution dependent	5 to 10% relative across range	Daily blank, daily standard within 10% of calibration, secondary standard after calibration
CO_2 purity, %	ISBT 2.0 Caustic absorption Zahm-Nagel	99.0% to 99.99%	±10% of reading	User calibration per manufacturer recommendation

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table 6. Summary of Analytical Parameters for Corrosion Coupons.

Parameters	Analytical Methods	Detection Limit/Range	Typical Precisions	QC Requirements
Mass	NACE RP0775-2005	0.005 mg	±2%	Annual calibration of scale (3rd Party)
Thickness	NACE RP0775-2005	0.001 mm	±0.005 mm	Factory calibration

Table 7. Summary of Measurement Parameters for Field Gauges.

Parameters	Methods	Detection Limit/Range	Typical Precisions	QC Requirements
Booster pump discharge pressure	ANSI Z540-I-1994	±0.001 psi / 0-3,500 psi	±0.01 psi	Annual calibration of scale (3rd Party)
Injection tubing temperature	ANSI Z540-I-1994	±0.001 F / 0-500 F	±0.01 F	Annual calibration of scale (3rd Party)
Annulus pressure	ANSI Z540-I-1994	±0.001 psi / 0-5,000 psi	±0.01 psi	Annual calibration of scale (3rd Party)
Injection tubing pressure	ANSI Z540-I-1994	±0.001 psi / 0-3,500 psi	±0.01 psi	Annual calibration of scale (3rd Party)
Wellhead pressure	Directi measurement			Annual calibration of scale (3rd Party)
Downhole temperature	Direct measurement			Annual calibration of scale (3rd Party)
Injection mass flow rate	Unknown	±0.1% of rate	±0.01 lbs/hr	Annual calibration of scale (3rd Party)

Table 8. Actionable Testing and Monitoring Outputs.

Activity or Parameter	Project Action Limit	Detection Limit	Anticipated Reading
External mechanical integrity (MIT Pulsed Neutron)	Action taken when detected CO_2 is outside of expected range	±0.5 SIGM	Brine saturated ~60 CO_2 saturated ~8
Internal mechanical integrity (Annular pressure gauge)	<3% pressure loss over 1 hour	± 2 psi	<3% pressure loss over 1 hour
Surface pressure	Action will be taken when pressures exceed modeled/expected range	See surface gauge table in appendix	Within injection zone: 90% of fracture gradient 0.71 psi/ft
Downhole pressure		See downhole gauge table in appendix	
Water quality (Cockfield Sands)	>10% deviation from baseline		±2%
Above-confining-zone pressure (Cockfield Sands)	>10% deviation from baseline		±2%

A.4.b. Precision

For USDW sampling, data accuracy will be assessed by the collection and analysis of field blanks to test sampling procedures and matrix spikes to test lab procedures. Field blanks will be taken no less than one per sampling event to spot check for sample bottle contamination. Laboratory assessment of analytical precision will be the responsibility of the individual laboratories per their standard operating procedures.

A.4.c. Bias

Laboratory assessment of analytical bias will be the responsibility of the individual laboratories per their standard operating procedures and analytical methodologies. For direct pressure or logging measurements, no bias is expected.

A.4.d. Representativeness

For USDW sampling, data representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. The sampling network has been designed to provide data representative of site conditions. For analytical results of individual groundwater samples, representativeness will be estimated by ion and mass balances. Ion balances with ±10% error or less will be considered valid. Mass balance assessment will be used in cases where the ion balance is greater than ±10% to help determine the source of error. For a sample and its duplicate, if the relative percent difference is greater than 10%, the sample may be considered non-representative.

A.4.e. Completeness

For USDW sampling, data completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is anticipated that data completeness of 90% for USDW sampling will be acceptable to meet monitoring goals. For direct pressure and temperature measurements, it is expected that data will be recorded no less than 90% of the time.

A.4.f. Comparability

Data comparability expresses the confidence with which one data set can be compared to another. The data sets to be generated by this project will be very comparable to future data sets because of the use of standard methods and the level of QA/QC effort. If historical groundwater quality data become available from other sources, their applicability to the project and level of quality will be assessed prior to use with data gathered on this project. Direct pressure, temperature, and logging measurements will be directly comparable to previously obtained data.

A.4.g. Method Sensitivity

Tables 9 through 15 provide details on gauge specifications and sensitivities.

Table 9. Pressure and Temperature—Downhole Gauge Specifications.

Parameter	Value
Calibrated working pressure range	Atmospheric to 10,000 psi
Initial pressure accuracy	<±2 psi over full scale
Pressure resolution	0.005 psi at 1-s sample rate
Pressure drift stability	<±1 psi per year over full scale
Calibrated working temperature range	77-226 degrees F
Initial temperature accuracy	<±0.9 degrees F per ±0.27 degrees F
Temperature resolution	0.009 degrees F at 1-s sample rate
Temperature drift stability	<±0.1 degrees F per year at 302 degrees F
Max temperature	302 degrees F
Instrument calibration frequency	Calibration frequency per manufacturer specifications

Table 10. Representative Logging Tool Specifications.

Parameter	RST	CBL	USI	Isolation Scanner
Logging speed	1,800 ft/hr	3,600 ft/hr	2,700 ft/hr standard 563 ft/hr high	2,700 ft/hr standard 563 ft/hr high
Vertical resolution	15 inhes	3 ft	0.6 inches standard 6 inches high speed	0.6 inches standard 6 inches high speed
Investigation	Formation	Casing, annulus and formation	Casing and annulus	Casing and annulus
Temperature rating	302 degrees F	350 degrees F	350 degrees F	350 degrees F
Pressure rating	15,000 psi	20,000 psi	20,000 psi	20,000 psi

Table 11. Pressure Field Gauge. PIT-012

Parameter	Value
Calibrated working pressure range	0 to 3,000 psi and 4-20 mA
Initial pressure accuracy	<0.0312%
Pressure resolution	0.001 psi and 0.00001 mA
Pressure drift stability	To be determined after 1st year

Table 12. Pressure Field Gauge—Injection Tubing Pressure. PIT-009

Parameter	Value
Calibrated working pressure range	0 to 3,000 psi and 4-20 mA
Initial pressure accuracy	<0.0437%
Pressure resolution	0.001 psi and 0.00001 mA
Pressure drift stability	To be determined after 1st year

Table 13. Pressure Field Gauge—Annulus Pressure. PIT-014

Parameter	Value
Calibrated working pressure range	0 to 3,000 psi and 4-20 mA
Initial pressure accuracy	<0.025%
Pressure resolution	0.001 psi and 0.00001 mA
Pressure drift stability	To be determined after 1st year

Table 14. Temperature Field Gauge—Injection Tubing Temperature. TIT-019

Parameter	Value
Calibrated working temperature range	0 to 500 degrees F 4-20 mA
Initial temperature accuracy	<0.005%
Temperature resolution	0.001 degrees F and 0.0001 mA
Temperature drift stability	To be determined after 1st year

Table 15. Mass Flow Rate Field Gauge—CO_2 Mass Flow Rate. FT-006

Parameter	Value
Calibrated working flow rate range	50,522 to 303,133 lbs/hr and 4-20 mA
Initial mass flow rate accuracy	<0.18%
Mass flow rate resolution	0.0001 lb/hr
Mass flow rate drift stability	To be determined after 1st year

A.5. Special Training/Certifications

A.5.a. Specialized Training and Certifications

Wireline logging and nonroutine sampling will be conducted by trained, qualified, and certified personnel per the service company's requirements.

Routine injectate and fluid sampling will be performed by trained personnel, this will not require certification. Some specialized training will be required for project personnel in regard to PNC logging interpretation, geophysical methods, data acquisition/transmission and certain sampling procedures.

Daily operations including monitoring and surveillance will be performed by trained and if required, certified personnel.

A.5. b/c. Training Provider and Responsibility

Training of personnel will be conducted by experienced project staff knowledgeable in task-specific procedures. Training documentation will be maintained as a project QA record A.6. Documentation and Records

A.6. Documentation and Records

Information that is recorded pursuant to the UIC Class VI permit requirements will include testing and monitoring results and will be provided to the UIC Program Director in Semi Annual Reports. All information pertaining to the testing and monitoring of this GS site will be stored electronically on data servers with sufficient backup as to maintain all documentation and records.A.6.a. Report Format and Package Information

A semi-annual report from CapturePoint Solutions, LLC will contain all required project data, including testing and monitoring information as specified by the UIC Class VI permit. Data will be provided in electronic or other formats as required by the UIC Program Director.

A.6.b. Other Project Documents, Records, and Electronic Files

Other documents, records and electronic files such as well logs, test results or other data will be provided as required by the UIC Program Director.

A.6. c/d. Data Storage and Duration

All data and project records will be stored electronically on a secure server system that is routinely backed up and be maintained as required.

A.6.e. QASP Distribution Responsibility

The plant manager will be responsible for ensuring that all those on the distribution list will receive the most current copy of the approved QASP.

B. Data Generation and Acquisition

B.1. Sampling Process Design

B.1.a. Design Strategy

CO_2 Stream Monitoring Strategy

The primary purpose of analyzing the carbon dioxide stream is to evaluate the potential interactions of carbon dioxide and/or other constituents of the injectate with formation solids and fluids. This analysis can also identify (or rule out) potential interactions with well materials. Establishing the chemical composition of the injectate also supports the determination of whether the injectate meets the qualifications of hazardous waste under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 et seq. (1976), and/or the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA) 42 U.S.C. 9601 et seq. (1980). Additionally, monitoring the chemical and physical characteristics of the carbon dioxide (e.g., isotopic signature, other constituents) may help distinguish the injectate from the native fluids and gases if unintended leakage from the storage reservoir occurred. Injectate monitoring is required at a sufficient frequency to detect changes to any physical and chemical properties that may result in a deviation from the permitted specifications.

Calibration of transmitters used to monitor pressures, temperatures, and flow rates of CO_2 into the injection well at the injection well and at the verification well shall be conducted annually by certified meter calibrators and certified third party lab. Reports shall contain test equipment used to calibrate the transmitters, including test equipment manufacturers, model numbers, serial numbers, calibration dates and expiration dates.

Corrosion Monitoring Strategy

Sample coupons representative of materials used in surface distribution lines, meters and gauges and well construction materials will be exposed to the injection stream using a flow-through testing station. Sample coupons will be pulled and evaluated as noted in the Testing and Monitoring Plan.

Corrosion coupon analyses will be conducted quarterly to aid in ensuring the mechanical integrity of the equipment in contact with the carbon dioxide. Coupons shall be sent quarterly to a qualified company for analysis and an analysis conducted in accordance with NACE Standard RP-0775 (or similar) to determine and document corrosion wear rates based on mass loss.

Shallow Groundwater Monitoring Strategy

As this project does not require a depth waiver or aquifer exemption this is not applicable

Deep Groundwater Monitoring Strategy

A monitoring well completed in the [redacted] directly above the uppermost confining layer from the injection zone intervals ([redacted]) will provide access to fluids and the ability to monitor pressure and temperature. Fluid samples will be collected and analyzed as described in the Testing and Monitoring Plan.

B.1.b. Type and Number of Samples/Test Runs

Groundwater and CO_2 sampling are proposed in Table 1. This will updated when the UIC Program director has approved the permit.

B.1.c. Site/Sampling Locations

Deep groundwater (first permeable layer above the confining zone) samples will be collected from the Cockfield Monitoring Well #8 located within at the injection site. Shallow groundwater samples from the [redacted] USDW will be collected from Monitoring Well #13 (at the injection site) and from Monitoring Well #12 located approximately one mile north and updip of the injection site.

B.1.d. Sampling Site Contingency

The shallow and deep groundwater monitoring wells are located on property owned by CapturePoint Solutions, LLC. No problems of site inaccessibility are anticipated. If inclement weather makes site access difficult, sampling schedules will be reviewed and alternative dates may be selected that would still meet permit-related conditions.

No problems of site inaccessibility are anticipated for CO_2 gas stream or corrosion coupon sampling. If inclement weather makes site access difficult, sampling schedules will be reviewed and alternative dates may be selected that would still meet permit related conditions.

B.1.e. Activity Schedule

All sampling and monitoring activities and frequencies are summarized in Table 1. This will updated when the UIC Program director has approved the permit.

B.1.f. Critical/Informational Data

During both USDW sampling and analytical efforts, detailed field and laboratory documentation will be taken. Documentation will be recorded in field and laboratory forms and notebooks. Critical information will include time and date of activity, person/s performing activity, location of activity (well-field sampling) or instrument (lab analysis), field or laboratory instrument calibration data, field parameter values. For laboratory analyses, much of the critical data are generated during the analysis and provided to end users in digital and printed formats. Noncritical data may include appearance and odor of the sample, problems with well or sampling equipment, and weather conditions.

B.1.g. Sources of Variability

Potential sources of variability related to monitoring activities include (1) natural variation in fluid quality, formation pressure and temperature and seismic activity; (2) variation in fluid quality, formation pressure and temperature, and seismic activity due to project operations; (3) changes in recharge due to precipitation; (4) changes in instrument calibration during sampling or analytical activity; 5) different staff collecting or analyzing samples; (6) differences in environmental conditions during field sampling activities; (7) changes in analytical data quality during life of project; and (8) data entry errors related to maintaining project database. Activities to eliminate, reduce, or reconcile variability related to monitoring activities include (1) collecting long-term baseline data to observe and document natural variation in monitoring parameters, (2) evaluating data in timely manner after collection to observe anomalies in data that can be addressed be resampled or reanalyzed, (3) conducting statistical analysis of monitoring data to determine whether variability in a data set is the result of project activities or natural variation, (4) maintaining weather related data using on-site weather monitoring data or data collected near project site (such as from local airports), (5) checking instrument calibration before, during and after sampling or sample analysis, (6) thoroughly training staff, (7) conducting laboratory quality assurance checks using third party reference materials, and/or blind and/or replicate sample checks, and (8) developing a systematic review process of data that can include sample-specific data quality checks (i.e., cation/anion balance for aqueous samples).

B.2. Sampling Methods

B.2. a/b. Sampling SOPs

Groundwater samples will be collected primarily using a low-flow sampling method consistent with ASTM D6452-99 (2005) or Puls and Barcelona (1996). If a flow-through cell is not used, field parameters will be measured in grab samples. Groundwater wells will be purged to ensure samples are representative of formation water quality. Static water levels in each well will be determined using an electronic water level indicator before any purging or sampling activities begin. Dedicated pumps (e.g., bladder pumps) will be installed in each monitoring well to minimize potential cross contamination between wells. Groundwater pH, temperature, specific conductance, and dissolved oxygen will be monitored in the field using portable probes and a flow-through cell consistent with standard methods (e.g., APHA, 2005) given sufficient flow rates and volumes. Field chemistry probes will be calibrated at the beginning of each sampling day according to equipment manufacturer procedures using standard reference solutions. When a flow-through cell is used, field parameters will be continuously monitored and will be considered stable when three successive measurements made three minutes apart meet the criteria listed in Table 16.

Table 16. Stabilization Criteria of Water Quality Parameters During Shallow Well Sampling.

Field Parameter	Stabilization Criteria
pH	±0.2 units
Temperature	±1 degree C
Specific conductance	±3% of reading in uS/cm
Dissolved oxygen	±10% of reading or 0.3 mg/L whichever is greater

After field parameters have stabilized, samples will be collected. Samples requiring filtration will be filtered through 0.45 μm flow-through filter cartridges as appropriate and consistent with ASTM D6564-00. Prior to sample collection, filters will be purged with a minimum of 100 mL of well water (or more if required by the filter manufacturer). For alkalinity and total CO_2 samples, efforts will be made to minimize exposure to the atmosphere during filtration, collection in sample containers, and analysis. For deep USDW sampling of well No. 8 will be used for the collection and processing of samples. Groundwater wells (Monitoring Wells #8, #12 and #13) used for sampling will not have a permanent installation for sampling and are anticipated to use a wireline sampling system with a sampling device (e.g., Kuster sampler or similar) capable of collecting a sample from a discrete interval. Samples from selected groundwater wells will be processed in a manner consistent with ISGS-SOP-WB-V1.14. Well No. 8 will be developed and purged extensively at the time of completion. Prior to sampling, each zone will be purged to ensure representative samples are collected. Due to the extensive well development, the amount of fluid to be purged at the time of sampling will be relatively small. If a three-foot zone is perforated, then the annular space between the 2-7/8-in. tubing and the 5-1/2-in. casing is only 1.92 gal. Thus, relatively small purge volumes will adequately refresh each isolated sampling interval. Additional information about sampling procedures at well No. 8 are given in Locke et al. (2013). For monitoring at well No. 8, it is anticipated that air lifting with nitrogen will be used to draw fluid into the well for purging. A gas lift valve will be placed in the tubing string at approximately 1,200 ft below ground surface at the time of the completion. The sampler will be positioned at the same elevation as the discrete perforated interval, and a sample would be collected after sufficient purging.

B.2.c. In-situ Monitoring

In-situ monitoring of temperature and pressure in the injection zones will occur at the in-zone monitoring well (well No 3). Monitoring at this location will be continuous and will utilize casing conveyed DTS fiber optic cable. In-situ monitoring above the confining zone will occur at well No. 8. Monitoring at this location will include continuous temperature and pressure monitoring and include scheduled fluid sample collection for analysis.

B.2.d. Continuous Monitoring

Pressure data will be collected from USDW wells on a periodic basis (e.g., hourly to daily) using dedicated pressure transducers with data loggers to generally characterize shallow water level trends. These data are informational only.

B.2.e. Sample Homogenization, Composition, Filtration

This section is addressed in B.2.b.

B.2.f. Sample Containers and Volumes

Information regarding sample containers and volumes is addressed in Table 17. For CO_2 stream monitoring, samples will be collected in a clean sample container rated for the appropriate collection pressure (i.e. mini cylinders or polybags provided by Airborne Labs International Inc., Somerset, NJ). Sample containers are described in tables 17 and 18.

B.2.g. Sample Preservation

Information pertaining to sample preservation is included in Table 18. See tables 17 and 18.

B.2.h. Cleaning/Decontamination of Sampling Equipment

Dedicated pumps (e.g., bladder pumps) will be installed in each USDW monitoring well to minimize potential cross contamination between wells. These pumps will remain in each well throughout the project period except for maintenance. Prior to installation, the pumps will be cleaned on the outside with a non-phosphate detergent. Pumps will be rinsed a minimum of three times with deionized water and a minimum of 1 liter of deionized water will be pumped through pump and sample tubing. Individual cleaned pumps and tubing will be placed in plastic garbage bags for transport to the field for installation. All field glassware (pipets, beakers, filter holders, etc.) are cleaned with tap water to remove any loose dirt, washed in a dilute nitric acid solution, and rinsed three times with deionized water before use.

CO_2 gas stream sampling containers will be either disposed or decontaminated by the analytical lab. No sampling equipment will be utilized with the corrosion coupons or annual field gauge calibrations.

B.2.i. Support Facilities

For sampling of USDW, the following are required: air compressor, vacuum pump, generator, multi-electrode water quality sonde, analytical meters (pH, specific conductance, etc.). Field activities are usually completed in field vehicles and portable laboratory trailers located on site.

Sampling tubing, connectors and valves required to sample the CO_2 gas stream will be supplied by the analytical lab providing the sampling containers. Sampling will occur within the existing CO_2 sampling station.

Similarly, corrosion coupons will be removed from the CO_2 injection line within the existing CO_2 flow-through station.

Field gauges will be removed from the injection well and verification well utilizing existing standard industry tools and equipment. Deployment and retrieval of verification well gauges will be done using procedures and equipment recommended by the vendor, subcontractor, or is standard per industry practice.

B.2.j. Corrective Action, Personnel, and Documentation

In the event that in place SOPs do not adequately outline sampling and monitoring procedures they will be modified and updated. This will be fully defined when the UIC Program director has approved the permit and the facility needs have been determined.

Field staff will be responsible for properly testing equipment and performing corrective actions on broken or malfunctioning field equipment. If corrective action cannot be taken in the field, then equipment will be returned to the manufacturer for repair or replaced. Significant corrective actions affecting analytical results will be documented in field notes.

B.3. Sample Handling and Custody

B.3.a. Maximum Hold Time/Time Before Retrieval

See tables 17 and 18.

B.3.b. Sample Transportation

Samples will be packaged and shipped in appropriate, sealed containers to the designated destination.

B.3.c. Sampling Documentation

Field notes will be collected for all USDW samples collected. These forms will be retained and archived as reference. The sample documentation is the responsibility of USDW sampling personnel.

B.3.d. Sample Identification

All sample bottles will have waterproof labels with information denoting project, sampling date, sampling location, sample identification number, sample type (freshwater or brine), analyte, volume, filtration used (if any), and preservative used (if any).

Table 17. Summary of Sample Containers, Preservation Treatments, and Holding Times for CO_2 Gas Stream Analysis.

Sample	Volume/Container Material	Preservation Technique	Sample Holding time (max)
CO_2 gas stream	(2) 2L MLB Polybags (1) 75 cc Mini Cylinder	Sample storage cabinets	5 business days

Table 18. Summary of Anticipated Sample Containers, Preservation Treatments, and Holding Times for Ground Water Samples.

Target Parameters	Volume/Container Material	Preservation Technique	Sample Holding Time
Cations: Ca, Fe, K, Mg, Na, Si, Al, Ba, Mn, As, Cd, Cr, Cu, Pb, Sb, Se Tl	250 ml/HDPE	Filtered nitric acid, cool 4 degrees C	60 days
Dissolved CO_2	60 ml/HDPE	Filtered cool 4 degrees C	14 days
Isotopes: ^{3}H, &D, &^{18}O, &^{34}S, and &^{13}C	2 x 60 ml/HDPE	Filtered cool 4 degrees C	4 weels
Alkalinity	500 ml/HDPE	Filtered cool 4 degrees C	45 days
Field Confirmation: Temperature, dissolved O_2, Specific Conductance, and pH	200 ml/glass jar	None	< 1 hr
Field Confirmation: Density	60 ml/HDPE	Filtered	< 1 hr

B.3.e. Sample Chain-of-Custody

For CO_2 stream analysis, an analysis authorization form will accompany the sample to the lab at which point a chain-of-custody accompanies the sample through their processes. For USDW samples, chain-of-custody will be documented using a standardized form. Copies of the form will be provided to the person/lab receiving the samples as well as the person/lab transferring the samples. These forms will be retained and archived to allow simplified tracking of sample status. The chain-of -custody form and record keeping is the responsibility of USDW sampling personnel.

B.4. Analytical Methods

B.4.a. Analytical SOPs

Analytical SOPs and other laboratory specific SOPs to be utilized by the laboratory will be determined after a contract laboratory has been selected. Upon request CapturePoint Solutions, LLC will provide the agency with all laboratory SOPs developed for the specific parameter using the appropriate standard method. Each laboratory technician conducting the analysis on the samples will be trained on the SOP developed for each standard method. CapturePoint Solutions, LLC will include the technician's training certification with the biannual report.

B.4.b. Equipment/Instrumentation Needed

Equipment and instrumentation is specified in the individual analytical methods referenced in Table 4-Table 7.

B.4.c. Method Performance Criteria

To be updated after geochemical lab has been selected.

B.4.d. Analytical Failure

Each laboratory conducting the analyses will be responsible for appropriately addressing analytical failure according to their individual SOPs

B.4.e. Sample Disposal

Each laboratory conducting the analyses will be responsible for appropriate sample disposal according to their individual SOPs.

B.4.f. Laboratory Turnaround

Laboratory turnaround will vary by laboratory, but generally turnaround of verified analytical results within one month will be suitable for project needs.

B.4.g. Method Validation for Nonstandard Methods

Nonstandard methods are not anticipated for this project. If nonstandard methods are needed or proposed in the future, the USEPA will be consulted on additional appropriate actions to be taken.

B.5. Quality Control

B.5.a. QC activities

Blanks

For shallow groundwater sampling, a field blank will be collected and analyzed for the inorganic analytes in Table 4 through Table 7 at a frequency of 10 percent or greater. Field blanks will be exposed to the same field and transport conditions as the groundwater samples. Blanks will also be utilized for deep groundwater sampling and analyzed for the inorganic analytes in Table 4 through Table 7 at a frequency of 10 percent or greater. Field blanks will be used to detect contamination resulting from the collection and transportation

Duplicates

For each shallow groundwater sampling round, a duplicate groundwater sample is collected from a well from a rotating schedule. Duplicate samples are collected from the same source immediately after the original sample in different sample containers and processed as all other samples. Duplicate samples are used to assess sample heterogeneity and analytical precision.

B.5.b. Exceeding Control Limits

If the sample analytical results exceed control limits (i.e., ion balances > ±10%), further examination of the analytical results will be done by evaluating the ratio of the measured total dissolved solids (TDS) to the calculated TDS (i.e., mass balance) per APHA method. The method indicates which ion analyses should be considered suspect based on the mass balance ratio. Suspect ion analyses are then reviewed in the context of historical data and interlaboratory results, if available. Suspect ion analyses are then brought to the attention of the analytical laboratory for confirmation and/or reanalysis. The ion balance is recalculated, and if the error is still not resolved, suspect data are identified and may be given less importance in data interpretations.

B.5.c. Calculating Applicable QC Statistics

Charge Balance

The analytical results are evaluated to determine correctness of analyses based on anion-cation charge balance calculation. Because all potable waters are electrically neutral, the chemical analyses should yield equally negative and positive ionic activity. The anion-cation charge balance will be calculated using the formula:

$$\%\ difference = 100 \ \ X \ \ \frac{\sum cations - \sum anions}{\sum cations + \sum anions} \qquad \text{(Equation 1)}$$

where the sums of the ions are represented in milliequivalents (meq) per liter and the criteria for acceptable charge balance is ±10%.

Mass Balance

The ratio of the measured TDS to the calculated TDS will be calculated in instances where the charge balance acceptance criteria are exceeded using the formula:

$$1.0 < \frac{Measured\ TDS}{Calculated\ \ TDS} < 1.2 \qquad \text{(Equation 2)}$$

where the anticipated values are between 1.0 and 1.2

Outliers

A determination of one or more statistical outliers is essential prior to the statistical evaluation of USDW. This project will use the USEPA's Unified Guidance (March 2009) as a basis for selection of recommended statistical methods to identify outliers in groundwater chemistry data sets as appropriate. These techniques include Probability Plots, Box Plots, Dixon's test, and Rosner's test. The EPA-1989 outlier test may also be used as another screening tool to identify potential outliers.

B.6. Instrument/Equipment Testing, Inspection, and Maintenance

Logging tool equipment will be maintained as per wireline industry best practices.

For USDW sampling, field equipment will be maintained, factory serviced, and factory calibrated per manufacturer's recommendations. Spare parts that may be needed during sampling will be included in supplies on-hand during field sampling.

For all laboratory equipment, testing, inspection and maintenance will be the responsibility of the analytical laboratory per standard practice, method-specific protocol, or NELAP requirement.

B.7. Instrument/Equipment Calibration and Frequency

B.7.a. Calibration and Frequency of Calibration

Pressure/temperature gauge calibration will occur per manufacturer specifications. Logging tool calibration will be at the discretion of the service company providing the equipment, following standard industry practices. Calibration frequency will be determined by standard industry practices.

For USDW sampling, portable field meters or multiprobe sondes used to determine field parameters (e.g., pH, temperature, specific conductance, dissolved oxygen) are calibrated according to manufacturer recommendations and equipment manuals (Hach, 2006) each day before sample collection begins. Recalibration is performed if any components yield atypical values or fail to stabilize during sampling.

B.7.b. Calibration Methodology

Logging tool calibration methodology will follow standard industry practices.

For USDW sampling, standards used for calibration are typically 7 and 10 for pH, a potassium chloride solution yielding a value of 1413 microseimens per centimeter (µS/cm) at 25°C for specific conductance, and a 100% dissolved O_2 solution for dissolved oxygen. Calibration is performed for the pH meters per manufacturer's specifications using a 2-point calibration bounding the range of the sample. For coulometry, sodium carbonate standards (typically yielding a concentration of 4,000 mg CO_2/L) are routinely analyzed to evaluate the instrument.

B.7.c. Calibration Resolution and Documentation

Logging tool calibration resolution and documentation will follow standard industry practices.

For USDW sampling, calibration values are recorded in daily sampling records and any errors in calibration are noted. For parameters where calibration is not acceptable, redundant equipment may be used so loss of data is minimized.

B.8. Inspection/Acceptance for Supplies and Consumables

B.8. a/b. Supplies, Consumables, and Responsibilities

Supplies and consumables for field and laboratory operations will be procured, inspected, and accepted as required from vendors approved by CapturePoint Solutions, LLC or the respective subcontractor responsible for the data collection activity. Acquisition of supplies and consumables related to USDW analyses will be the responsibility of the laboratory per established standard methodology or operating procedures.

B.9. Data Management

B.9.a. Data Management Scheme

CapturePoint Solutions, LLC or a designated contractor will maintain the required project data as provided elsewhere in the permit. Data will be submitted semi-annually using the Geologic Sequestration Data Tool and will also be backed up on secure servers.

B.9.b. Recordkeeping and Tracking Practices

All records of collected data will be securely held and properly labeled for auditing purposes.

B.9.c. Data Handling Equipment/Procedures

All equipment used to store data will be properly maintained and operated according to proper industry techniques. CapturePoint Solutions, LLC and vendor data acquisition systems will interface with one another and all subsequent data will be held on a secure server.

B.9.d. Responsibility

The primary project managers will be responsible for ensuring proper data management is maintained.

B.9.e. Data Archival and Retrieval

All data will be held by CapturePoint Solutions, LLC. These data will be maintained and stored for auditing purposes described in section B.10.a.

B.9.f. Hardware and Software Configurations

All CapturePoint Solutions, LLC and vendor hardware and software configurations will be appropriately interfaced.

B.9.g. Checklists and Forms

Checklists and forms will be procured and generated as necessary.

C. Assessment and Oversight

C.1. Assessments and Response Actions

C.1.a. Activities to be Conducted

Please refer to Table 1 in section A.3.a/b. (Summary of work to be performed and work schedule); USDW quality data will be collected at the frequency outlined in that table. After completion of sample analysis, results will be reviewed for QC criteria as noted in section B.5. If the data quality fails to meet criteria set in section B.5., samples will be reanalyzed, if still within holding time criteria. If outside of holding time criteria, additional samples may be collected or sample results may be excluded from data evaluations and interpretations. Evaluation for data consistency will be performed according to procedures described in the USEPA 2009 Unified Guidance (USEPA, 2009).

C.1.b. Responsibility for Conducting Assessments

Organizations gathering data will be responsible for conducting their internal assessments. All stop work orders will be handled internally within individual organizations.

C.1.c. Assessment Reporting

All assessment information should be reported to the individual organizations project manager outlined in A.1.a/b

C.1.d. Corrective Action

All corrective action affecting only an individual organization's data collection responsibility should be addressed, verified, and documented by the individual project managers and communicated to the other project managers as necessary. Corrective actions affecting multiple organizations should be addressed by all members of the project leadership and communicated to other members on the distribution list for the QASP. Assessments may require integration of information from multiple monitoring sources across organizations (operational, in-zone monitoring, above-zone monitoring) to determine whether correction actions are required and/or the most cost-efficient and effective action to implement. CapturePoint Solutions, LLC will coordinate multiorganization assessments and corrective actions as warranted.

C.2. Reports to Management

C.2. a/b. QA status Reports

QA status reports should not be needed. If any testing or monitoring techniques are changed, the QASP will be reviewed and updated as appropriate in consultation with USEPA. Revised QASPs will be distributed by CapturePoint Solutions, LLC to the full distribution list at the beginning of this document.

D. Data Validation and Usability

D.1. Data Review, Verification, and Validation

D.1.a. Criteria for Accepting, Rejecting, or Qualifying Data

USDW quality data validation will include the review of the concentration units, sample holding times, and the review of duplicate, blank and other appropriate QA/QC results. All groundwater quality results will be entered into a database or spreadsheet with periodic data review and analysis. CapturePoint Solutions, LLC will retain copies of the laboratory analytical test results and/or reports. Analytical results will be reported on a frequency based on the approved UIC permit conditions. In the periodic reports, data will be presented in graphical and tabular formats as appropriate to characterize general groundwater quality and identify intrawell variability with time. After sufficient data have been collected, additional methods, such as those described in the USEPA 2009 Unified Guidance (USEPA, 2009), will be used to evaluate intrawell variations for USDW constituents, to evaluate if significant changes have occurred that could be the result of CO_2 or brine seepage beyond the intended storage reservoir.

D.2. Verification and Validation Methods

D.2.a. Data Verification and Validation Processes

See sections D.1.a and B.5. Appropriate statistical software will be used to determine data consistency.

D.2.b. Data Verification and Validation Responsibility

CapturePoint Solutions, LLC or its designated subcontractor will verify and validate USDW sampling data.

D.2.c. Issue Resolution Process and Responsibility

CapturePoint Solutions, LLC or its designated coordinator will overview the USDW data handling, management, and assessment process. Staff involved in these processes will consult with the coordinator to determine actions required to resolve issues.

D.2.d. Checklist, Forms, and Calculations

Checklists and forms will be developed specifically to meet permit requirements.

D.3. Reconciliation with User Requirements

D.3.a. Evaluation of Data Uncertainty

Statistical software will be used to determine USDW data consistency using methods consistent with USEPA 2009 Unified Guidance (USEPA, 2009).

D.3.b. Data Limitations Reporting

The organization-level project managers will be responsible for ensuring that data developed by their respective organizations is presented with the appropriate data-use limitations.

CapturePoint Solutions, LLC will use the current operating procedure on the use, sharing, and presentation of results and/or data for the project. This procedure has been developed to ensure quality, internal consistency and facilitate tracking and record keeping of data end users and associated publications.

E. References

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