

NORTH DAKOTA DEPARTMENT OF HEALTH
PUBLIC NOTICE TO
ISSUE AN UNDERGROUND INJECTION CONTROL PERMIT

June 20, 2018

PURPOSE OF PUBLIC NOTICE

THE PURPOSE OF THIS NOTICE IS TO STATE THE DEPARTMENT'S INTENTION TO ISSUE A CLASS I UNDERGROUND INJECTION CONTROL PERMIT UNDER THE AUTHORITY OF ARTICLE 33-25 OF THE NORTH DAKOTA ADMINISTRATIVE CODE.

PERMIT INFORMATION

APPLICANT NAME: Secure Energy Services USA, LLC

MAILING ADDRESS: 5807 West Front St
Williston, ND 58801

FACILITY LOCATION: Stanley Full Service Terminal
4802 Highway 8
Stanley, ND 58784
Sec 35 T154N R091W
Mountrail County

TELEPHONE NUMBER: 701-609-5616

APPLICATION NUMBER: ND-UIC-109

UNDERGROUND INJECTION CONTROL PERMIT

It is the intent of the Department of Health, Division of Water Quality to issue a Class I underground injection control permit (Permit) for one commercial Class I non-hazardous waste underground injection well located at the Stanley Full Service Terminal (FST) approximately 13 miles south of Stanley in Mountrail County, North Dakota (Section 35, Township 154 North, Range 091 West).

The proposed Class I injection well is the existing Locken #3 saltwater disposal well (SWD) (API#33-061-90239-00-00) and was originally a Class II injection well that was permitted in September 2012 by the North Dakota Industrial Commission – Division of Oil and Gas. As of December 2017, the Locken #3 has injected approximately 9 million barrels of Class II fluids. The injection well will be permitted by the Department and operated as a commercial, Class I non-hazardous waste injection well.

The permitted waste stream consists of exempt and non-exempt non-hazardous industrial waste fluids. The well will be operated as a commercial Class I injection well and all waste fluids will be confirmed to be non-hazardous prior to injection. The permitted wastes are: produced water, flowback water, pipeline test water, refinery wastewater, landfill leachate from special waste landfills, oil terminal runoff, used and unused oil well fracturing fluids, vacuum truck rinsate, gas plant cooling tower cleaning waste, waste compressor fluids, pipeline pit wastewater, and pesticide wastes. The waste fluids are expected to contain elevated levels of petroleum hydrocarbons, total dissolved solids (TDS), sulfate, sodium, and chloride.

The waste fluids are authorized to be injected into one interval consisting of the Inyan Kara Formation between 5,090 and 5,378 feet below ground surface (bgs). The uppermost perforated injection interval in Well #1 is approximately 3,012 feet below the closest currently identified underground source of drinking water (USDW), the Fox Hills formation.

PUBLIC COMMENTS AND HEARING

The Draft Permit will be available for public review and comment for thirty (30) days following publication of the Public Notice. The public comment period begins June 20, 2018 and ends July 20, 2018. Interested persons may submit written comments to the Department on the Draft Permit during this period. The Department has tentatively scheduled a Public Hearing on the Draft Permit on July 30, 2018 at 2:00 pm Central Time at Stanley City Hall, located at 208 S. Main St. in Stanley, ND. The hearing will be held if there is sufficient public interest pertaining to the proposed Draft Permit. Interested persons may request a public hearing by stating the nature of the specific issues to be raised.

If sufficient public interest is not raised and a hearing is not requested by July 20, 2018, the hearing will not be conducted. Please check <http://www.ndhealth.gov/DoH/PublicNotices.aspx> or call the Department at 701-328-5210 on or after July 20, 2018 for confirmation of the hearing.

The North Dakota Department of Health will consider all comments prior to taking any action on the permit. Comments, questions, and written communication should be directed to:

Karl Rockeman, Director
North Dakota Department of Health
Division of Water Quality
918 East Divide Avenue, 4th Floor
Bismarck, ND 58501-1947

The Draft Permit, Fact Sheet, and Permit Application are available for review during the hours of 8:30 a.m. to 4:30 p.m., Monday through Friday, at the North Dakota Department of Health, Division of Water Quality, 918 East Divide Avenue, 4th Floor, Bismarck, North Dakota. A copy of this Public Hearing Notice is also on the Department's website at: <http://www.ndhealth.gov/DoH/PublicNotices.aspx>.

Anyone requiring special access or accommodations to review the documents may contact the Department at 701-328-5210.

PUBLIC NOTICE NUMBER: ND-2018-019

FACT SHEET

Injection Well #1 Class I Non-Hazardous Waste Underground Injection Well Permit

Secure Energy Services USA, LLC
Williston, North Dakota

North Dakota Department of Health UIC Permit No. ND-UIC-109

NDDH Contact:

Carl Anderson
Ground Water Protection Program Manager
North Dakota Department of Health
Division of Water Quality
918 E. Divide Avenue
Bismarck, ND 58501-1947
701-328-5213

Secure Energy Services Contact:

Sean Hammersmark
General Manager
Secure Energy Services USA, LLC
5807 West Front St
Williston, ND 58801
701-609-5616

PERMIT BACKGROUND INFORMATION

The North Dakota Department of Health (Department) received an application from Secure Energy Services USA, LLC (Secure Energy) (Permittee) requesting a Class I Underground Injection Control Permit (Permit) to install and operate a commercial non-hazardous waste disposal well. The permit application proposes to dispose non-hazardous industrial wastes from Secure Energy's Treating Plant and from commercial sources into a single injection well, the Locken SWD#3 (Injection Well #1). Well #1 is located at Secure Energy's Stanley Full Service, located approximately 13 miles south of Stanley, North Dakota.

If approved, Permit ND-UIC-109 (Permit) will authorize the injection of waste fluids into Injection Well #1 for a period of five (5) years, beginning from the effective date of the final Permit.

FACILITY INFORMATION AND INJECTION ACTIVITY

Secure Energy Services USA, LLC (Secure Energy) is an energy services company that provides resource processing, waste disposal, TENORM management, and drilling and completions support. Secure Energy operates six Class II injection wells in North Dakota, and 39 other facilities throughout North Dakota, Manitoba, Saskatchewan, Alberta, and British Columbia.

The permitted injection activity will be conducted at Secure Energy's Stanley Full Service Terminal (Stanley FST), which includes the Stanley Treating Plant (NDIC Facility Number 700062-01), an industrial water well (NDSWC Permit Number 6595), and the Locken SWD#3 salt water injection well (NDIC File Number 90239). The Stanley Treating Plant recovers salable oil from solid and liquid oilfield wastes. Processed waste streams have included wastes from saltwater disposal tanks, tank bottoms, drilling pit wastes, spill wastes, and other waste oil related to crude oil and natural gas exploration and production.

The Stanley Treating Plant is located approximately 13 miles south of Stanley, North Dakota and currently operates with a total capacity of 4,400 barrels of liquid waste and 505 barrels of solid waste. Liquid emulsion wastes are processed through an oil heater-treater; recovered oil is stored for sale, solids are disposed of in a special waste landfill, and the remaining liquid wastes are injected into the Locken SWD#3 Class II injection well. Slurry and other solid wastes are offloaded into heated processing tanks; solids are separated via mud shakers and disposed of in a special waste landfill, liquids are transferred to a centrifuge for separation and recovered oil is stored for sale, and the remaining liquid wastes are injected in to the Locken SWD#3 injection well.

The proposed Class I injection well (Well #1) is the existing Locken SWD #3 (API#33-061-90239-00-00) salt water disposal well. The well is currently permitted by the North Dakota Industrial Commission, Division of Oil and Gas (NDIC). The NDIC permit will be terminated before the NDDoH issues a Class I injection Permit for Well #1. Well #1 will then operate solely under the conditions of underground injection control permit ND-UIC-109.

The permitted waste stream consists of exempt and non-exempt non-hazardous industrial waste fluids. The well will be operated as a commercial Class I injection well and all waste fluids will be confirmed to be non-hazardous prior to injection. The expected wastes include, but are not limited to:

- Class II produced water, flowback water, and waste water
- Pipeline test water and other pipeline related wastes
- Refinery wastes
- Crude oil terminal wastewater and runoff
- Unused and unused fracturing fluids or acids
- Gas plant cooling tower cleaning wastes
- Waste compressor oil and blowdown
- Boiler cleaning wastes
- Landfill leachate
- Rinsate from trucks and drums transporting or containing non-RCRA exempt and non-hazardous wastes
- Non-hazardous pesticide wastes.

As a commercial waste disposal well, the sources and volumes of the injected waste streams are expected to vary. All waste sources will be confirmed as non-hazardous and will be approved by the Department prior to injection. Secure Energy maintains full responsibility for ensuring that all waste streams are classified as non-hazardous wastes.

The waste fluids are expected to contain elevated levels of petroleum hydrocarbons, total dissolved solids (TDS), sulfate, sodium, and chloride.

The waste fluids will be authorized for injection into an interval of the Inyan Kara Formation, a Cretaceous sandstone unit, between 5,090-5,378 feet below ground surface (bgs).

Injection Well #1 will be designed to have a maximum injection capacity of 420 gallons per minute (gpm). The maximum permitted volume of injected fluids is 5.5188×10^9 gallons. Should the well need corrective maintenance or be shut-in for testing, the injectate will be properly disposed of off-site or stored on-site until injection into the well can resume.

GEOLOGY AND HYDROGEOLOGY

Geology

The proposed Class I injection well is located in the SW ¼ of the SW ¼ of Section 35, Township 154N and Range 091 West in Mountrail County, North Dakota. Mountrail County is located near the center of the Williston Basin. The Williston Basin is a large, roughly circular depression consisting of both sedimentary and structural components, underlying parts of North and South Dakota, Montana, and the Canadian provinces of Saskatchewan and Manitoba. Within the Williston Basin, the Morrison Formation provides a base containment barrier and the Skull Creek Formation, consisting of alternating stacked shale layers provide upper containment and barrier to upward movement of waste fluids. The lower portion of the Inyan Kara Formation consists of thick, porous and permeable, Cretaceous age sandstone that make for a highly sustainable injection reservoir.

The following tabulation summarizes the geologic formations encountered while drilling Well #1.

Geologic Unit	Stratigraphic Formations	Estimated Depth of Top of Unit (feet below ground surface)	Estimated Depth of Bottom of Unit (feet below ground surface)

Quaternary, Tertiary, and Upper Cretaceous Units	Glacial and post-glacial sediments, Bullion Creek, Slope, Cannonball, Ludlow, Hell Creek, Fox Hills	0	2,072
Cretaceous Confining Units	Pierre, Greenhorn, Mowry, Newcastle, Skull Creek	2,072	5,066
Dakota Group	Inyan Kara	5,066	5,378
Jurassic/Triassic/Permian Confining Units	Morrison, Swift, Rierdon, Spearfish	5,378	5,540*

* Represents bottom of borehole

Hydrogeology of Proposed Injection Zone and Confining Zones

Well #1 injects wastewater into the Inyan Kara Formation in the interval from 5,090 to 5,378 feet below ground surface (bgs). The Inyan Kara Formation is part of the Dakota Group, which also includes the Mowry, Newcastle, and Skull Creek Formations. While various terms have been used to describe this geologic unit, including the Lower Cretaceous aquifer, Inyan Kara Group, and Lakota Formation, it is generally acceptable to simply reference it as the “Dakota aquifer”.

The Dakota aquifer is generally assumed to have TDS concentrations greater than 10,000 milligrams per liter (mg/L). An aquifer that has a TDS concentration greater than 10,000 mg/L is not considered an underground source of drinking water, and injection into the aquifer is allowed pursuant to state (NDAC Chapter 33-25-01) and federal (40 CFR Part 146) underground injection rules.

Formation water samples were not collected prior to the injection of production water into the Locken SWD #3 Class II injection well. Due to the historic injection of Class II wastes, the collection of a sample from the injection zone would not yield a water sample that is representative of typical Inyan Kara water chemistry. Therefore, the collection of a formation sample is not proposed at this time. As an alternative, the anticipated TDS concentration of the injection zone was calculated from the Locken SWD #3 wireline logs. The calculated TDS concentration Inyan Kara water at the injection well was estimated to be between 14,000 and 19,000 mg/L.

The uppermost perforated injection interval is approximately 3,012 feet below the lowermost underground source of drinking water (USDW), the Fox Hills formation. The base of the Fox Hills formation of the Upper Cretaceous Aquifer contains the lowest USDW, and is located at 2,072 feet bgs.

INJECTION INFORMATION

The waste fluids are authorized to be injected into one interval consisting of the Inyan Kara Formation between 5,090 and 5,378 feet below ground surface (bgs). The uppermost perforated injection interval in Well #1 is approximately 3,012 feet below the closest currently identified USDW, the Fox Hills formation.

DRAFT PERMIT CONDITIONS

This Fact Sheet summarizes the site-specific Permit conditions. The following section references refer to corresponding sections in NDDoH Permit ND-UIC-109 (Permit in Draft form). General permit conditions for which the content is mandatory and not subject to site-specific differences (based on 40 CFR Parts 124, 144, 146, and 147) are not included in this Fact Sheet.

Section IV – Well Construction Requirements

Casing and Cementing

(Condition 1)

The construction details submitted with the permit application are incorporated into the Permit, and are binding on the Permittee. Well #1 is constructed with a 9 5/8-inch outside diameter (OD) conductor casing set from ground surface to an approximate depth of 2,230 feet bgs, and a 7-inch OD surface casing set from ground surface to approximately 5,540 feet bgs.

Injection Tubing and Packer Specifications

(Condition 2)

Wastewater is injected through 4 1/2-inch OD tubing with a packer set at a depth of 5,028 feet bgs, or approximately 62 feet above the top of the targeted injection zone. The annulus between the injection tubing and protection casing is filled to the surface with inhibited brine, and a seal pot is attached to the annulus to detect well malfunctions. Injection pressure, flow rate, and tubing pressure are continuously monitored.

Monitoring Devices

(Condition 3)

The Permit establishes that the primary method of monitoring is pressure monitoring of the injection and casing tubing annulus pressure and of the injection rate and total volume of fluid injected into the well. All monitoring equipment shall be continuous recording, and shall be operated and maintained as long as the Permit is in effect. The Permit also requires that the wells have mechanisms to access the wellhead and injection line to obtain manual measurements of injection and annulus pressure and samples of the injection fluid. Each well shall be equipped with the following:

1. A digital, continuous-reading injection pressure monitoring device
2. A digital, continuous-reading wellhead annulus pressure monitoring device
3. A well shutdown switch (designed to shut down the injection pumps if the injection pressure exceeds the maximum allowable injection pressure)
4. Digital, continuous-reading flow meters to monitor injection flow and volume
5. An injection fluid sampling port.

Section V - Well Logging and Testing Requirements

Cement Bond Log

(Condition 4)

Based on the construction and cementing details of the injection well and on the cement bond log for Well #1, all USDWs should be adequately protected behind the cemented surface and long-string casings. The Permittee shall also run a new cement bond log following any work performed on the well that involves cementing.

Mechanical Integrity Testing

(Condition 5)

The Permittee shall give at least a two week, advance written notice to the Director of any planned well logging or testing. This notice shall include a plan for conducting the proposed test or log. The mechanical integrity of the well will be evaluated by conducting the following:

1. A differential temperature log from surface to total depth
2. An annular pressure test.

The mechanical integrity testing will be conducted at least every five years and whenever there has been a well workover. All mechanical integrity testing will be conducted in accordance with the requirements of 40 CFR 146.8 – Mechanical Integrity.

In addition, a pressure fall-off test will be conducted at least once a year for the propose of monitoring pressure buildup in the injection zone to (1) detect any significant loss of fluids due to fracturing in the injection and/or confining zone, and (2) to aid in determining the lateral extent of the injection plume.

Section VI - Well Operating Parameters

The injection of non-hazardous waste fluids into the proposed Class I underground injection wells will be covered under the authority of Permit ND-UIC-109 and is authorized subject to the conditions herein.

Injection Rate and Volume (Condition 6)

The maximum injection rate for Injection Well #1 shall not exceed 420 gpm. The maximum permitted volume of injected fluids is 5.52×10^9 gallons.

Injection Interval (Condition 7)

The injection interval shall be limited to the Inyan Kara Formation, in an injection interval between 5,090 and 5,387 feet bgs.

Injection Pressure (Condition 8)

The maximum injection pressure at the wellhead shall not exceed 1,500 pounds per square inch (psi) to ensure that fracturing of the injection zone and confining zone does not occur.

Annular Fluid (Condition 9)

The tubing/long string casing annulus of each well shall be filled with a fluid containing corrosion inhibitors. A pressure differential from the injection pressure of at least 100 psig (pounds per square inch gage) (measured at the wellhead) shall be maintained on the annulus to detect well malfunctions. For 30 minutes after the pressure differential drops below 100 psig, the Permittee can conduct troubleshooting and proceed to restore a minimum 100 psig pressure differential. If a minimum 100 psig pressure differential cannot be achieved within 30 minutes, the Permittee shall notify the Department and commence shut-in procedures on the well. The Permittee may continue to operate the well under flow conditions that maintain a minimum 100 psig pressure differential.

Injection Fluid (Condition 10)

The injected wastewater stream may consist of the streams specified in the Permit. However, with prior written approval from the Department, injection of wastewater streams other than those specified may be allowed if (1) the wastewater stream is compatible to the original waste stream, (2) the wastewater is non-hazardous, and (3) the wastewater stream will not interfere with the operation of the facility or its ability to meet Permit conditions.

Section VII – Injection Well Monitoring

Environmental Protection Agency (EPA) regulations (40 CFR Part 146.13) require continuous monitoring and recording of injection pressure, flow rate and volume, and tubing/casing annulus pressure. The Permittee is also required to analyze the water quality of the injected fluids.

Monitoring Devices (Condition 11)

Digital, continuous-reading flow meters will be used to measure the injection rate and total volume of fluid injected into the well. Digital, continuous-reading pressure gauges will be used to monitor and record the injection pressure and tubing/casing annulus pressure.

Injection Fluid Monitoring (Condition 12)

During the first year of operation, a grab sample of injected fluids shall be analyzed monthly for the parameters summarized in List A of Attachment A. If no anomalies are identified during the first year of injection activity, the analysis will be performed at a frequency specified by the Director. All new waste streams will also be tested for the parameters summarized in List A of Attachment A to ensure that the waste is classified as non-hazardous. A waste sample will also be collected from one randomly-selected load entering the facility per quarter; the sample will be analyzed for the parameters summarized in List A of Attachment A.

A complete chemical analysis shall be completed for the waste fluids no later than 14 days following commencement of injection activities to confirm the classification of the waste as non-hazardous. This complete analysis shall include the parameters specified in Lists A and B, summarized in Attachment A of the Permit. The Director will establish an on-going waste sampling schedule to ensure compliance with this Permit.

Section VIII – Ambient Monitoring Program

Injection Zone Monitoring (Condition 13)

The pressure buildup in the injection zone will be evaluated at least annually by conducting a pressure fall-off test. The data obtained will be used to evaluate the zone of influence in the well to date, reservoir transmissivity, and reservoir skin factor.

Section IX – Proposed Changes and Well Workovers

Notification (Condition 14)

The Permittee shall give the Department written notification at least two (2) weeks in advance of any planned physical alterations or additions to the permitted wells. A plan for the workover or

change shall be submitted with the notification. For emergency workover or well service, 24-hour prior notification to the Department will be provided with the proposed work plan also submitted for review.

Reporting

(Condition 15)

The Permittee shall provide the Department with all records of well workovers. The documentation shall include the reason for the workover and the details of the work performed.

Mechanical Integrity

(Condition 16)

A demonstration of the mechanical integrity shall be performed within thirty (30) days of completion of any change or workover. Injection into the well(s) will not resume until mechanical integrity is demonstrated.

Section X – Reporting

Quarterly Reports

(Condition 17)

The Permittee shall file quarterly reports within thirty (30) days after the last day of March, June, September, and December of each year. The report should include (1) monthly average, maximum, and minimum values for injection pressure, injection rate and volume, and annular pressure for the well; (2) the results of analyses of the injected fluid, (3) the results of the groundwater monitoring well analyses, (4) Waste source information, and (5) a summary of waste rejections and approval contraventions.

Additional Reports

(Condition 18)

The results of mechanical integrity tests, pressure fall-off tests, and well workovers shall be submitted as part of the first quarterly report following their completion.

Oral Reporting

(Condition 19)

The Permittee shall report orally within twenty-four (24) hours from the time (1) monitoring or other information indicates that any contaminant may cause an endangerment to an USDW, and/or (2) information is obtained that indicates noncompliance with a Permit condition or a malfunction of the injection system (e.g., loss of mechanical integrity) which may cause fluid migration into or between USDWs.

A written report shall follow within five (5) days. The written report shall contain a description of the noncompliance and its causes, the period of noncompliance (including exact date and times), and if the noncompliance has not been corrected, the anticipated time it is expected to continue.

Non-Compliance Reporting

(Condition 20)

The Permittee shall report all other instances of noncompliance at the time monitoring reports are submitted. The reports shall contain the information listed above.

Compliance Reporting

(Condition 21)

In the event that the Permittee is placed on a compliance schedule, a report of compliance or noncompliance with the requirements of the schedule shall be submitted no later than fourteen (14) days following each schedule date.

Omissions Reporting

(Condition 22)

If the Permittee becomes aware that he failed to submit any relevant facts in a Permit application or submitted incorrect information, he shall promptly submit such facts and information to the Department.

Conversion/Abandonment Reporting

(Condition 23)

The Permittee shall notify the Department at least sixty (60) days before conversion or abandonment of the disposal well.

Section XI - Recordkeeping

Monitoring Records

(Condition 24)

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by the Permit, and records of all data used to complete the application for the Permit for a period of at least three (3) years from the date of the sample measurement, report, or application submittal.

Injection Fluid Records

(Condition 25)

The Permittee shall retain all records concerning the nature and composition of injected fluids for five (5) years after completion of plugging and abandonment procedures.

Waste Source Records

(Condition 26)

The permittee shall retain all records concerning the source and provider of all injected fluids for five (5) years after completion of the plugging and abandonment procedures.

Section XII – Plugging and Abandonment

Notification

(Condition 27)

The Permittee shall notify the Department in writing sixty (60) days prior to commencing plugging operations. The plugging and abandonment procedure shall be in accordance with an Injection Well Closure Plan approved by the Department.

Abandonment Report

(Condition 28)

Within sixty (60) days after plugging the well, the Permittee shall submit a report to the Department. The person who performed the plugging operation shall certify the report as accurate and the report should consist of either (1) a statement that the well was plugged in

accordance with the plan, or (2) where actual plugging differed from the plan, a statement that specifies the different procedures followed.

Section XIII - Financial Responsibility

Surety Performance Bond

(Condition 29)

The Permittee is required to maintain continuous financial responsibility and resources to close, plug, and abandon the injection well as provided in the plugging and abandonment plan. The Permittee has estimated a cost of \$180,000 for well plugging and abandonment. The Permittee will submit a Surety Performance Bond for the plugging and abandonment of the injection well and for post-closure activities prior to final Permit approval.

PUBLIC INVOLVEMENT

Public Comment Period

Public Notice was issued on June 20, 2018, inviting comments on the Draft Permit developed for Secure Energy Services USA, LLC. Comments should be directed to the North Dakota Department of Health, Division of Water Quality, 918 E. Divide Avenue, Bismarck, ND 58501-1947. All information received by July 20, 2018 will be considered prior to final consideration on issuing an approval to operate Injection Well #1.

Public Hearing

The Department has tentatively scheduled a Public Hearing on the Draft Permit on July 30, 2018 at 2:00 pm Central Time at Stanley City Hall, located at 208 S. Main St. in Stanley, ND. The hearing will be held if there is sufficient public interest pertaining to the proposed Draft Permit. Interested persons may request a public hearing by stating the nature of the specific issues to be raised.

If sufficient public interest is not raised and a hearing is not requested by July 20, 2018, the hearing will be canceled, and the final Permit will be issued within sixty (60) days after the public comment period ends. Please check <http://www.ndhealth.gov/DoH/PublicNotices.aspx> or call the Department at 701-328-5210 on or after July 20, 2018 for confirmation of the hearing

Additional Information

Additional information may be obtained upon request by calling the NDDoH at (701) 328-5210, or by writing to the address listed above. The Permit Application, Draft Permit ND-UIC-109, and related documents are available for review and reproduction at the Department.



PERMIT APPLICATION - UNDERGROUND INJECTION CONTROL PROGRAM
 NORTH DAKOTA DEPARTMENT OF HEALTH
 WATER QUALITY DIVISION
 SFN 8294 (10/97)

I. Name of Facility Stanley Full Service Terminal CLASS I Well		Application Date	
II. Name of Facility Contact Person Lawrence Medhurst		Title General Manager	
III. Mailing Address 5807 Westfront St	City Williston	State ND	Zip Code 58801
IV. Facility Location - Street, Route, and Legal Description (Twp, Rng, Sec, Qtrs) 4802 Hwy 8, SWSW Sec 35 T15N R1W			
County Mountrail	City Stanley	State ND	Zip Code 58784
V. SIC CODES: List in descending order of significance the four 4-digit Standard Industrial Classification (SIC) Codes found in the "Standard Industrial Classification Manual" which best describes your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words.	1st	SIC No. 1389	Name Oil & Gas Services
	2nd	SIC No. 4959	Name Unclassified Services
	3rd	SIC No.	Name
	4th	SIC No.	Name
VI. Name of Operator Sedure Energy Services USA, LLC		Telephone No. 701-609-5600	
STATUS: () F=Federal () S=State () P=Private (X) M=Public (Other than Federal or State) () O=Other (Specify)			
Mailing Address 5807 Westfront St	City Williston	State ND	Zip Code 58801
VII. INDIAN LANDS: Is this facility located on Indian Land? () Yes (X) No			
VIII. EXISTING ENVIRONMENTAL PERMITS	UIC - Underground Injection of Fluids	Permit No.: 90239	
	NPDES - Discharge to Surface Water	Permit No.: NDR32069	
	RCRA - Hazardous Wastes	Permit No.:	
	PSD - Air Emissions from Proposed Sources	Permit No.:	
	Other (specify) Radioactive materials	Permit No.: 33-52510-01	
X. Brief Description of Nature of Business: Non hazardous injection well for oilfield and industrial wastes			
IX. Certification: I certify, under penalty of the law, that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe the information is true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of imprisonment.			
SEE BACK OF FORM FOR DETAILS ON MAP AND ENGINEERING REPORT THAT MUST BE SUBMITTED WITH THIS APPLICATION.		NAME (Typed) Lawrence Medhurst	
		TITLE (Typed) General Manager	
		Signature	

Permit No.: ND-UIC-109

Effective Date: XXXXXXX, 2018

Expiration Date: XXXXXXX, 2023

DRAFT PERMIT

AUTHORIZATION TO INJECT UNDER THE NORTH DAKOTA UNDERGROUND INJECTION CONTROL PROGRAM

In compliance with Chapter 33-25-01 (Underground Injection Control Program) of the North Dakota Department of Health (Department) rules, as promulgated under Chapter 61-28 (North Dakota Water Pollution Control Act) of the North Dakota Century Code, Secure Energy Services USA, LLC. is authorized to inject waste fluids in accordance with the limitations, monitoring requirements, and other conditions set forth in this Permit.

This Permit shall become effective on XXXXXXX, 2018 and shall expire at midnight on XXXXXXX, 2023, unless amended or terminated by the Department.

Karl Rockeman, Director

Division of Water Quality

Date:_____

I. NAME OF PERMITTEE

Secure Energy Services USA, LLC
5807 West Front Street
Williston, ND 58801

II. NATURE OF BUSINESS

Secure Energy Services USA, LLC (Secure Energy) is an energy services company that provides resource processing, waste disposal, TENORM management, and drilling and completions support. Secure Energy operates six Class II injection wells in North Dakota, and 39 other facilities throughout North Dakota, Manitoba, Saskatchewan, Alberta, and British Columbia.

The permitted injection activity will be conducted at Secure Energy's Stanley Full Service Terminal (Stanley FST), which includes the Stanley Treating Plant (NDIC Facility Number 700062-01), an industrial water well (NDSWC Permit Number 6595), and the Locken SWD#3 salt water injection well (NDIC File Number 90239). The Stanley Treating Plant recovers salable oil from solid and liquid oilfield wastes. Processed waste streams have included wastes from saltwater disposal tanks, tank bottoms, drilling pit wastes, spill wastes, and other waste oil related to crude oil and natural gas exploration and production.

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III. DESCRIPTION AND LOCATION OF INJECTION ACTIVITY

Well Location. North Dakota Underground Injection Permit ND-UIC-109 (Permit) authorizes Secure Energy Services USA, LLC. (Permittee) to dispose of non-hazardous treating plant waste fluids and commercial, non-hazardous liquid wastes into one (1) Class I non-hazardous waste underground injection well (Well #1). Well #1 is located at the Stanley FST at 4802 Highway 8, Stanley, ND 58784 (Township 154N, Range 091W, Section 35 SWSW).

Wastewater Description. The permitted waste stream consists of exempt and non-exempt non-hazardous industrial waste fluids. The well will be operated as a commercial Class I injection well and all waste fluids will be confirmed to be non-hazardous prior to injection. Potential waste streams include the following:

- Class II produced water, flowback water, and waste water
- Pipeline test water and other pipeline related wastes
- Refinery Wastes
- Crude oil terminal wastewater and runoff
- Unused and unused fracturing fluids or acids
- Gas plant cooling tower cleaning wastes
- Waste compressor oil and blowdown
- Boiler cleaning wastes
- Landfill leachate
- Rinsate from trucks and drums transporting or containing non-RCRA exempt and non-hazardous wastes
- Non-hazardous pesticide wastes.

As a commercial waste disposal well, the sources and volumes of the injected waste streams are expected to vary. All waste sources will be confirmed as non-hazardous and will be approved by the North Dakota Department of Health (Department) prior to injection. Secure Energy maintains full responsibility for ensuring that all waste streams are classified as non-hazardous wastes.

The waste fluids are expected to contain elevated levels of petroleum hydrocarbons, total dissolved solids (TDS), sulfate, sodium, and chloride.

Well #1 Information. Well #1 was originally permitted by the North Dakota Industrial Commission (NDIC) Division of Oil and Gas and operated as the Locken SWD#3 saltwater disposal well. The well has been re-permitted as a commercial Class I, non-hazardous waste injection well and operates solely under the conditions of the Department's permit number ND-UIC-109. The waste fluids are injected into an interval of the Inyan Kara Formation, a Cretaceous sandstone unit, between 5,090-5,378 feet below ground surface (bgs).

Well #1 is constructed with a 9 5/8-inch outside diameter (OD) conductor casing set from ground surface to an approximate depth of 2,230 feet bgs, and a 7-inch OD surface casing set from ground surface to approximately 5,540 feet bgs.

Wastewater is injected through 4 1/2-inch OD tubing with a packer set at a depth of 5,028 feet bgs, or approximately 62 feet above the top of the targeted injection zone. The annulus between the injection tubing and protection casing is filled to the surface with inhibited brine, and a seal pot is attached to the annulus to detect well malfunctions. Injection pressure, flow rate, and tubing pressure are continuously monitored.

Injection Well #1 is designed to have a maximum injection capacity of 420 gallons per minute (gpm). The maximum permitted volume of injected fluids is 5.5188×10^9 gallons.

Should the well need corrective maintenance or be shut-in for testing, the injectate will be properly disposed of off-site or stored on-site until injection into the well can resume.

The Permittee is authorized to conduct injection into Well #1 in accordance with the provisions of Chapter 33-25-01 (Underground Injection Control Program) of the North Dakota Administrative Code and with the limitations, requirements, and other conditions set forth in this Permit.

IV. WELL CONSTRUCTION REQUIREMENTS

- A. Casing and cementing. The construction details submitted with the Class I Permit Application are hereby incorporated into this Permit and are binding on the Permittee. Any proposed changes to the construction of the wells must be submitted to the Department for review and written approval.
- B. Tubing and Packer Specifications. The well shall have a tubing and packer construction of materials of sufficient quality and strength for the proposed injection activity.
- C. Monitoring Devices. The primary method of monitoring shall be continuous pressure monitoring of the injection and casing tubing annulus pressure (at the wellhead) and continuous monitoring of the injection rate and total volume. Prior to commencement of injection activities, the operator shall install and maintain in good operation condition the following equipment:
 - (1) Injection Pressure Monitoring Device. The injection pressure will be monitored using a digital, continuous reading pressure monitoring device in the injection tubing at the wellhead.
 - (2) Wellhead Annulus Pressure Monitoring Device. The wellhead pressure of the tubing/casing annular space will be monitored using a digital continuous reading pressure monitoring device in the wellhead casing/tubing annulus. The tubing/casing annulus shall be maintained with an inhibited brine fluid that is under a differential pressure of at least 100 pounds per square inch (psi). The annulus pressure may be maintained above or below the wellhead injection pressure as long as the absolute differential pressure is at least 100 psi. The annulus pressure can be transitioned from positive differential (annulus pressure greater than the wellhead tubing pressure) to a negative differential (annulus pressure less than the wellhead tubing pressure) or the reverse in 30 minutes without being in violation of the minimum 100 psi differential pressure requirement. The minimum annulus differential pressure of 100 psi must be restored within 30 minutes. A mineral oil freeze blanket, or other fluid as approved in writing by the Director, may be circulated from surface to below frost level at completion to prevent freezing and possible equipment failure during winter months.

- (3) Well Shutdown Switch. The maximum surface injection (tubing) pressure shall be less than 1,500 psi in Well #1. Any increase in pressure that exceeds the allowable injection pressure shall result in an immediate shutdown of the injection pump.
- (4) Flow Meters. Flow meters and digital, continuous recording devices shall be installed in the injection line immediately upstream of, and on the wellhead to track and document disposal fluid flow rates and total fluid volumes. For a given injection rate, the injection pressure should remain relatively constant. Input flow volumes shall be cross checked against injection pressure records to identify any possible divergence in the injection pressure for a given flow rate. A drop in injection pressure without a corresponding reduction in input flow rate may indicate a possible casing, packer, or other failure.
- (5) Fluid Sampling Ports. The injection line shall be equipped with sampling ports and appropriate connections to facilitate the periodic collection of injection fluid samples for chemical analysis. The sampling point shall be in an unobstructed portion of the injection line.

V. WELL LOGGING AND TESTING REQUIREMENTS

The Permittee shall give at least a two week, advance written notice to the Director of any planned well logging or testing. This notice shall include a plan for conducting the proposed test or log.

- A. Pressure Fall-Off Test. A pressure fall-off test is required for Class I operations [40 CFR 146.13 (d) (1)] and must be performed at least once every twelve months to detect any significant loss of fluids due to fracturing in the injection and/or confining zone and to aid in determining the lateral extent of the injection plume. The test shall conform to the test plan provided to the Department. The Permittee shall analyze test results and provide a report with an appropriate narrative interpretation of the test results, including an estimate of reservoir parameters, information on any reservoir boundaries, an estimate of the well skin effect, and a summary of reservoir flow conditions. The report shall also compare the test results with the previous year's test data and shall be prepared by a knowledgeable analyst.
- B. Mechanical Integrity Testing. Prior to commencement of injection, the mechanical integrity of the well will be evaluated by conducting the following:
 1. A differential temperature log from surface to total depth
 2. An annular pressure test.

The mechanical integrity testing will also be conducted at least every five years and whenever there has been a well workover. All mechanical integrity testing will be

conducted in accordance with the requirements of 40 CFR 146.8 – Mechanical Integrity.

VI. WELL OPERATING PARAMETERS

- A. Injection Rate. This Permit authorizes injection into one (1) well. The maximum instantaneous injection rate in Well #1 shall be 420 gallons per minute (gpm) (10 barrels per minute).
- B. Injection Interval. Injection into Well #1 is limited to the Inyan Kara Formation, a Cretaceous sandstone unit, in the interval from 5,090 to 5,378 feet below ground surface (bgs). The uppermost perforated injection interval in Well #1 is approximately 3,012 feet below the base of the lowermost underground source of drinking water (USDW), the Fox Hills Sand.
- C. Injection Pressure. The wellhead injection pressure with fresh water specific gravity fluid shall not exceed 1,500 psi in Well #1 to assure that fracturing of the injection zone and confining zone does not occur.
- D. Annular Fluid. The tubing/long string casing annulus shall be filled with a fluid containing corrosion inhibitors. A pressure with a differential (positive or negative) from injection pressure of at least 100 psi, measured at the surface, shall be maintained on the annulus to detect well malfunctions. The annulus pressure can be transitioned from positive differential (annulus pressure greater than the wellhead tubing pressure) to a negative differential (annulus pressure less than the wellhead tubing pressure) or the reverse within 30 minutes without being in violation of the minimum 100 psi differential pressure requirement. The minimum annulus differential pressure of 100 psi must be restored within 30 minutes. For 30 minutes after the pressure differential drops below 100 psig, the Permittee can conduct troubleshooting and proceed to restore a minimum 100 psig pressure differential. If a minimum 100 psig pressure differential cannot be achieved within 30 minutes, the Permittee shall notify the Department and commence shut-in procedures on the well. The Permittee may continue to operate the well under flow conditions that maintain a minimum 100 psig pressure differential.
- E. Injection Fluid. The injected wastewater stream may consist of the streams specified in Section III of this Permit. However, with prior written approval from the Department, injection of wastewater streams other than those specified may be allowed if they meet the following conditions:
1. The wastewater stream is compatible to those streams outlined in Section III.
 2. The wastewater is nonhazardous.
 3. The wastewater stream will not interfere with the operation of the facility or its ability to meet Permit conditions.

VII. INJECTION WELL MONITORING

- A. Pressure Gauges. Pressure gauges shall be installed and maintained in proper operating conditions at all times on the injection tubing and on the tubing/long string casing annulus of the wellhead.
- B. Recording Devices. Continuous recording devices shall be installed and maintained in proper operating conditions at all times to record injection tubing pressures, injection flow rates, injection total volumes, and tubing/long string casing annulus pressures.
- C. Mechanical Integrity. The mechanical integrity of the well shall be verified by the continuous monitoring of the tubing/long string casing annulus pressure. An annular pressure test and a temperature survey will be completed at least every five years.
- D. Monitoring. During the first year of operation, a grab sample of injected fluids shall be analyzed monthly for the parameters summarized in List A of Attachment A. If no anomalies are identified during the first year of injection activity, the analysis will be performed at a frequency specified by the Director. All new waste streams will also be tested for the parameters summarized in List A of Attachment A to ensure that the waste is classified as non-hazardous. A waste sample will also be collected from one randomly-selected load entering the facility per quarter; the sample will be analyzed for the parameters summarized in List A of Attachment A.
- E. Chemical Analysis. A complete chemical analysis shall be completed for the waste fluids no later than 14 days following commencement of injection activities to confirm the classification of the waste as non-hazardous. This complete analysis shall include the parameters specified in Lists A and B, summarized in Attachment A. The Director will establish an on-going waste sampling schedule to ensure compliance with this Permit.
- F. Groundwater Monitoring. Secure Energy's onsite industrial water supply well will be sampled on a semi-annual basis; the samples will be analyzed for the parameters specified in List C, Attachment A. The groundwater elevation in the well shall also be measured.

VIII. AMBIENT MONITORING PROGRAM

- A. Pressure Fall-Off Test. Minimum requirements are annual monitoring of the pressure buildup in the injection zone, including a shutdown of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve. The zone of influence to date, the reservoir transmissivity, and the reservoir skin factor shall be calculated and submitted with the results of the pressure fall-off test.

- B. Additional Testing. The Department may also require any additional monitoring, based on a site-specific assessment of the potential for fluid movement from the well or injection zone and on the potential value of monitoring wells to detect such movement.

IX. PROPOSED CHANGES AND WELL WORKOVERS

The Permittee shall give at least two (2) week advance notice to the Department of any planned physical alterations or additions to the permitted well. A major alteration or workover shall be considered any work performed that affects the well casing, packer, or tubing. The notification shall be in writing and shall include plans for the workover. For emergency workover or well service, 24-hour prior notification to the Department will be provided with the proposed work plan also submitted for review.

The Permittee shall provide all records of well workovers, logging, or other test data to the Department as part of the quarterly report for the period in which the activity was completed. The report should include the reason for the workover or change and the details of the work performed.

A demonstration of mechanical integrity (tubing/casing annulus pressure test) shall be performed within thirty (30) days of completion of any change or workover and prior to resuming injection activities.

X. REPORTING

- A. The Permittee shall file quarterly reports within thirty (30) days after the last day of March, June, September, and December of each year. The report should include:
1. Monthly average, maximum and minimum values for injection pressure, injection rate and volume, and annular pressure for the well. The report should include summary graphs of the data collected during the reporting period.
 2. Results of analyses of the injected fluids.
 3. Results of the groundwater monitoring well analyses.
 4. Waste source information. The report should include the entity providing the waste fluids, the source of the waste fluids, the composition of the waste fluids, and the volume of the waste fluids.
 5. A summary of any waste rejections and approval contraventions.

The results of periodic tests of mechanical integrity, annual ambient monitoring, and well workovers shall be submitted as part of the first quarterly report following their completion.

- B. The Permittee shall report orally within twenty-four (24) hours from the time these circumstances are made aware of:
1. Any monitoring or other information which indicates that any contaminant may cause an endangerment to an USDW.
 2. Any noncompliance with a Permit condition or malfunction of the injection system such as loss of mechanical integrity which may cause fluid migration into or between USDWs.

A written report shall follow within five (5) days. The written report shall contain a description of the noncompliance and its causes, the period of noncompliance (including exact date and times), and if the noncompliance has not been corrected, the anticipated time it is expected to continue. Steps should be taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

- C. The Permittee shall report all other instances of noncompliance at the time monitoring reports are submitted. The report shall contain the information listed above.
- D. In the event that the Permittee is placed on a compliance schedule, report of compliance or noncompliance with the requirements of the schedule shall be submitted no later than fourteen (14) days following each schedule date.
- E. If the Permittee becomes aware that he failed to submit any relevant facts in a Permit application or submitted incorrect information he shall promptly submit such facts and information.
- F. The Permittee shall notify the director at least (sixty) 60 days before conversion or abandonment of the disposal well.

XI. RECORDKEEPING

- A. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this Permit, and records of all data used to complete the application for this Permit for a period of at least three (3) years from the date of the sample measurement, report, or application. Records of monitoring information shall include:

1. The date, exact place and time of sampling or measurements.
 2. The name of individual(s) who performed the sampling or measurements.
 3. The date(s) analyses were performed.
 4. The name of the laboratory and individual(s) who performed the analyses.
 5. The analytical techniques or methods used.
 6. The results of such analyses.
- B. The Permittee shall retain all records concerning the nature and composition of injected fluids for five (5) years after completion of plugging and abandonment procedures.
- C. The permittee shall retain all records concerning the source and provider of all injected fluids for five (5) years after completion of plugging and abandonment procedures.

XII. PLUGGING AND ABANDONMENT

- A. Notification. The Permittee shall notify the Department in writing sixty (60) days prior to commencing plugging operations.
- B. Injection Well Closure Plan. The Permittee shall plug and abandon the well in accordance with the Injection Well Closure Plan.

If the Permittee wishes to modify the plugging procedure, he shall furnish the Department the following information:

1. The location of the plugs,
 2. The type of grades and quantity of cement to be used,
 3. The method of placement of the plugs,
 4. The method for insuring static equilibrium in the well prior to the placement of the plugs.
- C. Plugging and Abandonment Report. Within sixty (60) days after plugging the well, the Permittee shall submit a report to the Department. The person who performed the plugging operation shall certify the report as accurate and the report should consist of either (1) a statement that the well was plugged in accordance with the plan, or (2) where actual plugging differed from the plan, a statement that specifies the different procedures followed.

XIII. FINANCIAL RESPONSIBILITY

The Permittee is required to maintain continuous financial responsibility and resources to close, plug, and abandon the injection well as provided in the plugging and abandonment plan. The Permittee has submitted a \$180,000 Surety Performance Bond for the plugging and abandonment of the injection well.

XIV. GENERAL CONDITIONS

- A. **Duty to Comply.** The Permittee must comply with all conditions of this Permit. Any permit noncompliance constitutes a violation of Chapter 33-25-01 of the N.D.A.C. and is grounds for enforcement action; for Permit termination, revocation and reissuance or modification; or for denial of a Permit renewal application.
- B. **Injection Period.** The injection period will be five (5) years from the effective date of this Permit. The Permittee must apply for and obtain a new Permit to continue injection after the expiration date of this Permit.
- C. **Halting or Reducing Injection.** The Permittee must halt or reduce injection if necessary to maintain compliance with the conditions of this Permit.
- D. **Duty to Mitigate.** The Permittee shall minimize or correct any adverse impact on the environment resulting from noncompliance with this Permit.
- E. **Proper Operation and Maintenance.** The Permittee shall at all times properly operate and maintain the well and all related appurtenances. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures.
- F. **Modification, Reissuance, or Termination.** This Permit may be modified, revoked, and reissued or terminated for cause. The filing of a request by the Permittee for a Permit modification, revocation, and reissuance or termination, or a notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any Permit condition.
- G. **Conveyance of Rights.** This Permit does not convey any property rights of any sort or any exclusive privilege.
- H. **Duty to Provide Information.** The Permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this permit. The Permittee shall also furnish to the Department, upon request, copies of records required to be kept by this Permit.

- I. Inspection and Entry. The Permittee shall allow the Department or an authorized representative upon the presentation of credentials to:
 1. Enter upon the Permittee's premises where the well or the records that must be kept under the conditions of this Permit are located.
 2. Have access to and copy, at reasonable times, the records that must be kept under the condition of this Permit.
 3. At reasonable times, inspect the wells and the monitoring and control equipment.
 4. Sample or monitor, at reasonable times, for the purpose of assuring Permit compliance.

- J. Report Certification. All reports or information submitted to the Department under the terms of this Permit shall be signed and certified as follows:
 1. By a principal executive officer of at least the level of vice-president, or a duly authorized representative.
 2. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described above.
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the well.
 - c. The written authorization is submitted to the Department.
 3. If an authorization is no longer accurate because a different individual has responsibility for the overall operation of the wells, a new authorization must be submitted to the Department prior to, or together with, any document signed by an authorized representative.
 4. The person signing the document shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

- K. Reporting on Noncompliance. The Permittee shall give advance notice to the

Department of any planned changes in the operation of the well which may result in noncompliance with Permit requirements.

- L. Transfers. This Permit is not transferable to any person except after information is provided to the Department. The Department may require modification or revocation and reissuance of the Permit to change the name of the Permittee and to incorporate such other requirements as may be necessary under the Safe Drinking Water Act.

DRAFT

ATTACHMENT A

Parameters for Chemical Analysis

List A – Hazardous Waste Classification

Corrosivity by pH
Setaflash Flashpoint
Complete Toxicity Characteristic Leaching Procedure (TCLP)

TCLP Metals

Arsenic
Barium
Cadmium
Chromium
Lead
Mercury
Selenium
Silver

TCLP Pesticides

Endrin
Chlordane
Heptaclor
Heptachor Epoxide
Methoxychlor
Meptachlorepoide
Toxaphene
Lindane

TCLP Herbicides

2,4-D
2,4,5-TP

TCLP Volatile Organic Compounds

Benzene
Carbon Tetrachloride
Chlorobenzene
Chloroform
1,2-Dichloroethane
1,1-Dichoroethylene
Methyl Ethyl Ketone
Tetrachloroethylene
Trichloroethylene
Vinyl Chloride

TCLP Semi Volatile Compounds

Cresol
o-Cresol
m-Cresol
p-Cresol
Pentachlorophenol
1,4-Dichlorobenzene
2,4-Dinitrotoluene
Hexachlorobenzene
Nitrobenzene
Pyridine
2,4,5-Trochlorophenol
2,4,6-Trichlorophenol

List B – General Waste Characterization

Volatile Organic Compounds (VOCs)
Semi Volatile Organic Compounds (SVOCs)
Total Suspended Solids (TSS)
Total Dissolved Solids (TDS)
pH
Specific Gravity
Specific Conductivity
Temperature

Arsenic (dissolved)
Barium (dissolved)
Cadmium (dissolved)
Calcium
Chloride
Total Chromium (dissolved)
Silver (dissolved)
Fluoride

Hardness
Total Organic Carbon (TOC)
Chemical Oxygen Demand (COD)
Turbidity
Sulfate
Sulfite
Nitrogen (Nitrate)
Nitrogen (Nitrite)
Total Kjeldahl Nitrogen
Ammonia (as N)
Viscosity
Alkalinity
Carbonate
Bicarbonate
Aluminum
Bromide
Antimony
Lead 210

Iron
Lead (dissolved)
Magnesium
Cyanide
Copper
Strontium
Manganese (dissolved)
Molybdenum (dissolved)
Nickel (dissolved)
Phosphorus (dissolved)
Potassium (total)
Selenium (dissolved)
Silver (dissolved)
Sodium
Mercury (dissolved)
Zinc (dissolved)
Calcium Carbonate
Radium 226/228

List C – Abbreviated Waste Characterization

pH
Total Dissolved Solids (TDS)
Sulfate
Calcium
Sodium
Chloride
Resistivity

Total Organic Carbon (TOC)
Specific Gravity
Magnesium
Temperature
Potassium
Calcium Carbonate