BW-028

ANNUAL REPORT

2017

ANNUAL CLASS III WELL REPORT FOR 2017

Key Energy Services, Inc. (Key)

State S Brine Station

Permit BW-028

API No. 30-025-33547

May 01, 2018

Submitted by: _____

Rick Graham | Key Energy Services | Environmental Director
o: 713.651.4437 | c: 346.274.5432 | e: rgraham01@keyenergy.com

Prepared By: Wayne Price- Price LLC

505-715-2809
wayneprice@q.com

Bullet Point 2- Summary of Operations:
(Permit Condition 2.J.2 Annual Report: "Summary of Class III well operations for the year including a description and reason for any remedial or major work on the well with a copy of C-103.")

During the 2016 year, The OCD requested a cavern MIT, and after some issues that caused Key to cease operations temporarily, operations were resumed in 2017. See ***Bullet Point 6*** for additional detail information.

General housekeeping was routinely performed and daily on-site visits were conducted to ensure permit conditions are maintained.

Key Energy has a Web based monitoring and automation system at this site. This system monitors all equipment, fluid levels, and driver access. The integrated Control System (ICS) system also sends out alarms to personnel via text or Email, as well as, allows users to monitor and control remotely via the WWW.

Yearly cavity size calculations were analyzed to determine cavern size and stability. The calculated cavern radius grew about one foot this year, from 78 feet to 79 feet, for an estimated worst-case maximum diameter of 158 ft.

The "Area of Review" was up-dated and is described in detail below. The cavern subsidence monitors were surveyed and only very minor variation was noted.

Included in ***Appendix G*** is a copy of the Approved Discharge Permit for reference.

Bullet Point 3- Production Volumes:

(Permit condition 2.J.3 "Monthly fluid injection and brine production volume, including the cumulative total carried over each year"

Key has an electronic card system that tracks sales of both fresh and brine water. In addition, Key has Halliburton flow meters on the well to monitor both water injected and brine produced. The operator reads these flow meters daily. The meters are not currently connected to the ICS system.

Monthly, Yearly and Lifetime Injection and Production Volumes:

The monthly, yearly and lifetime fresh water injection and brine production volumes are attached herein for review in ***Appendix A*****.** The total 2017 brine production volume was 220,196 bbl. and the lifetime production volume is 5,514,464 bbl.

Bullet Point 4- "Injection Pressure Data."

(Permit condition 2.J.4 "Injection Pressure Data"

A new submersible centrifugal injection pump was installed in the fresh water storage tank in the 2014 year. The system has an automatic shut-down switch set at 224 psig.

For this reason, permit condition 3.B.2. **Pressure Limiting Device:** *"The operator shall have a working pressure limiting device or controls to prevent overpressure."* is conditionally met.

The average injection pressure is noted by Key's personal and is reported to range from 182 psig to 195 psig, This reading is taken either from a pressure gauge mounted on the wellhead inlet, and/or can be from the ICS.

Bullet Point 5- Chemical Analysis:

(Permit condition 2.J.5 "A copy of the quarterly chemical analysis shall be included with data summary and all QA/QC information.")

Please find attached in ***Appendix B*** the quarterly chemical analysis and chain-of-custody of the brine and fresh water injection water samples, collected for the annual report. The laboratory used common approved EPA methods to analyze and reporting.

The first two quarters of 2017 has the fresh water results in tabulated form, but the Brine Water analysis was not supplied. It appears the brine water analysis may have been ran, but due to an unexpected turnover in the Key Environmental Division personnel, these results were not readily available for the 2017 report.

Fresh and Brine water samples were collected in June, July, October and November of 2018 and are included in **Appendix** B.

Special Note: The identification of fresh water samples was inadvertently referred to as "Fresh Water Well". Key does not have fresh water wells at this site, as the water is supplied from the City of Eunice, NM's fresh water supply pipeline.

The analysis revealed the brine water is predominately sodium chloride with a density of 1.20 specific gravity, which equates to normal 10 lb brine water. This analysis is very representative of Salado "Salt" formation waters found in the area.

Key Energy routinely performs field-testing to ensure brine well quality. This testing generally shows close to 10 lb brine using the field method.

The June 2017 brine water analysis appears to have been inadvertently labeled fresh water by another party. (Price LLC flagged this out on the report)

The July 2017 results were skewed as Key had shut down their well to investigate some fresh water quality issues. None were found. This may have been due to improper sampling location, or an anomaly in the fresh water supply.

Bullet Point 6- Mechanical Integrity:

(Permit condition 2.J.6 "Copy of any mechanical integrity test chart, including the type of test, i.e., duration, gauge pressure, etc;")

On or about late November or early December of 2016, a cavern MIT was attempted and some issues were experienced. The well apparently would not pressure up to the required 300 psig as normally required by the OCD. In addition, once the pumping was halted, it was noted the well pressure dropped substantially overnight.

The OCD requested Key to shut-in the well with a concern the well cavern may have been fractured or there was a casing leak.

As a result, OCD required Key to pull the tubing and run standard 30-minute casing test, which was performed on December 27, 2016.

The test was successful and approved by OCD. OCD then required Key to perform a cavern test to determine if the cavern had mechanical integrity.

On February 2, 2017, Key ran a 4-hour Cavern pressure test at an approved reduced test pressure of 220 psig. The test passed and OCD approved Key to continue brine well operations.

Key will continue to evaluate and collect information pertaining to the well issue.

As noted above, a 4-hour Cavern Mechanical Integrity Test (MIT) was successfully ran and passed on February 02, 2017 and subsequently approved by OCD.

The next five-year test will be scheduled for November of 2021, unless otherwise required by OCD for good cause shown, or permit condition requirements.

Please find in ***Appendix "D"*** a copy of the approved C-103s, test charts with meter calibration notes, and documentation of the MIT process.

Recommendations: *Key Energy recommends that when running a cavern formation test in the future, both parties, Key and OCD agree upon a pressure that will not exceed the fracture pressure of the cavern.*

It appears that since the agency (OCD) requested the flow in the well to go back to normal flow (fresh water down the tubing, and brine water up the casing),

neither party may not have taken into account the additional pressure exerted by the heavier fluid in the casing during testing.

While there is some confusion on Key's part as to whether OCD required Key to go to a pressure that was used in the past is really a mute point, as the normal 300 psig required on the casing appears to exceed the frac pressure of this well.

Key also requests that OCD continue to be flexible in allowing the cavern test to be under 300 psig, and a pressure not to exceed the frac pressure when using fluids as the pressure media, or to allow other media such as gas (Nitrogen) to perform the test if 300 psig is required.

Key wants to point out this last test cost Key Energy several thousands of dollars in trying to re-enter the well after the required Casing MIT. The workover unit was on the well for eleven days (11) trying to re-establish production.

Key should place a sign on the well indicating maximum pressures.

Bullet Point 7- Deviations from Normal Production Methods:

(Permit condition 2.J.7 "Brief explanation describing deviations from normal operations.")

In 2008 two OCD permitted brine wells collapsed. As a result of those incidents, the OCD issued a temporary moratorium on new brine well permits. During the moratorium OCD facilitated a work group to determine a proper path forward for current and new brine well operations.

As a result of those proceedings, OCD issued instructions to operators to change OCD's previous requirement of injecting fresh water down the annulus and producing brine up the tubing; to injecting fresh water down the tubing and producing brine up the annulus.

On June 1, 2009 Key followed OCD instructions and change the flow pattern. It should be noted that it took over a month in order to obtain 10# brine.

During the 2017 year, Key continued the normal flow production procedure and encountered no problems during this time.

Bullet Point 8- Leak and Spill Reports:

(Permit condition 2.J.8 "Results of any leaks and spill reports;")

The brine station is designed with an impermeable liner under the brine tanks and loading pads. The concrete loading pads are designed to catch de-minimus drips from hose connections and are piped to two 250 bbl fiberglass tanks. This liquid material is routinely re-cycled or disposed of at an OCD approved site.

Rainwater that collects inside of the lined bermed area is routinely pumped out and re-cycled or disposed of at an OCD approved site. Small quantities of rainwater, which cannot be pumped are left to evaporate.

The entire facility is bermed to prevent run-on or run-off. Any reportable or non-reportable spill is cleaned up pursuant to OCD rules and guidance.

Bullet Point 9- Area of Review Update Summary:

(Permit condition 2.J.9 "An Area of Review (AOR) update summary;")

An extensive AOR review was conducted for the Key Eunice "Old GoldStar" brine well, OCD permit # BW-28, located in UL E (1340 FNL & 330 FWL) of Section 15-Ts21S-R37E. Key used OCD records and field verification to confirm wells in the AOR.

Using OCD on-line files, a well status list and aerial AOR plot plan has been constructed **(*see Appendix C*)** listing all wells within adjacent quarter sections of the BW-28 location. The list shows API#, Operator well name, UL, Section, Township and Range, footages, wells within 800 ft and ¼ mile, well checked for casing program status, casing/cementing status, and corrective action required status.

There are a total of 44 wells located within these adjacent units, with no wells added in 2017. Within a ¼ mile radius of the brine well there are 18 wells, and 4 wells are actually within the 800- foot critical radius.

This comprehensive list was formulated to provide a baseline for future AOR studies. Since any future brine wells may be limited in size, a critical AOR was established, and all wells within that radius will be researched in greater detail.

The rational of this approach is the fact that brine wells are non-static in terms of size and configuration and the fact that Key has no direct control on wells drilled in close proximity. By just initially focusing on the current wells in the ¼ mile AOR and assuming the status of these wells will remain the same could be a mistake.

Therefore, Key is taking a more dynamic approach and will study wells as the brine well grows, especially wells in the critical zone. We used the current estimated diameter of the brine well i.e. 158 ft (r = 79.0 ft) up-dated for 2017, and added a 10:1 safety factor which equates to about 790 ft. As the brine well grows, the critical AOR will be expanded and new wells will be added.

All four wells located in the critical zone were reinvestigated by checking the OCD on-line well records. They are identified as API# 30-025-09914, 30-025-09913 (P&A), 30-025-06586, and 30-025-39277. (Checked by Price LLC, April 11, 2018).

In late November and early December of 2016, Apache performed a well workover on its WBDU Unit #113 API (30-025-39277). The work included several high-pressurized acid jobs in the well bore. This well is located in the Key brine well critical zone and is approximately 500-600 feet apart. Included in ***Appendix C*** is an aerial photo showing the proximity of the two wells.

Recommendations: Key should notify Apache that their well is located in our critical AOR.

Bullet Point 10- Subsidence/Cavern Volumes/Geometric Measurements

(Permit condition 2.J.10. "A summary with interpretations of MIT's, surface subsidence surveys, cavern volume and geometric measurements with conclusion(s) and recommendation(s);")

The last cavern survey did not provide adequate information pertaining to the size of the cavern. This has been an issue with many brine wells and until the validity of using sonar test is resolved, an alternate method will be employed.

This alternate method has been discussed with Jim Griswold-OCD and it was mutually decided that an estimated worst-case diameter was to be determined in order to provide maximum protection and ensure the permit conditions are being met.

The Solution Mining Research Institute (SMRI), other state agencies, OCD work-group, along with various studies conducted during the permitting of the WIPP site, has concluded that failures, such as "catastrophic collapses", have a higher probability when the roof diameter of the cavern exceeds a certain value compared to the actual depth of the cavern. This number is typically called D/H where "D" is the diameter of the cavity and "H" is the depth from surface to the casing shoe. Various reports seem to conclude that when a ratio of D/H reaches or exceeds 0.66 then the probably of collapse increases to a point that the well may be considered un-safe, thus closing procedures, such as proper plugging and abandonment, and possible long term subsidence monitoring should be considered.

The alternate method mentioned above involves calculating the maximum diameter of the cavern by using a worst-case scenario of an ***"inverted cone" i.e. base located at the top***.

The cavern volume is calculated using the lifetime brine production volume and multiplying it by a *"rule of thumb"* conversion factor to determine the volumetric size of the cavern. The rule of thumb conversion factor was taken from the 1982 Wilson Report, which equates that every barrel of brine produced, will create approximately one cubic foot of cavity.

Please find attached in ***Appendix H***, a wellbore sketch depicting the volume calculations for the brine well, and the lifetime brine production tally of approximately 5.514 million barrels of brine produced as of December 2017. The

maximum diameter was calculated to be approximately 158 feet with a corresponding D/H ratio of 0.11, updated for the 2017 year.

Comparing the current D/H ratio of 0.12 to the 0.66 value mentioned above, it can be concluded that the current brine well status meets and exceeds the recommended safety value by five times.

Permit Condition 2.B. SOLUTION CAVERN MONITORING PROGRAM:

1. Surface Subsidence Monitoring Plan: The Permittee shall submit a Surface *Subsidence Monitoring Plan to OCD within 180 days of the effective data of this permit. The Surface Subsidence Monitoring Plan shall specify that the Permittee will install at least three survey monuments and shall include a proposal to monitor the elevation of the monuments at least semiannually.*

The Permittee shall survey each benchmark at least semiannually to monitor for possible surface subsidence and shall tie each survey to the nearest USGS benchmark. The Permittee shall employ a licensed professional surveyor to conduct the subsidence-monitoring program. The Permittee shall submit the results of all subsidence surveys to OCD within 15 days of the survey. If the monitored surface subsidence at any measuring point reaches 0.10 feet compared to its baseline elevation, then the Permittee shall suspend operation of the Class III well . If the Permittee cannot demonstrate the integrity of the cavern and well to the satisfaction of OCD, then it shall cease all brine production and submit a corrective action plan to mitigate the subsidence.

Key Response: Please find enclosed in "**Appendix E**" a copy of the 2017 subsidence monitoring report. There was one slight deviation of .01" (up) observed on one of the monitoring points. Key will continue to monitor and if any trend is noted, will notify OCD.

Special Note: Key ***requested a Minor Modification*** that allows the results be supplied in the annual report, unless there is an exceedance, as noted in the permit. OCD approved the modification and the approval is included in **"Appendix E".**

2. Solution Cavern Characterization Program: *The Permittee shall submit a Solution Cavern Characterization Plan to characterize the size and shape of the solution cavern using geophysical methods within 180 days of the effective date of this permit. The Permittee shall characterize the size and shape of the solution cavern using a geophysical methods approved by OCD at least once before November 8, 2018. The Permittee shall demonstrate that at least 90% of the calculated volume of salt removed*

based upon injection and production volumes has been accounted for by the approved geophysical method(s) for such testing to be considered truly representative.

Solution Cavern Characterization Plan: Key proposed to use a combination of calculated results as determined above, and will experiment with various geophysical methods, including actually performing an "Induced Current Method" and report these results in the annual report.

The 'Induced Current" Method has not been totally successful, primarily to bad connections; low DC voltage used, capacitance effect, and ground interference. Key will investigate other methods and consult with OCD on this issue. The old fashion cavern calculation continues to be the best economic method available.

Special Note: In an E-mail dated April 3, 2018 OCD (Mr. Carl Chavez Environmental Engineer) notify Wayne Price LLC that a study group was not being planned, but OCD is now accepting the Cone Calculation method when an additional well log is supplied supporting the calculation. OCD sent an example and is included in **Appendix "H"**.

Since the BW-28 well never had any logs run, a well log was obtained from a nearby well and annotated to reflect the geophysical characterization of the area lithology. In addition a mass balance has been calculated and the results are included in **Appendix 'H"**.

The mass balance compares the measured salt removed to the calculated salt removed. The comparison was within 9%, which satisfies permit condition 2.

Key would like to point out that the OCD example showed a cone with the base at the bottom, while Key has always used a cone with the base inverted to present the Worst Case analysis of a roof collapse.

Both methods will work, but the D/H critical calculation has to use the inverted base to obtain the proper D/H ratio.

Bullet Point #11- Ratio of Injected/Produced Fluids

(Permit condition 2.J.11 "A summary of the ratio of the volume of injected fluids to the volume of produced brine;")

Enclosed in ***Appendix A*** is the tables section of the report showing the injection and production data and the comparison chart of injected water to produced water with comments.

The 2017 results show a somewhat normal 105.6% variance, while the total variance during the life of the well is 106.0%.

Special Note: **Key Energy requests a minor modification of the permit**

requirement 3.K *"The Permittee shall suspend injection if the monthly injection volume is less than 110% or greater than 120% of associated brine production. If such an event occurs, the Permittee shall notify OCD within 24 hours."*

*And a **Minor Modification** to permit requirement 2.B.2.b, which has similar language to above, but sets a variance between 90% to 110%. This requirement seems to fit the Key BW-28 better, but there are still times that the monthly variance can be out side of this range, while there is no immediate issue at hand.*

Generally the Annual variance does fall into the 90%-110% range.

Dear Jim Griswold-NMOCD Environmental Bureau Chief and Carl Chavez Environmental Engineer.

As you know, this topic has been discussed and kicked around for a long time. The current permit requirements do not take into account many factors that can cause the normal variance to be under or over the requirement of 110%-120% and outside of the range of 90% to 110%, notwithstanding some anomaly.

The theoretical 115% ratio came about using the rule of thumb from the "Old Wilson" report that 1 barrel of 10 lb. brine causes a cavity increase of approximately one cubic foot. If you back calculate, this equates to a salt density of about 90 lbs./ft3.

Many deeper brine wells such as the Key BW-28 will probably has a higher salt density, possibly even up to 100-120 lbs./ft3. Thus, it requires less fresh water to make 10 lb. brine water, which lowers the Fresh Water/Brine Water ratio.

As long as the brine well can make a quality brine and does not experience any unexpected loss in pressure, the requirement to suspend operations is not based on any real parameter or trend that may be an immediate threat to the well, groundwater or the environment. The current requirement puts some operators in a continuous violation and interruption of operations.

Of course notwithstanding, if you have a well that produces for extended periods of time, or starts to pressure up, then you know you may have communicated to a pressure zone, or, if the well loses circulation and/or pressure, then immediate action should be taken and notification to the agency made.

The point to be made here is that the permit required parameters are a trailing indicator not a leading indicator. Of course a continued pattern that deviates from the statically norm (emphasis on norm for a particular well) would be cause for concern. However, this concern may or may not, be an indication of possible collapse, which appears to be OCD's main emphasis for the monitoring.

Currently the permit could reads as follows:

The Permittee shall immediately suspend injection and notify the agency within 72 hours, if the Fresh Water Injection does not cause a normal immediate return of Brine Water to the surface, or if the well flows excessively for an unusual amount of time without fresh water injection after the cavern pressure has been stabilized to it's normal operating pressure, or if permittee has become aware of any out of zone injection or communication. The Permittee shall include in each annual report a summary showing the monthly variance, the average monthly variance for the year and the total accumulative variance over the life of the well. The operator shall certify and explain that any yearly variance that falls outside of the range of 20%, (Difference between the normal ratio of Fresh Water input and Brine Water output) will not cause harm to Fresh Water, Public Health or the Environment.

The point here is that each operator should determine the normal range for their specific well and relay that to the agency in the annual report.

Bullet Point #12- Summary of Activities

(Permit condition 2.J.12 "A summary of all major Facility activities or events, which occurred during the year with any conclusions and recommendations;)

See Bullet Point #2 for summary.

5.B. BONDING OR FINANCIAL ASSURANCE: *The Permittee shall submit an estimate of the minimum cost to properly close, plug and abandon its Class III well, conduct ground water restoration if applicable, and any post-operational monitoring as may be needed (see 20.6.2.5210B(17) NMAC) within 90 days of permit issuance (See 20.6.2.5210B(17) NMAC). The Permittee's cost estimate shall be based on third person estimates. After review, OCD will require the Permittee to submit a single well plugging bond based on the third person cost estimate.*

Appendix "F" contains a third party closure estimate for the Eunice BW-28 brine well.

Bullet Point #13- Annual Certification

(Permit condition 2.J.13 "Annual Certification in accordance with Permit Condition 2.B.3. ***"2.B.3. Annual Certification:*** *The Permittee shall certify annually that continued salt solution mining will not cause cavern collapse, surface subsidence, property damage, or otherwise threaten public health and the environment, based on geologic and engineering data.")*

Operator Response: Based on all current information and actual on-site observance, the operator of record herby certifies that the current operations pose no threat to public health and the environment at the submission of this report. If any substantial event that, has or may cause, this current certification to change, then the operator will notify OCD and take the necessary actions to protect the public and environment.

By signing the cover sheet of Bullet Point 1 of permit condition 2.J.1, the operator hereby certifies this condition of the permit.

Bullet Point 14- Groundwater Monitoring:
(Permit condition 2.J.14 "A summary of any new discoveries of ground water contamination with all leaks, spills and releases and corrective actions taken;")

The BW-28 facility does not have groundwater monitoring at this site. There are no planned or intentional discharges of water contaminants that may move directly or indirectly into groundwater. Any unintentional discharge, leak, spill, or drip is handled pursuant to the permit conditions.

Bullet Point 15- Annual Reporting

(Permit condition 2.J.15 "The Permittee shall file its Annual Report in an electronic format with a hard copy submitted to OCD's Environmental Bureau.")

The operator hereby submits a PDF file on flash drive and can supply a hard copy upon request.

Appendix A-

- Production Table &
  Injection Comparison Chart

TABLE 1

TABLE 1 BW-28 Annual Report Brine Well Production Volumes and Lifetime History Volumes

Year	Month	Reported Monthly Brine Production	Quarterly Brine Production (bbls)	Annual Brine Production (bbls)	Reported Monthly Freshwater Injection (bbls)	Quarterly Freshwater Injection (bbls)	Annual Freshwater Injection (bbls)	Comments	Operator
1996	October	10,588			10,588				Goldstar SWD
	November	17,770			17,743				
	December	32,223	60,581	60,581	33,004	61,335	61,335		
1997	January	20,194			20,445			estimate (1)	
	February	20,194			20,445			estimate (1)	
	March	20,194	60,582		20,445	61,335		estimate (1)	
	April	48,226			47,714				
	May	38,000			36,571				
	June	47,970	134,196		42,264	126,549			
	July	24,711			24,271				
	August	31,817			31,559				
	September	38,120	94,648		38,697	94,527			
	October	27,462			25,512				
	November	26,618			26,261				
	December	16,137	70,217	359,643	15,850	67,623	350,034		
1998	January	13,301			13,614				
	February	47,212			49,552				
	March	42,337	102,850		44,964	108,130			
	April	27,072			27,519				
	May	18,084			18,161				
	June	26,699	71,855		26,976	72,656			
	July	16,535			15,929				
	August	8,287			7,488				
	September	9,994	34,816		9,021	32,438			
	October	13,312			17,302				
	November	9,822			9,873				
	December	8,287	31,421	240,942	9,497	36,672	249,896		
1999	January	4,026			4,607				
	February	6,867			8,138				
	March	5,641	16,534		6,030	18,775			
	April	7,873			7,338				
	May	34,100			32,461				
	June	20,708	62,681		20,171	59,970			
	July	35,278			34,566				
	August	35,876			35,995				
	September	43,196	114,350		42,724	113,285			
	October	9,700			10,097				
	November	8,383			9,080				
	December	28,662	46,745	240,310	29,721	48,898	240,928		
2000	January	65,492			65,028				
	February	37,709			36,909				
	March	40,409	143,610		40,414	142,351			
	April	20,181			20,404				
	May	52,092			50,373				
	June	41,371	113,644		37,776	108,553			
	July	33,860			31,757				
	August	37,535			35,492				
	September	58,042	129,437		53,288	120,537			
	October	28,777			27,216				
	November	22,677			24,130				
	December	17,670	69,124	455,815	17,369	68,715	440,156		
2001	January	32,427			37,083				
	February	17,493			23,076				
	March	34,050	83,970		33,216	93,375			
	April	32,900			36,064				Change to Yale E. Key
	May	66,724			52,555				
	June	37,607	137,231		42,347	130,966			
	July	16,399			15,588				
	August	10,173			33,664				
	September	16,185	42,757		16,200	65,452			
	October	25,184			24,147				
	November	10,447			8,666				
	December	21,061	56,692	320,650	18,733	51,546	341,339		
2002	January	11,809			10,135				
	February	22,700			23,733				
	March	4,693	39,202		4,369	38,237			
	April	15,160			16,776				
	May	16,321			17,283				
	June	13,938	45,419		15,276	49,335			
	July	8,301			10,688				
	August	7,079			6,842				
	September	18,560	33,940		17,240	34,770			
	October	7,040			7,823				
	November	9,788			10,950				
	December	11,666	28,494	147,055	19,667	38,440	160,782		
2003	January	20,278			23,526				
	February	8,603			5,310				
	March	37,680	66,561		35,548	64,384			
	April	31,782			31,619				
	May	17,767			13,305				
	June	10,733	60,282		9,260	54,184			
	July	27,104			13,927				
	August	9,555			7,197				
	September	7,945	44,604		5,056	26,180			
	October	12,014			10,394				
	November	26,100			12,438				
	December	38,748	76,862	248,309	18,218	41,050	185,798		
2004	January	7,980			8,539				
	February	8,130			8,797				
	March	8,220	24,330		8,894	26,230			
	April	29,898			31,931				
	May	14,233			15,428				
	June	28,716	72,847		30,410	77,769			
	July	1,840			2,060				
	August	29,898			30,201				
	September	20,277	52,015		20,266	52,527			
	October	24,436			23,784				
	November	21,925			22,430				
	December	32,225	78,586	227,778	33,630	79,844	236,370		
2005	January	17,873			19,160				
	February	23,929			24,958				
	March	37,896	79,698		40,435	84,553			
	April	29,882			31,794				
	May	39,575			42,385				
	June	22,766	92,223		23,995	98,174			
	July	7,593			7,640				
	August	31,573			29,316				
	September	47,305	86,471		48,230	85,186			
	October	38,571			51,232				
	November	31,533			27,670				
	December	36,430	106,534	364,926	36,412	115,314	383,227		

TABLE 1

TABLE 1 BW-28 Annual Report Brine Well Production Volumes and Lifetime History Volumes

Year	Month	Reported Monthly Brine Production	Quarterly Brine Production (bbls)	Annual Brine Production (bbls)	Reported Monthly Freshwater Injection (bbls)	Quarterly Freshwater Injection (bbls)	Annual Freshwater Injection (bbls)	Comments	Operator
2006	January	18,480			19,977				
	February	33,250			35,511				
	March	39,492	91,222		38,630	94,118			
	April	40,194			43,605				
	May	51,009			54,630				
	June	22,374	113,577		24,832	123,067			
	July	38,208			37,613				
	August	35,627			36,201				
	September	48,784	122,619		47,312	121,126			
	October	50,375			51,232				
	November	26,084			27,670				
	December	8,224	84,683	412,101	10,202	89,104	427,415		
2007	January	31,540			33,320				
	February	24,313			25,260				Change to Key Energy Services
	March	40,514	96,367		38,412	96,992			
	April	34,095			35,120				
	May	19,308			23,130				
	June	9,170	62,573		11,009	69,259			
	July	30,857			28,468				
	August	12,394			18,884				
	September	25,970	69,221		23,360	70,712			
	October	7,882			7,643				
	November	2,476			2,630				
	December	3,933	14,291	242,452	4,528	14,801	251,764		
2008	January	1,706			1,982				
	February	5,845			6,203				
	March	21,386	28,937		21,673	29,858			
	April	25,787			22,704				
	May	17,100			19,842				
	June	16,598	59,485		17,479	60,025			
	July	32,458			36,448				
	August	37,458			38,377				
	September	39,945	109,861		37,203	112,028			
	October	25,572			26,551				
	November	27,325			25,792				
	December	26,825	79,722	278,005	28,694	81,037	282,948		
2009	January	20,990			21,310				
	February	650			1,306				
	March	3,249	24,889		3,420	26,036			
	April	5,428			5,360				
	May	1,343			1,762				
	June	630	7,401		1,232	8,354			
	July	1,546			1,673				
	August	881			1,031				
	September	2,672	5,099		2,930	5,634			
	October	9,898			8,861				
	November	3,716			3,618				
	December	1,474	15,088	52,477	2,035	14,514	54,538		
2010	January	0			0				
	February	1,650			1,810				
	March	4,092	5,742		4,789	6,599			
	April	5,092			6,150				
	May	12,256			14,953				
	June	2,099	19,447		2,033	23,136			
	July	5,068			6,322				
	August	10,270			15,126				
	September	11,281	26,619		10,334	31,782			
	October	7,575			8,802				
	November	20,304			24,494				
	December	36,765	64,644	116,452	44,153	77,449	138,966		
2011	January	44,126			52,975				
	February	24,388			29,666				
	March	19,421	87,935		23,284	105,925			
	April	18,356			22,365				
	May	9,828			11,754				
	June	15,661	43,845		18,902	53,021			
	July	17,503			20,961				
	August	14,401			17,273				
	September	5,430	37,334		16,000	54,234			
	October	11,359			8,284				
	November	18,585			19,662				
	December	23,228	53,172	222,286	27,806	55,752	268,932		
2012	January	21,570			25,897				
	February	12,230			14,854				
	March	10,124	43,924		12,190	52,941			
	April	18,185			22,110				
	May	23,761			28,667				
	June	31,207	73,153		37,707	88,484			
	July	20,931			25,225				
	August	31,025			35,837				
	September	29,414	81,370		34,226	95,288			
	October	17,507			21,138				
	November	28,038			33,360				
	December	23,015	68,560	267,007	25,205	79,703	316,416		
2013	January	16,097			21,395				
	February	17,379			20,812				
	March	14,816	48,292		21,978	64,185			
	April	19,374			23,799				
	May	23,932			25,979				
	June	34,926	78,232		38,500	88,278			
	July	18,446			22,414				
	August	29,958			35,877				
	September	16,923	65,327		20,230	78,521			
	October	22,409			25,868				
	November	14,139			16,972				
	December	24,920	61,468	253,319	29,762	72,602	303,586		
2014	January	31,460			35,865				
	February	38,614			45,444				
	March	43,210	113,284		50,710	132,019			
	April	36,217			44,597				
	May	45,170			54,007				
	June	24,524	105,911		23,748	122,352			
	July	19,428			20,442				
	August	15,545			24,683				
	September	23,652	58,625		26,341	71,466			
	October	5,692			7,057				
	November	10,914			13,136				
	December	15,966	32,572	310,392	17,466	37,659	363,496		
2015	January	28,665			30,266				
	February	26,229			29,541				
	March	24,106	79,000		29,666	89,473			

TABLE 1

TABLE 1 BW-28 Annual Report Brine Well Production Volumes and Lifetime History Volumes

Year	Month	Reported Monthly Brine Production	Quarterly Brine Production (bbls)	Annual Brine Production (bbls)	Reported Monthly Freshwater Injection (bbls)	Quarterly Freshwater Injection (bbls)	Annual Freshwater Injection (bbls)	Comments	Operator
	April	19,087			24,034				
	May	19,573			22,921				
	June	27,070	65,730		32,555	79,510			
	July	34,975			39,132				
	August	19,234			23,879				
	September	16,952	71,161		20,455	83,466			
	October	23,972			25,739				
	November	18,722			21,557				
	December	13,942	56,636	272,527	17,412	64,708	317,157		
2016	January	15,897			18,182				
	February	15,649			17,434				
	March	10,759	42,305		12,095	47,711			
	April	8,608			9,575				
	May	12,202			14,032				
	June	19,354	40,164		20,745	44,352			
	July	20,725			23,809				
	August	20,410			22,859				
	September	18,278	59,413		21,020	67,688			
	October	24,944			28,521				
	November	22,899			25,928				
	December	11,516	59,359	201,241	13,940	68,389	228,140	Ratio FW/BW	
2017	January	21,709			23,795			109.61%	
	February	11,551			14,531			125.80%	
	March	20,673	53,933		21,931	60,257		106.09%	
	April	29,467			30,958			105.06%	
	May	26,817			27,209			101.46%	
	June	15,463	71,747		18,156	76,323		117.42%	
	July	800			1,428			178.50%	* System Shut Down to Check Water Quality
	August	7,743			6,228			80.43%	*
	September	6,279	14,822		4,357	12,013		69.39%	*
	October	23,253			24,108			103.68%	
	November	24,204			27,380			113.12%	
	December	32,237	79,694	220,196	32,445	83,933	232,526	105.60%	Monthly/Year End Average Average
				5,514,464			5,835,749	106%	Total Average

Appendix B - Chemical Analysis

Fresh Water Testing Data
New Mexico Brine Station

State # 1 Brine Station. Eunice NM

Special Note: Key Energy BW-28 State S Brine Station does not have a fresh water well. Water is supplied by the City of Eunice, NM's fresh water pipeline.
By: Price LLC April 11, 2018.

State # 1 Brine Station Aka State S

Permit issued on: Nov 8, 2013

2 Water Wells. Fresh Water Well and Brine Water Well

Quarterly sampling for both wells

API #	30-025-33547	
Discharge Permit Number:	BW - 28	

State S - Fresh Water Well Monitoring

Quarter	Na-	Cl-	TDS
Q3 2015	50.5	57.3	404
Q4 2015	-	-	-
Q1 2016	46.7	65.6	414
Q2 2016	-	-	413
Q3 2016	40.9	22.2	391
Q4 2016	80.7	122	514
Q1 2017	51.5	68.8	452
Q2 2017	389	691	1480

e-Hardcopy 2.0
Automated Report

Technical Report for

Key Energy

STATE S Brine Station

SGS Accutest Job Number: TD5345

Sampling Date: 06/16/17

Report to:

Key Energy
6 Desota Drvie Suite 4300
Midland, TX 79705
mcoligan@keyenergy.com; lucas.middleton@soudermiller.com

ATTN: Ana Ramirez

Total number of pages in report: **26**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Richard Rodriguez
Laboratory Director

Client Service contact: Electa Brown 713-271-4700

Certifications: TX (T104704220-17-27) AR (14-016-0) AZ (AZ0769) FL (E87628) KS (E-10366) LA (85695/04004) NJ (TX010) OK (2016-170) VA (8999)

Table of Contents

Sections: 1 2 3 4 5 6 7

Sample Summary

Key Energy

STATE S Brine Station

Job No: TD5345

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
TD5345-1	06/16/17	09:35		06/24/17	AQ	Water	FRESH WATER WELL

Special Note: It appears this water was inadvertently labeled “Fresh” it appears to be high quality Brine Water. By Price LLC April 11, 2018.

Summary of Hits

Job Number: TD5345
Account: Key Energy
Project: STATE S Brine Station
Collected: 06/16/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
TD5345-1	**FRESH WATER WELL**					
Sodium [a]		59700000	50000		ug/l	SW846 6010B
Chloride		170000	10000		mg/l	EPA 300
Solids, Total Dissolved [b]		292000	1000		mg/l	SM 2540C-2011

(a) Analysis performed at SGS Accutest, Lafayette, LA.
(b) Sample received outside the holding time.

Sample Results

Report of Analysis

Special Note: It appears this water was inadvertently labeled “Fresh” it appears to be high quality Brine Water. By Price LLC April 11, 2018.

SGS Accutest

Report of Analysis

Client Sample ID:	FRESH WATER WELL		
Lab Sample ID:	TD5345-1	**Date Sampled:**	06/16/17
Matrix:	AQ - Water	**Date Received:**	06/24/17
		Percent Solids:	n/a
Project:	STATE S Brine Station		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	59700000	50000	ug/l	100	06/27/17	06/28/17	ALA	SW846 6010B [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA8234
(2) Prep QC Batch: L:MP8370

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	FRESH WATER WELL		
Lab Sample ID:	TD5345-1	**Date Sampled:**	06/16/17
Matrix:	AQ - Water	**Date Received:**	06/24/17
		Percent Solids:	n/a
Project:	STATE S Brine Station		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	170000	10000	mg/l	20000	06/27/17 14:31	ES	EPA 300
Solids, Total Dissolved [a]	292000	1000	mg/l	1	06/26/17	MS	SM 2540C-2011

(a) Sample received outside the holding time.

Special Note: It appears this water was inadvertently labeled “Fresh” it appears to be high quality Brine Water. By Price LLC April 11, 2018.

RL = Reporting Limit

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

CHAIN OF CUSTODY

SGS ACCUTEST

10165 Harwin Dr, Ste 150 Houston, TX 77036
TEL. 713-271-4700 FAX: 713-271-4770
www.accutest.com

PAGE ___ OF ___

FED-EX Tracking #: | Bottle Order Control #:
SGS Accutest Quote #: | SGS Accutest Job #: TD5345

Client / Reporting Information

Company Name: Key Energy Services
Street Address: 6 Desta Dr.
City: Midland State: TX Zip: 79705
Project Contact: cramirez81@keyenergy.com E-mail:
Phone #: 432-571-7903 Fax #:
Sampler(s) Name(s): Ana Ramirez Phone #:

Project Information

Project Name: State S Brine Station
Street:
City: Eunice State: NM
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)

Company Name:
Street Address:
City: State: Zip:
Attention:

Requested Analyses

TDS, Na, Cl -

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL- Sludge; SED-Sediment; Oil - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB-Field Blank

SGS Accutest Sample #	Field ID / Point of Collection	Collection: Date	Time	Sampled By	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	ZnAc/NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	TSP	NaHSO4	ENCORE	OTHER	LAB USE ONLY
1	Fresh Water Well	06/16/17	9:35am	AR	W	2												X	X

TAGGED BY: _____

VERIFIED BY: _____

Turnaround Time (Business days)

- [ ] Standard
- [ ] 5 Day *RUSH*
- [ ] 4 Day *RUSH*
- [ ] 3 Day *RUSH*
- [ ] 2 Day *RUSH*
- [ ] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULT1 (Level 3+4)
- [ ] REDT1 (Level 3+4)
- [ ] Commercial "C"
- [ ] TRRP
- [ ] EDD Format
- [ ] Other _____

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
Commercial "C" = Results + QC & Surrogate Summary

Form: SM021-0

Comments / Special Instructions

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Date Time:	Relinquished By:	Date Time:	Received By:	Date Time:
1	Ana Ramirez	06/23/17 14:04	Jason Fisher 6/23/17	14:00	2 Jason Fisher 6/23/17	16:00	2 Fed Ex	
3	Fed Ex		Jason Fisher 6/24/17	1020	4		4	
5	Relinquished by:	Date Time:	Received By: 5	Date Time:	Custody Seal #	Intact / Not intact	Preserved where applicable	On Ice ✓ Cooler Temp. 2.0

TD5345: Chain of Custody
Page 1 of 4

ACCUTEST

COOLER TEMP FORM

TC# TD5345

Delivered by (circle one): FedEx UPS ALGC Driver Client

Date: 6/24/17

Client: Key Energy

Cooler Number: 1

Thermometer ID: DLS CF, °C 0 Corrected Temp, °C 0

SAMPLES CONTAINED IN COOLER

ORIGIN ID:HGRA (432) 234-3079
JASON FISHER
SGS ACCUTEST
3385 N I-20 SERVICE ROAD
STANTON, TX 79782
UNITED STATES US

SHIP DATE: 15NOV16
ACTWGT: 55.0 LB MAN
CAD: 0243296/CAFE2916

BILL SENDER

TO SAMPLE MANAGEMENT
SGS ACCUTEST
10165 HARWIN DRIVE
SUITE 150
HOUSTON TX 77036
(713) 271-4700
REF: SUPPLIES

FedEx Express

FedEx
TRK# 0221 6746 8797 3810

XO SGRA

RETURNS MON-SAT
SATURDAY 12
PRIORITY OVERNI

77036
IAH
TX-US

ACCUTEST LABORATORIES
CUSTODY SEAL CUSTODY SEAL
DATE / TIME SEALED: 6/23/17

TD5345: Chain of Custody
Page 2 of 4

SGS Accutest Sample Receipt Summary

Job Number: TD5345 **Client:** KEY ENERGY **Project:** STATE BRINE STATION

Date / Time Received: **Delivery Method:** **Airbill #'s:** 674687973810

No. Coolers: 1 **Therm ID:** IR-5; **Temp Adjustment Factor:** 0;

Cooler Temps (Initial/Adjusted): #1: (2/2);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:			
3. Cooler media:	Ice (Bag)		

Quality Control Preservation	Y	or	N	N/A	WTB	STB
1. Trip Blank present / cooler:	☐		☐	☑	☐	☐
2. Trip Blank listed on COC:	☐		☐	☑		
3. Samples preserved properly:	☑		☐			
4. VOCs headspace free:	☐		☐	☑		

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Sample Receipt Log

Job #: TD5345 **Date / Time Received:** 6/24/2017 10:20:00 AM **Initials:** DS

Client: KEY ENERGY

Cooler #	Sample ID:	Vol	Bot #	Location	Pres	pH	Therm ID	Initial Temp	Therm CF	Corrected Temp
1	TD5345-1	500ml	1	3I	N/P	Note #2 - Preservative check not applicable.	IR-5	2	0	2
1	TD5345-1	500ml	2	3I	N/P	Note #2 - Preservative check not applicable.	IR-5	2	0	2

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD5345
Account: KEYETXM - Key Energy
Project: STATE S Brine Station

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Chloride	GP42969/GN82803	0.50	0.0	mg/l	10	10.1	101.0	90-110%
Solids, Total Dissolved	GN82777	10	0.0	mg/l	500	482	96.4	88-110%
Sulfate	GP42969/GN82803	0.60	0.0	mg/l	10	10.4	104.0	90-110%

Associated Samples:
Batch GN82777: TD5345-1
Batch GP42969: TD5345-1
(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD5345
Account: KEYETXM - Key Energy
Project: STATE S Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Chloride	GP42969/GN82803	LA34612-1	mg/l	598	622	3.9	0-20%
Solids, Total Dissolved	GN82777	TD5340-1	mg/l	27400	28500	3.9	0-5%
Sulfate	GP42969/GN82803	LA34612-1	mg/l	129	126	2.4	0-20%

Associated Samples:
Batch GN82777: TD5345-1
Batch GP42969: TD5345-1
(*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD5345
Account: KEYETXM - Key Energy
Project: STATE S Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Chloride	GP42969/GN82803	LA34612-1	mg/l	598	500	1230	126.4N(a)	80-120%
Sulfate	GP42969/GN82803	LA34612-1	mg/l	129	500	593	92.8	80-120%

Associated Samples:
Batch GP42969: TD5345-1
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(a) Outside control limits due to matrix interference.

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest Lafayette)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL: 713-271-4700 FAX: 713-271-4770
www.sgs.com

FED-EX Tracking #: | Bottle Order Control #:
SGS Accutest Quote #: | SGS Accutest Job #: TD5345

Client / Reporting Information

Company Name: SGS Accutest
Street Address: 10165 Harwin Drive
City: Houston State: TX Zip: 77036
Project Contact: long.nguyen2@sgs.com E-mail:
Phone #: 713-271-4700 Fax #:
Sampler(s) Name(s): Phone:

Project Information

Project Name: STATE S Brine Station
Street:
City: State:
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)

Company Name:
Street Address:
City: State: Zip:
Attention:

Requested Analysis (see TEST CODE sheet)

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL- Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank
EB-Equipment Blank
RB- Rinse Blank
TB-Trip Blank

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	NA	LAB USE ONLY
1	FRESH WATER WELL		6/16/17	9:35:00 AM		AQ	1			X						X	1

Turnaround Time (Business days)

Approved By (SGS Accutest PM): / Date:

- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [X] other Due 7/3/2017

Emergency & Rush T/A data available VIA Lablink

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [X] Other COMMB

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

3W2

Sample Custody must be documented below each time samples change possession, including courier delivery. 0715

Relinquished by Sampler: S. Jones	Date Tir 16/6-26-17	Received By: 1 SGS-TX	6-27-17	Relinquished By: 2 SGS-TX	Date Time: 6-27-17	Received By: 2 Walter Newman
Relinquished by Sampler: Walter Newman	Date Time: 1020 6-27-17	Received By: 3 Kaylyn Kidd		Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5		Custody Seal # CSG	Intact / Not Intact	Preserved where applicable	On Ice	Cooler Temp. 1.3 PU 2U0

6.1.6

TD5345: Chain of Custody
Page 1 of 3
SGS Accutest Lafayette

Date / Time: 6/26/2017 5:08:57 PM
CSR: LONGN
Job #: TD5345
Client Project: STATE S Brine Station
Deliverable: COMMB
TAT: Due 7/3/2017

Sub Lab: Accutest Gulf Coast Louisiana
Address: 500 Ambassador Caffery Prkway
City: Scott
State: LA Zip: 70583
Contact: Sample Receiving
Phone: 800-304-5227

SGS Accutest Sample #	Client Sample Description	Analysis	Location	Sampled By	Date Sampled	Time Sampled	Aliquot
TD5345-1	FRESH WATER WELL	NA ,	3I ,		6/16/2017	9:35:00 AM	

Comments:

Sample Management Receipt: _____ Date: _____

250 ml nitric 3w2

6.1
6

TD5345: Chain of Custody
Page 2 of 3

SGS Accutest Sample Receipt Summary

Job Number: TD5345 **Client:** SGS **Project:** STATE S BRINE STATION

Date / Time Received: 6/27/2017 10:20:00 AM **Delivery Method:** Accutest Courier **Airbill #'s:**

Cooler Temps (Initial/Adjusted): #1: (1.3/1.3);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Thermometer ID:	;		
3. Cooler media:	Ice (direct contact)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

TD5345: Chain of Custody
Page 3 of 3

Metals Analysis

QC Data Summaries

(SGS Accutest Lafayette)

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: TD5345
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: STATE S Brine Station

QC Batch ID: MP8370
Matrix Type: AQUEOUS

Methods: SW846 6010B
Units: ug/l

Prep Date: 06/27/17

Metal	RL	IDL	MDL	MB raw	final
Aluminum	100	14	46		
Antimony	6.0	1.4	3.7		
Arsenic	10	1.9	2.6		
Barium	10	.21	1.3		
Beryllium	4.0	.05	.3		
Boron	100	.95	10		
Cadmium	5.0	.13	.9		
Calcium	100	5.1	58		
Chromium	10	.29	.9		
Cobalt	10	.15	.8		
Copper	10	.43	4		
Iron	100	2.8	33		
Lead	10	.9	1.8		
Lithium	10	1.1	6.3		
Magnesium	100	18	37		
Manganese	10	.05	1.1		
Molybdenum	10	.15	1.1		
Nickel	10	.3	1		
Potassium	500	25	50		
Selenium	10	1.7	3.6		
Silver	10	.32	1.4		
Sodium	500	6.5	53	-19	<500
Strontium	10	.09	1		
Thallium	5.0	1.3	1.6		
Tin	10	.76	.9		
Titanium	10	.46	1.7		
Vanadium	10	.33	.9		
Zinc	20	.63	4.3		

Associated samples MP8370: TD5345-1

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD5345
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: STATE S Brine Station

QC Batch ID: MP8370
Matrix Type: AQUEOUS

Methods: SW846 6010B
Units: ug/l

Prep Date: 06/27/17

Metal	TD5377-1A Original MS		Spikelot ICPSPIKE1% Rec		QC Limits
Aluminum	anr				
Antimony					
Arsenic					
Barium					
Beryllium					
Boron					
Cadmium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Lithium					
Magnesium	anr				
Manganese					
Molybdenum					
Nickel					
Potassium					
Selenium					
Silver					
Sodium	2980000	2980000	10000	0.0 (a)	75-125
Strontium					
Thallium					
Tin					
Titanium					
Vanadium					
Zinc	anr				

Associated samples MP8370: TD5345-1

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD5345
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: STATE S Brine Station

QC Batch ID: MP8370
Matrix Type: AQUEOUS

Methods: SW846 6010B
Units: ug/l

Prep Date: 06/27/17

Metal	TD5377-1A Original MSD		Spikelot ICPSPIKE1% Rec		MSD RPD	QC Limit
Aluminum	anr					
Antimony						
Arsenic						
Barium						
Beryllium						
Boron						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium	anr					
Manganese						
Molybdenum						
Nickel						
Potassium						
Selenium						
Silver						
Sodium	2980000	3070000	10000	900.0(a)	3.0	20
Strontium						
Thallium						
Tin						
Titanium						
Vanadium						
Zinc	anr					

Associated samples MP8370: TD5345-1

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: TD5345
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: STATE S Brine Station

QC Batch ID: MP8370
Matrix Type: AQUEOUS

Methods: SW846 6010B
Units: ug/l

Prep Date: 06/27/17

Metal	BSP Result	Spikelot ICPSPIKE1%	Rec	QC Limits
Aluminum	anr			
Antimony				
Arsenic				
Barium				
Beryllium				
Boron				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Lithium				
Magnesium	anr			
Manganese				
Molybdenum				
Nickel				
Potassium				
Selenium				
Silver				
Sodium	10400	10000	104.0	80-120
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc	anr			

Associated samples MP8370: TD5345-1

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: TD5345
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: STATE S Brine Station

QC Batch ID: MP8370
Matrix Type: AQUEOUS

Methods: SW846 6010B
Units: ug/l

Prep Date: 06/27/17

Metal	TD5377-1A Original	SDL 5:25	%DIF	QC Limits
Aluminum	anr			
Antimony				
Arsenic				
Barium				
Beryllium				
Boron				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Lithium				
Magnesium	anr			
Manganese				
Molybdenum				
Nickel				
Potassium				
Selenium				
Silver				
Sodium	2980000	3920000	31.5*(a)	0-10
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc	anr			

Associated samples MP8370: TD5345-1

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested
(a) Serial dilution indicates possible matrix interference.

e-Hardcopy 2.0
Automated Report

Technical Report for

Key Energy

Key State S

SGS Accutest Job Number: TD6530

Sampling Date: 07/13/17

Report to:

Key Energy
12400 W 120 E
Odessa, TX 79765
mcoligan@keyenergy.com; bdinwiddie@keyenergy.com

ATTN: Ana Ramirez

Total number of pages in report: **29**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Richard Rodriguez
Laboratory Director

Client Service contact: Electa Brown 713-271-4700

Certifications: TX (T104704220-17-27) AR (14-016-0) AZ (AZ0769) FL (E87628) KS (E-10366) LA (85695/04004) NJ (TX010) OK (2016-170) VA (8999)

Sections: 1 2 3 4 5 6 7

Table of Contents

Sample Summary

Key Energy

Key State S

Job No: TD6530

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
TD6530-1	07/13/17	14:00		07/20/17	AQ	Water	FWT
TD6530-1A	07/13/17	14:00		07/20/17	AQ	Water	FWT
TD6530-2	07/13/17	13:30		07/20/17	AQ	Water	BWW
TD6530-2A	07/13/17	13:30		07/20/17	AQ	Water	BWW

Summary of Hits

Job Number: TD6530
Account: Key Energy
Project: Key State S
Collected: 07/13/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
TD6530-1	**FWT**					
Chloride		616	25		mg/l	EPA 300
Solids, Total Dissolved		1180	10		mg/l	SM 2540C-2011
TD6530-1A	**FWT**					
Sodium [a]		274000	500		ug/l	SW846 6010C
TD6530-2	**BWW**					
Chloride		32400	2500		mg/l	EPA 300
Solids, Total Dissolved		41500	1000		mg/l	SM 2540C-2011
TD6530-2A	**BWW**					
Sodium [a]		11400000	25000		ug/l	SW846 6010C

(a) Analysis performed at SGS Accutest, Lafayette, LA.

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	FWT		
Lab Sample ID:	TD6530-1	**Date Sampled:**	07/13/17
Matrix:	AQ - Water	**Date Received:**	07/20/17
		Percent Solids:	n/a
Project:	Key State S		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	616	25	mg/l	50	07/20/17 15:50	ES	EPA 300
Solids, Total Dissolved	1180	10	mg/l	1	07/20/17	BG	SM 2540C-2011

RL = Reporting Limit

Report of Analysis

Client Sample ID:	FWT		
Lab Sample ID:	TD6530-1A	**Date Sampled:**	07/13/17
Matrix:	AQ - Water	**Date Received:**	07/20/17
		Percent Solids:	n/a
Project:	Key State S		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	274000	500	ug/l	1	07/21/17	07/24/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA8505
(2) Prep QC Batch: L:MP8603

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BWW		
Lab Sample ID:	TD6530-2	**Date Sampled:**	07/13/17
Matrix:	AQ - Water	**Date Received:**	07/20/17
		Percent Solids:	n/a
Project:	Key State S		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	32400	2500	mg/l	5000	07/20/17 16:37	ES	EPA 300
Solids, Total Dissolved	41500	1000	mg/l	1	07/20/17	BG	SM 2540C-2011

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BWW		
Lab Sample ID:	TD6530-2A	**Date Sampled:**	07/13/17
Matrix:	AQ - Water	**Date Received:**	07/20/17
		Percent Solids:	n/a
Project:	Key State S		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	11400000	25000	ug/l	50	07/21/17	07/24/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA8505
(2) Prep QC Batch: L:MP8603

(a) Analysis performed at SGS Accutest, Lafayette, LA.

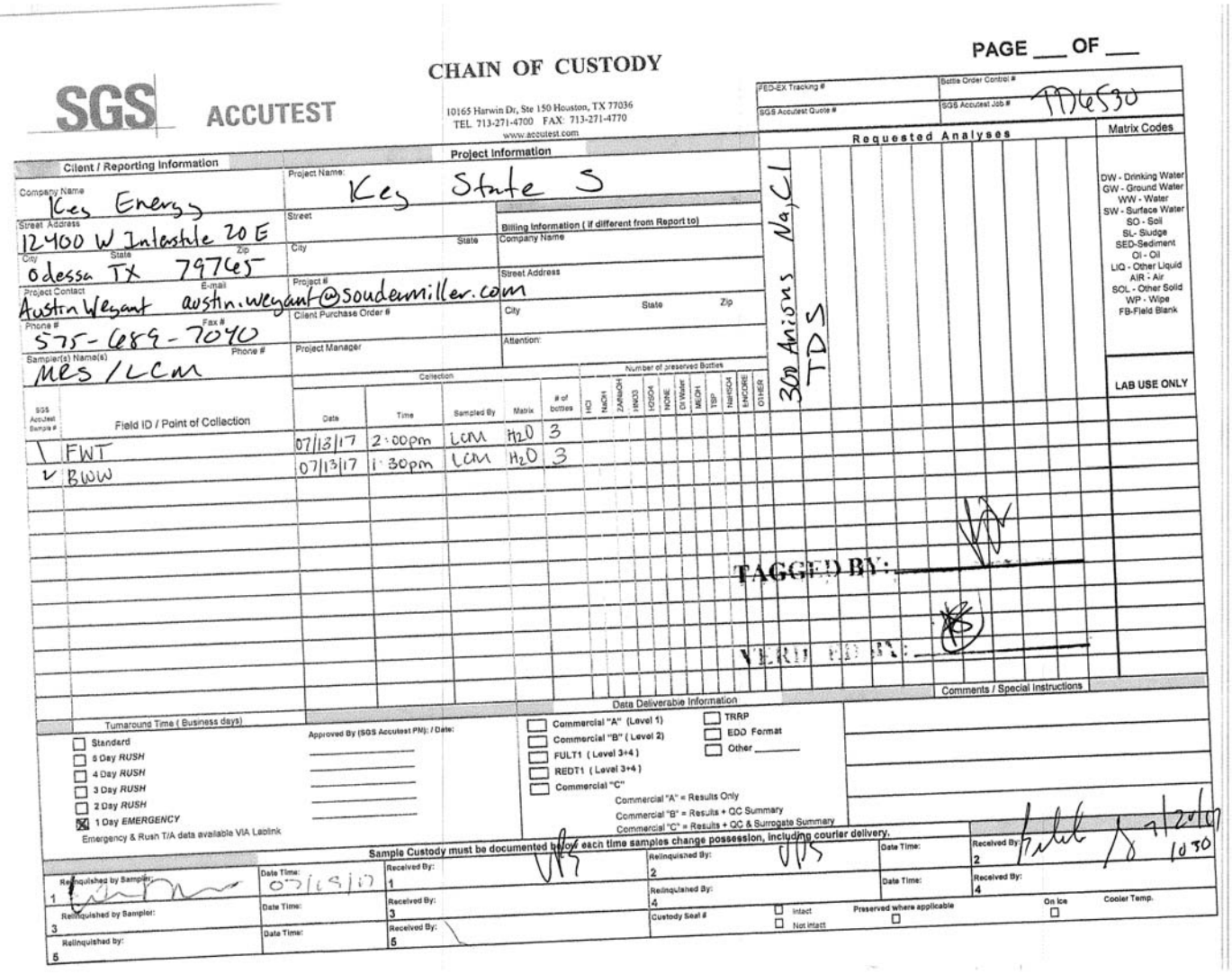
RL = Reporting Limit

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody



SGS ACCUTEST

CHAIN OF CUSTODY

PAGE ___ OF ___

10165 Harwin Dr, Ste 150 Houston, TX 77036
TEL 713-271-4700 FAX: 713-271-4770
www.accutest.com

FED-EX Tracking #

Bottle Order Control #

SGS Accutest Quote #

SGS Accutest Job # TD6530

Client / Reporting Information

Company Name: Ker Energy
Street Address: 12400 W Interstate 20 E
City: Odessa State: TX Zip: 79765
Project Contact: Austin Weyant E-mail: austin.weyant@soudermiller.com
Phone #: 575-689-7040 Fax # Phone #
Sampler(s) Name(s): MES / LCM

Project Information

Project Name: Key State S
Street
City State
Project #
Client Purchase Order #
Project Manager

Billing Information (if different from Report to)

Company Name
Street Address
City State Zip
Attention:

Requested Analyses

300 Anions Na, Cl
TDS

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL - Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank

LAB USE ONLY

SGS Accutest Sample #	Field ID / Point of Collection	Collection Date	Time	Sampled By	Matrix	# of bottles	Number of preserved Bottles	
1	FWT	07/13/17	2:00pm	LCM	H_2O	3		
2	BWW	07/13/17	1:30pm	LCM	H_2O	3		

TAGGED BY:

VERIFIED BY:

Comments / Special Instructions

Turnaround Time (Business days)

- [ ] Standard
- [ ] 5 Day *RUSH*
- [ ] 4 Day *RUSH*
- [ ] 3 Day *RUSH*
- [ ] 2 Day *RUSH*
- [x] 1 Day *EMERGENCY*

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULT1 (Level 3+4)
- [ ] REDT1 (Level 3+4)
- [ ] Commercial "C"
- [ ] TRRP
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
Commercial "C" = Results + QC & Surrogate Summary

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler: 1	Date Time: 07/13/17	Received By: 1	Relinquished By: 2	Date Time:	Received By: 2
Relinquished by Sampler: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	Intact / Not Intact	Preserved where applicable / On Ice / Cooler Temp.

7/14/2017 10:30

TD6530: Chain of Custody
Page 1 of 5

ACCUTEST

COOLER TEMP FORM

TC#

Delivered by (circle one): FedEx UPS ALGC Driver Client

Date: 7/20/17

Client: Key Energy

Cooler Number: 1

Thermometer ID: IR5 CF, °C 0 Corrected Temp, °C 3.0

SAMPLES CONTAINED IN COOLER

Form: SM027-06 Rev 10/24/2016

4.1

4

TD6530: Chain of Custody
Page 2 of 5

SGS Accutest Sample Receipt Summary

Job Number: TD6530 **Client:** KEY ENERGY **Project:** KEY STATE S

Date / Time Received: **Delivery Method:** **Airbill #'s:** 1Z6569E80145393071

No. Coolers: 1 **Therm ID:** IR9; **Temp Adjustment Factor:** 0;

Cooler Temps (Initial/Adjusted): #1: (3/3);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:			
3. Cooler media:	Ice Pack (Blue)		

Quality Control Preservation	Y	or	N	N/A	WTB	STB
1. Trip Blank present / cooler:	☐		☐	☑	☐	☐
2. Trip Blank listed on COC:	☐		☐	☑		
3. Samples preserved properly:	☑		☐			
4. VOCs headspace free:	☐		☐	☑		

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☐		☑
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments Received sample out of HT for short holds.

Problem Resolution

Accutest Job Number: TD6530

CSR: _____ **Response Date:** _____

Response:

Sample Receipt Log

Job #: TD6530 **Date / Time Received:** 7/20/2017 10:30:00 AM **Initials:** BG

Client: KEY ENERGY

Cooler #	Sample ID:	Vol	Bot #	Location	Pres	pH	Therm ID	Initial Temp	Therm CF	Corrected Temp
1	TD6530-1	500ml	1	3P	N/P	Note #2 - Preservative check not applicable.	IR9	3	0	3
1	TD6530-1	125ML	2	1FF	H2SO4	pH < 2	IR9	3	0	3
1	TD6530-1	125ML	3	SUB	HNO3	pH < 2	IR9	3	0	3
1	TD6530-2	500ml	1	3P	N/P	Note #2 - Preservative check not applicable.	IR9	3	0	3
1	TD6530-2	125ML	2	1FF	H2SO4	pH < 2	IR9	3	0	3
1	TD6530-2	125ML	3	SUB	HNO3	pH < 2	IR9	3	0	3

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD6530
Account: KEYENTXO - Key Energy
Project: Key State S

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Bromide	GP43317/GN83336	0.50	0.0	mg/l	10	10.3	103.0	90-110%
Chloride	GP43317/GN83336	0.50	0.0	mg/l	10	10.2	102.0	90-110%
Fluoride	GP43317/GN83336	0.50	0.0	mg/l	10	10.4	104.0	90-110%
Nitrogen, Nitrate	GP43317/GN83336	0.50	0.0	mg/l	10	9.99	99.9	90-110%
Solids, Total Dissolved	GN83331	10	0.0	mg/l	500	492	98.4	88-110%
Sulfate	GP43317/GN83336	0.60	0.0	mg/l	10	10.4	104.0	90-110%

Associated Samples:
Batch GN83331: TD6530-1, TD6530-2
Batch GP43317: TD6530-1, TD6530-2
(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD6530
Account: KEYENTXO - Key Energy
Project: Key State S

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Bromide	GP43317/GN83336	TD6509-1	mg/l	0.0	0.0	0.0	0-20%
Chloride	GP43317/GN83336	TD6509-1	mg/l	13.4	12.5	6.9	0-20%
Fluoride	GP43317/GN83336	TD6509-1	mg/l	0.38	0.36	5.4	0-20%
Nitrogen, Nitrate	GP43317/GN83336	TD6509-1	mg/l	1.7	1.7	0.0	0-20%
Solids, Total Dissolved	GN83331	TD6562-1	mg/l	1830	1840	0.5	0-5%
Sulfate	GP43317/GN83336	TD6509-1	mg/l	23.1	21.7	6.3	0-20%

Associated Samples:
Batch GN83331: TD6530-1, TD6530-2
Batch GP43317: TD6530-1, TD6530-2
(*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD6530
Account: KEYENTXO - Key Energy
Project: Key State S

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Bromide	GP43317/GN83336	TD6509-1	mg/l	0.0	10	11.0	110.0	80-120%
Chloride	GP43317/GN83336	TD6509-1	mg/l	13.4	20	34.4	105.0	80-120%
Fluoride	GP43317/GN83336	TD6509-1	mg/l	0.38	10	13.0	126.2N(a)	80-120%
Nitrogen, Nitrate	GP43317/GN83336	TD6509-1	mg/l	1.7	10	12.1	104.0	80-120%
Sulfate	GP43317/GN83336	TD6509-1	mg/l	23.1	20	43.7	103.0	80-120%

Associated Samples:
Batch GP43317: TD6530-1, TD6530-2
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(a) Outside control limits due to matrix interference.

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest Lafayette)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL. 713-271-4700 FAX: 713-271-4770
www.sgs.com

FED-EX Tracking # | Bottle Order Control #
SGS Accutest Quote # | SGS Accutest Job: TD6530

Client / Reporting Information
Company Name: SGS Accutest
Street Address: 10165 Harwin Drive
City: Houston State: TX Zip: 77036
Project Contact E-mail: long.nguyen2@sgs.com
Phone #: 713-271-4700 Fax #
Sampler(s) Name(s) Phone

Project Information
Project Name: Key State S
Street
City State
Project #
Client Purchase Order #
Project Manager

Billing Information (if different from Report to)
Company Name
Street Address
City State Zip
Attention

Requested Analysis (see TEST CODE sheet)

Matrix Codes
DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL - Sludge
SED-Sediment
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid
WP - Wipe
FB-Field Blank
EB-Equipment Blank
RB- Rinse Blank
TB-Trip Blank

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Date	Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	MA	LAB USE ONLY
1A	FWT		7/13/17	2:00:00 PM		AQ	1			X						X	
2A	BWW		7/13/17	1:30:00 PM		AQ	1			X						X	

Turnaround Time (Business days)
- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [x] other Due 7/24/2017

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information
- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [x] Other COMMB

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions
3W2
RUSH

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 S. Ramos	7-20-17 1800	1 SGS-TX 7-21-17	2 SGS-TX	7-20-17	2 Johnny Helaire
3 Johnny Helaire	7-21-17 10:15	3 Kaylyn Kidd	4		4
5		5	Custody Seal # CSA	Intact / Not intact; Preserved where applicable	On Ice; Cooler Temp. 1.1 IRV439

TD6530: Chain of Custody
Page 1 of 3
SGS Accutest Lafayette

Date / Time: 7/20/2017 3:28:33 PM
CSR: LONGN
Job #: TD6530
Client Project: Key State S
Deliverable: COMMB
TAT: Due 7/24/2017

Sub Lab: Accutest Gulf Coast Louisiana
Address: 500 Ambassador Caffery Prkway
City: Scott
State: LA Zip: 70583
Contact: Sample Receiving
Phone: 800-304-5227

SGS Accutest Sample #	Client Sample Description	Analysis	Location	Sampled By	Date Sampled	Time Sampled	Aliquot
TD6530-1A	FWT	NA .			7/13/2017	2:00:00 PM	
TD6530-2A	BWW	NA .			7/13/2017	1:30:00 PM	

Comments:

Sample Management Receipt: _____ Date: _____

2
1
1

1 = 150 ml nitric 3W2

TD6530: Chain of Custody
Page 2 of 3

SGS Accutest Sample Receipt Summary

Job Number: TD6530 **Client:** SGS **Project:** KEY STATE S

Date / Time Received: 7/21/2017 10:15:00 AM **Delivery Method:** Accutest Courier **Airbill #'s:**

Cooler Temps (Initial/Adjusted): #1: (1.1/1.1);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Thermometer ID:	DV439;		
3. Cooler media:	Ice (direct contact)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Metals Analysis

QC Data Summaries

(SGS Accutest Lafayette)

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: TD6530
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYENTXO: Key State S

QC Batch ID: MP8603
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 07/21/17

Metal	RL	IDL	MDL	MB raw	final
Aluminum	100	14	46		
Antimony	6.0	1.4	3.7		
Arsenic	10	1.9	2.6		
Barium	10	.21	1.3		
Beryllium	4.0	.05	.3		
Boron	100	.95	10		
Cadmium	5.0	.13	.9		
Calcium	100	5.1	58		
Chromium	10	.29	.9		
Cobalt	10	.15	.8		
Copper	10	.43	4		
Iron	100	2.8	33		
Lead	10	.9	1.8		
Lithium	10	1.1	6.3		
Magnesium	100	18	37		
Manganese	10	.05	1.1		
Molybdenum	10	.15	1.1		
Nickel	10	.3	1		
Potassium	500	25	50		
Selenium	10	1.7	3.6		
Silver	10	.32	1.4		
Sodium	500	6.5	53	-8.9	<500
Strontium	10	.09	1		
Thallium	5.0	1.3	1.6		
Tin	10	.76	.9		
Titanium	10	.46	1.7		
Vanadium	10	.33	.9		
Zinc	20	.63	4.3		

Associated samples MP8603: TD6530-1A, TD6530-2A

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD6530
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYENTXO: Key State S

QC Batch ID: MP8603
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 07/21/17

Metal	TD6473-5 Original MS		Spikelot ICPSPIKE1% Rec	QC Limits
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt	anr			
Copper				
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel	anr			
Potassium				
Selenium	anr			
Silver	anr			
Sodium	902000	891000	10000	-110.0(a 75-125
Strontium				
Thallium				
Tin				
Titanium				
Vanadium	anr			
Zinc	anr			

Associated samples MP8603: TD6530-1A, TD6530-2A

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD6530
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYENTXO: Key State S

QC Batch ID: MP8603
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 07/21/17

Metal	TD6473-5 Original MSD	Spikelot ICPSPIKE1% Rec	MSD RPD	QC Limit
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt	anr			
Copper				
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel	anr			
Potassium				
Selenium	anr			
Silver	anr			
Sodium	902000	872000 10000	-300.0(a	2.2 20
Strontium				
Thallium				
Tin				
Titanium				
Vanadium	anr			
Zinc	anr			

Associated samples MP8603: TD6530-1A, TD6530-2A

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: TD6530
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYENTXO: Key State S

QC Batch ID: MP8603
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 07/21/17

Metal	BSP Result	Spikelot ICPSPIKE1%	Rec	QC Limits
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt	anr			
Copper				
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel	anr			
Potassium				
Silver	anr			
Sodium	9560	10000	95.6	80-120
Strontium				
Thallium				
Tin				
Titanium				
Vanadium	anr			
Zinc	anr			

Associated samples MP8603: TD6530-1A, TD6530-2A

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: TD6530
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYENTXO: Key State S

QC Batch ID: MP8603
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 07/21/17

Metal	TD6473-5 Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt	anr			
Copper				
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel	anr			
Potassium				
Selenium	anr			
Silver	anr			
Sodium	902000	1130000	25.6*(a)	0-10
Strontium				
Thallium				
Tin				
Titanium				
Vanadium	anr			
Zinc	anr			

Associated samples MP8603: TD6530-1A, TD6530-2A

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested
(a) Serial dilution indicates possible matrix interference.

e-Hardcopy 2.0
Automated Report

Technical Report for

Key Energy

State# 1 Brine Station

SGS Accutest Job Number: TD11627

Sampling Date: 10/24/17

Report to:

Key Energy
6 Desota Drvie Suite 4300
Midland, TX 79705
bdinwiddie@keyenergy.com; Clair.Gonzales@tetratech.com

ATTN: Blake Dinwiddie

Total number of pages in report: **33**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Richard Rodriguez
Laboratory Director

Client Service contact: Electa Brown 713-271-4700

Certifications: TX (T104704220-17-27) AR (14-016-0) AZ (AZ0769) FL (E87628) KS (E-10366) LA (85695/04004) NJ (TX010) OK (2017-002) VA (8999)

Table of Contents

Sections: 1 2 3 4 5 6 7 8 9

Sample Summary

Key Energy

State# 1 Brine Station

Job No: TD11627

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
TD11627-1	10/24/17	00:00		11/01/17	AQ	Water	FRESH WATER
TD11627-2	10/24/17	00:00		11/01/17	AQ	Water	BRINE WATER WELL

Summary of Hits

Job Number: TD11627
Account: Key Energy
Project: State# 1 Brine Station
Collected: 10/24/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
TD11627-1	**FRESH WATER**					
Sodium [a]		363000	500		ug/l	SW846 6010C
Chloride		606	50		mg/l	EPA 300.0
Density [b]		1.0			g/ml	ASTM DEF
Solids, Total Dissolved [c]		1520	20		mg/l	SM 2540C-2011
Specific Conductivity		2510	1.0		umhos/cm	EPA 120.1
pH [d]		7.66			su	SM 4500H+ B-2011
TD11627-2	**BRINE WATER WELL**					
Sodium [a]		55400000	250000		ug/l	SW846 6010C
Chloride		177000	5000		mg/l	EPA 300.0
Density [b]		1.2			g/ml	ASTM DEF
Solids, Total Dissolved [c]		260000	1000		mg/l	SM 2540C-2011
Specific Conductivity		312000	1.0		umhos/cm	EPA 120.1
pH [e]		6.79			su	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Lafayette, LA.
(b) Analysis performed at SGS Accutest, Dayton, NJ.
(c) Sample received outside the holding time.
(d) Field analysis required. Received out of hold time and analyzed by request. temp. 21.2 c
(e) Field analysis required. Received out of hold time and analyzed by request. temp. 21.4 c

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	FRESH WATER		
Lab Sample ID:	TD11627-1	**Date Sampled:**	10/24/17
Matrix:	AQ - Water	**Date Received:**	11/01/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	363000	500	ug/l	1	11/07/17	11/07/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA9765
(2) Prep QC Batch: L:MP9713

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	FRESH WATER		
Lab Sample ID:	TD11627-1	**Date Sampled:**	10/24/17
Matrix:	AQ - Water	**Date Received:**	11/01/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	606	50	mg/l	100	11/06/17 13:24	SM	EPA 300.0
Density [a]	1.0		g/ml	1	11/17/17 11:00	ANJ	ASTM DEF
Solids, Total Dissolved [b]	1520	20	mg/l	1	11/02/17	BG	SM 2540C-2011
Specific Conductivity	2510	1.0	umhos/cm	1	11/02/17 15:00	PA	EPA 120.1
pH [c]	7.66		su	1	11/02/17 14:50	PA	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Dayton, NJ.
(b) Sample received outside the holding time.
(c) Field analysis required. Received out of hold time and analyzed by request. temp. 21.2 c

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BRINE WATER WELL		
Lab Sample ID:	TD11627-2	**Date Sampled:**	10/24/17
Matrix:	AQ - Water	**Date Received:**	11/01/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	55400000	250000	ug/l	500	11/07/17	11/08/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA9769
(2) Prep QC Batch: L:MP9713

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BRINE WATER WELL		
Lab Sample ID:	TD11627-2	**Date Sampled:**	10/24/17
Matrix:	AQ - Water	**Date Received:**	11/01/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	177000	5000	mg/l	10000	11/06/17 15:48	SM	EPA 300.0
Density [a]	1.2		g/ml	1	11/17/17 11:00	ANJ	ASTM DEF
Solids, Total Dissolved [b]	260000	1000	mg/l	1	11/03/17	BG	SM 2540C-2011
Specific Conductivity	312000	1.0	umhos/cm	1	11/02/17 15:00	PA	EPA 120.1
pH [c]	6.79		su	1	11/02/17 14:50	PA	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Dayton, NJ.
(b) Sample received outside the holding time.
(c) Field analysis required. Received out of hold time and analyzed by request. temp. 21.4 c

RL = Reporting Limit

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

Analysis Request of Chain of Custody Record

TD11627 Page 1 of

Tetra Tech, Inc.

4000 N. Big Spring Street, Ste 401 Midland,Texas 79705 Tel (432) 682-4559 Fax (432) 682-3946

Client Name: Key Energy	Site Manager: Clair Gonzales
Project Name: State S Brine 1	
Project Location: (county, state)	Project #: 212C-HN-00522
Invoice to: Key Energy	
Receiving Laboratory: SGS Accutest	Sampler Signature: Matt McDaniel
Comments:	

ANALYSIS REQUEST (Circle or Specify Method No.)

LAB # (LAB USE ONLY)	SAMPLE IDENTIFICATION	SAMPLING YEAR: DATE	TIME	MATRIX WATER	MATRIX SOIL	PRESERVATIVE METHOD HCL	PRESERVATIVE METHOD HNO_3	PRESERVATIVE METHOD ICE	# CONTAINERS	FILTERED (Y/N)	BTEX 8021B BTEX 8260B	TPH TX1005 (Ext to C35)	TPH 8015M (GRO - DRO - ORO - MRO)	PAH 8270C	Total Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC/MS Vol. 8260B / 624	GC/MS Semi. Vol. 8270C/625	PCB's 8082 / 608	NORM	PLM (Asbestos)	Chloride	Chloride Sodium TDS	General Water Chemistry (see attached list)	Anion/Cation Balance	Density	Conductivity	pH	HOLD
1	Fresh Water	10/24/2017		X				X	3																X			X	X	X		
2	Brine Water Well	10/24/2017		X				X	3																X			X	X	X		

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Matt	10/31/17	1345	Susan Fisher	10/31/17	13:45
Susan Fisher	10/31/17	16:00	FedEx	11/1/17	0930

LAB USE ONLY

Sample Temperature

REMARKS: Standard

RUSH: Same Day 24 hr 48 hr 72 hr

Rush Charges Authorized

Special Report Limits or TRRP Report

(Circle) HAND DELIVERED FEDEX UPS Tracking #:

ORIGINAL COPY

TD11627: Chain of Custody
Page 1 of 5

ACCUTEST

COOLER TEMP FORM

TC#

Delivered by (circle one): FedEx/UPS ALGC Driver Client

Date: 11-1-17

Client: Tetra Tech

Cooler Number: 1

Thermometer ID: IR4 CF, °C 0 Corrected Temp, °C 2.6

SAMPLES CONTAINED IN COOLER

ORIGIN ID:SGRA (432) 234-3079
JASON FISHER
SGS ACCUTEST
3385 N I-20 SERVICE ROAD
STANTON, TX 79782
UNITED STATES US

SHIP DATE: 15NOV16
ACTWGT: 55.0 LB MAN
CAD: 0243296/CAFE2916

BILL SENDER

TO SAMPLE MANAGEMENT
SGS ACCUTEST
10165 HARWIN DRIVE
SUITE 150
HOUSTON TX 77036
(713) 271-4700
REF: SUPPLIES

FedEx Express

WED - 01 NOV 10:30A
PRIORITY OVERNIGHT

FedEx TRK# 0221 6746 8797 3533

AB SGRA

77036 TX-US IAH

EXP 09/18

ACCUTEST LABORATORIES

CUSTODY SEAL CUSTODY SEAL

DATE / TIME SEALED: 10/31/17 15:

Form: SM027-06 Rev 10/24/2016

SGS Accutest Sample Receipt Summary

Job Number: TD11627 **Client:** TETRA TECH **Project:**

Date / Time Received: **Delivery Method:** **Airbill #'s:** 674687973533

No. Coolers: 1 **Therm ID:** IR-4; **Temp Adjustment Factor:** 0;

Cooler Temps (Initial/Adjusted): #1: (2.6/2.6);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☐		☑

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:			
3. Cooler media:	Ice (Bag)		

Quality Control Preservation	Y	or	N	N/A	WTB	STB
1. Trip Blank present / cooler:	☐		☐	☑	☐	☐
2. Trip Blank listed on COC:	☐		☐	☑		
3. Samples preserved properly:	☑		☐			
4. VOCs headspace free:	☐		☐	☑		

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments No collection time listed on chain or labels.

Problem Resolution

Accutest Job Number: TD11627

CSR: _____ **Response Date:** _____

Response:

Sample Receipt Log

Job #: TD11627 **Date / Time Received:** 11/1/2017 9:30:00 AM **Initials:** bg

Client: TETRA TECH

Cooler #	Sample ID:	Vol	Bot #	Location	Pres	pH	Therm ID	Initial Temp	Therm CF	Corrected Temp
1	TD11627-1	1000ml	1	3J	N/P	Note #2 - Preservative check not applicable.	IR-4	2.6	0	2.6
1	TD11627-1	500ml	2	3J	N/P	Note #2 - Preservative check not applicable.	IR-4	2.6	0	2.6
1	TD11627-1	250ml	3	SUB	HNO3	pH < 2	IR-4	2.6	0	2.6
1	TD11627-2	1000ml	1	3J	N/P	Note #2 - Preservative check not applicable.	IR-4	2.6	0	2.6
1	TD11627-2	500ml	2	3J	N/P	Note #2 - Preservative check not applicable.	IR-4	2.6	0	2.6
1	TD11627-2	250ml	3	SUB	HNO3	pH < 2	IR-4	2.6	0	2.6

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD11627
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Chloride	GP44917/GN85769	0.50	0.0	mg/l	10	9.55	95.5	90-110%
Fluoride	GP44917/GN85769	0.50	0.0	mg/l	10	9.11	91.1	90-110%
Solids, Total Dissolved	GN85673	10	0.0	mg/l	500	492	98.4	88-110%
Solids, Total Dissolved	GN85707	10	0.0	mg/l	500	488	97.6	88-110%
Specific Conductivity	GN85688	1.0	<1.0	umhos/cm				
Sulfate	GP44917/GN85769	0.60	0.0	mg/l	10	9.39	93.9	90-110%

Associated Samples:
Batch GN85673: TD11627-1
Batch GN85688: TD11627-1, TD11627-2
Batch GN85707: TD11627-2
Batch GP44917: TD11627-1, TD11627-2
(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD11627
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Chloride	GP44917/GN85769	TD11560-1	mg/l	31.6	35.1	10.5	0-20%
Fluoride	GP44917/GN85769	TD11560-1	mg/l	1.2	0.0	200.0(a)	0-20%
Solids, Total Dissolved	GN85673	LA38485-7	mg/l	334	327	2.1	0-5%
Solids, Total Dissolved	GN85707	LA38508-1	mg/l	424	426	0.5	0-5%
Specific Conductivity	GN85688	LA38485-7	umhos/cm	571	571	0.0	0-10%
Sulfate	GP44917/GN85769	TD11560-1	mg/l	26.4	27.2	3.0	0-20%
pH	GN85718	TD11627-1	su	7.66	7.66	0.0	0-10%

Associated Samples:
Batch GN85673: TD11627-1
Batch GN85688: TD11627-1, TD11627-2
Batch GN85707: TD11627-2
Batch GN85718: TD11627-1, TD11627-2
Batch GP44917: TD11627-1, TD11627-2
(*) Outside of QC limits
(a) RPD acceptable due to low duplicate and sample concentrations.

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD11627
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Chloride	GP44917/GN85769	TD11560-1	mg/l	31.6	50	81.3	99.4	80-120%
Fluoride	GP44917/GN85769	TD11560-1	mg/l	1.2	50	46.1	89.8	80-120%
Sulfate	GP44917/GN85769	TD11560-1	mg/l	26.4	50	74.3	95.8	80-120%

Associated Samples:
Batch GP44917: TD11627-1, TD11627-2
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest Lafayette)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL. 713-271-4700 FAX. 713-271-4770
www.sgs.com

Page 1 of 2

FED-EX Tracking #:
Bottle Order Control #:
SGS Accutest Quote #:
SGS Accutest Job: TD11627

Client / Reporting Information

Company Name: SGS Accutest
Street Address: 10165 Harwin Drive
City: Houston State: TX Zip: 77036
Project Contact: E-mail: pleola.brown@sgs.com
Phone #: 713-271-4700 Fax #:
Sampler(s) Name(s): Phone:

Project Information

Project Name: State# 1 Brine Station
Street:
City: State:
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)
Company Name:
Street Address:
City: State: Zip:
Attention:

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water, GW - Ground Water, WW - Water, SW - Surface Water, SO - Soil, SL - Sludge, SED - Sediment, OI - Oil, LIQ - Other Liquid, AIR - Air, SOL - Other Solid, WP - Wipe, FB - Field Blank, EB - Equipment Blank, RB - Rinse Blank, TB - Trip Blank

	SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	NA,	LAB USE ONLY
1	1	FRESH WATER		10/24/17	12:00:00 AM		AQ	1			x						X	/
2	2	BRINE WATER WELL		10/24/17	12:00:00 AM		AQ	1			x						X	/

Turnaround Time (Business days)

- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [X] other Due 11/8/2017

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [X] Other COMMB

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

LA

3w2

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 [signature] 11/6/17	1800	1 SGS	2 SGS		2 [signature]
Relinquished by Sampler: 3 [signature]	Date Time: 11/6/17 2315	Received By: 3 [signature] 11-7-17 7:42 AM	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal # CS6c	☐ Intact ☐ Not intact	Preserved where applicable ☐ / On Ice ☐ / Cooler Temp. 1.8 DV441

TD11627: Chain of Custody
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SGS Accutest Lafayette

6.1
6

SGS Accutest Sample Receipt Summary

Job Number: TD11627 **Client:** SGS (TX) **Project:** BRINE STATION

Date / Time Received: 11/7/2017 7:42:00 AM **Delivery Method:** Accutest Courier **Airbill #'s:**

Cooler Temps (Initial/Adjusted): #1: (1.8/1.8); DV441

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Thermometer ID:	DV441;		
3. Cooler media:	Ice (direct contact)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

TD11627: Chain of Custody
Page 2 of 2

Metals Analysis

QC Data Summaries

(SGS Accutest Lafayette)

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP9713
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 11/07/17

Metal	RL	IDL	MDL	MB raw	final
Aluminum	100	14	46		
Antimony	6.0	1.4	3.7		
Arsenic	10	1.9	2.6		
Barium	10	.21	1.3		
Beryllium	4.0	.05	.3		
Boron	100	.95	10		
Cadmium	5.0	.13	.9		
Calcium	100	5.1	58		
Chromium	10	.29	.9		
Cobalt	10	.15	.8		
Copper	10	.43	4		
Iron	100	2.8	33		
Lead	10	.9	1.8		
Lithium	10	1.1	6.3		
Magnesium	100	18	37		
Manganese	10	.05	1.1		
Molybdenum	10	.15	1.1		
Nickel	10	.3	1		
Potassium	500	25	50		
Selenium	10	1.7	3.6		
Silver	10	.32	1.4		
Sodium	500	6.5	53	-41	<500
Strontium	10	.09	1		
Thallium	5.0	1.3	1.6		
Tin	10	.76	.9		
Titanium	10	.46	1.7		
Vanadium	10	.33	.9		
Zinc	20	.63	4.3		

Associated samples MP9713: TD11627-1, TD11627-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP9713
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 11/07/17

Metal	TD11683-1 Original MS		Spikelot ICPSPIKE1% Rec	QC Limits
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium	anr			
Boron				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron	anr			
Lead	anr			
Lithium				
Magnesium				
Manganese	anr			
Molybdenum				
Nickel				
Potassium				
Selenium				
Silver				
Sodium	697000	660000	10000	-370.0(a 75-125
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				

Associated samples MP9713: TD11627-1, TD11627-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP9713
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 11/07/17

Metal	TD11683-1 Original MSD		Spikelot ICPSPIKE1% Rec	MSD RPD	QC Limit
Aluminum					
Antimony					
Arsenic					
Barium					
Beryllium	anr				
Boron					
Cadmium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron	anr				
Lead	anr				
Lithium					
Magnesium					
Manganese	anr				
Molybdenum					
Nickel					
Potassium					
Selenium					
Silver					
Sodium	697000	653000	10000	-440.0(a	1.1 20
Strontium					
Thallium					
Tin					
Titanium					
Vanadium					
Zinc					

Associated samples MP9713: TD11627-1, TD11627-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP9713
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 11/07/17

Metal	BSP Result	Spikelot ICPSPIKE1%	Rec	QC Limits
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium	anr			
Boron				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron	anr			
Lead	anr			
Lithium				
Magnesium				
Manganese	anr			
Molybdenum				
Nickel				
Potassium				
Selenium				
Silver				
Sodium	9700	10000	97.0	80-120
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				

Associated samples MP9713: TD11627-1, TD11627-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP9713
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 11/07/17

Metal	TD11683-1 Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony				
Arsenic				
Barium				
Beryllium	anr			
Boron				
Cadmium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron	anr			
Lead	anr			
Lithium				
Magnesium				
Manganese	anr			
Molybdenum				
Nickel				
Potassium				
Selenium				
Silver				
Sodium	697000	860000	23.4*(a)	0-10
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				

Associated samples MP9713: TD11627-1, TD11627-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested
(a) Serial dilution indicates possible matrix interference.

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest New Jersey)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL. 713-271-4700 FAX: 713-271-4770
www.sgs.com

FED-EX Tracking # 5642 4621 4699 5642 4621 4699
Bottle Order Control #
SGS Accutest Quote #
SGS Accutest Job TD11627

Client / Reporting Information	Project Information	Billing Information (if different from Report to)
Company Name: SGS Accutest	Project Name: State# 1 Brine Station	
Street Address: 10165 Harwin Drive	Street	Company Name
City: Houston State: TX Zip: 77036	City State	Street Address
Project Contact: electa.brown@sgs.com E-mail	Project #	City State Zip
Phone #: 713-271-4700 Fax #	Client Purchase Order #	Attention:
Sampler(s) Name(s) Phone	Project Manager	

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL- Sludge; SED-Sediment; OI - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB-Field Blank; EB-Equipment Blank; RB- Rinse Blank; TB-Trip Blank

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	DENS.	LAB USE ONLY
1	FRESH WATER		10/24/17	12:00:00 AM		AQ	1					x				X	TX
2	BRINE WATER WELL		10/24/17	12:00:00 AM		AQ	1					x				X	

Turnaround Time (Business days)

Approved By (SGS Accutest PM): / Date:

- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [X] other Due 11/21/2017

Emergency & Rush T/A data available VIA Lablink

INITIAL ASESSMENT 13/17
LABEL VERIFICATION

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [X] Other COMMB

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

[redacted]

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler: 1	Date Time: 11/15 17 1	Received By: 1 Fedex	Relinquished By: 2 Fedex	Date Time: 11/16/17 9:10	Received By: 2		
Relinquished by Sampler: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4		
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal # [ ] Intact [ ] Not intact	Preserved where applicable [ ]	On Ice 8	Cooler Temp 1.8°C 2.1°C	

SGS Accutest Sample Receipt Summary

Job Number: TD11627 **Client:** _____ **Project:** _____

Date / Time Received: 11/16/2017 9:10:00 AM **Delivery Method:** _____ **Airbill #'s:** _____

Cooler Temps (Raw Measured) °C: Cooler 1: (1.8); Cooler 2: (2.1);

Cooler Temps (Corrected) °C: Cooler 1: (2.7); Cooler 2: (3.0);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	IR Gun		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	2		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☑	☐
2. Trip Blank listed on COC:	☐		☑	☐
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

SM089-02
Rev. Date 12/1/16

8.1

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TD11627: Chain of Custody
Page 2 of 2

General Chemistry

QC Data Summaries

(SGS Accutest New Jersey)

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD11627
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Density	GN72802	TD11627-1	g/ml	1.0	1.0	0.0	0-20%

Associated Samples:
Batch GN72802: TD11627-1, TD11627-2
(*) Outside of QC limits

e-Hardcopy 2.0
Automated Report

Technical Report for

Key Energy

State# 1 Brine Station

SGS Accutest Job Number: TD12929

Sampling Date: 11/29/17

Report to:

Key Energy
6 Desota Drvie Suite 4300
Midland, TX 79705
bdinwiddie@keyenergy.com; Clair.Gonzales@tetratech.com;
madeline.mauk@tetratech.com
ATTN: Blake Dinwiddie

Total number of pages in report: **32**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Richard Rodriguez
Laboratory Director

Client Service contact: Electa Brown 713-271-4700

Certifications: TX (T104704220-17-27) AR (14-016-0) AZ (AZ0769) FL (E87628) KS (E-10366) LA (85695/04004) NJ (TX010) OK (2017-002) VA (8999)

Sections: 1 2 3 4 5 6 7 8 9

Table of Contents

Sample Summary

Key Energy

State# 1 Brine Station

Job No: TD12929

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
TD12929-1	11/29/17	10:20		11/30/17	AQ	Water	FRESH WATER
TD12929-2	11/29/17	09:55		11/30/17	AQ	Water	BRINE WATER WELL

Summary of Hits

Job Number: TD12929
Account: Key Energy
Project: State# 1 Brine Station
Collected: 11/29/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
TD12929-1	**FRESH WATER**					
Sodium [a]		1130000	5000		ug/l	SW846 6010C
Chloride		700	25		mg/l	EPA 300.0
Density [b]		1.0			g/ml	ASTM DEF
Solids, Total Dissolved		1550	10		mg/l	SM 2540C-2011
Specific Conductivity		2710	1.0		umhos/cm	EPA 120.1
pH [c]		8.32			su	SM 4500H+ B-2011
TD12929-2	**BRINE WATER WELL**					
Sodium [a]		128000000	250000		ug/l	SW846 6010C
Chloride		146000	5000		mg/l	EPA 300.0
Density [b]		1.2			g/ml	ASTM DEF
Solids, Total Dissolved		262000	1000		mg/l	SM 2540C-2011
Specific Conductivity		2650	1.0		umhos/cm	EPA 120.1
pH [d]		6.99			su	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Lafayette, LA.
(b) Analysis performed at SGS Accutest, Dayton, NJ.
(c) Field analysis required. Received out of hold time and analyzed by request.temp 21.3 c
(d) Field analysis required. Received out of hold time and analyzed by request.temp 21.7 c

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	FRESH WATER		
Lab Sample ID:	TD12929-1	**Date Sampled:**	11/29/17
Matrix:	AQ - Water	**Date Received:**	11/30/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	1130000	5000	ug/l	10	12/04/17	12/05/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA10056
(2) Prep QC Batch: L:MP10002

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	FRESH WATER		
Lab Sample ID:	TD12929-1	**Date Sampled:**	11/29/17
Matrix:	AQ - Water	**Date Received:**	11/30/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	700	25	mg/l	50	12/05/17 05:04	SM	EPA 300.0
Density [a]	1.0		g/ml	1	12/07/17	ANJ	ASTM DEF
Solids, Total Dissolved	1550	10	mg/l	1	12/01/17	MS	SM 2540C-2011
Specific Conductivity	2710	1.0	umhos/cm	1	12/01/17 17:00	PA	EPA 120.1
pH [b]	8.32		su	1	11/30/17 20:30	OZ	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Dayton, NJ.
(b) Field analysis required. Received out of hold time and analyzed by request.temp 21.3 c

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BRINE WATER WELL		
Lab Sample ID:	TD12929-2	**Date Sampled:**	11/29/17
Matrix:	AQ - Water	**Date Received:**	11/30/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

Total Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Sodium [a]	128000000	250000	ug/l	500	12/04/17	12/04/17	ALA	SW846 6010C [1]	SW846 3010A [2]

(1) Instrument QC Batch: L:MA10053
(2) Prep QC Batch: L:MP10002

(a) Analysis performed at SGS Accutest, Lafayette, LA.

RL = Reporting Limit

Report of Analysis

Client Sample ID:	BRINE WATER WELL		
Lab Sample ID:	TD12929-2	**Date Sampled:**	11/29/17
Matrix:	AQ - Water	**Date Received:**	11/30/17
		Percent Solids:	n/a
Project:	State# 1 Brine Station		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	146000	5000	mg/l	10000	12/05/17 05:19	SM	EPA 300.0
Density [a]	1.2		g/ml	1	12/07/17	ANJ	ASTM DEF
Solids, Total Dissolved	262000	1000	mg/l	1	12/01/17	MS	SM 2540C-2011
Specific Conductivity	2650	1.0	umhos/cm	1	12/01/17 17:00	PA	EPA 120.1
pH [b]	6.99		su	1	11/30/17 20:30	OZ	SM 4500H+ B-2011

(a) Analysis performed at SGS Accutest, Dayton, NJ.
(b) Field analysis required. Received out of hold time and analyzed by request.temp 21.7 c

RL = Reporting Limit

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

TD12929

Analysis Request of Chain of Custody Record

Page 1 of 1

Tetra Tech, Inc.

4000 N. Big Spring Street, Ste 401 Midland,Texas 79705 Tel (432) 682-4559 Fax (432) 682-3946

Client Name: Key Energy	Site Manager: Madeline Maulk
Project Name: State S Brine 1	
Project Location: (county, state) Lea County, New Mexico	Project #: 212C-HN-00522
Invoice to: Tetra Tech, Inc.	
Receiving Laboratory: SGS Accutest	Sampler Signature: Clair Gonzales
Comments:	

LAB # (LAB USE ONLY)	SAMPLE IDENTIFICATION	SAMPLING YEAR DATE	SAMPLING TIME	MATRIX WATER	MATRIX SOIL	PRESERVATIVE METHOD HCL	PRESERVATIVE METHOD HNO_3	PRESERVATIVE METHOD ICE	# CONTAINERS	FILTERED (Y/N)
1	Fresh Water	11/29/2017	1020	X				X		
2	Brine Water Well	11/29/2017	0955	X				X		

ANALYSIS REQUEST (Circle or Specify Method No.)

BTEX 8021B	BTEX 8260B	TPH TX1005 (Ext to C35)	TPH 8015M (GRO - DRO - ORO - MRO)	PAH 8270C	Total Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC/MS Vol. 8260B / 624	GC/MS Semi. Vol. 8270C/625	PCB's 8082 / 608	NORM	PLM (Asbestos)	Chloride	Sodium	TDS	General Water Chemistry (see attached list)	Anion/Cation Balance	Density	Conductivity	pH	HOLD
															X					X	X	X	
															X					X	X	X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	11/29/17	1145	[signature]	11/29/17	11:45
[signature]	11-29-17	1230	[signature]	11-29-17	1230

LAB USE ONLY

Sample Temperature 2.0°C

REMARKS:

- ☐ RUSH: Same Day 24 hr 48 hr 72 hr
- ☐ Rush Charges Authorized
- ☐ Special Report Limits or TRRP Report

(Circle) HAND DELIVERED FEDEX UPS Tracking #:

ORIGINAL COPY

TD12929: Chain of Custody
Page 1 of 4

TD12929: Chain of Custody
Page 2 of 4

SGS Accutest Sample Receipt Summary

Job Number: TD12929 **Client:** TETRA TECH **Project:** 212C HN 00522

Date / Time Received: 11/30/2017 10:30:00 AM **Delivery Method:** **Airbill #'s:** 674687974378

No. Coolers: 1 **Therm ID:** IR9; **Temp Adjustment Factor:** 0;

Cooler Temps (Initial/Adjusted): #1: (2/2);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:			
3. Cooler media:	Ice (Bag)		

Quality Control Preservation	Y	or	N	N/A	WTB	STB
1. Trip Blank present / cooler:	☐		☐	☑	☐	☐
2. Trip Blank listed on COC:	☐		☐	☑		
3. Samples preserved properly:	☑		☐			
4. VOCs headspace free:	☐		☐	☑		

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

Sample Receipt Log

Job #: TD12929 **Date / Time Received:** 11/30/2017 10:30:00 AM 10: **Initials:** EC

Client: TETRA TECH

Cooler #	Sample ID:	Vol	Bot #	Location	Pres	pH	Therm ID	Initial Temp	Therm CF	Corrected Temp
1	TD12929-1	1000ml	1	3Q	N/P	Note #2 - Preservative check not applicable.	IR9	2	0	2
1	TD12929-1	500ml	2	3Q	N/P	Note #2 - Preservative check not applicable.	IR9	2	0	2
1	TD12929-1	500ml	3	SUB	HNO3	pH < 2	IR9	2	0	2
1	TD12929-2	1000ml	1	3Q	N/P	Note #2 - Preservative check not applicable.	IR9	2	0	2
1	TD12929-2	500ml	2	3Q	N/P	Note #2 - Preservative check not applicable.	IR9	2	0	2
1	TD12929-2	500ml	3	SUB	HNO3	pH < 2	IR9	2	0	2

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD12929
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Chloride	GP45305/GN86354	0.50	0.0	mg/l	10	9.98	99.8	90-110%
Solids, Total Dissolved	GN86287	10	0.0	mg/l	500	478	95.6	88-110%
Specific Conductivity	GN86295	1.0	<1.0	umhos/cm				
Sulfate	GP45305/GN86354	0.60	0.0	mg/l	10	10.3	103.0	90-110%

Associated Samples:
Batch GN86287: TD12929-1, TD12929-2
Batch GN86295: TD12929-1, TD12929-2
Batch GP45305: TD12929-1, TD12929-2
(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD12929
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Chloride	GP45305/GN86354	LA39233-4	mg/l	1.7	1.8	5.7	0-20%
Solids, Total Dissolved	GN86287	TD12929-1	mg/l	1550	1550	0.0	0-5%
Specific Conductivity	GN86295	LA39227-1	umhos/cm	168	168	0.0	0-10%
Sulfate	GP45305/GN86354	LA39233-4	mg/l	9.2	9.4	2.2	0-20%
pH	GN86280	TD12929-2	su	6.99	6.99(a)	0.0	0-10%

Associated Samples:
Batch GN86280: TD12929-1, TD12929-2
Batch GN86287: TD12929-1, TD12929-2
Batch GN86295: TD12929-1, TD12929-2
Batch GP45305: TD12929-1, TD12929-2
(*) Outside of QC limits
(a) temp 21.7 c

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD12929
Account: KEYETXM - Key Energy
Project: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Chloride	GP45305/GN86354	LA39233-4	mg/l	1.7	10	11.2	95.0	80-120%
Sulfate	GP45305/GN86354	LA39233-4	mg/l	9.2	10	19.6	104.0	80-120%

Associated Samples:
Batch GP45305: TD12929-1, TD12929-2
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest Lafayette)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL. 713-271-4700 FAX: 713-271-4770
www.sgs.com

FED-EX Tracking #:
Bottle Order Control #:
SGS Accutest Quote #:
SGS Accutest Job: TD12929

Client / Reporting Information
Company Name: SGS Accutest
Street Address: 10165 Harwin Drive
City: Houston State: TX Zip: 77036
Project Contact / E-mail: alecta.brown@sgs.com
Phone #: 713-271-4700 Fax #:
Sampler(s) Name(s): Phone:

Project Information
Project Name: State# 1 Brine Station
Street:
City: State:
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)
Company Name:
Street Address:
City: State: Zip:
Attention:

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water, GW - Ground Water, WW - Water, SW - Surface Water, SO - Soil, SL- Sludge, SED-Sediment, OI - Oil, LIQ - Other Liquid, AIR - Air, SOL - Other Solid, WP - Wipe, FB-Field Blank, EB-Equipment Blank, RB- Rinse Blank, TB-Trip Blank

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Date	Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	NA	LAB USE ONLY
1	FRESH WATER		11/29/17	10:20:00 AM		AQ	1			X						X	
2	BRINE WATER WELL		11/29/17	9:55:00 AM		AQ	1			X						X	

RUSH

Turnaround Time (Business days)
- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [x] other Due 12/7/2017

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information
- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [x] Other COMMB

LA

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions: 3wk

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 S. James	12-1-17 1800	1 SGS	2 SGS		2 Dilmar Allen
3 Dilmar Allen	12/1/17 2300	3 Jonathan Pakdill 12-2-17 08:10	4		4
5		5	Custody Seal # CS/cooler	✓ Intact / Not intact	Preserved where applicable ✓ / On Ice ✓ / Cooler Temp. 1.9 DV484

TD12929: Chain of Custody
Page 1 of 2
SGS Accutest Lafayette

SGS Accutest Sample Receipt Summary

Job Number: TD12929 **Client:** SGS ACCUTEST **Project:** STATE #1 BRINE STATION

Date / Time Received: 12/2/2017 8:10:00 AM **Delivery Method:** Accutest Courier **Airbill #'s:**

Cooler Temps (Initial/Adjusted): 0

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Thermometer ID:	;		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☐	☑
2. Trip Blank listed on COC:	☐		☐	☑
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

TD12929: Chain of Custody
Page 2 of 2

Metals Analysis

QC Data Summaries

(SGS Accutest Lafayette)

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY
Part 2 - Method Blanks

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP10002
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 12/04/17

Metal	RL	IDL	MDL	MB raw	final
Aluminum	100	10	46		
Antimony	6.0	1.5	3.7		
Arsenic	10	1.5	2.6		
Barium	10	.25	1.3		
Beryllium	4.0	.04	.3		
Boron	100	1.4	10		
Cadmium	5.0	.13	.9		
Calcium	100	5.9	58		
Chromium	10	.35	.9		
Cobalt	10	.15	.8		
Copper	10	.98	4		
Iron	100	4.3	33		
Lead	10	.79	1.8		
Lithium	10	2	6.3		
Magnesium	100	19	37		
Manganese	10	3.6	1.1		
Molybdenum	10	.19	1.1		
Nickel	10	.67	1		
Potassium	500	37	50		
Selenium	10	1.7	3.6		
Silver	10	.42	1.4		
Sodium	500	89	53	-140	<500
Strontium	10	.08	1		
Thallium	5.0	1.4	1.6		
Tin	10	.51	.9		
Titanium	10	.34	1.7		
Vanadium	10	.28	.9		
Zinc	20	9.9	4.3		

Associated samples MP10002: TD12929-1, TD12929-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP10002
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 12/04/17

Metal	LA39343-2 Original MS		Spikelot ICPSPIKE1% Rec		QC Limits
Aluminum					
Antimony					
Arsenic	anr				
Barium	anr				
Beryllium					
Boron					
Cadmium	anr				
Calcium					
Chromium	anr				
Cobalt					
Copper	anr				
Iron					
Lead	anr				
Lithium					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Potassium					
Selenium	anr				
Silver	anr				
Sodium	489000	485000	10000	-40.0(a)	75-125
Strontium					
Thallium					
Tin					
Titanium					
Vanadium					
Zinc					

Associated samples MP10002: TD12929-1, TD12929-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP10002
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 12/04/17

Metal	LA39343-2 Original MSD		Spikelot ICPSPIKE1% Rec	MSD RPD	QC Limit
Aluminum					
Antimony					
Arsenic	anr				
Barium	anr				
Beryllium					
Boron					
Cadmium	anr				
Calcium					
Chromium	anr				
Cobalt					
Copper	anr				
Iron					
Lead	anr				
Lithium					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Potassium					
Selenium	anr				
Silver	anr				
Sodium	489000	467000	10000	-220.0(a	3.8 20
Strontium					
Thallium					
Tin					
Titanium					
Vanadium					
Zinc					

Associated samples MP10002: TD12929-1, TD12929-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(N) Matrix Spike Rec. outside of QC limits
(anr) Analyte not requested
(a) Spike amount low relative to the sample amount. Refer to lab control or spike blank for recovery information.

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP10002
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 12/04/17

Metal	BSP Result	Spikelot ICPSPIKE1%	Rec	QC Limits
Aluminum				
Antimony				
Arsenic	anr			
Barium	anr			
Beryllium				
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt				
Copper	anr			
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel				
Potassium				
Selenium	anr			
Silver	anr			
Sodium	8970	10000	89.7	80-120
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				

Associated samples MP10002: TD12929-1, TD12929-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

SERIAL DILUTION RESULTS SUMMARY

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

QC Batch ID: MP10002
Matrix Type: AQUEOUS

Methods: SW846 6010C
Units: ug/l

Prep Date: 12/04/17

Metal	LA39343-2 Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony				
Arsenic	anr			
Barium	anr			
Beryllium				
Boron				
Cadmium	anr			
Calcium				
Chromium	anr			
Cobalt				
Copper	anr			
Iron				
Lead	anr			
Lithium				
Magnesium				
Manganese				
Molybdenum				
Nickel				
Potassium				
Selenium	anr			
Silver	anr			
Sodium	489000	506000	3.6	0-10
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				

Associated samples MP10002: TD12929-1, TD12929-2

Results < IDL are shown as zero for calculation purposes
(*) Outside of QC limits
(anr) Analyte not requested

Misc. Forms

Custody Documents and Other Forms

(SGS Accutest New Jersey)

Includes the following where applicable:

- Chain of Custody

SGS ACCUTEST

CHAIN OF CUSTODY

10165 Harwin Drive, Houston, TX 77036
TEL. 713-271-4700 FAX: 713-271-4770
www.sgs.com

FED-EX Tracking #: 5642 4621 5169
Bottle Order Control #:
SGS Accutest Quote #:
SGS Accutest Job: TD12929

Client / Reporting Information	Project Information	
Company Name: SGS Accutest	Project Name: State# 1 Brine Station	
Street Address: 10165 Harwin Drive	Street	Billing Information (if different from Report to)
City: Houston State: TX Zip: 77036	City State	Company Name
Project Contact / E-mail: electa.brown@sgs.com	Project #	Street Address
Phone #: 713-271-4700 Fax #	Client Purchase Order #	City State Zip
Sampler(s) Name(s) Phone	Project Manager	Attention:

Requested Analysis (see TEST CODE sheet)

SGS Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	DENS	LAB USE ONLY
1	FRESH WATER		11/29/17	10:20:00 AM		AQ	1					x				X	
2	BRINE WATER WELL		11/29/17	9:55:00 AM		AQ	1					x				X	

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL - Sludge; SED - Sediment; OI - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB - Field Blank; EB - Equipment Blank; RB - Rinse Blank; TB - Trip Blank

Turnaround Time (Business days)

- [ ] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [X] other Due 12/7/2017

Emergency & Rush T/A data available VIA Lablink

Approved By (SGS Accutest PM): / Date:

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [ ] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [X] Other COMMB

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

[redacted]

INITIAL ASSESSMENT RP 2B
LABEL VERIFICATION

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler: 1	Date Time: 12/4/17 1500	Received By: 1 FEDEX	Relinquished By: 2 FEDEX	Date Time: 12-5-17 945	Received By: 2
Relinquished by Sampler: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal #	☐ Intact ☐ Not intact	Preserved where applicable ☐ On Ice ☐ Cooler Temp. 1.1 °C

IP

8.1 8

TD12929: Chain of Custody
Page 1 of 2
SGS Accutest New Jersey

SGS Accutest Sample Receipt Summary

Job Number: TD12929 **Client:** _____ **Project:** _____

Date / Time Received: 12/5/2017 9:45:00 AM **Delivery Method:** _____ **Airbill #'s:** _____

Cooler Temps (Raw Measured) °C: Cooler 1: (1.1);

Cooler Temps (Corrected) °C: Cooler 1: (2.0);

Cooler Security	Y	or	N		Y	or	N
1. Custody Seals Present:	☑		☐	3. COC Present:	☑		☐
2. Custody Seals Intact:	☑		☐	4. Smpl Dates/Time OK	☑		☐

Cooler Temperature	Y	or	N
1. Temp criteria achieved:	☑		☐
2. Cooler temp verification:	IR Gun		
3. Cooler media:	Ice (Bag)		
4. No. Coolers:	1		

Quality Control Preservation	Y	or	N	N/A
1. Trip Blank present / cooler:	☐		☑	☐
2. Trip Blank listed on COC:	☐		☑	☐
3. Samples preserved properly:	☑		☐	
4. VOCs headspace free:	☐		☐	☑

Sample Integrity - Documentation	Y	or	N
1. Sample labels present on bottles:	☑		☐
2. Container labeling complete:	☑		☐
3. Sample container label / COC agree:	☑		☐

Sample Integrity - Condition	Y	or	N
1. Sample recvd within HT:	☑		☐
2. All containers accounted for:	☑		☐
3. Condition of sample:	Intact		

Sample Integrity - Instructions	Y	or	N	N/A
1. Analysis requested is clear:	☑		☐	
2. Bottles received for unspecified tests	☐		☑	
3. Sufficient volume recvd for analysis:	☑		☐	
4. Compositing instructions clear:	☐		☐	☑
5. Filtering instructions clear:	☐		☐	☑

Comments

SM089-02
Rev. Date 12/1/16

8.1

8

TD12929: Chain of Custody
Page 2 of 2

General Chemistry

QC Data Summaries

(SGS Accutest New Jersey)

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: TD12929
Account: ALGC - SGS Accutest Gulf Coast
Project: KEYETXM: State# 1 Brine Station

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Density	GN73592	TD12929-1	g/ml	1.0	1.0	0.0	0-20%

Associated Samples:
Batch GN73592: TD12929-1, TD12929-2
(*) Outside of QC limits

Appendix C- Area of Review

- AOR Well Status List
- AOR Aerial Map

2017 BW-28 AOR Review-- Well Status List

up-dated April 2018

	API #	Well Name	UL	Section	Ts	Rg	Footage	Within 1/4 mi AOR * within 800 ft			Casing Program Checked	Cased/Cemented across salt section	Corrective Action Required
1	***30-025-33547***	***Key-State no.001***	***E***	***15***	***21s***	***37e***	***1340 FNL & 330 FWL***	NA			NA		
1	30-025-06591	Apache NEDU 604	E	15	21s	37e	2310 FNL & 990 FWL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-09913 (P&A)	Shell NEDU 603	E	15	21s	37e	3390 FSL & 4520 FEL	**Yes***	1	1	yes	yes	no
1	30-025-09914	Apache NEDU 602	E	15	21s	37e	1980 FNL & 660 FWL	**Yes***	1	1	yes	yes	no
1	30-025-35271	Apache NEDU 602625	E	15	21s	37e	2580 FNL & 1300 FWL	no			na	na	na
0	30-025-37223 Never Drilled **	Apache NEDU 628	E	15	21s	37e	1410 FNL & 380 FWL	Never Drilled	0	0	na	na	na
1	**30-025-41600 (in Production 2014)**	Apache NEDU 544	E	15	21s	37e	1355 FNL &1190 FWL	yes	0	1	Yes	yes	no
0	30-025-42237 (Withdrawn)	Apache NEDU 648	E	15	21s	37e	1640 FNL & 1300 FWL	yes	0	1	na	na	na
1	30-025-06609	Chevron St. 002	C	15	21s	37e	660 FNL & 1980 FWL	no			na	na	na
1	30-025-06611	Chevron St. 004	C	15	21s	37e	660 FNL & 2080 FWL	no			na	na	na
1	30-025-06613	Apache NEDU 605	C	15	21s	37e	760 FNL & 1980 FWL	no			na	na	na
1	30-025-34649	Apache NEDU 622	C	15	21s	37e	1229 FNL & 2498 FWL	no			na	na	na
1	30-025-34886	Apache NEDU 524	C	15	21s	37e	160 FNL & 1350 FWL	no			na	na	na
1	30-025-39831(added 2010)	Chevron State S no. 2	C	15	21s	37e	990 FNL & 1330 FWL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-34887	Apache NEDU 624	C	15	21s	37e	1250 FNL & 1368 FWL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-41485	Brammer Engr. St No 12	C	15	21s	37e	990 FNL & 1330 FWL	yes		1	yes+++	yes	no
1	30-025-41583	Apache NEDU 661	C	15	21s	37e	1240 FNL & 1930 FWL	no			na	na	na
1	30-025-41598	Apache NEDU 558	C	15	21s	37e	150 FNL & 2295 FWL	no			na	na	na
1	30-025-06586	Chevron St. 001	D	15	21s	37e	660 FNL & 660 FWL	**yes***	1	1	yes	yes	no
1	30-025-06612	Chevron St. 005	D	15	21s	37e	660 FNL & 990 FWL	yes		1	yes	yes	no
1	30-025-06614	Apache NEDU 601	D	15	21s	37e	600 FNL & 990 FWL	yes		1	yes	yes	no
1	30-025-36809	Apache NEDU 526	D	15	21s	37e	130 FNL & 330 FWL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-06585	Apache St. 002	F	15	21s	37e	1980 FNL & 1980 FWL	no			na	na	na
1	30-025-06587	Apache NEDU 606	F	15	21s	37e	3375 FSL & 3225 FEL	no			na	na	na
1	30-025-06590	Apache NEDU 608	F	15	21s	37e	1980 FNL & 1880 FWL	no			na	na	na
1	30-025-41275	Apache NEDU 650	F	15	21s	37e	2550 FNL & 1925 FWL	no			na	na	na
0	30-025-42236 (Withdrawn)	Apache NEDU 647	F	15	21s	37e	1710 FNL & 2360 FWL	no			na	na	na
1	30-025-06603	Apache Argo 006	K	15	21s	37e	1650 FSL & 2310 FWL	no			na	na	na
1	30-025-06607(added 2010)	Apache Argo 011	K	15	21s	37e	2080 FSL & 1650 FWL	no			na	na	na
1	30-025-09918	Apache NEDU 703	K	15	21s	37e	1980 FSL & 1980 FWL	no			na	na	na
1	30-025-39828	Apache Argo 14	K	15	21s	37e	2190 FSL & 2130 FWL	no			na	na	na
1	30-025-34657	Apache NEDU 623	K	15	21s	37e	2540 FSL & 2482 FWL	no			na	na	na
1	30-025-06606	Apache Argo 010	L	15	21s	37e	1880 FSL & 760 FWL	no			na	na	na
1	30-025-09915	Apache Argo 007	L	15	21s	37e	2310 FSL & 990 FWL	no			na	na	na
1	30-025-09916	Apache NEDU 701	L	15	21s	37e	1980 FSL & 660 FWL	no			na	na	na
1	30-025-34888	Apache NEDU 713	L	15	21s	37e	1330 FSL & 1142 FWL	no			na	na	na
1	30-025-37238	Apache NEDU 629	L	15	21s	37e	2630 FSL & 330 FWL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
0	30-025-42232 (Withdrawn)	Apache NEDU 639	L	15	21s	37e	1960 FSL & 740 FWL	no			na	na	na
1	30-025-06623	Apache WBDU 057	A	16	21s	37e	660 FNL & 660 FEL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-25198	Chevron HLNCT 006	A	16	21s	37e	330 FNL & 600 FEL	no			no	na	na
1	30-025-39277	Apache WBDU 113	A	16	21s	37e	1290 FNL & 330 FEL	**yes***	1	1	yes	yes	no
1	30-025-06621	Apache WBDU 056	H	16	21s	37e	1980 FNL & 660 FEL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-06624	Chevron HLNCT 005	H	16	21s	37e	2310 FNL & 330 FEL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
1	30-025-36741	Chevron HLNCT 007	H	16	21s	37e	1330 FNL & 1070 FEL	no			na	na	na
1	30-025-37834	Chevron HLNCT 008	H	16	21s	37e	2310 FNL & 030 FEL	yes		1	no	Will check if critical radius approaches	Will check if critical radius approaches
0	30-025-42537 (Proposed)	Apache WBDU 164	H	17	21s	37e	2610 FNL & 300 FEL	Yes	0	0	yes	Well P&A	Well P&A
1	30-025-06617	Apache St. DA 005	I	16	21s	37e	1980 FSL & 330 FEL	no			na	na	na
1	30-025-06619	Apache WBDU078	I	16	21s	37e	1980 FSL & 660 FEL	no			na	na	na
1	30-025-37916	Apache St. DA 013	I	16	21s	37e	1650 FSL & 780 FEL	no			na	na	na
									4	18			

44 Total # of wells in adjacent quarter-sections
18 Total # of wells in 1/4 mile AOR
4 Total # of wells that are or have become within 800 ft of the outside radius of the brine well.

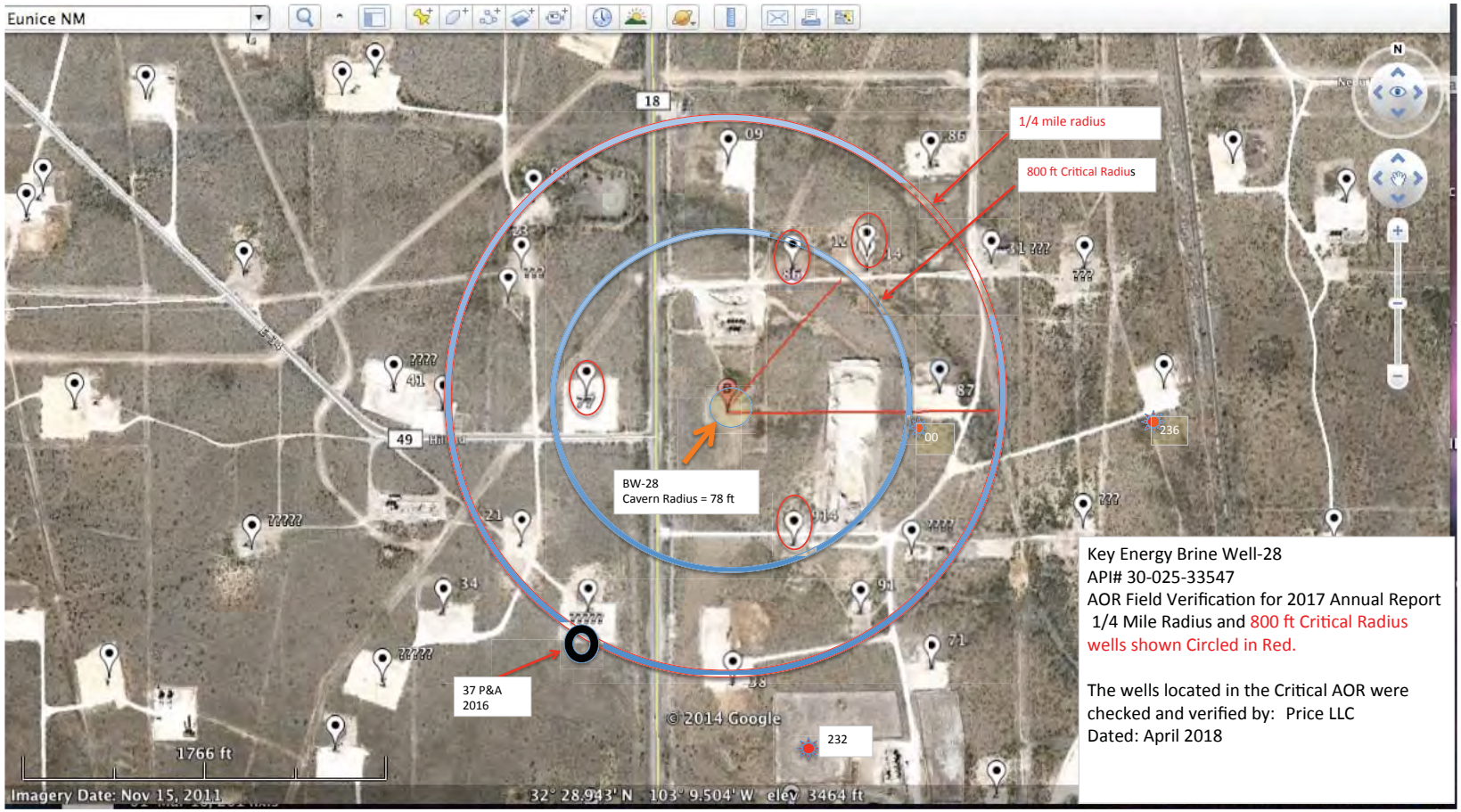
Notes:

*** Means the well is within the calculated Critical outside radius of the brine well and casing program will be checked annually.**

The Critical Radius of Review is 10x the calucated brine well radius.

**** API # 30-025-37223 not drilled too close to Brine Well**

"+++checked casing 1000 sks for 714 ft3 ok between 7-5/8 and 5.5 covers salt section



Field Notes: Last two or three well digits are the last number for the Well API#.

Appendix D-

- 2016-2017 MIT

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised July 18, 2013

WELL API NO. 30-025-33547
5. Indicate Type of Lease STATE ☑ FEE ☐
6. State Oil & Gas Lease No. 28411

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name: State S
1. Type of Well: Oil Well ☐ Gas Well ☑ Other
8. Well Number 001
2. Name of Operator: Key Energy Services, LLC
9. OGRID Number
3. Address of Operator: 6 Desta Dr. Ste 4300 Midland, TX 79705
10. Pool name or Wildcat
4. Well Location
Unit Letter E : 1340 feet from the North line and 330 feet from the West line
Section 15 Township 21S Range 37E NMPM County LEA
11. Elevation (Show whether DR, RKB, RT, GR, etc.) GL Elevation 3458

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
PERFORM REMEDIAL WORK	☐	PLUG AND ABANDON	☐	REMEDIAL WORK	☐	ALTERING CASING	☐
TEMPORARILY ABANDON	☐	CHANGE PLANS	☐	COMMENCE DRILLING OPNS.	☐	P AND A	☐
PULL OR ALTER CASING	☐	MULTIPLE COMPL	☐	CASING/CEMENT JOB	☐		
DOWNHOLE COMMINGLE	☐						
CLOSED-LOOP SYSTEM	☐						
OTHER:	☐			OTHER: Cavern MIT OCD Condition of Approval	☑		

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

Spud Date: | Rig Release Date:

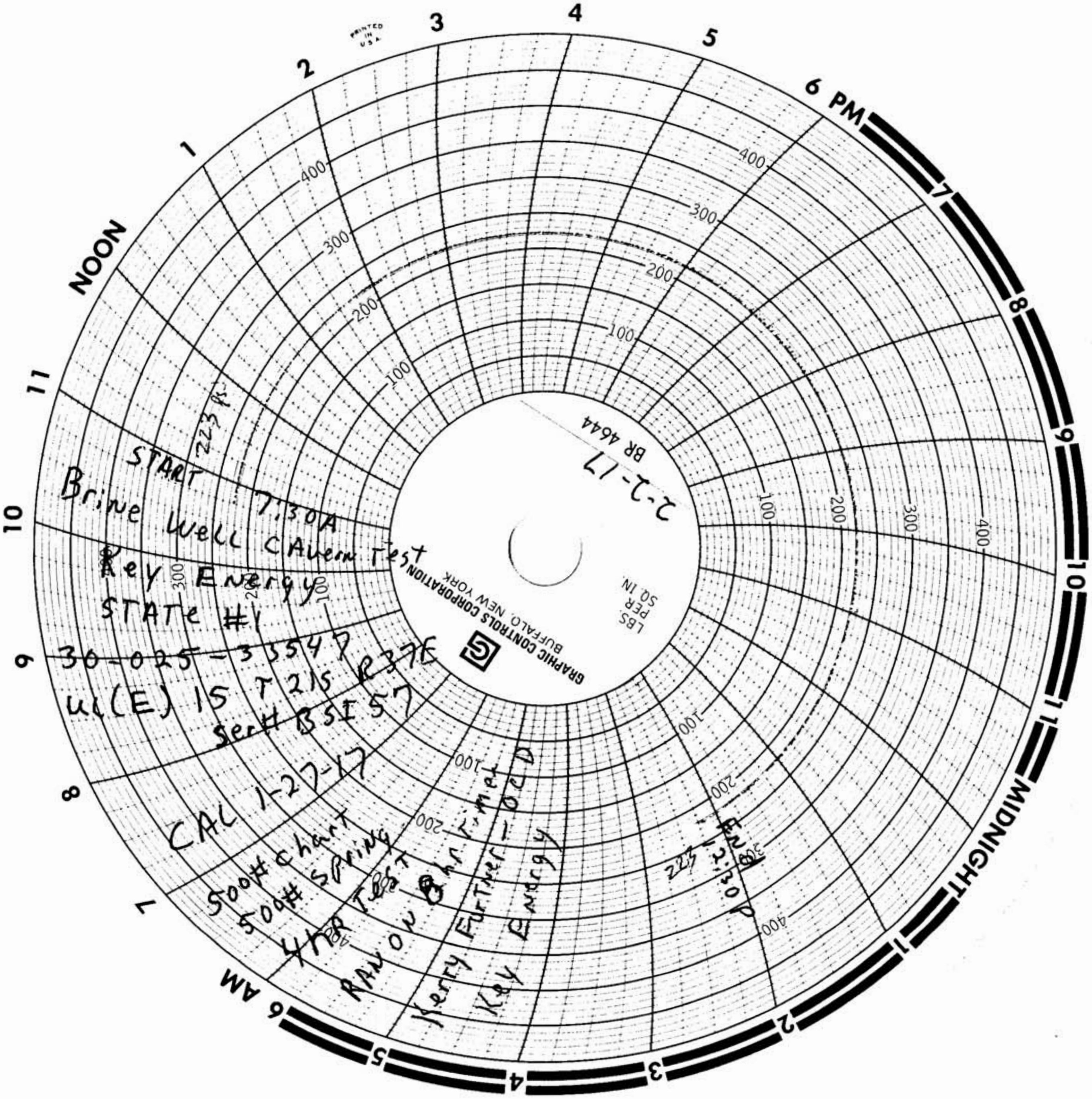
I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Jerry Waylon Jackson TITLE Prod. Serv. Sup. DATE 2-3-17

Type or print name Jerry Waylon Jackson E-mail address: jjackson05@keyenergy.com PHONE: (806) 637-3507

For State Use Only

APPROVED BY: Paul F. Kautz TITLE Environmental Engineer DATE 2/7/2017
Conditions of Approval (if any):


NOON
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MIDNIGHT
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6 AM
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PRINTED IN U.S.A.
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
LBS. PER SQ. IN.
BR 4644
2-2-17
START 7:30A
223
Brine Well CAvern Test
Key Energy
STATE #1
30-025-33547
UL(E) 15 T21S R37E
Ser# BSI57
CAL 1-27-17
500# chart
500# Spring
4 HR TEST
RAN ON 8 hr timer
Kerry Fortner - OCD
Key Energy
END 11:30A
223

OCD Condition of Approval

Mr. Houston, et al.:

OCD hereby requires that Key Energy Services, LLC (Key) conduct within 30-days of receipt of this Form, a Cavern MIT with pressure up to at least 200 psig for at least 4 hrs. recorded on a calibrated chart (within past 90 days) recorder with not greater than a 500 lb. spring. The start of the MIT shall be witnessed by OCD Hobb Field Staff. The intent of this test is to verify that the cavern has healed or whether there may be an external MIT problem with the well.

You may contact Mr. Mark A. Whitaker at the OCD Hobbs District Office at (575) 393-6161 Ext. #120 or Cell at (575) 399-3202.

Please acknowledge receipt of this message and provide Key's schedule for completing the above.

OCD appreciates Key's cooperation in this matter.

Please contact Mark A. Whitaker if you have questions. Thank you.

BSI Big Spring Instrument, Inc.

5409 N. Service Road
Big Spring, TX 79720
(432) 267-7185

CALIBRATION REPORT

Type Instrument: 1024 BARTON SINGLE PEN

Manufacturer: BARTON

Model Number: BSI #47

Serial Number: BSI #47

Measurement Range: 0-500 PSI CHART CLOCK

Equipment Used: PRESSURE RECORDER

	Measured Variable In Percent				
	0%	25%	50%	75%	100%
Flow (Indicated)					
Flow (Corrected)					
Pressure (Indicated)	0	200	400	470	500#
Fressure (Corrected)	100	150	350	400	500
Temperature (Indicated)					
Temperature (Corrected)					

Inspected By: [signature] Date: 1-07 Recall Date: 2-07

REMARKS: OK. [signature]

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised July 18, 2013

WELL API NO. 30-025-33547
5. Indicate Type of Lease STATE ☑ FEE ☐
6. State Oil & Gas Lease No. 2841

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name: State S
8. Well Number: 001
1. Type of Well: Oil Well ☐ Gas Well ☑ Other
9. OGRID Number
2. Name of Operator: Key Energy Services, LLC
10. Pool name or Wildcat
3. Address of Operator: 6 Desta Drive Suite 4300 Midland, TX 79705
4. Well Location
Unit Letter E : 1340 feet from the N line and 330 feet from the W line
Section 15 Township 21S Range 37E NMPM County Lea
11. Elevation (Show whether DR, RKB, RT, GR, etc.) GL 3458

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
PERFORM REMEDIAL WORK	☐	PLUG AND ABANDON	☐	REMEDIAL WORK	☐	ALTERING CASING	☐
TEMPORARILY ABANDON	☐	CHANGE PLANS	☐	COMMENCE DRILLING OPNS.	☐	P AND A	☐
PULL OR ALTER CASING	☐	MULTIPLE COMPL	☐	CASING/CEMENT JOB	☐		
DOWNHOLE COMMINGLE	☐						
CLOSED-LOOP SYSTEM	☐						
OTHER: Casing MIT	☑			OTHER:			☐

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

Spud Date: | Rig Release Date:

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Jerry Waylon Jackson TITLE Production Service Supervisor DATE 1-3-17

Type or print name Jerry Waylon Jackson E-mail address: jjackson95@keyenergy.com PHONE: (806) 637-3507

For State Use Only

APPROVED BY: Carl J. Chavez TITLE Environmental Engineer DATE 1/10/2017
Conditions of Approval (if any):

See attached Condition of Approval.

OCD Condition of Approval

Mr. Houston, et al.:

OCD hereby requires that Key Energy Services, LLC (Key) conduct within 30-days of receipt of this Form, a Cavern MIT with pressure up to at least 200 psig for at least 4 hrs. recorded on a calibrated chart (within past 90 days) recorder with not greater than a 500 lb. spring. The start of the MIT shall be witnessed by OCD Hobb Field Staff. The intent of this test is to verify that the cavern has healed or whether there may be an external MIT problem with the well.

You may contact Mr. Mark A. Whitaker at the OCD Hobbs District Office at (575) 393-6161 Ext. #120 or Cell at (575) 399-3202.

Please acknowledge receipt of this message and provide Key's schedule for completing the above.

OCD appreciates Key's cooperation in this matter.

Please contact Mark A. Whitaker if you have questions. Thank you.

MIDNIGHT
NOON
6 AM
6 PM
Graphic Controls
DATE 12-27-16
BR 2221
Casing MIT
PRINTED IN U.S.A.

American Valve & Meter, Inc.

1113 W. BROADWAY

P.O. BOX 166 HOBBS,
NM 88240

T0: Key Energy **DATE:07/20/16**

This is to certify that:

I, Tony Flores, Technician for American Valve & Meter Inc. has checked the calibration of the following instrument.

8 "_Pressure recorder **Ser# 1G53214**

at these points.

Pressure #			* Pressure #		
Test	Found	Left	Test	Found	Left
- 0	-	- 0	-	-	-
- 500	- S	- 500	-	-	-
- 700	- A	- 700	-	-	-
- 1000	- M	- 1000	-	-	-
- 200	- E	- 200	-	-	-
- 0	-	- 0	-	-	-

Remarks:_____

_____

_____

Signature: Tony Flores

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Tuesday, January 3, 2017 8:41 AM
To: Houston, Ken; 'Jackson, Jerry'; Boone, Teresa
Cc: Catanach, David, EMNRD; Griswold, Jim, EMNRD; Brown, Maxey G, EMNRD; Whitaker, Mark A, EMNRD
Subject: BW-28 Key Energy Services, L.L.C. State Well #1 (API# 30-025-33547): Casing MIT Pass on 12/27/2016

Mr. Houston, et al.:

The New Mexico Oil Conservation Division (OCD) witnessed the recent above subject MIT, and the well passed the test. Please submit the C-103 Form for the MIT, original MIT chart, and copy of chart calibration sheet to me in order to update the administrative record within 7-days of receipt of this message.

OCD hereby allows Key Energy Services, LLC to resume brine production operations. OCD is also evaluating the formation leak-off problem from the prior Formation MIT, and may require additional testing and/or information.

Please contact me if you have questions. Thank you.

Mr. Carl J. Chavez
New Mexico Oil Conservation Division
Energy Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico 87505
Ph. (505) 476-3490
E-mail: CarlJ.Chavez@state.nm.us
"Why not prevent pollution, minimize waste to reduce operating costs, reuse or recycle, and move forward with the rest of the Nation?" (To see how, go to: http://www.emnrd.state.nm.us/OCD and see "Publications")

From: Griswold, Jim, EMNRD
Sent: Thursday, December 15, 2016 3:50 PM
To: Catanach, David, EMNRD <David.Catanach@state.nm.us>; Brown, Maxey G, EMNRD <MaxeyG.Brown@state.nm.us>; Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Subject: FW: State S Brine

From: Houston, Ken [mailto:KHouston@keyenergy.com]
Sent: Thursday, December 15, 2016 3:48 PM
To: Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>
Cc: Jackson, Jerry <jjackson05@keyenergy.com>; Coligan, Maren <mcoligan@keyenergy.com>; Aqueron, Rene <raqueron@keyenergy.com>
Subject: State S Brine

December 15, 2016
Dear Mr. Griswold,

Key's State S brine well has been shut in. No water is being injected and no brine produced from the cavern. Key will resume contact with the area OCD office to provide notice prior to performing the casing MIT.

Best regards,

Ken Houston | **Key Energy Services, LLC**
Vice President QHSE and SWD Operations
1301 McKinney Street, Suite 1800, Houston, TX 77010
o: 713.757.5512 | **c:** 713.419.3908 | **e:** khouston@keyenergy.com
Doing it the right way. The *Key*Way. Every time.
Please consider the environment before printing this email

Chavez, Carl J, EMNRD

From: Griswold, Jim, EMNRD
Sent: Thursday, December 15, 2016 3:50 PM
To: Catanach, David, EMNRD; Brown, Maxey G, EMNRD; Chavez, Carl J, EMNRD
Subject: FW: State S Brine

From: Houston, Ken [mailto:KHouston@keyenergy.com]
Sent: Thursday, December 15, 2016 3:48 PM
To: Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>
Cc: Jackson, Jerry <jjackson05@keyenergy.com>; Coligan, Maren <mcoligan@keyenergy.com>; Aqueron, Rene <raqueron@keyenergy.com>
Subject: State S Brine

December 15, 2016
Dear Mr. Griswold,
Key's State S brine well has been shut in. No water is being injected and no brine produced from the cavern. Key will resume contact with the area OCD office to provide notice prior to performing the casing MIT.

Best regards,

Ken Houston | **Key Energy Services, LLC**
Vice President QHSE and SWD Operations
1301 McKinney Street, Suite 1800, Houston, TX 77010
o: 713.757.5512 | **c:** 713.419.3908 | **e:** khouston@keyenergy.com
Doing it the right way. The *Key*Way. Every time.
Please consider the environment before printing this email

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Friday, December 2, 2016 10:15 AM
To: 'Jackson, Jerry'; Boone, Teresa
Cc: Whitaker, Mark A, EMNRD; Fortner, Kerry, EMNRD; Brown, Maxey G, EMNRD; Griswold, Jim, EMNRD
Subject: BW-28 Key Energy Services, L.L.C. State Well #1 (API# 30-025-33547): Cavern MIT Reschedule

Mr. Jackson, et al.:

Good morning. The New Mexico Oil Conservation Division (OCD) is following up on our phone call this morning. There is one key change requiring a Casing MIT instead of a Cavern MIT from this morning's communication.

Key Energy Services, LLC (Key) experienced difficulty pressuring up to the 300 psi MIT pressure this morning. On Thursday (12/1), pressure in the cavern would not exceed ~ 280 psi. OCD believed that the salt cavern was fractured, and requires time to heal. However, the cavern bled off overnight to 240 psi, which is a very significant reduction in pressure. Historical Cavern MITs have been successfully run as high as 350 psi. Consequently, OCD is concerned this may be more than a cavern fracture scenario, and more likely a casing issue.

Therefore, OCD requires Key to reschedule a Casing MIT (300 psi for 30 min. +/- 10% pass/fail) within the next 90 days. A packer should be set within 50 ft. or less from the casing shoe depth.

Also, on a side note, OCD has noticed pressuring up on the mature cavern with fluid has taken a longer period of time, and Key may want to consider nitrogen gas for future Cavern MITs where the pressure up time would be minimal. Let's see if we can get past this EPA 5-Yr. MIT with the Casing MIT.

Please contact Mark A. Whitaker with the OCD Hobbs District Office to reschedule the Casing MIT. Thank you.

Mr. Carl J. Chavez
New Mexico Oil Conservation Division
Energy Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico 87505
Ph. (505) 476-3490
E-mail: CarlJ.Chavez@state.nm.us
"Why not prevent pollution, minimize waste to reduce operating costs, reuse or recycle, and move forward with the rest of the Nation?" (To see how, go to: http://www.emnrd.state.nm.us/OCD and see "Publications")

Griswold, Jim, EMNRD

From: Griswold, Jim, EMNRD
Sent: Tuesday, July 30, 2013 1:58 PM
To: 'wayne price'
Cc: Mike Slaughter; Brian Kenne; Gonzales, Elidio L, EMNRD; Whitaker, Mark A, EMNRD; Brown, Maxey G, EMNRD
Subject: RE: Key Energy Eunice BW-28 5 year MIT

Please proceed with whatever arrangements must be made to facilitate the future testing. Be aware that the test as proposed will subject both the brine cavern and entry casing to pressure. If the combination is not able to sustain the static test pressure for the duration, then further testing will be needed to determine where any observable loss might be occurring. This may dictate removal of all tubing from the well, installation of a packer to isolate the well casing, and independent pressure testing. Thank you.

Jim Griswold
Senior Hydrologist
EMNRD/Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505.476.3465
email: jim.griswold@state.nm.us

-----Original Message-----
From: wayne price [mailto:wayneprice77@earthlink.net]
Sent: Tuesday, July 30, 2013 9:10 AM
To: Griswold, Jim, EMNRD
Cc: Mike Slaughter; Brian Kenne
Subject: Key Energy Eunice BW-28 5 year MIT

Dear Jim,

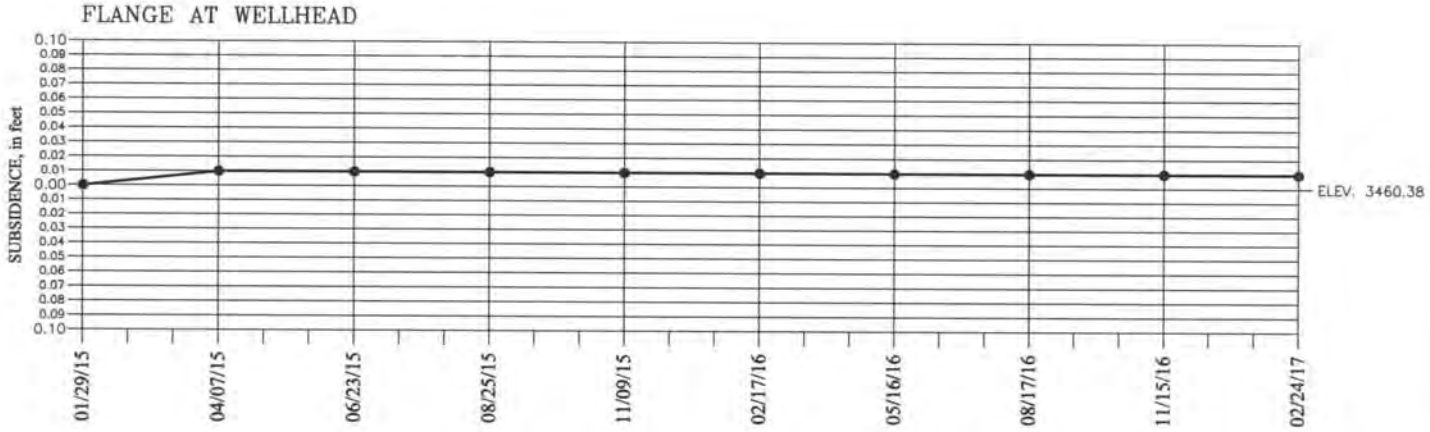
Pursuant to our meeting in Santa Fe the other day, we would like to officially request that our next 5 year MIT, (schedule 2014) Key would be able to use the normal open to formation pressure test using either nitrogen or water, pressure up to approximately 300 psig, use a conventional chart recorder calibrated for 0-500 psig, use a maximum of 12 hour clock, hold pressure for 4 hours.

Please advise so we can make proper arrangements.

Wayne Price

Appendix E- Subsidence Reports

VERTICAL ELEVATION TABLE
KEY ENERGY SERVICES, LLC. – STATE #1



SURVEYORS CERTIFICATE

I, TERRY J. ASEL, NEW MEXICO PROFESSIONAL SURVEYOR NO. 15079, DO HEREBY CERTIFY THAT I CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND MEETS THE "MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO" AS ADOPTED BY THE NEW MEXICO STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND SURVEYORS.

Terry J. Asel 2/28/2017

Terry J. Asel N.M. R.P.L.S. No. 15079

Asel Surveying

P.O. BOX 393 – 310 W. TAYLOR
HOBBS, NEW MEXICO – 575-393-9146

BASIS OF ELEVATIONS: US C & GS BENCH MARK
"L-98 1935" – CV0320
ELEV. = 3434.37

KEY ENERGY SERVICES, LLC.

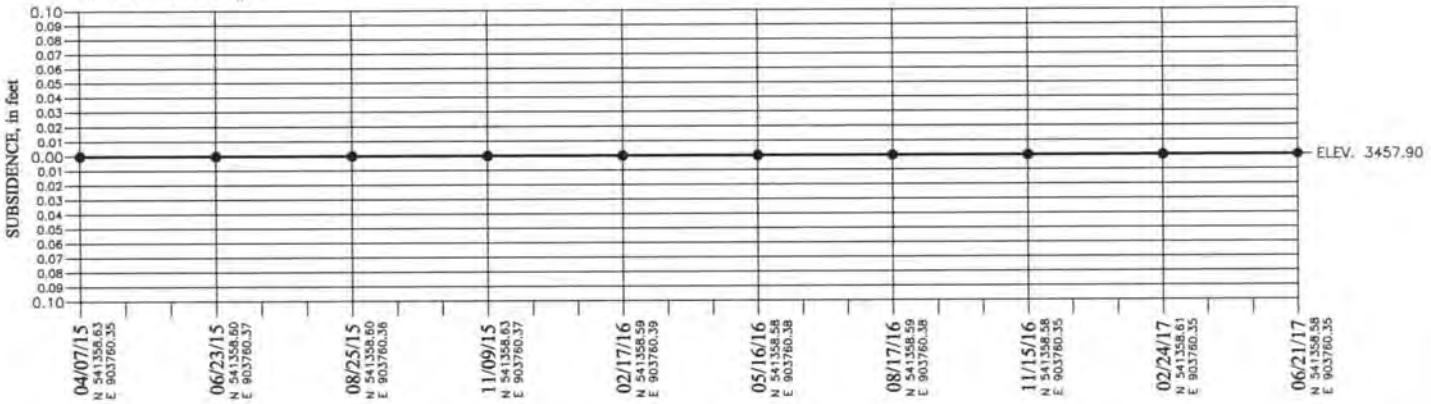
ELEVATIONS FOR THE KEY ENERGY SERVICES, LLC. – EUNICE STATE #1 WELL IN SECTION 15, TOWNSHIP 21 SOUTH, RANGE 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO

Survey Date: 02/24/17	Sheet 1 of 1 Sheets	
W.O. Number: 170224MS-a	Drawn By: KA	Rev:
Date: 02/27/17	170224MS-a	Scale: 1"=1000'

VERTICAL SUBSIDENCE TABLE
KEY ENERGY SERVICES, LLC. – STATE #1

NEW MEXICO EAST NAD 83

MONUMENT #1



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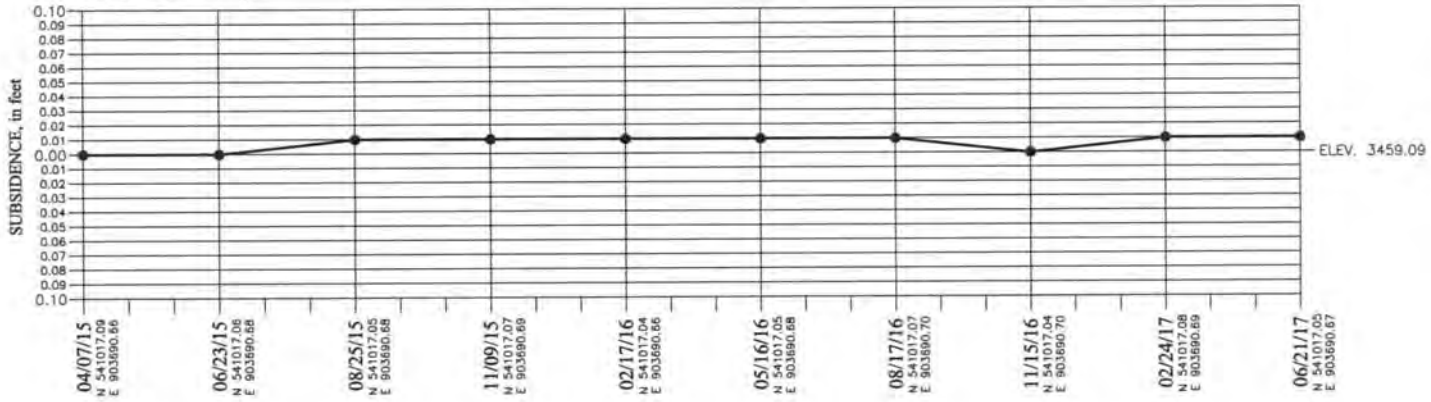

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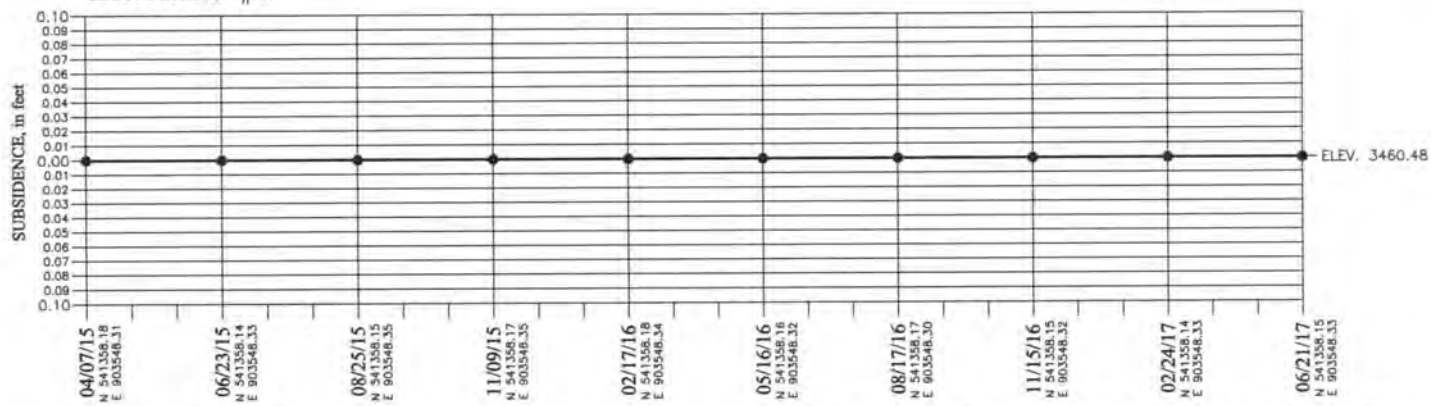

BASIS OF ELEVATIONS: US C & GS BENCH MARK
"L-98 1935" – CVO320
ELEV. = 3434.37

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Terry J. Asel 6/22/2017

Terry J. Asel N.M. R.P.L.S. No. 15079

TERRY J ASEL NEW MEXICO 15079 REGISTERED PROFESSIONAL LAND SURVEYOR

Asel Surveying

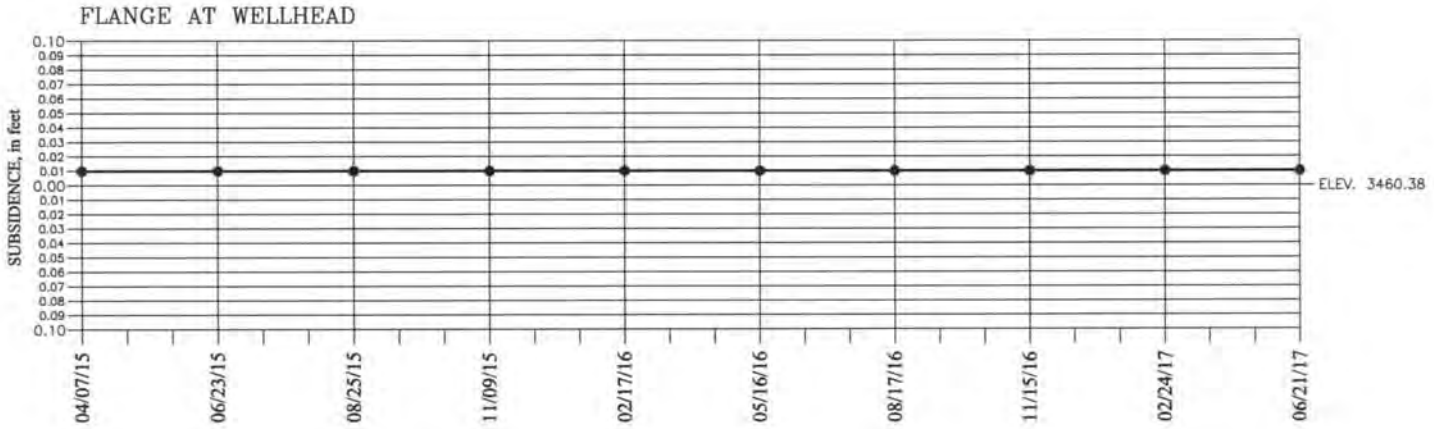
P.O. BOX 393 – 310 W. TAYLOR
HOBBS, NEW MEXICO – 575-393-9146

KEY ENERGY SERVICES, LLC.

SUBSIDENCE MONITORING FOR THE KEY ENERGY SERVICES, LLC. – EUNICE STATE #1 WELL IN SECTION 15, TOWNSHIP 21 SOUTH, RANGE 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO

Survey Date: 06/21/17	Sheet 1 of 2 Sheets	
W.O. Number: 170621MS	Drawn By: KA	Rev:
Date: 06/21/17	170621MS	Scale:1"=1000'

VERTICAL ELEVATION TABLE
KEY ENERGY SERVICES, LLC. – STATE #1



TERRY J ASEL
NEW MEXICO
15079
REGISTERED PROFESSIONAL LAND SURVEYOR

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Terry J. Asel 6/22/2017

Terry J. Asel N.M. R.P.L.S. No. 15079

Asel Surveying

P.O. BOX 393 – 310 W. TAYLOR
HOBBS, NEW MEXICO – 575-393-9146

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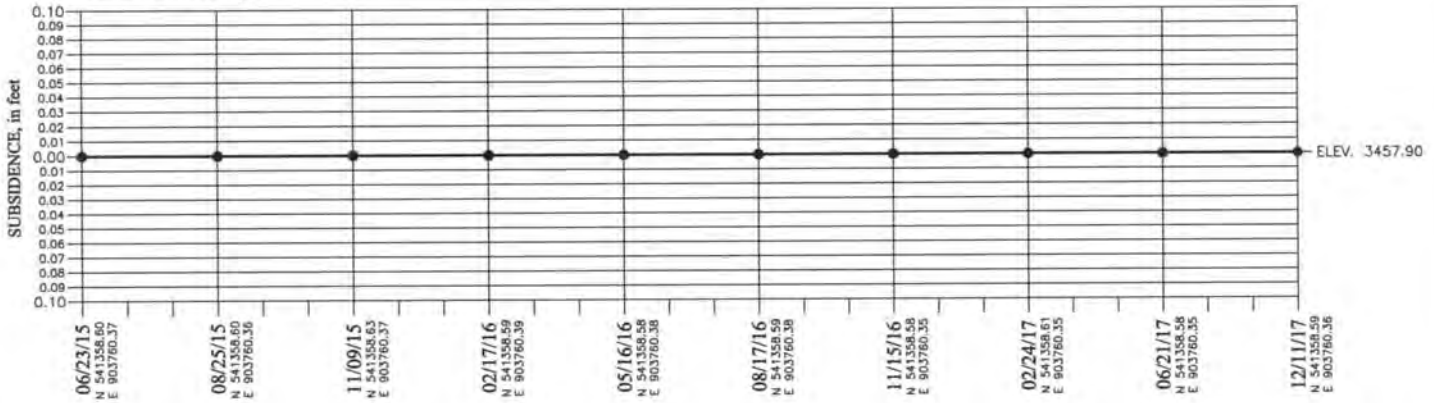
ELEVATIONS FOR THE KEY ENERGY SERVICES, LLC. – EUNICE STATE #1 WELL IN SECTION 15, TOWNSHIP 21 SOUTH, RANGE 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO

Survey Date: 06/21/17	Sheet 2 of 2 Sheets	
W.O. Number: 170621MS	Drawn By: KA	Rev:
Date: 06/21/17	170621MS	Scale: 1"=1000'

VERTICAL SUBSIDENCE TABLE
KEY ENERGY SERVICES, LLC. – STATE #1

NEW MEXICO EAST NAD 83

MONUMENT #1



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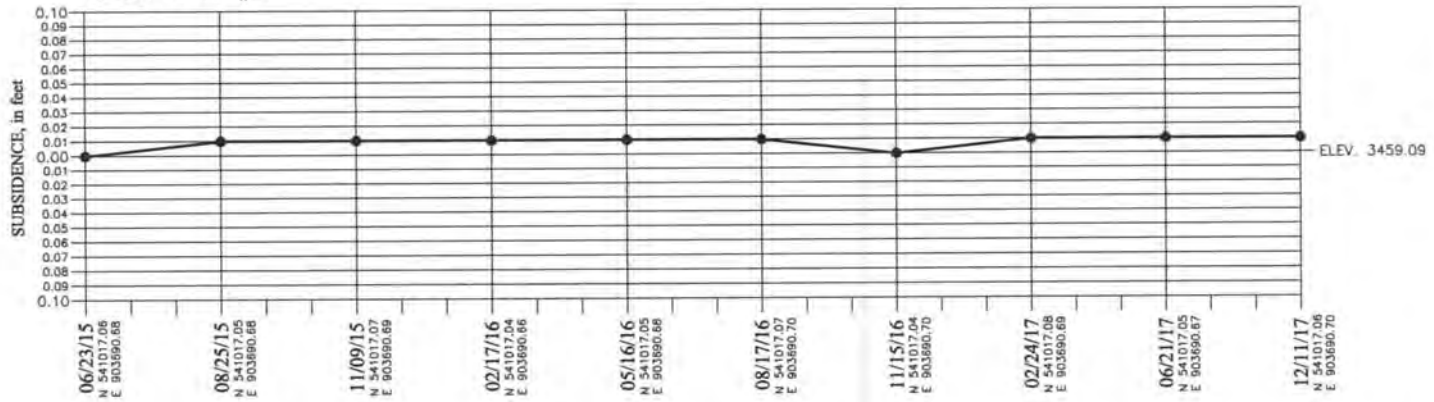

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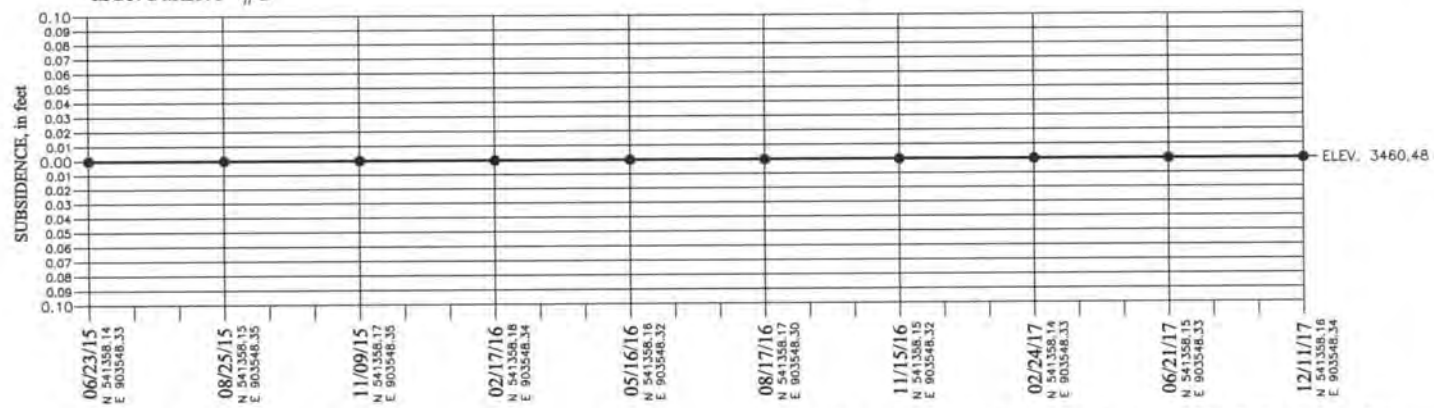

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TERRY J. ASEL NEW MEXICO 15079 REGISTERED PROFESSIONAL LAND SURVEYOR

Terry J. Asel 12/14/2017

Terry J. Asel, N.M. R.P.L.S. No. 15079

Asel Surveying

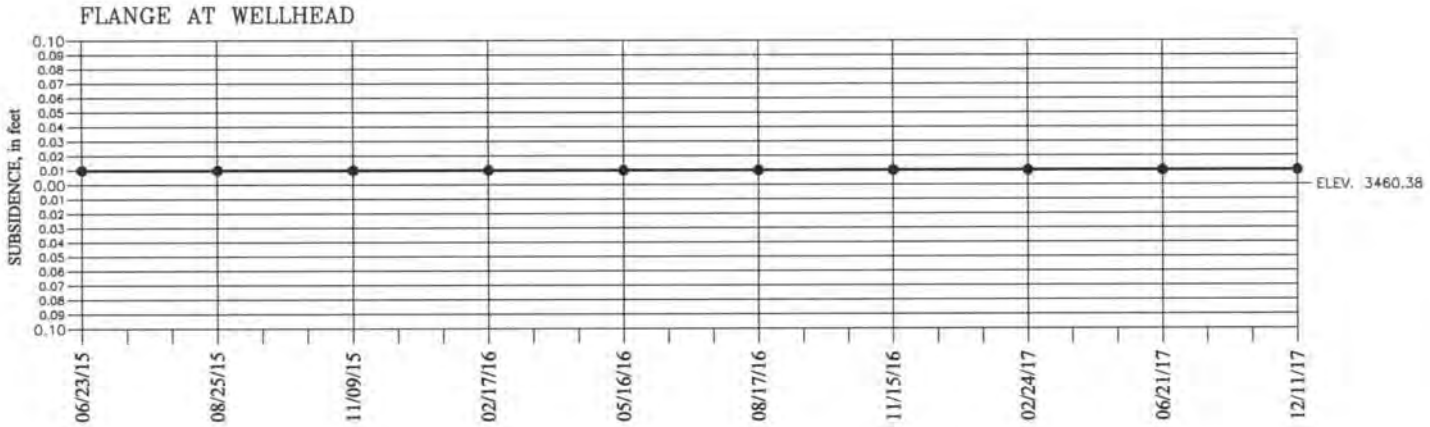
P.O. BOX 393 – 310 W. TAYLOR
HOBBS, NEW MEXICO – 575-393-9146

KEY ENERGY SERVICES, LLC.

SUBSIDENCE MONITORING FOR THE KEY ENERGY SERVICES, LLC. – EUNICE STATE #1 WELL IN SECTION 15, TOWNSHIP 21 SOUTH, RANGE 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO

Survey Date: 12/11/17	Sheet 1 of 2 Sheets	
W.O. Number: 171211MS	Drawn By: KA	Rev:
Date: 12/12/17	171211MS	Scale:1"=1000'

VERTICAL ELEVATION TABLE
KEY ENERGY SERVICES, LLC. – STATE #1



TERRY J ASEL
NEW MEXICO
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Terry J. Asel 12/12/2017

Terry J. Asel, N.M. R.P.L.S. No. 15079

Asel Surveying

P.O. BOX 393 – 310 W. TAYLOR
HOBBS, NEW MEXICO – 575-393-9146

BASIS OF ELEVATIONS: US C & GS BENCH MARK
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KEY ENERGY SERVICES, LLC.

ELEVATIONS FOR THE KEY ENERGY SERVICES, LLC. – EUNICE STATE #1 WELL IN SECTION 15, TOWNSHIP 21 SOUTH, RANGE 37 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO

Survey Date: 12/11/17	Sheet 2 of 2 Sheets	
W.O. Number: 171211MS	Drawn By: KA	Rev:
Date: 12/12/17	171211MS	Scale:1"=1000'

From: "Griswold, Jim, EMNRD" <Jim.Griswold@state.nm.us>
Subject: **RE: Minor Modification Request- Key Energy NM Brine Wells Subsidence Monitoring BW-19 & BW-28**
Date: February 2, 2015 1:27:52 PM MST
To: wayne price <wayneprice77@earthlink.net>
Cc: John Sanders <jsanders01@keyenergy.com>, Brad Stauffer <bstauffer@keyenergy.com>, Bobby Sisson <bsisson@keyenergy.com>, Dan Gibson <dgibson@keyenergy.com>

Approved. Please retain this email as no hardcopy will be sent. Thanks.

Jim Griswold
Environmental Bureau Chief
EMNRD/Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505.476.3465
email: jim.griswold@state.nm.us

-----Original Message-----
From: wayne price [mailto:wayneprice77@earthlink.net]
Sent: Monday, February 02, 2015 1:11 PM
To: Griswold, Jim, EMNRD
Cc: John Sanders; Brad Stauffer; Bobby Sisson; Dan Gibson
Subject: Minor Modification Request- Key Energy NM Brine Wells Subsidence Monitoring BW-19 & BW-28

Dear Jim,

This is to confirm our permit requirements for performing the required monitoring for Key's Brine well operations. The Carlsbad and Eunice Brine Well Subsidence Surveys have been completed. In order to satisfy and catch-up from the missed surveys, we are working with the previous surveyor to establish the original baselines.

Per our most recent communication, I fully understand your concern, thus we will agreed to perform 4 consecutive quarters in order to reestablished a baseline. Of course we have performed site visual surveys which will be noted in the annual report.

I had submitted a minor modification when we submitted the last annual report. It basically requested we be allowed to send the required surveys and a summary in the annual report. We also committed to an immediate notification if we saw a significant change, or a progressing trend.

We respectfully request approval.

Wayne Price-Price LLC

Appendix "F"

2017 Annual Report

BW-28 Key Energy Closure Cost

Key Energy Rig	$0	In-house
Halliburton Cement Job	$15,000.00	
Post Subsidance Monitoring 5 years	$10,000.00	
Tank Removal, Pad Clean-Up	$50,000.00	
Consulting fees	$15,000.00	
Total Estimate	$90,000	

Appendix G

- BW-28 Discharge Permit

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey
Division Director
Oil Conservation Division

November 8, 2013

Dan Gibson
Key Energy Services, LLC.
6 Desta Drive, Suite 4300
Midland, Texas 79705

RE: Renewal of Discharge Permit BW-28 for the State Brine Well #1 in Unit E of Section 15, Township 21 South, Range 37 East NMPM; Lea County, New Mexico

Dear Mr. Gibson,

Pursuant to all applicable parts of the Water Quality Control Commission regulations 20.6.2 NMAC and more specifically 20.6.2.3104 thru.3999 discharge permit, and 20.6.2.5000 thru .5299 Underground Injection Control, the Oil Conservation Division hereby renews the discharge permit and authorizes operation and injection for the Key Energy Services, LLC (owner/operator) brine well associated with BW-28 (API# 30-025-33547) at the location described above and under the conditions specified in the attached Discharge Permit Approval Conditions.

Be advised that approval of this permit does not relieve the owner/operator of responsibility should operations result in pollution of surface water, groundwater, or the environment. Nor does this permit relieve the owner/operator of any responsibility or consequences associated with subsidence or cavern failure. This permit does not relieve the owner/operator of its responsibility to comply with any other applicable governmental rules or regulations.

If you have any questions, please contact Jim Griswold of my staff at (505) 476-3465 or by email at *jim.griswold@state.nm.us*. On behalf of the Oil Conservation Division, I wish to thank you and your staff for your cooperation and patience during this renewal application review.

Respectfully,

Jami Bailey
Director

JB/JG/jg
Attachment – Discharge Permit Approval Conditions

cc: Michael Mariano, State Land Office

DISCHARGE PERMIT BW-28

1. GENERAL PROVISIONS:

1.A. PERMITTEE AND PERMITTED FACILITY: The Director of the Oil Conservation Division (OCD) of the Energy, Minerals and Natural Resources Department renews Discharge Permit BW-28 (Discharge Permit) to Key Energy Services, LLC. (Permittee) to operate its Underground Injection Control (UIC) Class III wells for the in situ extraction of salt (State Brine Well #1 – API No. 30-025-33547) located 1340 FNL and 330 FWL (SW/4 NW/4, Unit Letter E) in Section 15, Township 21 South, Range 37 East, NMPM, Lea County, New Mexico at its Brine Production Facility (Facility). The Facility is located approximately two miles north of Eunice, New Mexico along the east side of NM 207/CR 18.

The Permittee is permitted to inject water into the subsurface salt layers and produce brine for use in the oil and gas industry. Ground water that may be affected by a spill, leak, or accidental discharge occurs at a depth of approximately 60 feet below ground surface and has a total dissolved solids concentration of approximately 1,200 mg/L.

1.B. SCOPE OF PERMIT: OCD has been granted the authority by statute and by delegation from the Water Quality Control Commission (WQCC) to administer the Water Quality Act (Chapter 74, Article 6 NMSA 1978) as it applies to Class III wells associated with the oil and gas industry (See Section 74-6-4, 74-6-5 NMSA 1978).

The Water Quality Act and the rules promulgated pursuant to the Act protect ground water and surface water of the State of New Mexico by providing that, unless otherwise allowed by 20.6.2 NMAC, no person shall cause or allow effluent or leachate to discharge so that it may move directly or indirectly into ground water unless such discharge is pursuant to an approved discharge plan (See 20.6.2.3104 NMAC, 20.6.2.3106 NMAC, and 20.6.2.5000 through 20.6.2.5299 NMAC).

This Discharge Permit for a Class III well is issued pursuant to the Water Quality Act and WQCC rules, 20.6.2 NMAC. This Discharge Permit does not authorize any treatment of, or on-site disposal of, any materials, product, by-product, or oil-field waste.

Pursuant to 20.6.2.5004A NMAC, the following underground injection activities are prohibited:

1. The injection of fluids into a motor vehicle waste disposal well is prohibited.

2. The injection of fluids into a large capacity cesspool is prohibited.

3. The injection of any hazardous or radioactive waste into a well is prohibited except as provided by 20.6.2.5004A(3) NMAC.

4. Class IV wells are prohibited, except for wells re-injecting treated ground water into the same formation from which it was drawn as part of a removal or remedial action.

5. Barrier wells, drainage wells, recharge wells, return flow wells, and motor vehicle waste disposal wells are prohibited.

This Discharge Permit does not convey any property rights of any sort nor any exclusive privilege, and does not authorize any injury to persons or property, any invasion of other private rights, or any infringement of state, federal, or local laws, rules or regulations.

The Permittee shall operate in accordance with the terms and conditions specified in this Discharge Permit to comply with the Water Quality Act and the rules issued pursuant to that Act, so that neither a hazard to public health nor undue risk to property will result (see 20.6.2.3109C NMAC); so that no discharge will cause or may cause any stream standard to be violated (see 20.6.2.3109H(2) NMAC); so that no discharge of any water contaminant will result in a hazard to public health, (see 20.6.2.3109H(3) NMAC); so that the numerical standards specified of 20.6.2.3103 NMAC are not exceeded; and, so that the technical criteria and performance standards (see 20.6.2.5000 through 20.6.2.5299 NMAC) for Class III wells are met. Pursuant to 20.6.2.5003B NMAC, the Permittee shall comply with 20.6.2.1 through 20.6.2.5299 NMAC.

The Permittee shall not allow or cause water pollution, discharge, or release of any water contaminant that exceeds the Water Quality Control Commission (WQCC) standards specified at 20.6.2.3101 NMAC and 20.6.2.3103 NMAC or 20.6.4 NMAC (Water Quality Standards for Interstate and Intrastate Streams). Pursuant to 20.6.2.5101A NMAC, the Permittee shall not inject non-hazardous fluids into ground water having 10,000 mg/l or less total dissolved solids (TDS).

The issuance of this permit does not relieve the Permittee from the responsibility of complying with the provisions of the Water Quality Act, any applicable regulations or water quality standards of the WQCC, or any applicable federal laws, regulations or standards (See Section 74-6-5 NMSA 1978).

1.C. DISCHARGE PERMIT RENEWAL: This Discharge Permit is a permit renewal that replaces the permit being renewed. Replacement of a prior permit does not relieve the Permittee of its responsibility to comply with the terms of that prior permit while that permit was in effect.

1.D. DEFINITIONS: Terms not specifically defined in this Discharge Permit shall have the same meanings as those in the Water Quality Act or the rules adopted pursuant to the Act, as the context requires.

1.E. FILING FEES AND PERMIT FEES: Pursuant to 20.6.2.3114 NMAC, every facility that submits a Discharge Permit application for initial approval or renewal shall pay the permit fees specified in Table 1 and the filing fee specified in Table 2 of 20.6.2.3114 NMAC. OCD has already received the required $100.00 filing fee. The Permittee is now required to submit the $1,700.00 permit fee for a Class III well. Please remit payment made payable to the Water Quality Management Fund in care of OCD at 1220 South St. Francis Drive in Santa Fe, New Mexico 87505.

1.F. EFFECTIVE DATE, EXPIRATION, RENEWAL CONDITIONS, AND PENALTIES FOR OPERATING WITHOUT A DISCHARGE PERMIT: This Discharge Permit becomes effective 30 days from the date that the Permittee receives this discharge permit or until the permit is terminated or expires. This Discharge Permit will expire on **November 8, 2018.** The Permittee shall submit an application for renewal no later than 120 days before that expiration date, pursuant to 20.6.2.5101F NMAC. If a Permittee submits a renewal application at least 120 days before the Discharge Permit expires and is in compliance with the approved Discharge Permit, then the existing Discharge Permit will not expire until OCD has approved or disapproved the renewal application. A discharge permit continued under this provision remains fully effective and enforceable. Operating with an expired Discharge Permit may subject the Permittee to civil and/or criminal penalties (See Section 74-6-10.1 NMSA 1978 and Section 74-6-10.2 NMSA 1978).

1.G. MODIFICATIONS AND TERMINATIONS: The Permittee shall notify the OCD Director and OCD's Environmental Bureau of any Facility expansion or process modification (See 20.6.2.3107C NMAC). The OCD Director may require the Permittee to submit a Discharge Permit modification application pursuant to 20.6.2.3109E NMAC and may modify or terminate a Discharge Permit pursuant to Sections 74-6-5(M) through (N) NMSA 1978.

1. If data submitted pursuant to any monitoring requirements specified in this Discharge Permit or other information available to the OCD Director indicate that 20.6.2 NMAC is being or may be violated, then the OCD Director may require modification or, if it is determined by the OCD Director that the modification may not be adequate, may terminate this Discharge Permit for a Class III well that was approved pursuant to the requirements of 20.6.2.5000 through 20.6.2.5299 NMAC for the following causes:

a. Noncompliance by Permittee with any condition of this Discharge Permit; or,

b. The Permittee's failure in the discharge permit application or during the discharge permit review process to disclose fully all relevant facts, or Permittee's misrepresentation of any relevant facts at any time; or,

c. A determination that the permitted activity may cause a hazard to public health or undue risk to property and can only be regulated to acceptable levels by discharge permit modification or termination (See Section 75-6-6 NMSA 1978; 20.6.2.5101I NMAC; and, 20.6.2.3109E NMAC).

2. This Discharge Permit may also be modified or terminated for any of the following causes:

a. Violation of any provisions of the Water Quality Act or any applicable regulations, standard of performance or water quality standards;

b. Violation of any applicable state or federal effluent regulations or limitations; or

c. Change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge (See Section 75-6-5M NMSA 1978).

1.H. TRANSFER OF CLASS III WELL DISCHARGE PERMIT:

1. The transfer provisions of 20.6.2.3111 NMAC do not apply to a discharge permit for a Class III well.

2. Pursuant to 20.6.2.5101H NMAC, the Permittee may request to transfer its Class III well discharge permit if:

a. The OCD Director receives written notice 30 days prior to the transfer date; and,

b. The OCD Director does not object prior to the proposed transfer date. OCD may require modifications to the discharge permit as a condition of transfer, and may require demonstration of adequate financial responsibility.

3. The written notice required in accordance with Permit Condition 1.H.2.a shall:

a. Have been signed by the Permittee and the succeeding Permittee, and shall include an acknowledgement that the succeeding Permittee shall be responsible for compliance with the Class III well discharge permit upon taking possession of the facility; and

b. Set a specific date for transfer of the discharge permit responsibility, coverage and liability; and

c. Include information relating to the succeeding Permittee's financial responsibility required by 20.6.2.5210B(17) NMAC.

1.I. COMPLIANCE AND ENFORCEMENT: If the Permittee violates or is violating a condition of this Discharge Permit, OCD may issue a compliance order that requires compliance immediately or within a specified time period, or assess a civil penalty, or both (See Section 74-6-10 NMSA 1978). The compliance order may also include a suspension or termination of this Discharge Permit. OCD may also commence a civil action in district court for appropriate relief, including injunctive relief (See Section 74-6-10(A)(2) NMSA 1978). The Permittee may be subject to criminal penalties for discharging a water contaminant without a discharge permit or in violation of a condition of a discharge permit; making any false material statement, representation, certification or omission of material fact in a renewal application, record, report, plan or other document filed, submitted or required to be maintained under the Water Quality Act; falsifying, tampering with or rendering inaccurate any monitoring device, method or record required to be maintained under the Water Quality Act; or failing to monitor, sample or report as required by a Discharge Permit issued pursuant to a state or federal law or regulation (See Section 74-6-10.2 NMSA 1978).

2. GENERAL FACILITY OPERATIONS:

2.A. QUARTERLY MONITORING REQUIREMENTS FOR CLASS III WELLS: The Permittee may use either or both fresh water or water from otherwise non-potable sources. Pursuant to 20.6.2.5207C, the Permittee shall provide analysis of the injected fluids at least quarterly to yield data representative of their characteristics. The Permittee shall analyze the injected fluids for the following characteristics:

- pH;
- density;
- concentration of total dissolved solids; and,
- chloride concentration.

The Permittee shall also provide analysis of the produced brine on a quarterly basis. The Permittee shall analyze the produced brine for the following characteristics:

- pH;
- density;
- concentration of total dissolved solids;
- chloride concentration; and,
- sodium concentration.

2.B. SOLUTION CAVERN MONITORING PROGRAM:

1. Surface Subsidence Monitoring Plan: The Permittee shall submit a Surface Subsidence Monitoring Plan to OCD within 180 days of the effective data of this permit. The Surface Subsidence Monitoring Plan shall specify that the Permittee will install at least three survey monuments and shall include a proposal to monitor the elevation of the monuments at least semiannually.

The Permittee shall survey each benchmark at least semiannually to monitor for possible surface subsidence and shall tie each survey to the nearest USGS benchmark. The Permittee shall employ a licensed professional surveyor to conduct the subsidence monitoring program. The Permittee shall submit the results of all subsidence surveys to OCD within 15 days of the survey. If the monitored surface subsidence at any measuring point reaches 0.10 feet compared to its baseline elevation, then the Permittee shall suspend operation of the Class III well . If the Permittee cannot demonstrate the integrity of the cavern and well to the satisfaction of OCD, then it shall cease all brine production and submit a corrective action plan to mitigate the subsidence.

2. Solution Cavern Characterization Program: The Permittee shall submit a Solution Cavern Characterization Plan to characterize the size and shape of the solution cavern using geophysical methods within 180 days of the effective date of this permit. The Permittee shall characterize the size and shape of the solution cavern using a geophysical methods approved by OCD at least once before November 8, 2018. The Permittee shall demonstrate that at least 90% of the calculated volume of salt removed based upon injection and production volumes has been accounted for by the approved geophysical method(s) for such testing to be considered truly representative.

a. The Permittee shall provide an estimate of the size and shape of the solution cavern at least annually, based on fluid injection and brine production data.

b. The Permit shall compare the ratio of the volume of injected fluids to the volume of produced brine monthly. If the average ratio of injected fluid to produced brine varies is less than 90% or greater than 110%, the Permittee shall report this to OCD and cease injection and production operations of its Class III well within 24 hours. The Permittee shall begin an investigation to determine the cause of this abnormal ratio within 72 hours. The Permittee shall submit to OCD a report of its investigation within 15 days of cessation of injection and production operations of its Class III well.

3. Annual Certification: The Permittee shall certify annually that continued salt solution mining will not cause cavern collapse, surface subsidence, property damage, or otherwise threaten public health and the environment, based on geologic and engineering data.

If the solution cavern is determined by either OCD or the Permittee to be potentially unstable by either direct or indirect means, then the Permittee shall cease all fluid injection and brine production within 24 hours. If the Permittee ceases operations because it or OCD has determined that the solution cavern is unstable, then it shall submit a plan to stabilize the solution cavern within 30 days. OCD may require the Permittee to implement additional subsidence monitoring and to conduct additional corrective action.

2.C. CONTINGENCY PLANS: The Permittee shall implement its proposed contingency plan(s) included in its Permit Renewal Application to cope with failure of a system(s) in the Discharge Permit.

2.D. CLOSURE: Prior to closure of the facility, the Permittee shall submit for OCD's approval, a closure plan including a completed form C-103 for plugging and abandonment of the Class III well. The Permittee shall plug and abandon its well pursuant to 20.6.2.5209 NMAC and as specified in Permit Condition 2.D.

1. Pre-Closure Notification: Pursuant to 20.6.2.5005A NMAC, the Permittee shall submit a pre-closure notification to OCD's Environmental Bureau at least 30 days prior to the date that it proposes to close or to discontinue operation of its Class III well. Pursuant to 20.6.2.5005B NMAC, OCD's Environmental Bureau must approve all proposed well closure activities before Permittee may implement its proposed closure plan.

2. Required Information: The Permittee shall provide OCD's Environmental Bureau with the following information:

- Name of facility;
- Address of facility;
- Name of Permittee (and owner or operator, if appropriate);
- Address of Permittee (and owner or operator, if appropriate);
- Contact person;
- Phone number;
- Number and type of well(s);

- Year of well construction;
- Well construction details;
- Type of discharge;
- Average flow (gallons per day);
- Proposed well closure activities (*e.g.*, sample fluids/sediment, appropriate disposal of remaining fluids/sediments, remove well and any contaminated soil, clean out well, install permanent plug, conversion to other type of well, ground water and vadose zone investigation, other);
- Proposed date of well closure;
- Name of Preparer; and,
- Date.

2.E. PLUGGING AND ABANDONMENT PLAN: Pursuant to 20.6.2.5209A NMAC, when the Permittee proposes to plug and abandon its Class III well, it shall submit to OCD a plugging and abandonment plan that meets the requirements of 20.6.2.3109C NMAC, 20.6.2.5101C NMAC, and 20.6.2.5005 NMAC for protection of ground water. If requested by OCD, Permittee shall submit for approval prior to closure, a revised or updated plugging and abandonment plan. The obligation to implement the plugging and abandonment plan as well as the requirements of the plan survives the termination or expiration of this Discharge Permit. The Permittee shall comply with 20.6.2.5209 NMAC.

2.F RECORD KEEPING: The Permittee shall maintain records of all inspections, surveys, investigations, *etc.*, required by this Discharge Permit at its Facility office for a minimum of five years and shall make those records available for inspection by OCD.

2.G. RELEASE REPORTING: The Permittee shall comply with the following permit conditions, pursuant to 20.6.2.1203 NMAC, if it determines that a release of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, has occurred. The Permittee shall report unauthorized releases of water contaminants in accordance with any additional commitments made in its approved Contingency Plan. If the Permittee determines that any constituent exceeds the standards specified at 20.6.2.3103 NMAC, then it shall report a release to OCD's Environmental Bureau.

1. Oral Notification: As soon as possible after learning of such a discharge, but in no event more than twenty-four (24) hours thereafter, the Permittee shall notify OCD's Environmental Bureau. The Permittee shall provide the following:

- The name, address, and telephone number of the person or persons in charge of the facility, as well as of the owner and/or operator of the facility;
- The name and location of the facility;
- The date, time, location, and duration of the discharge;
- The source and cause of discharge;
- A description of the discharge, including its chemical composition;
- The estimated volume of the discharge; and,

- Any corrective or abatement actions taken to mitigate immediate damage from the discharge.

2. Written Notification: Within one week after the Permittee has discovered a discharge, the Permittee shall send written notification (may use form C-141 with attachments) to OCD's Environmental Bureau verifying the prior oral notification as to each of the foregoing items and providing any appropriate additions or corrections to the information contained in the prior oral notification.

The Permittee shall provide subsequent written reports as required by OCD's Environmental Bureau.

2.H. OTHER REQUIREMENTS:

1. Inspection and Entry: Pursuant to Section 74-6-9 NMSA 1978 and 20.6.2.3107A NMAC, the Permittee shall allow any authorized representative of the OCD Director, to:

- Upon the presentation of proper credentials, enter the premises at reasonable times;
- Inspect and copy records required by this Discharge Permit;
- Inspect any treatment works, monitoring, and analytical equipment;
- Sample any injection fluid or produced brine; and,
- Use the Permittee's monitoring systems and wells in order to collect samples.

2. Advance Notice: The Permittee shall provide OCD's Environmental Bureau and Hobbs District Office with at least five (5) working days advance notice of any environmental sampling to be performed pursuant to this Discharge Permit, or any well plugging, abandonment or decommissioning of any equipment associated with its Class III well.

3. Environmental Monitoring: The Permittee shall ensure that any environmental sampling and analytical laboratory data collected meets the standards specified in 20.6.2.3107B NMAC. The Permittee shall ensure that all environmental samples are analyzed by an accredited "National Environmental Laboratory Accreditation Conference" (NELAC) Laboratory. The Permittee shall submit data summary tables, all raw analytical data, and laboratory QA/QC.

2.I. BONDING OR FINANCIAL ASSURANCE: Pursuant to 20.6.2.5210B(17) NMAC, the Permittee shall maintain at a minimum, a single well plugging bond in the amount that it shall determine, in accordance with Permit Condition 5.B, to cover potential costs associated with plugging and abandonment of the Class III well, surface restoration, and post-operational monitoring, as may be needed. OCD may require additional financial assurance to ensure adequate funding is available to plug and abandon the well and/or for any required corrective actions.

Methods by which the Permittee shall demonstrate the ability to undertake these measures shall include submission of a surety bond or other adequate assurances, such as financial statements or other materials acceptable to the OCD Director, such as: (1) a surety bond; (2) a trust fund with a New Mexico bank in the name of the State of New Mexico, with the State as Beneficiary; (3) a

non-renewable letter of credit made out to the State of New Mexico; (4) liability insurance specifically covering the contingencies listed in this paragraph; or (5) a performance bond, generally in conjunction with another type of financial assurance. If an adequate bond is posted by the Permittee to a federal or another state agency, and this bond covers all of the measures specified above, the OCD Director shall consider this bond as satisfying the bonding requirements of Sections 20.6.2.5000 through 20.6.2.5299 NMAC wholly or in part, depending upon the extent to which such bond is adequate to ensure that the Permittee will fully perform the measures required hereinabove.

2.J. ANNUAL REPORT: The Permittee shall submit its annual report pursuant to 20.6.2.3107 NMAC to OCD's Environmental Bureau by **June 1**st of the following year. The annual report shall include the following:

- Cover sheet marked as "Annual Class III Well Report, Name of Permittee, Discharge Permit Number, API number of well(s), date of report, and person submitting report;
- Summary of Class III well operations for the year including a description and reason for any remedial or major work on the well with a copy of form C-103;
- Monthly fluid injection and brine production volume, including the cumulative total carried over each year;
- Injection pressure data;
- A copy of the quarterly chemical analyses shall be included with data summary and all QA/QC information;
- Copy of any mechanical integrity test chart, including the type of test, *i.e.*, duration, gauge pressure, etc.;
- Brief explanation describing deviations from the normal operations;
- Results of any leaks and spill reports;
- An Area of Review (AOR) update summary;
- A summary with interpretation of MITs, surface subsidence surveys, cavern volume and geometry measurements with conclusion(s) and recommendation(s);
- A summary of the ratio of the volume of injected fluids to the volume of produced brine;
- A summary of all major Facility activities or events, which occurred during the year with any conclusions and recommendations;
- Annual Certification in accordance with Permit Condition 2.B.3.
- A summary of any new discoveries of ground water contamination with all leaks, spills and releases and corrective actions taken; and,
- The Permittee shall file its Annual Report in an electronic format with a hard copy submittal to OCD's Environmental Bureau.

3. CLASS III WELL OPERATIONS:

3.A. OPERATING REQUIREMENTS: The Permittee shall comply with the operating requirements specified in 20.6.2.5206A NMAC and 20.6.2.5206A NMAC to ensure that:

1. Injection will occur through the innermost tubing string and brine production through the annulus between the casing and tubing string to promote cavern development at depth. Injection and production flow can be reversed as required to achieve optimal cavern shaping, mine salt most efficiently, and to periodically clean the tubing and annulus. Injection must only occur in the intended solution mining interval.

2. Injection between the outermost casing and the well bore is prohibited in a zone other than the authorized injection zone. If the Permittee determines that its Class III well is discharging or suspects that it is discharging fluids into a zone or zones other than the permitted injection zone specified in Permit Condition 3.B.1., then the Permittee shall within 24 hours notify OCD's Environmental Bureau and Hobbs District Office of the circumstances and action(s) taken. The Permittee shall cease operations until proper repairs are made and it has received approval from OCD to re-start injection operations.

3.B. INJECTION OPERATIONS:

1. Well Injection Pressure Limit: The Permittee shall ensure that the maximum wellhead or surface injection pressure on its Class III well shall not exceed the fracture pressure of the injection salt formation and will not cause new fractures or propagate any existing fractures of cause damage to the system.

2. Pressure Limiting Device: The Permittee shall equip and operate its Class III well or system with a pressure limiting device which shall, at all times, limit surface injection pressure to the maximum allowable pressure for its Class III well. The Permittee shall monitor the pressure-limiting device daily and shall report all pressure exceedances within 24 hours of detecting an exceedance to OCD's Environmental Bureau.

The Permittee shall take all steps necessary to ensure that the injected fluids enter only the proposed injection interval and is not permitted to escape to other formations or onto the ground surface. The Permittee shall report to OCD's Environmental Bureau within 24 hours of discovery any indication that new fractures or existing fractures have been propagated, or that damage to the well, the injection zone, or formation has occurred.

3.C. CONTINUOUS MONITORING DEVICES: The Permittee shall use continuous monitoring devices to provide a record of injection pressure, flow rate, flow volume, and pressure on the annulus between the tubing and the long string of casing.

3.D. MECHANICAL INTEGRITY FOR CLASS III WELLS:

1. Pursuant to 20.6.2.5204 NMAC, the Permittee shall demonstrate mechanical integrity for its Class III well at least once every five years or more frequently as the OCD

Director may require for good cause during the life of the well. The Permittee shall demonstrate mechanical integrity for its Class III well every time it performs a well workover, including when it pulls the tubing. A Class III well has mechanical integrity if there is no detectable leak in the casing or tubing which OCD considers to be significant at maximum operating temperature and pressure; and no detectable conduit for fluid movement out of the injection zone through the well bore or vertical channels adjacent to the well bore which the OCD Director considers to be significant. The Permittee shall conduct a casing Mechanical Integrity Test (MIT) from the surface to the approved injection depth to assess casing integrity. The MIT shall consist of a 30-minute test at a minimum pressure of 300 psig measured at the surface.

The Permittee shall notify OCD's Environmental Bureau 5 days prior to conducting any MIT to allow OCD the opportunity to witness the MIT.

2. The following criteria will determine if the Class III well has passed the MIT:

a. Passes MIT if zero bleed-off during the test;

b. Passes MIT if final test pressure is within ± 10% of starting pressure, if approved by OCD;

c. When the MIT is not witnessed by OCD and fails, the Permittee shall notify OCD within 24 hours of the failure of the MIT.

3. Pursuant to 20.6.2.5204C NMAC, the OCD Director may consider the use by the Permittee of equivalent alternative test methods to determine mechanical integrity. The Permittee shall submit information on the proposed test and all technical data supporting its use. The OCD Director may approve the Permittee's request if it will reliably demonstrate the mechanical integrity of the well for which its use is proposed.

4. Pursuant to 20.6.2.5204D NMAC, when conducting and evaluating the MIT(s), the Permittee shall apply methods and standards generally accepted in the oil and gas industry. When the Permittee reports the results of all MIT(s) to the OCD Director, it shall include a description of the test(s), the method(s) used, and the test results.

3.E. WELL WORKOVER OPERATIONS: Pursuant to 20.6.2.5205A(5) NMAC, the Permittee shall provide notice to and shall obtain approval from OCD's District Office in Hobbs and the Environmental Bureau in Santa Fe prior to commencement of any remedial work or any other workover operations to allow OCD the opportunity to witness the operation. The Permittee shall request approval using form C-103 (Sundry Notices and Reports on Wells) with copies sent to OCD's Environmental Bureau and Hobbs District Office. Properly completed Forms C-103 and/or C-105 must be filed with OCD upon completion of workover activities and copies included in that year's Annual Report.

3.K. FLUIDS INJECTION AND BRINE PRODUCTION VOLUMES AND PRESSURES: The Permittee shall continuously monitor the volumes of water injected and brine production . The Permittee shall submit monthly reports of its injection and production volumes on or before the 10th day of the following month. The Permittee shall suspend injection if the monthly injection volume is less than 110% or greater than 120% of associated brine production. If such an event occurs, the Permittee shall notify OCD within 24 hours.

3.L. AREA OF REVIEW (AOR): The Permittee shall report within 72 hours of discovery any new wells, conduits, or any other device that penetrates or may penetrate the injection zone within a 1-mile radius from its Class III well.

4. CLASS V WELLS: Pursuant to 20.6.2.5002B NMAC, leach fields and other waste fluids disposal systems that inject non-hazardous fluid into or above an underground source of drinking water are UIC Class V injection wells. This Discharge Permit does not authorize the use of a Class V injection well for the disposal of industrial waste. Pursuant to 20.6.2.5005 NMAC, the Permittee shall close any Class V industrial waste injection well that injects non-hazardous industrial wastes or a mixture of industrial wastes and domestic wastes (*e.g.*, septic systems, leach fields, dry wells, *etc*.) within 90 calendar days of the issuance of this Discharge Permit. The Permittee shall document the closure of any Class V wells used for the disposal of non-hazardous industrial wastes or a mixture of industrial wastes and domestic wastes other than contaminated ground water in its Annual Report. Other Class V wells, including wells used only for the injection of domestic wastes, shall be permitted by the New Mexico Environment Department.

5. SCHEDULE OF COMPLIANCE:

5.A. ANNUAL REPORT: The Permittee shall submit its annual report to OCD by June 1st of each year.

5.B. BONDING OR FINANCIAL ASSURANCE: The Permittee shall submit an estimate of the minimum cost to properly close, plug and abandon its Class III well, conduct ground water restoration if applicable, and any post-operational monitoring as may be needed (see 20.6.2.5210B(17) NMAC) within 90 days of permit issuance (See 20.6.2.5210B(17) NMAC). The Permittee's cost estimate shall be based on third person estimates. After review, OCD will require the Permittee to submit a single well plugging bond based on the third person cost estimate.

5.C. **SURFACE SUBSIDENCE MONITORING PLAN:** The Permittee shall submit the Surface Subsidence Monitoring Plan required in accordance with Permit Condition 2.B.1 within 180 days of permit issuance.

5.D. SOLUTION CAVERN CHARACTERIZATION PLAN: The Permittee shall submit the Solution Cavern Characterization Plan required in accordance with Permit Condition 2.B.2 within 180 days of permit issuance.

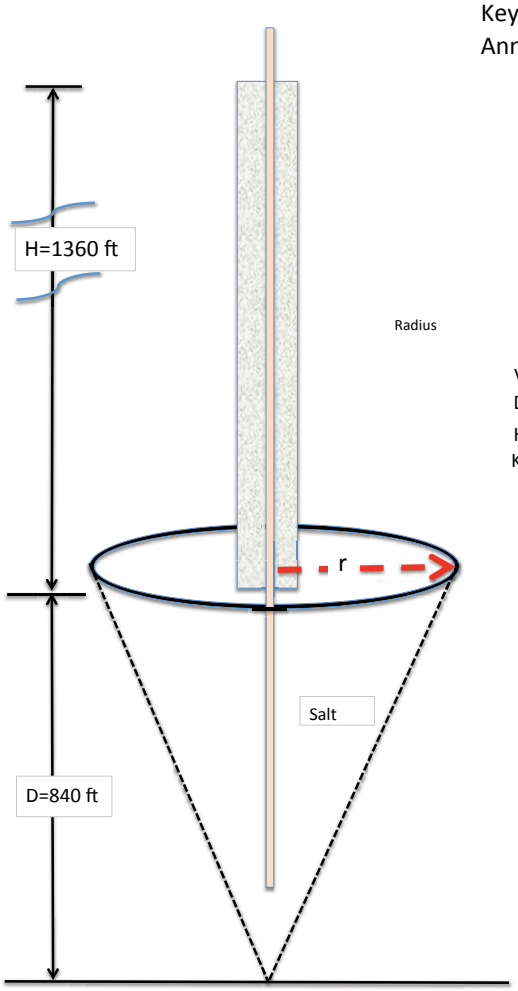
Appendix H:

- Well Bore Sketch with Cavity Calculations, Radius, Diameter and D/H values.

- Cavern Characterization using New OCD Example Applied to BW-28.

    - OCD E-mail.
    - Example of OCD Well Log + Cavern Layout.
    - BW-28 Cavern Superimposed on Nearby Well Log.
    - Mass Balance.

Key Energy Eunice BW-28
Annual Cavity Calculation



2017 Calculations

Radius r=SqRtV(V*3/π*D)

V	Volume	=	5,514,464	bbls	Inputs
D	Depth	=	840	ft	
H	Height	=	1360	ft	
Kf	ft3 salt/bbl		1	est	
	r	=	79	ft	formula
	Diameter		158	ft	formula
		D/H=	0.12		formula

From: "Chavez, Carl J, EMNRD" <CarlJ.Chavez@state.nm.us>
Subject: RE: Key Eunice BW-28 Compliance letter response.
Date: April 6, 2018 at 10:59:51 AM MDT
To: Wayne Price <wayneprice@q.com>

E-mail for documentation by Price LLC April 7, 2018- Per C. Chavex- OCD can apply to Wasserhund wells BW-04 & BW-22 also.

Wayne:

Good morning. Please see attachment.

Thank you.

-----Original Message-----
From: Wayne Price <wayneprice@q.com>
Sent: Thursday, April 5, 2018 7:40 PM
To: Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Cc: Wayne Price <wayneprice@q.com>
Subject: Re: Key Eunice BW-28 Compliance letter response.

Hi Carl,

What type of well Log?

On Apr 3, 2018, at 1:43 PM, Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us> wrote:

Mr. Price, et al.:

Good afternoon. The New Mexico Oil Conservation Division (OCD) is in receipt of the Key Energy Services letter (letter) dated March 30, 2018.

The letter was recently added to the above subject well administrative record.

OCD will consider the letter for the upcoming discharge permit renewal.

Regarding the workgroup for the cavern characterization, etc., OCD

is accepting the "cone" calculation with additional well log characterization supporting the calculation. Upon request, OCD can send you an example. Therefore, OCD does not believe a "study group" is necessary at this time; however, it will remain an option as OCD reviews the submittals, receives any new proposals, and seeks out any new scientific information on the subject.

Thank you.

Mr. Carl J. Chavez, CHMM (#13099)
New Mexico Oil Conservation Division
Energy Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe, New Mexico 87505
Ph. (505) 476-3490
E-mail: CarlJ.Chavez@state.nm.us
"Why not prevent pollution, minimize waste to reduce operating costs, reuse or recycle, and move forward with the rest of the Nation?" (To see how, go to: http://www.emnrd.state.nm.us/OCD and see "Publications")

-----Original Message-----
From: Wayne Price <wayneprice@q.com>
Sent: Monday, April 2, 2018 12:26 PM
To: Griswold, Jim, EMNRD <Jim.Griswold@state.nm.us>; Chavez, Carl J, EMNRD <CarlJ.Chavez@state.nm.us>
Cc: Wayne Price <wayneprice@q.com>; Rick Graham <rgraham01@keyenergy.com>
Subject: Key Eunice BW-28 Compliance letter response.

Dear Mr. Griswold and Mr. Chavez:

Please find attached a response letter to your February 16, 2018 letter requesting record information and a response by May 04, 2018. Price LLC, a consultant for Key Energy has already supplied the Annual Reports for the 2011-2016 years .

Please note this response has some Minor Modification requests.

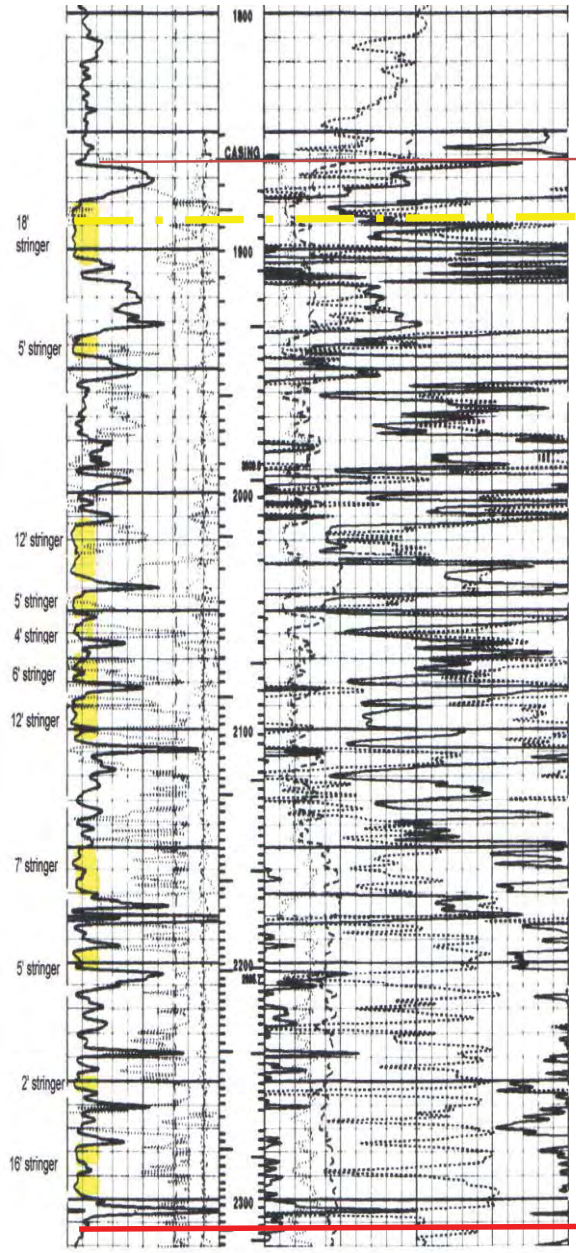
Please note, you can evaluate them now, or you can wait until we submit the renewal permit application which is due 120 days before expiration of November 08, 2018 of this year.

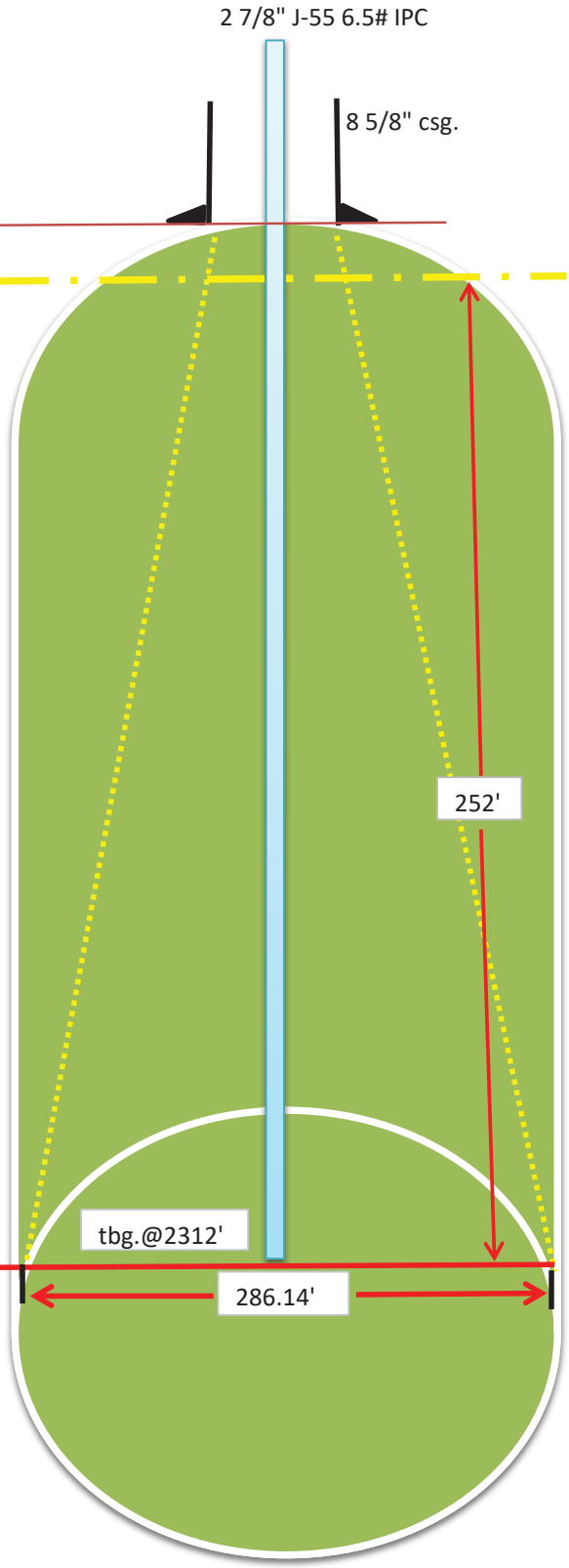
Please file in the Key OCD BW-28 file. Please let us know if you received this correspondence.

Wayne Price-Price LLC
312 Encantado Ridge CT NE
Rio Rancho, NM 87124
wayneprice@q.com
505-715-2809

EXAMPLE SALT CAVERN CHARACTERIZATION

John Doe Well No6
API 30-015-#####
SEC36 T18S R38E LAT: 32.##### LONG:-103.#####





PPG 9.97 brine
PPG 8.34 fresh
SG 1.1951
2006 to 2017 Total Brine bbl. 3,538,154
122.136 LBS / BBL = 432,135,977 LBS HALITE
(432,135,977 LBS) / (80BLS per ft³) = 5,401,700 ft³

$V = \prod R^2 h / 3$
$V = (3.14159 * 143.07^2) * (252') / 3$
$V = 5,401,648.6\ ft.^3$

Est. hight is 252'
Est. cavern floor diameter is 286.14'

BAKER HUGHES

CALIPER LOG

HOBBS OCD

FEB 2 4 2014

RECEIVED

FILE NO: MD10882	COMPANY	APACHE CORPORATION	
API NO: 30-025-41600	WELL	NEDU 544D	
	FIELD	DRINKARD	
	COUNTY	LEA	STATE NEW MEXICO

Ver. 3.87

FINAL PRINT

LOCATION:
1355' FNL & 1190' FWL

SEC 15 TWP 21S RGE 37E

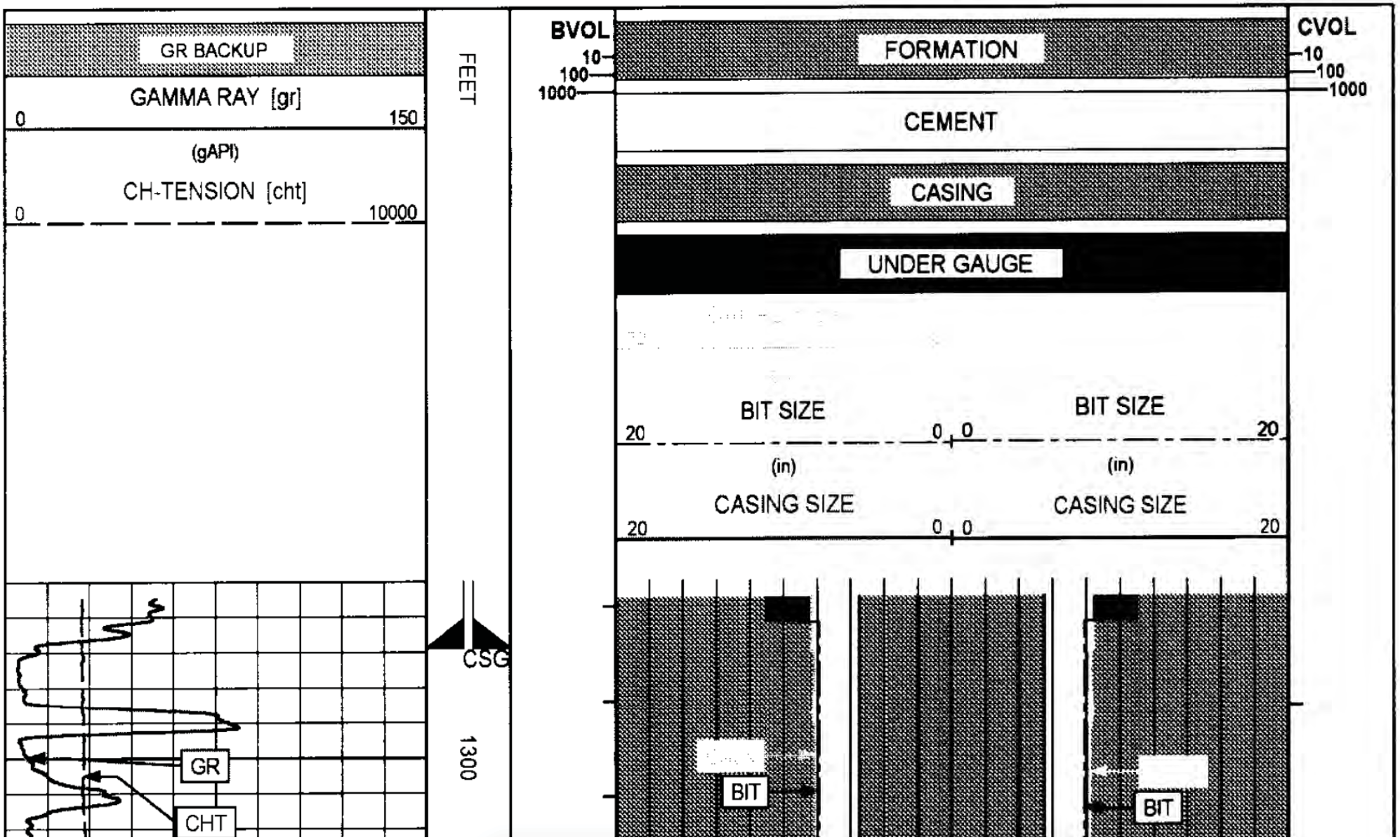
OTHER SERVICES
ZDL/CN/DSL
DLL/MLL

PERMANENT DATUM	GL	ELEVATION	3446 FT
LOG MEASURED FROM	KB	13 FT	ABOVE P.D.
DRILL. MEAS. FROM	KELLY BUSHING		

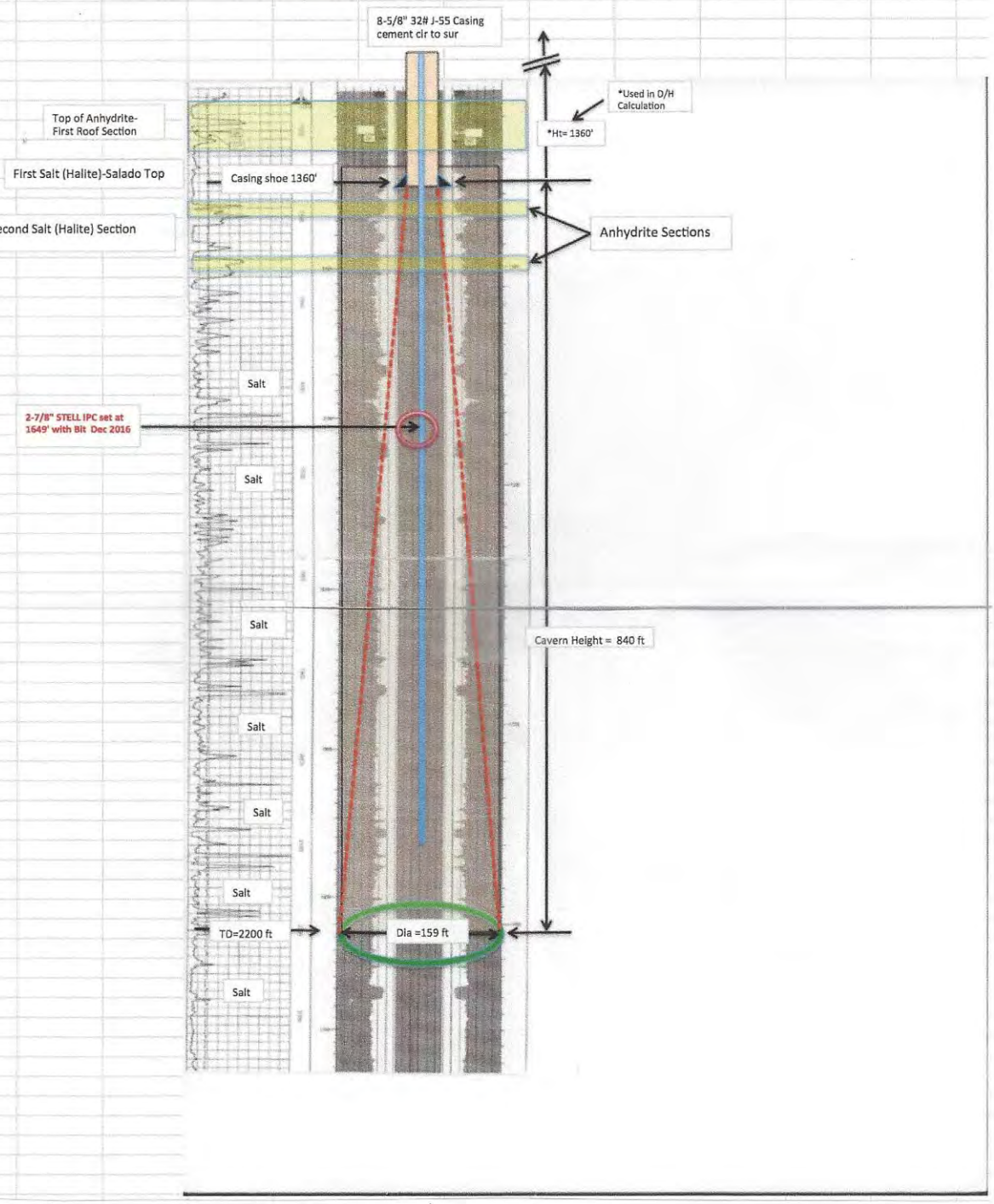
ELEVATIONS:

KB	3459 FT
DF	3458 FT
GL	3446 FT

DATE		14-FEB-2014					
RUN	TRIP	1	1				
SERVICE ORDER		635438					
DEPTH DRILLER		6954 FT					
DEPTH LOGGER		6955 FT					
BOTTOM LOGGED INTERVAL		6912 FT					
TOP LOGGED INTERVAL		1269 FT					
CASING DRILLER		8.625 IN	@ 1269 FT			@	
CASING LOGGER		1269 FT					
BIT SIZE		7.875 IN					
TYPE OF FLUID IN HOLE		BRINE					
DENSITY	VISCOSITY	10 LB/G	31 S				
PH	FLUID LOSS	8	13 C3				
SOURCE OF SAMPLE		CIRCULATION TANK					
RM AT MEAS. TEMP.		0.035 OHMM	@ 80 DEGF			@	
RMF AT MEAS. TEMP.		0.028 OHMM	@ 80 DEGF			@	
RMC AT MEAS. TEMP.		0.043 OHMM	@ 80 DEGF			@	
SOURCE OF RMF	RMC	CALCULATED	CALCULATED				
RM AT BHT		0.027 OHMM	@ 107 DEGF			@	
TIME SINCE CIRCULATION		10 HOURS					
MAX. RECORDED TEMP.		107 DEGF					
EQUIP. NO.	LOCATION	HL6672	MIDLAND, TX				
RECORDED BY		J. ULMER					
WITNESSED BY		J. JAHE					


GR BACKUP
GAMMA RAY [gr]
0
150
(gAPI)
CH-TENSION [cht]
0
10000
FEET
BVOL
10
100
1000
FORMATION
CEMENT
CASING
UNDER GAUGE
CVOL
10
100
1000
BIT SIZE
20
0
0
BIT SIZE
20
(in)
(in)
CASING SIZE
20
0
0
CASING SIZE
20
CSG
1300
GR
CHT
BIT
BIT

Key BW-28 Cavern Superimposed on the Apache NEDU 544D Located 600 ft west of Brine Well. As Orginally Completed w 2074' of 2-7/8" FG Tubing Aug 96



BW-28 Mass Balance

Measured Salt Removed vs Calculated Salt Removed

Independent Inputs

Formulas

Dependent Variables

2017 year End total Production Volume	5,526,794	BBls	Independent variable
Average Density #/gal produced water measured	9.92	lbs/gal	Independent variable — Seven year Average
Average Salt Density-Est	80	lbs/ft3	Independent variable — Used OCD number for salt density
FT3/bbl	7.35	ft3/bbl	Independent variable
LBs of salt per gal	1.586	Lbs/gal	Dependent Variable
LBs of Salt per BBL	87.23	Lbs/bbl	Dependent Variable
Total LBs of Salt Removed	482,102,241	LBS	Dependent Variable
Ft3 of salt removed	6,026,278	Ft3	Estimated Cavern Size calculated from Production Numbers

Geo-Physical Worst Case Cone Calculation			
V= ∏R2h / 3			
Radius	Radius	79 ft	Dependent Variable
	Height from Log	840 ft	Independent Variable
Volume of Worst Case Cone		5,487,087 Ft3	Calculated using "Worst Case Cone"

9% Within 10 % Passes

" Plus % = Means Cone Calulation is less than measured salt removed

" Neg % = Means Cone Calculaton is more than measured salt remove